



Catalog

Optical electronic sensors



The Company

For almost four decades, Leuze electronic has been working in the field of optical sensors. Today, as a specialist in this area, Leuze is able to offer one of the biggest product pallets reaching from the photoelectric sensor, devices for work place security to identification systems. Production facilities and sales offices in all important countries exemplify the extraordinary market presence.

When it comes to innovations, Leuze can refer to the know-how of their own technology facilities: of Leuze lumiflex in Munich, which has been dealing with optical-electronic protective devices for workplace safety for more than 20 years and Leuze optoelectronic in Unterstadien, a specialist for the manufacture of electronic components.

Today our products are used in almost all areas of industrial automation. They can be found in the storage and conveyance technology as well as in the packaging, food and beverage industry, in the production facilities of the automobile industry, in paper and lumber industry or in textile, tool machines or robots and production facilities.

Our customers and their needs are in the center of attention when we think of our products and new developments. Through this we become specialists even for very specific problem solutions. We ourselves profit from the practical experiences of the direct customer contact and reinvest this knowledge for example in new products.

Of course we are taking our time for consultations which are especially important for technically demanding products. We are aware of the fact that most times it is not sufficient to have a talk on the telephone hotline to solve all problems.

We react flexibly to new trends in the automation technology. By concentrating on optical sensors, optical sensor technology for work place safety, and identification systems for logistics tasks, we are able to meet current market requirements upon release and offer "tailored" solutions for almost any application.

The highest possible product quality and reliability are a matter of course for us. High-Tech manufacturing procedures and a time-tested quality management system are building the basis for this. The companies of the Leuze electronic group are certified acc. to ISO 9001.



Leuze electronic, Owen

Leuze electronic is not a name, Leuze electronic is a common term. At least it has become one. Ever since its founding almost 40 years ago, Leuze has striven to be cut above the competition through innovative standards, uncompromising attention to quality and, even then, an impressive orientation towards customers.

Our production facilities are state of the art and help us to live up to our "High-Quality" standards. Our world-wide presence is maintained through numerous subsidiaries, located in all important industrial centers around the globe.

Hotline



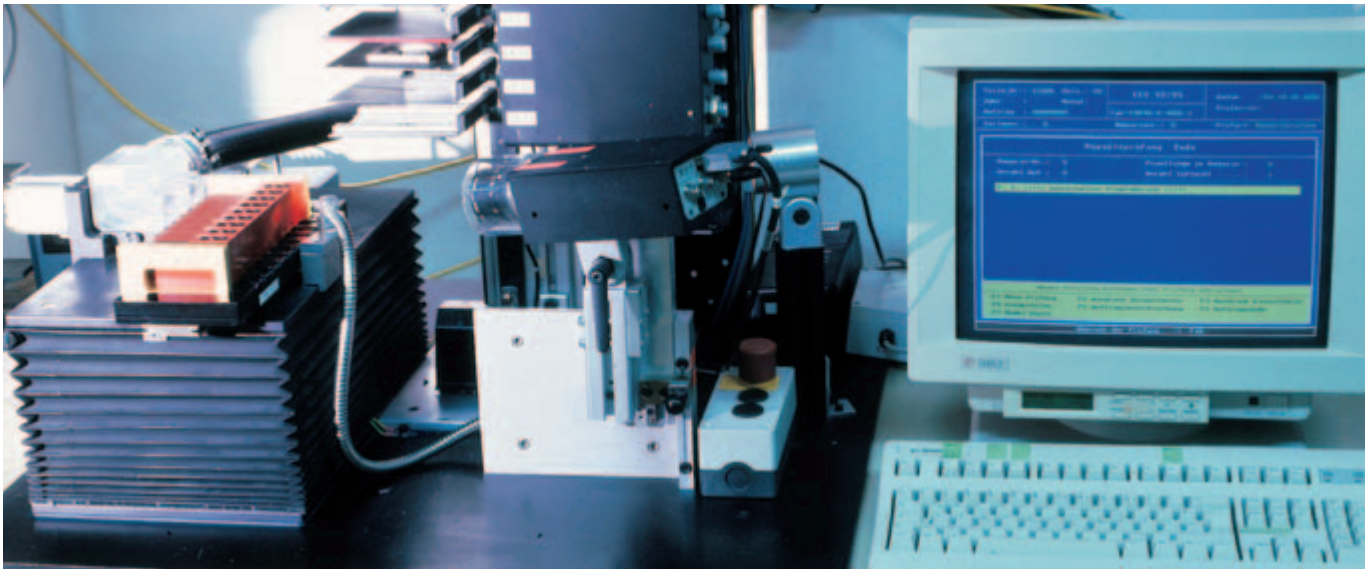
Questions? Please call!

Hotline:
Phone +49 7021/573-217

Centre:
Phone +49 7021/573-0

24 hours emergency service:
In case of an emergency, a special service is available.
Phone +49 7021/573-0

We reserve the right to make changes without prior notice.



Research and development

New products are developed through intensive co-operation with the users. Therefore, most times we are just a little faster with new developments, we are able to focus on actual market requirements, and make special customer-specific product ideas come true. There are convincing examples of the ability and capability for innovation which our research and development team possesses.

The first optical data transceiver for wireless data transfer and the first surface optical distance sensor were produced by us. In order to meet future challenges, we will continue to invest strongly in research and development.

High-end products and quality

Rapidly changing working processes are always a new challenge for optical electronic sensors. In the meantime, much more than just the switching function is expected from photoelectric sensors and their optical electronic relatives. Our developers have always read the symptoms of our time at an early stage.

Due to intensive research in modern technologies we are today able to offer solutions to engineers of machines and plants for even the most complicated applications. When it comes to quality, we do not accept any compromises, no matter if high-tech products or simple sensors are handled.

Greatest possible care during manufacture are the guarantee for reliability and safety. Metal housings and glass optics characterise our robust photoelectric sensors. Even rough environmental conditions cannot harm our powerful sensors.

Great performance reserves and careful selection of the components secure reliability and long working life with respect to the "electrical inner-life" of the devices. Highly developed testing methods guarantee uniform quality. Our quality management has been certified acc. to DIN EN ISO 9001.

Service and consulting

The more powerful modern optical sensor technology becomes, the more important become service and customer assistance.

Therefore, support dealing with different applications is very important to us. A dense network of continuously trained, technically oriented field engineers guarantees optimal on-site support.

In addition to that, our engineers are answering any question on the telephone hotline and our technical application laboratory is available for customer support at any time.

The customer newspaper "Contact", many articles in trade journals, and target-oriented product information do their share to provide important practical knowledge.





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Accessories

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Further product range

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Optical Sensor ABCs

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Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

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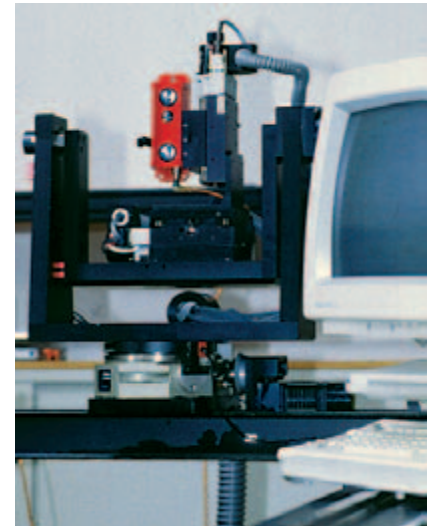


Optical sensor ABCs

Almost nothing runs in modern industrial facilities without automation. Optical electronic sensors are the "eyes" of the control systems used in these facilities. The wide variety of applications requires a corresponding variety of solutions.

The optical sensor ABC and the selection tables shall assist you in selecting the right sensor.

You will find here explanations on the different optical sensor types, the additional functions and a lot of information for the practitioner.





Optical sensor types

The wide variety of photoelectric sensors with their varying function characteristics solves almost every "detection problem". The following explanations shall assist you in making the right selection for the corresponding application.

The following symbols are used for easy selection of the different optical sensors.

Fundamentals



Throughbeam photoelectric sensors
Protective throughbeam photoelectric sensors
Forked photoelectric sensors

LS...
SLS...
GS...



Retro-reflective photoelectric sensors
with polarisation filter

RK...
PRK...



Diffuse reflection light scanners
Energetic

RK...
RT...



Diffuse reflection light scanners
with background suppression

FRK...
HRT...



Optical distance sensors
Ultrasonic distance sensors

ODS...
HRTU...
VRTU...



Contrast scanner

KRT...



Colour sensors

CRT...



Luminescence scanners

LRT...

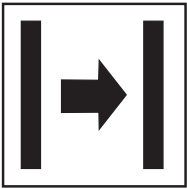


Fibre optic cable control devices
Glass fibre optic cable
Plastic fibre optic cable

LVS...
GF...
KF...



Throughbeam photoelectric sensors



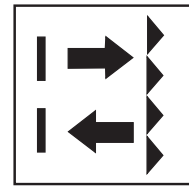
Throughbeam photoelectric sensors consist of transmitter and receiver, which are contained in separate housings. The beam of the transmitter travels the whole light path only once, therefore, long operating ranges are possible when using throughbeam photoelectric sensors. If choosing the correct device, throughbeam photoelectric sensors are especially suited for applications under difficult conditions, e.g. if heavy contamination occurs or out in the open.

The installation is more extensive than with retro-reflective photoelectric sensors as both the transmitter and the receiver must be electrically wired.

Forked photoelectric sensors also belong to the group of throughbeam photoelectric sensors.

Because both transmitter and receiver are integrated in the "fork", an alignment of the optical axis is not necessary. Typical applications include the scanning of punched disks or labels, conveyor belt edges or switch lugs.

Retro-reflective photoelectric sensors

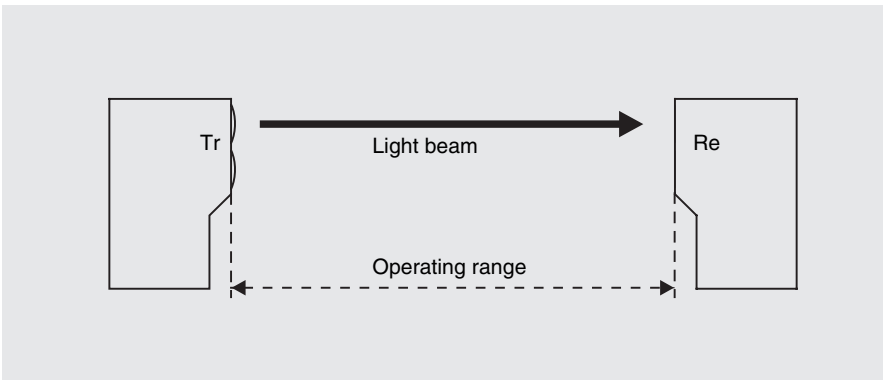


With retro-reflective photoelectric sensors, the transmitter and receiver are combined in one housing. The beam of the transmitter meets the reflector and is redirected to the receiver of the photoelectric sensor. The electrical wiring is therefore only required on one end of the light path.

Retro-reflective photoelectric sensors with polarisation filter

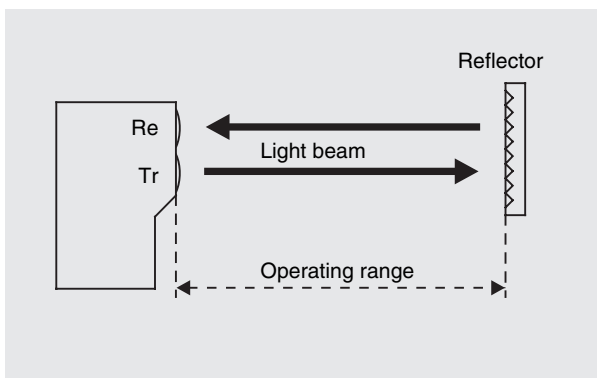
Highly reflective objects, such as mirror-like metal parts could cause switching errors if using standard photoelectric sensors. If retro-reflective photoelectric sensors work with polarised light, those problems are avoided.

The polarised light of the transmitter meets the reflector, which "rotates" the plane of polarisation by 90°. The receiver recognises only this light from the reflector. The receiver is not tricked by "false" light reflected directly by the object because its plane of polarisation was not changed.

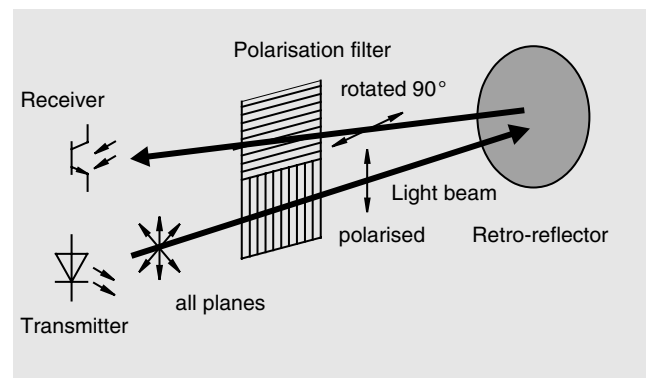


With throughbeam photoelectric sensors, the beam of the transmitter travels the whole light path only once.

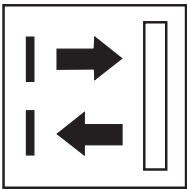
Operating principles



Retro-reflective photoelectric sensor: transmitter and receiver are located in one housing. The reflector returns the transmitted light to the receiver.



Retro-reflective photoelectric sensor with polarised optics, the receiver only recognises the light rotated 90° by the reflector.

Energetic diffuse reflection light scanners


With diffuse reflection light scanners, as well as with retro-reflective photoelectric sensors, transmitter and receiver are located in one housing.

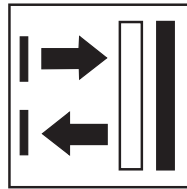
The transmitter's beam however, is returned by the surface to be scanned itself. The scanning range of such a sensor is depending on its performance abilities and the reflection properties of the scanned surface.

An energetic diffuse reflection light scanner can detect a bright, reflective surface over a greater distance than it can detect a dark, poorly reflective.

When choosing a device, the user should be aware of the fact that the scanning range as mentioned in the data sheet refers to the maximum possible working range based on white paper.

Diffuse reflection light scanners are used primarily where neither a receiver nor a transmitter can be mounted.

Another application area for diffuse reflection light scanners is the detection of objects with different reflective properties, e.g. dark print-marks on light background.

Diffuse reflection light scanners with background suppression


The construction of diffuse reflection light scanners with background suppression uses multiple receiver elements and thus takes into account the relation between transmitter and receiver elements.

The geometric relation created makes these sensors less susceptible to varying object and background colours.

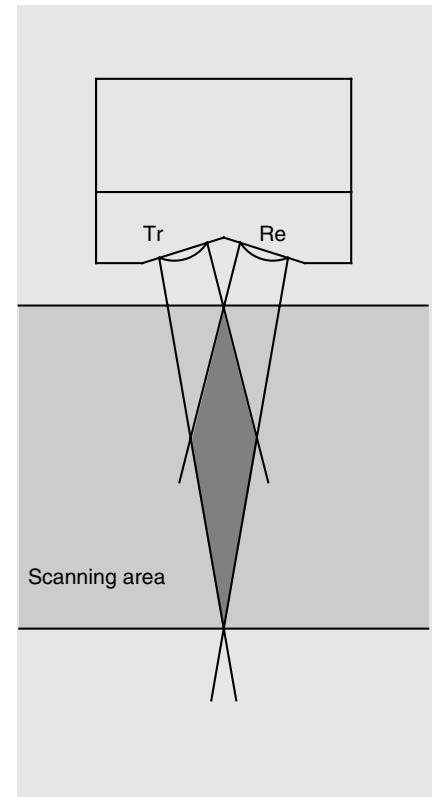
The scanner is set to the respective scanning plane electronically or mechanically and then recognises only objects in front of this scanning plane.

Even the smallest objects < 1 mm can be reliably detected through the use of laser transmitter diodes.

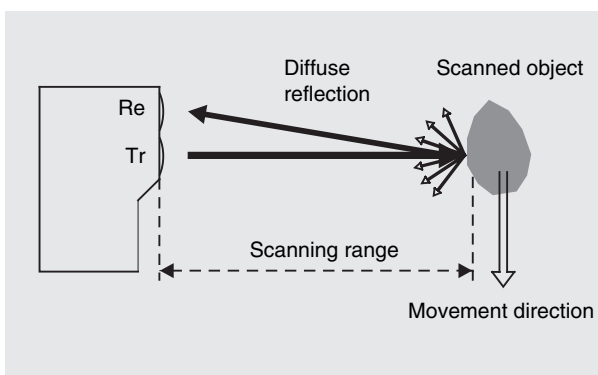
When using diffuse reflection light scanners with background suppression, the fitting position has to be taken into consideration. Moving and shining objects in the background can cause interference. This interference can be minimised by mounting the sensors in an inclined position.

Diffuse reflection light scanners with V-formed optics

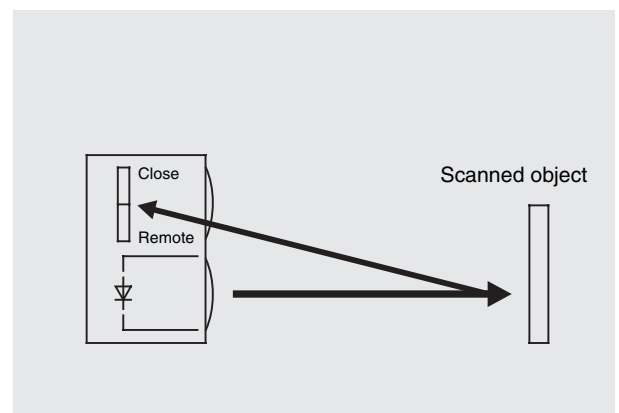
A special variant is the diffuse reflection light scanner with angled or V-formed optics. The scanning range is defined by an area overlapped by the transmitter and receiver beams. The advantages are reliable detection of objects with different reflectance factors combined with a relatively good background suppression.



Diffuse reflection light scanners with V-formed optics

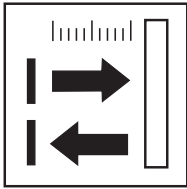


The transmitted light is directly reflected from the surface.



Diffuse reflection light scanners with background suppression

Optical distance sensors



These sensors function with red, infrared or laser light.

Through the use of various receiving elements, such as CCD lines or a PSD element, the performance of the sensor can be adapted to the application or the given requirements.

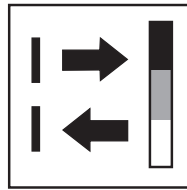
With these devices, various measurement techniques are used for distance determination. These include, among others: triangulation, phase measurement and the pulse propagation time technique. The accuracy of the measurement result is almost completely independent of differences in object colour. All systems can be adapted to a given application using programming software.

The switching signals or distances are made available via digital, analogue or serial outputs of the machine controller. Connection to a fieldbus system is also possible.

Ultrasonic distance sensors

With these sensors, acoustic waves are transmitted and are reflected by the objects which are to be detected. The propagation time of the acoustic waves reflected back to the sensor is measured and the distance to the object calculated. This physical principle is particularly well suited for the detection of fluid-, powder-, and transparent media. The switching signals and distance information are available via digital or analogue outputs. Application-specific parameters can be set directly on the sensor using programming software.

Contrast scanners

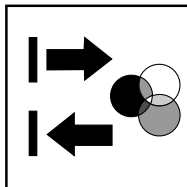


Contrast scanners are high-resolution, energetic diffuse reflection light scanners which differentiate between objects and/or object colours by grey values. This means that the brightness and shininess of the object or object colour strongly affect the measurement result. Contrast scanners have focusing optics and a special light-spot geometry. In order to detect slight variations in grey value, the distance to the object must not change. The resolution decreases with increasing scanning range.

If different object colours are illuminated with the same transmitter colour, these may return the same grey value. In this case, positive differentiation is not possible. To avoid this, various, automatically switching transmitter colours are used.

With these characteristics, it is possible to, for example, detect any markings on any background.

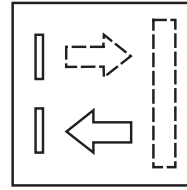
Colour sensors



Colour sensors are diffuse reflection light scanners which break down object colours into their different spectral components using a special combination of transmitter light. The different spectral composition of the received light is analysed by the sensor and compared with values stored previously in the sensor. If all spectral components match, the colour is considered detected.

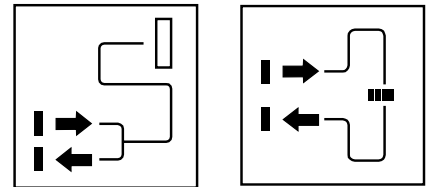
This process can be used for opaque as well as transparent objects. For shiny objects, the sensor must be oriented at an angle of 10 ... 15° to the object.

Luminescence scanners



Luminescence scanners are energetic diffuse reflection light scanners which illuminate luminescing materials by means of their special UV transmission light. The resulting visible light is detected by the luminescence sensor. Some of these luminescent materials are invisible and are available in a variety of solid and fluid forms. These can be used to make markings which are invisible under normal lighting conditions.

Fibre optic sensors



A speciality of modern optical electronics are fibre optic sensors. The complete functionality of the photoelectric sensor is located in one controlling device.

This determines the electrical key data of the system. The special thing about fibre optic cable control devices is that the light of the transmitter element is transported to the place to be scanned and back to the receiver element (both in the control unit) through the fibre optic cable.

The transporting effect of the light is based on a total reflection. This happens always when light comes in contact with a medium having a lower optical density than the medium in which it is travelling. In a cylindrical fibre, the light undergoes total reflection as it is reflected back and forth. As a result, the light can follow the bends of the curved fibre optic cable.

Fibre optic sensors made of glass as well as plastic are available, functioning on the throughbeam and scanning principle. Depending on the application requirements and the environmental conditions at the place of application, a selection from the extensive range of products should be made.

Mini photoelectric sensors

The mini photoelectric sensors are well suited for installation locations with limited space. These are commonly known as "conventional", photoelectric sensors without amplifiers in miniature format. Their small construction and the extremely small bending radius of the connection cables facilitate installation even in places which are difficult to access.

Through the possibility to choose from a number of amplifiers of different sizes and functions, adaptation to any kind of application is especially easy.

Optical sensors with additional functionality

Today, optical sensors can do much more than just detect objects. The advances in electronics and micro-electronics have also left their footprints in photoelectric sensor technology. As a result the sensors have become "intelligent" and offer numerous useful options. These functions simplify sensor use and have created entirely new application possibilities.

Contactless active protective devices



A contactless active protective device (AOPD) is designed for machines with possible risk of injury. It offers protection by telling the machine to move into a safe operating state before a person can get into a dangerous situation.

To choose the right protective device, the following has to be observed:

- the possible state of injury
- the duration of time spent by a person in the hazardous area
- the possibility to prevent dangers

Depending on the safety requirements, two different categories are possible:

- Contactless active protective device with testing function: Category 2.

On these systems, the functional safety is checked through cyclically reoccurring, external testing pulses.

- Contactless active protective device with self-monitoring: Category 4.

On these systems, the functional safety is permanently checked through self-monitoring. It is the responsibility of the machine manufacturer and/or user to determine with which standard the respective application is to be measured.

Automatic contamination control: autoControl

Though optical sensors function reliably, they are not immune to damage, misalignment or contamination of their optics.

Monitoring circuits protect against such "accidents" by warning the user in good time. Such a warning signal has many advantages in practical life. It indicates interference before an error can occur. Therefore, precise maintenance work is possible; unnecessary procedures are avoided. It is possible to differentiate between two operating principles: time dependent and counting.

With time-dependent monitoring, an integrated monitoring circuit measures the time the signal spends in the critical brightness range and triggers the warning signal as required.

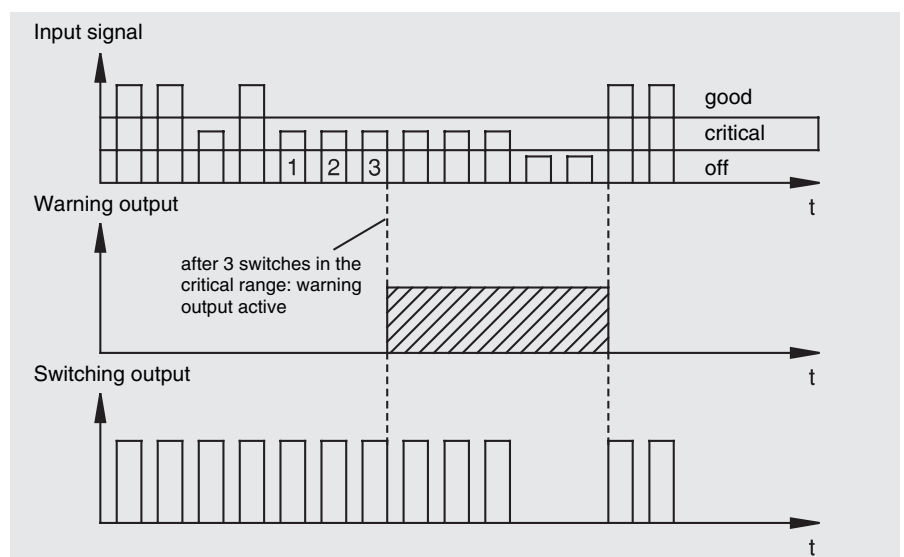
This time-dependent method, however, is only suitable for static applications.

Dynamic processes can cause "false" error messages. For this purpose, a testing circuit, which works on a counting basis is better suited.

The patented autoControl testing circuit monitors the input pulse and detects possible impairment by counting the reduced incoming signals. If the incoming light signal is at a reduced level for three consecutive switching cycles, this critical function status is evaluated as a negative trend and the warning signal output is activated.

At this point in time, the switching function of the optical sensor is not yet impaired. Therefore, targeted maintenance measures can be taken before a complete system failure occurs. If the signal is within limits again, the warning output is reset automatically. During short-term interference, this means if the light reception is reduced less than three times, the warning output is not activated.

Options



Counting operating principle (autoControl)

AS interface


The AS-interface is an optimised bus system for the lowest field level of the automation technology

Aim of the AS-interface is the cost saving connection of binary sensors and actuators to a primary controller. Voltage supply and data exchange pass through the same (unshielded) two-wire connection. Bus-compatible sensors with integrated AS-i chip can be connected directly to the bus; connection of common sensors is possible through so-called coupling modules.

The tree structure of the AS-i bus system as well as the technical key features enable a considerable reduction of expenditures during wiring and installation. The AS-interface is therefore a future-oriented alternative to standard parallel wiring.

Housing

Photoelectric sensors are located in either a robust plastic or metal housing.

Especially under rough operating conditions, the use of metal-type devices which offer special protection against mechanical and chemical influences is recommended.

Optics

The light outlet surface of a photoelectric sensor is, depending on the model, made of plastic or glass. Covers or optics made of hard glass fulfil the highest requirements. They are resistant against detergents, chemicals and scratching.

To increase the effectiveness of the optics and to reduce the effects of possible contamination, glass as well as plastic optics have the largest possible surface area.

Diaphragms

In order to detect small objects over great distances, appropriate pin or slit diaphragms, which are fitted on the transmitter and receiver, are offered for some throughbeam photoelectric sensors.

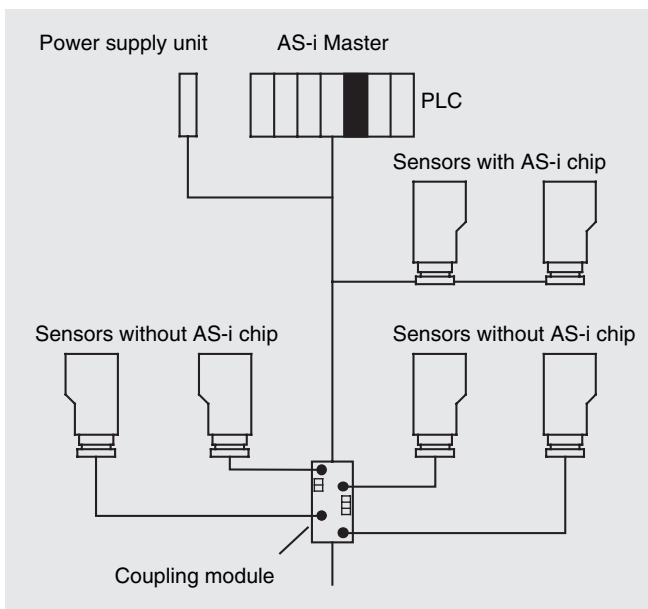
As a result e.g. drilling bits can be safely detected even at a distance of several meters. The size of the diaphragm is dependent on the size of the object and the required range.

Protection classes

In order to make the protection of housings against foreign objects and water comparable, the protection classes have been defined in DIN 40050. The first digit refers to the protection against foreign objects, the second to water protection.

Almost every sensor is dustproof and protected against immersion.

Equipment



Bus coupling

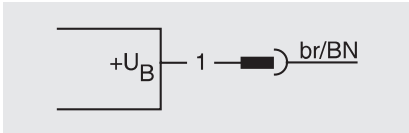
First digit	Contact protection and foreign object protection	Second digit	Water protection
0	No special protection	0	No special protection
1	Against large foreign objects, dia. > 50mm	1	Against vertically falling water drops
2	Against medium foreign objects, dia. > 12mm	2	Against angled falling water drops (up to 15° from vertical)
3	Against small foreign objects, dia. > 2.5mm	3	Against sprayed water (up to 60° from vertical)
4	Against corn-formed foreign objects, dia. > 1mm	4	Against splashed water from all directions
5	Dust protected; dust deposits permitted but not in quantities which interfere with the function of the device	5	Against water jets from a nozzle from all directions
6	Dust proof	6	Against flooding
		7	Against dipping
		8	Against submerging

Protection classes acc. to IEC 529 and/or DIN 40050

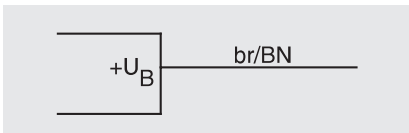
Connection types

There are three common types of connection for optical electronic sensors: plugs, cables or terminals.

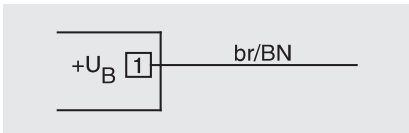
The three different possibilities can be easily identified in the connection illustrations of the individual devices.



Devices with this connection diagram are connectable via plugs. Ready-made cables with fitting connectors are available for almost every sensor.



These devices have a cable connection, usually with a 2m cable. Special cable lengths are available upon request.



Devices with this connection diagram are equipped with screw terminals. Cables are fed through PG cable glands.

Switching delay

Photoelectric sensors or amplifiers with integrated switching delay work with slow operation and/or slow release. Slow operation is used if short events need to be suppressed. Slow release prolongs the duration of the output signals which is often necessary for control purposes.

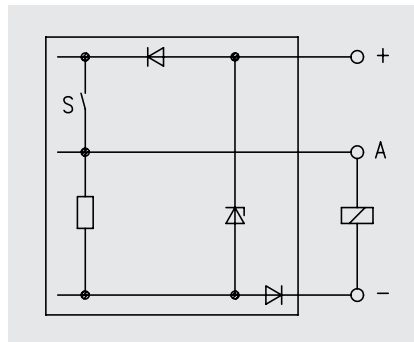
Outputs

Optical electronic sensors are most commonly offered with relay or transistor output. Relay outputs with changeover contacts are the most universal, however, they also have their disadvantages: relays require a large amount of space, their time delays cannot be accepted in every application, and, due to their moving parts, their operating life is limited.

The user can choose between NPN, PNP and push-pull type transistor outputs. It is therefore optimally compatible with the respective control system to be connected.

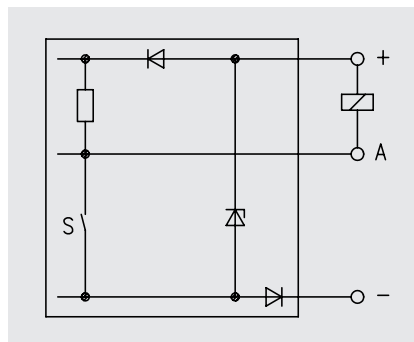
PNP transistor outputs

The PNP transistor output is a high-impedance switching output with open collector. It switches positive potential to the connected load.



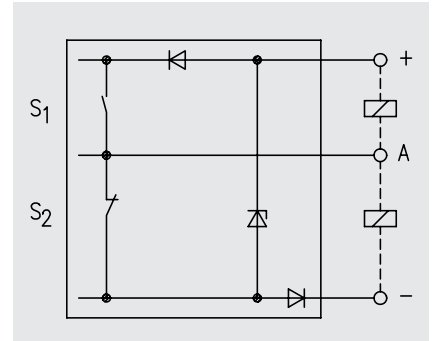
NPN transistor outputs

The NPN transistor output is a high-impedance switching output with open collector. It switches GND to the connected load.



Push-pull transistor output

This type of transistor output has a low impedance and is immune to interference (push-pull technology). The outputs can be used in connection with both, PNP and NPN control systems. The output automatically recognises the connected hardware. Symmetric response behaviour is a further advantage. Push-pull outputs must not be connected in parallel.



Short-circuit protection

Transistor outputs are usually short-circuit proof. This is achieved by monitoring the output current and, should it exceed a certain level, cutting off the supply to the transistor.

The information on the maximum current given on the data sheet have to be observed despite the short-circuit protection.

Sensors with laser transmitter



(LASER = **L**ight **A**mplification by **S**timu-
Lated **E**mission of **R**adiation)

Laser diodes as sensor light source enable the realisation of higher operating and scanning ranges with small beam geometries.

Red light laser diodes offer the advantage of fast function control and alignment. The beam output is expressed by the laser class. On sensors of the laser class 1 + 2, no additional protective measures are specified.

Laser safety classes

Laser-specific regulations are included in the European Standard EN 60825 - Safety of Laser Devices. The products are divided into danger classes according to the intensity of the laser light and the safety measures contained either within the device or to be provided outside of the device.

Class 1:

The accessible laser radiation is not dangerous - integrated safety by means of constructive measures such as laser power monitoring

Class 2:

Due to low transmitting power, the accessible laser radiation is usually not dangerous. Natural reflex reaction (eyelid closure) is usually adequate eye protection.

Class 3A:

Looking directly into the laser beam with optical aides, such as a telescope or magnifying glass, may be dangerous.

Class 3B:

Looking directly into the beam in the vicinity of the laser is dangerous

Class 4:

High laser power - even diffuse reflection may be dangerous, e.g. for skin and eyes.

Laser security

For the use of laser products of Leuze electronic, the standard IEC 60825-1-am2 applies: Do not stare into the beam - not even with optical instruments.

In connection with visible beams, eye-protection is usually guaranteed through the eye lid closing reflex. The standard prescribes that the laser beam path should be closed at the end of its purpose-oriented way, where this is practically and responsibly possible. Do not point the laser at people (head level).

Application of laser optical sensors

All laser sensors work with small light spots. Through this, a corresponding object resolution and exact positioning is achieved.

In order to use these advantages, throughbeam and retro-reflective photoelectric sensors are equipped with a mechanical focus adjustment (collimator).

Through this, the light spot can be optimally adjusted to the application over the complete working distance.

Laser optical sensors

Parallel and serial connection

A direct logical linking is possible on optical sensors with PNP or NPN transistor outputs. Through internal protective circuits, up to ten sensors with equal output potential (PNP or NPN) can be connected to a parallel circuit. This can be useful for, among other things, collective messages (e.g. from warning outputs).

An activation input is needed in order to connect several sensors in series.

That means that, for example, the PNP output of the first device has to be connected to a "positively" activated input of the second device etc.

Both parallel and serial connection can be performed directly on the devices with PNP or NPN transistor outputs. This reduces wiring requirements and PLC capacity in the form of inputs and outputs.

Parallel connection of optical sensors with push-pull transistor output is not permitted.

Alignment of optical sensors

The optimal alignment is absolutely required for fault-free function characteristics.

With throughbeam photoelectric sensors, the transmitted beam should meet the receiver's optics as centrally as possible. For this purpose, the light beam is to be corner-cut from all four directions, e.g. with a piece of cardboard.

When optimally aligned, the receiver switches with symmetric shadowing. In connection to large ranges, a laser alignment device simplifies the adjustment. For some devices, special alignment and mounting parts with three-point adjustment are available.

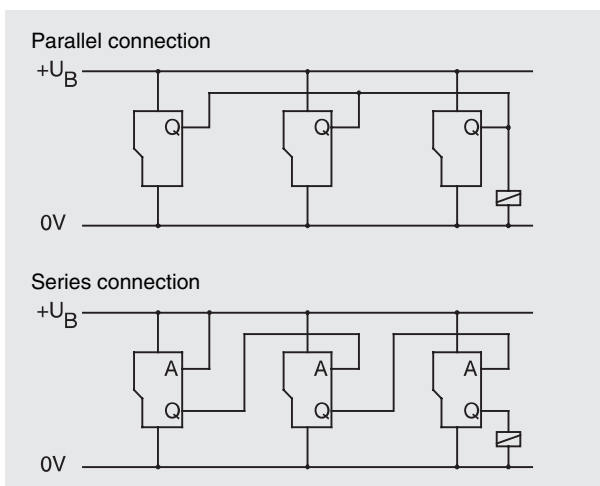
There are two possibilities for adjusting a retro-reflective photoelectric sensor: the user can cover all four sides of the reflector with an object until the photoelectric sensor output switches. The forward switching points are symmetric if the alignment is optimal. The second possibility involves covering the outer area of the reflector with non-reflective material, then aligning the photoelectric sensor (the material is removed upon conclusion of the procedure). When mounting the reflector, it is essential to observe that it is fixed at right angles towards the light axis. However, variations of up to 15° are unproblematic.

Sensors with red light LED or red light lasers offer simple function control and in addition to that fast and simple alignment.

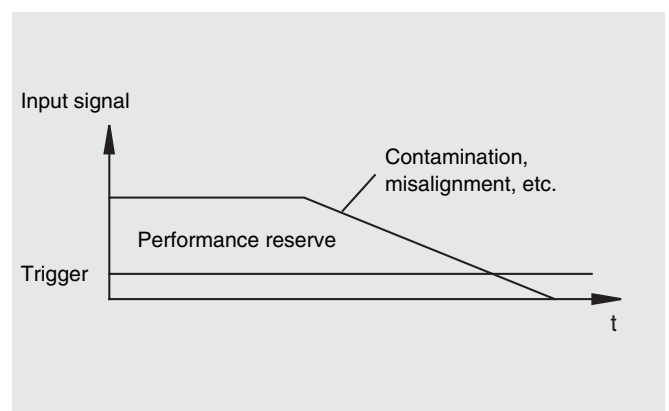
Performance reserve

Receivers of optical sensors require a minimum amount of light to be able to switch (trigger). All light over and above this minimum amount is designated as "performance reserve". A distinction must be made between the internal performance reserve and the performance reserve selected by the user. The internal performance reserve provides the user with additional security that the information given on the data-sheet is not the limit of what is actually possible. If, in individual cases, heavy contamination can be expected, the user should provide additional performance reserve by selecting the sensor with the next higher operating range.

Application



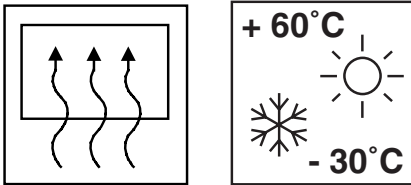
Parallel and serial connection



Performance reserve: the light intensity during normal operation is clearly above the minimum value required by the receiver to trigger.



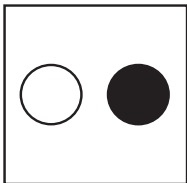
Optics heating and low-temperature versions



Optical sensors are designed for a broad temperature range. Extreme conditions, e.g. intense cooling plants, permanent outdoor installation or on gates and sluices with frequent high/low temperature transitions, require special low-temperature versions with optics heating.

With permanent optics heating in the front cover, the sensors of, for example, the series 96 can maintain a "clear view" and ensure proper operation all the way down to a frosty -35°C.

Light and dark switching



With light switching optical sensors, the transistor is switched through if the light path is free and disabled if the light path is interrupted.

With dark switching sensors it is the other way around. Many photoelectric sensor types offer the choice between light and dark switching variants.

Optical sensors with changeover relay are usable in both operating modes. The user chooses through the respective connection.

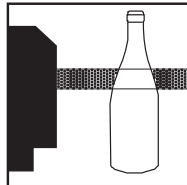
Static - Dynamic

The optical sensor output directly follows the light reception during static operation. During dynamic operation however, the optical sensor reacts to the change of brightness. A signal of a certain length is deducted from the change of light to dark.

Dynamic optical sensors are suitable for applications which would otherwise deliver impulses too short for evaluation.

A typical application would be the monitoring of thin thread on spinning machines. The torn thread passes through the light path only once.

User guidance



For detection of highly-transparent objects, special retro-reflective photoelectric sensors have to be used. Adjustment of these photoelectric sensors is normally very time-consuming and varies from sensor to sensor.

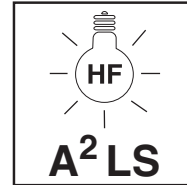
With user guidance, adjustment happens without an object. Through this, a fast and always reproducible adjustment is achieved. For PET, clear and coloured glass, separate operating points are set within the sensor.

Tracking: Automatic contamination compensation



Sensors for the detection of transparent objects such as foils and glass surfaces are very sensitive to soiling due to their detection characteristics. The tracking function compensates for this gradual soiling. The sensor determines the current reception level and compares this with the initial reference value. In this way, the regulator compensates not only for the soiling, but also for the elevated signal level which occurs after cleaning without the need for new system calibration. It is no longer necessary to stop the machine. In addition, this tracking function makes possible automatic sensor commissioning. Commissioning calibration in the form of a teach-in is no longer necessary. The maintenance intervals are extended considerably.

A²LS: Active suppression of extraneous light for optical sensors

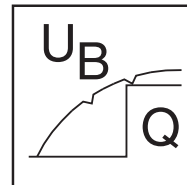


A²LS is the acronym for **Active Ambient Light Suppression**, the active suppression of extraneous light. And it functions as follows:

An optical sensor transmits and receives light at a specific signal frequency and phase. If the sensor detects ambient light which is similar in frequency and/or phase of its own sensor signal, the optical sensor actively and automatically changes its signal or the phase. A high degree of permanent detection reliability is achieved in this way.

As a result, not even the pulsed light from energy-saving lamps or other optical sensors has a negative effect on the A²LS optical sensors.

Delay before start-up



During connection respectively disconnection of the operating voltage to a sensor, different internal standardising procedures are performed. The device is not working during this period. Also during this phase, a short, undefinable output pulse can be generated. The delay before start-up suppresses sensor operation until all device-internal preparations have been concluded. This process takes approximately 50 to 200ms.

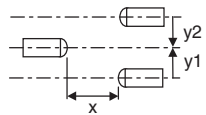
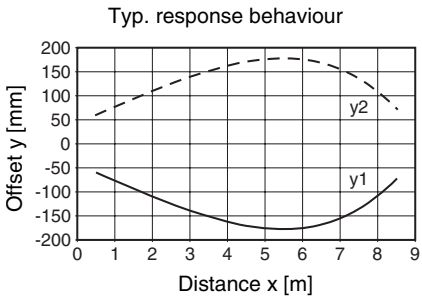
Special functions

Typical response behaviour

Throughbeam photoelectric sensors:

The diagram illustrates the possible offset of the optical axis from the transmitter and receiver as a function of their distance.

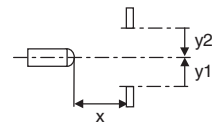
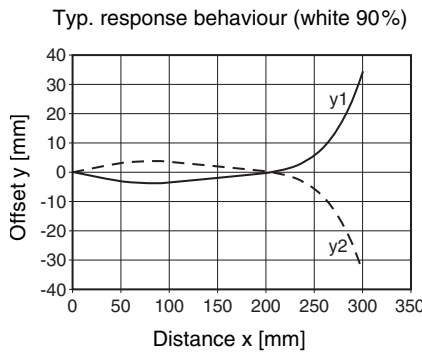
Detection by the transmitter and receiver takes place within the two curves.



Energetic diffuse reflection light scanners and diffuse reflection light scanners with background suppression:

The diagram illustrates the possible offset of the optical axis of the sensor and the boundary of the measured object (90% white) as a function of distance.

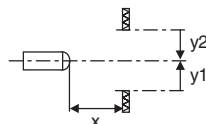
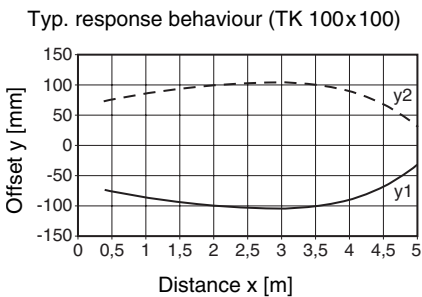
With larger distances, the edge of the measured object must cover the optical axis in order to be detected.



Retro-reflective photoelectric sensors:

The diagram illustrates the possible offset of the optical axis of the sensor and the boundary of the reference reflector TK 100x100 as a function of the distance.

The sensor is detected by the reflector within the two curves.



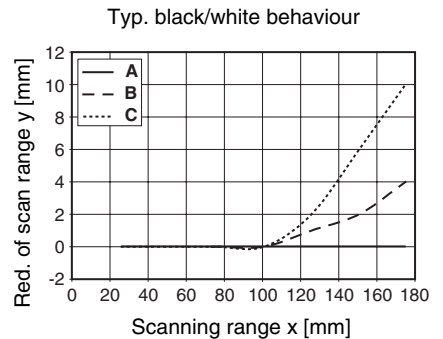
Typical black/white behaviour

Diffuse reflection light scanner with background suppression:

The diagram illustrates the reduction of the scanning range of different-coloured measured objects relative to a white measured object as a function of distance.

In the diagram, the scanning range reduction from black (6% diffuse reflection) and grey (18% diffuse reflection) relative to white (90% diffuse reflection) is plotted.

In this example, a scanning range reduction of 8mm relative to black is read for a scanning range setting on the sensor of 160mm. Thus, the sensor has a scanning range of 152mm on black.



- A white 90%
- B grey 18%
- C black 6%

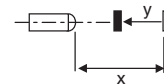


Diagram types

Optical sensors for the potentially explosive area



In order to use optical sensors in potentially explosive atmospheres, it is necessary to take constructive measures to avoid the explosion of an inflammable mixture even if an error occurs. The principle of such a measure is marked by the protection method (examples: pressurisation or intrinsic safety).

The protection method intrinsic safety is available for all sensor operating principles. They are examined and equipped with the respective certificate of conformity. They also conform to the standards of the BG-Chemie.

Intrinsically safe optical sensors

An intrinsically safe circuit must never, neither in normal function nor in abnormal conditions, release sufficient ignition energy which can through

- sparks (opening, closing, short circuit, ground contact)

or

- extreme heating of the operating material and conductors

cause an ignition of the surrounding explosive atmosphere.

Switching amplifiers take over the function of dividing the explosive area and the safe area. The connection to the sensor is done via the NAMUR-interface acc. to DIN 19234. The different switching amplifier types differ with respect to operating voltage and output. Via DIP switches the output signal can be inverted (light/dark switching) and wire-break or short-circuit monitoring can be activated.

CE labelling



An important goal of the European Union (EU) is free trade and the standardisation of applicable regulations within EU member countries. To achieve this aim, the European parliament has enacted certain guidelines.

89/392/EWG machine standard

89/336/EWG EMC standard

73/23/EWG low voltage standard

If a product falls under one of these guidelines, it must, after a certain period of time, only be placed on the market if it meets the requirements of the respective guideline. The product also has to be marked with the CE label. The CE label certifies the conformity to the applicable standards.

All listed products are equipped with the CE label.

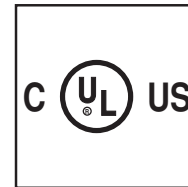
Standards

For optical sensors, there are independent, harmonised product standards on both national and international levels. These product standards ensure adherence to the corresponding basic and specific standards.

Among other topics, optical sensor functions, construction requirements, pin assignments, temperature ranges, protection classes, electromagnetic compatibility as well as vibration and shock load are described in these standards.

The applicable international guideline is the IEC 60947-5-2, for Europe EN 60947-5-2, national (German) VDE 660 part 208.

C-UL-US labelling



Products with this label meet the requirements specified by UL (Underwriters Laboratory Inc.) for both the USA as well as Canada. The adherence to the specifications is checked during periodical audits by the UL officials or their representatives.

Standards and certification





Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

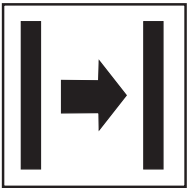
Further Product Range

Appendix – Index



Cubic Sensors - Selection Tables Overview

Table 1



Throughbeam photoelectric sensors

Transmitter and receiver are contained in different housings. The sensor beam travels the whole way only once. Large operating ranges are possible. Those devices are especially suited if heavy contamination occurs.

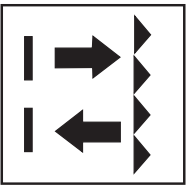
The Selection Table

Even though the product variety is huge, it is easy to find the right optical sensor for the corresponding application.

By using the clear selection tables, the correct device can be found in no time.

Basic questions are answered quickly with the optical ABC. In cases where technical problems can not be solved, the people at Leuze are available to serve you with their special knowledge.

Table 2



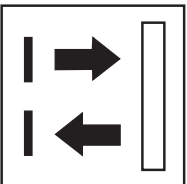
Retro-reflective photoelectric sensors

Transmitter and receiver are located in one housing. The beam of the transmitter meets the reflector and is retrodirected to the receiver of the photoelectric sensor. The electrical wiring is therefore only required on one side.

Hotline No.

+49 70 21 / 573-217

Table 3



Diffuse reflection light scanners

Transmitter and receiver are located in one housing. The transmitters' beam however, is returned by the surface to be scanned itself.

The scanning range depends on the sensor performance and the reflective properties of the material surface.

The Selection



Table 1 - Throughbeam photoelectric sensors

Figure	Series	Typ. operating range limit in m				
		10m	20m	80m	150m	450m
	303 Series	5 7				
	3 Series	8.5				
	406 Series	12				
	408 Series	14				
	713 Series	9 65				
	18 Series					
	8 Series	20 100				
	525 Series	11				
	95 Series	10 18 20				
	97 Series	6 9				












Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection					Housing			Options					Application		Page		
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment	Time delay	Low temperature/optics heating	Protective photoelectric sensor AOPD type 2	Dynamic	
•	•		•			•	•			1000Hz	•	•	•					•			•		•						45
•			•			•	•			1000Hz	•	•	•					•			•	•	•	•					63
	•		•			•				500Hz	•	•		•				•			•								87
	•		•			•				1000Hz	•	•		•				•			•		•						99
•		•	•			•				5000Hz	•	•	•					•	•				•	•	•				117
																													139
•		•	•			•	•			1500Hz 2800Hz	•	•		•				•	•				•						159
	•		•			•	•			1000Hz	•	•		•				•			•		•	•					201
•	•		•		•	•		•		200Hz 1000Hz	•	•		•				•				•	•	•			•		215
•	•		•			•	•			200Hz	•			•	•			•	•				•	•					261



Table 1 - Throughbeam photoelectric sensors

(continued)





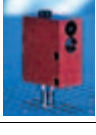





Figure	Series	Typ. operating range limit in m				
		10m	20m	80m	150m	450m
	46 Series	36		50		
	92 Series	16	26			
	93 Series					
	450 Series	25				
	72 Series	12				
	64 Series	30		60	120	150
	96 Series	39		65	150	
	85 Series	13	65		78	
	78 Series	150			180	450



Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection				Housing			Options				Application		Page				
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment	Time delay	Low temperature/optics heating	Protective photoelectric sensor AOPD type 2	Dynamic	
	•		•		•	•			•	200Hz	•	•		•				•			•	•	•				•		277
	•		•			•				200Hz	•	•		•		•			•			•	•						317
																													345
	•		•	•		•		•		20Hz 200Hz	•	•		•	•				•				•						361
	•		•			•	•			100Hz	•			•		•		•	•				•						381
	•	•	•			•				100Hz	•	•		•					•				•	•				•	397
•	•		•	•	•	•	•	•	•	20Hz 500Hz	•	•		•			•		•		•	•	•	•	•	•	•	•	407
	•		•	•		•	•	•		20Hz 300Hz	•			•		•			•			•	•				•		487
	•		•	•		•	•	•		20Hz 300Hz	•	•		•			•		•			•		•	•	•	•		513



Table 2 - Retro-reflective photoelectric sensors

Figure	Series	Typ. operating range limit in m				
		2m	5m	8m	16m	24m
	303 Series	1.2	5			
	3 Series	4	5			
	406 Series	5				
	408 Series	5				
	713 Series	5	7			
	18 Series	0.6	2.5	5		
	8 Series	2.4	8	21		
	525 Series	6				
	95 Series	3	6	12		
	97 Series	6				












Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection					Housing			Options					Application		Page		
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment	Time delay	Low temperature/optics heating	Polarisation filter	Transparent media	
•			•			•	•			1000Hz	•	•	•					•			•						•	•	45
•			•			•	•			1000Hz	•	•	•					•			•	•	•	•			•		63
•			•			•				500Hz	•	•		•				•			•						•		87
•			•			•				500Hz	•	•		•				•			•						•		99
•			•	•		•	•			2500Hz 5000Hz	•	•	•					•	•				•				•		117
•	•		•			•	•		•	1000Hz 1500Hz	•	•	•	•				•	•	•		•	•				•	•	139
•			•			•	•			1500Hz 2800Hz	•	•		•				•	•				•				•	•	159
•			•			•	•			1000Hz	•	•		•				•			•		•				•		201
•			•		•	•	•		•	1000Hz	•	•		•					•			•	•	•			•	•	215
•	•		•			•	•			200Hz	•	•		•	•			•	•				•	•			•		261



Table 2 - Retro-reflective photoelectric sensors

(continued)





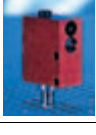





Figure	Series	Typ. operating range limit in m				
		2m	5m	8m	16m	24m
	46 Series	7		16		
	92 Series	2	12.5			
	93 Series					
	450 Series	8				
	72 Series	6				
	64 Series					
	96 Series	1.85	10		18	24
	85 Series	6		10		
	78 Series	7.5				



Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection				Housing			Options				Applica-tion		Page					
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment	Time delay	Low temperature/optics heating	Polarisation filter	Transparent media		
•			•		•	•			•	200Hz	•	•		•				•			•	•	•				•		277	
•			•		•	•			•	100Hz 500Hz	•	•		•	•			•	•			•	•	•			•	•	317	
																													345	
•			•	•		•		•		20Hz 200Hz	•	•		•	•				•								•		361	
•	•		•			•	•			100Hz 200Hz	•	•		•	•			•	•								•		381	
																													397	
•	•		•	•	•	•	•	•	•	20Hz 1000Hz	•	•		•			•		•		•	•	•	•	•	•	•	•	•	407
•	•		•	•		•	•	•		20Hz 200Hz	•	•			•				•			•		•	•		•	•	487	
	•		•	•		•	•	•		20Hz 100Hz	•	•				•			•						•				513	



Table 3 - Diffuse reflection light scanners

Figure	Series	Typ. scanning range limit in mm				
		100mm	200mm	500mm	1000mm	2500mm
	303 Series	60	120			
	3 Series		300	500		
	406 Series			500		
	408 Series				700	
	713 Series	120	150			
	18 Series					
	8 Series		200	250	800	
	525 Series	100		400		
	95 Series		150	230	500	900
	97 Series	100	150	200		












Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection			Housing			Options			Appli- cation		Page							
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment/ Scanning range	Time delay	Low temperature/optics heating	Background suppression	Focussing		
•			•			•	•			1000Hz	•	•	•					•												45
•			•			•	•			1000Hz	•	•	•	•				•									•	•		63
	•		•			•				500Hz	•	•		•				•						•						87
	•		•			•				100Hz	•	•		•				•						•						99
•			•	•		•	•			1000Hz 5000Hz	•		•					•	•					•			•	•		117
																														139
•			•	•		•	•			1500Hz 2800Hz	•	•		•				•	•					•			•	•		159
	•		•			•	•			1000Hz	•	•		•				•						•						201
•	•		•		•	•	•	•		200Hz 1000Hz	•	•		•					•				•		•		•	•		215
•	•		•			•	•			200Hz	•	•		•	•			•	•					•	•		•	•		261



Table 3 - Diffuse reflection light scanners

(continued)

Figure	Series	Typ. scanning range limit in mm						
		100mm	200mm	500mm	1000mm	2500mm		
	46 Series	140		600		1000		
	92 Series	300			400	900	1600	
	93 Series	23	65	170	210			
	450 Series	500						
	72 Series	340						
	64 Series							
	96 Series	700			1200	1800	2500	
	85 Series	300		800	2000			
	78 Series	300		800	2000			



Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection			Housing			Options				Application		Page					
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment/ Scanning range	Time delay	Low temperature/optics heating	Background suppression	Focussing	
•	•		•		•	•			•	200Hz	•	•						•			•						•	•	277
•	•		•			•			•	200Hz 500Hz	•	•			•			•	•								•	•	317
	•		•		•	•	•		•	150Hz 250Hz	•	•			•			•									•	•	345
	•		•	•		•		•		20Hz 200Hz	•	•		•	•				•								•		361
	•		•			•	•			100Hz 150Hz	•	•			•			•											381
																													397
•	•		•	•	•	•	•	•	•	20Hz 500Hz	•	•		•				•		•	•	•	•	•	•	•	•	•	407
	•		•	•		•	•	•		20Hz 200Hz	•	•		•		•			•								•		487
	•		•	•		•		•		20Hz 100Hz	•	•						•									•		513



303 Series

Overview and advantages



Miniature Series in robust plastic housing



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Retro-reflective photoelectric sensors with polarisation filter for detection of transparent objects
- Energetic diffuse reflection light scanners



- Visible red light for fast and easy alignment
- Invisible infrared light for door and gate applications



High switching frequency of 1000Hz for detection of fast events



10 ... 30V DC with PNP or NPN transistor output



- M8 connector for fast installation
- Cable connection for restricted installation space



Options:

- Activation input
- Special profile for installation in door frames





Operating principle	Designation	Typ. operating range limit/typ. scanning	Housing	Light source		Output		Switching
				Plastic	Red light	Infrared	PNP transistor	
	LSR 303/44.8-S8	0 ... 5000mm	•	•		•		•
	LSR 303/44.8	0 ... 5000mm	•	•		•		•
	LSR 303/22.8-S8	0 ... 5000mm	•	•			•	•
	LSR 303/22.8	0 ... 5000mm	•	•			•	•
	LS 303/44.87-S8	0 ... 7000mm	•		•	•		•
	LS 303/44.87, 5000	0 ... 7000mm	•		•	•		•
	LS 303/22.87-S8	0 ... 7000mm	•		•		•	•
	LS 303/22.87, 5000	0 ... 7000mm	•		•		•	•
	PRK 303/44-S8	20 ... 2000mm	•	•		•		•
	PRK 303/44	20 ... 2000mm	•	•		•		•
	PRK 303/22-S8	20 ... 2000mm	•	•			•	•
	PRK 303/22	20 ... 2000mm	•	•			•	•
	PRK 303/44.4-S8	50 ... 1200 mm	•	•		•		•
	PRK 303/44.4	50 ... 1200 mm	•	•		•		•
	PRK 303/22.4-S8	50 ... 1200 mm	•	•			•	•
	PRK 303/22.4	50 ... 1200 mm	•	•			•	•
	RTR 303/44-100-S8	0 ... 120mm	•	•		•		•
	RTR 303/44-100	0 ... 120mm	•	•		•		•
	RTR 303/22-100-S8	0 ... 120mm	•	•			•	•
	RTR 303/22-100	0 ... 120mm	•	•			•	•
	RTR 303/44-50-S8	0 ... 60mm	•	•		•		•
	RTR 303/44-50	0 ... 60mm	•	•		•		•
	RTR 303/22-50-S8	0 ... 60mm	•	•			•	•
	RTR 303/22-50	0 ... 60mm	•	•			•	•



Switching frequency	Connection		Options						Page
	Cable	M 8 connector	Activation input	Background suppression	Polarisation filter	Sensitivity adjustment	Frame optics	Transparent media > 18%	
1000Hz		•	•						49
1000Hz	•		•						49
1000Hz		•	•						49
1000Hz	•		•						49
1000Hz		•	•				•		51
1000Hz	•		•				•		51
1000Hz		•	•				•		51
1000Hz	•		•				•		51
1000Hz		•			•				53
1000Hz	•				•				53
1000Hz		•			•				53
1000Hz	•				•				53
1000Hz		•			•	•		•	55
1000Hz	•				•	•		•	55
1000Hz		•			•	•		•	55
1000Hz	•				•	•		•	55
1000Hz		•				•			57
1000Hz	•					•			57
1000Hz		•				•			57
1000Hz	•					•			57
1000Hz		•				•			59
1000Hz	•					•			59
1000Hz		•				•			59
1000Hz	•					•			59

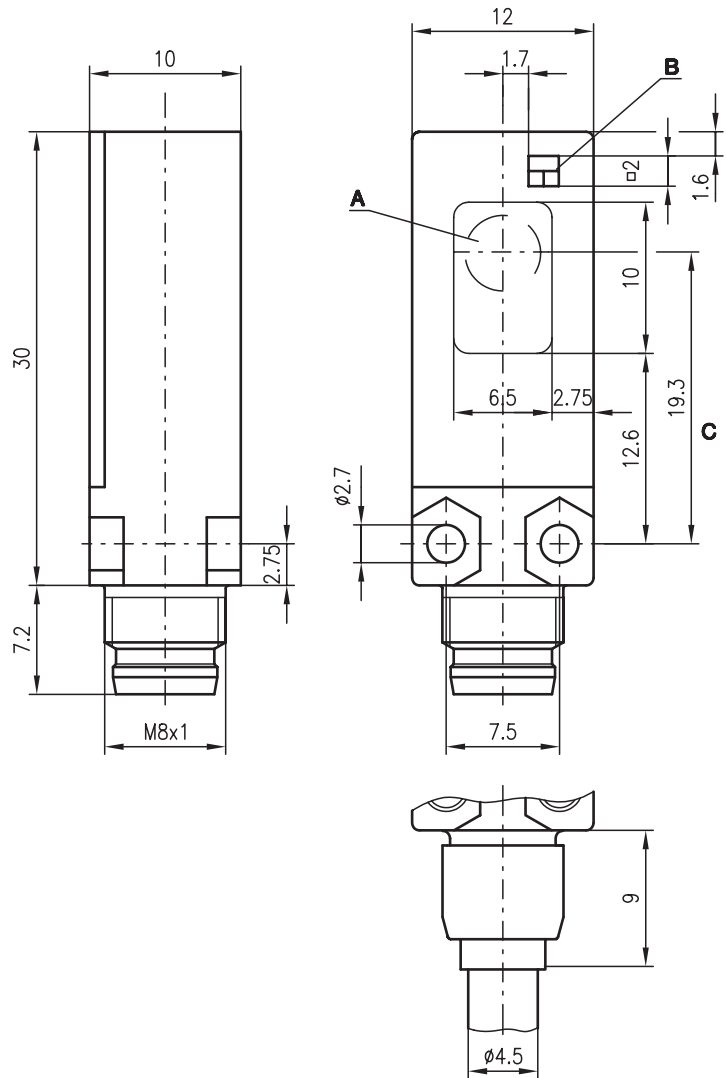


LSR 303

Throughbeam photoelectric sensors



Dimensioned drawing



- A Transmitter/receiver
- B Indicator diode
- C Optical axis

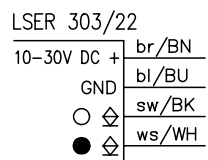
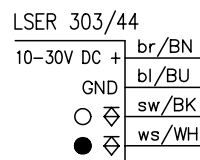
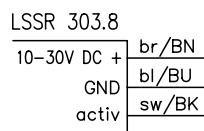
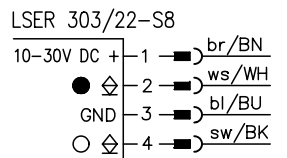
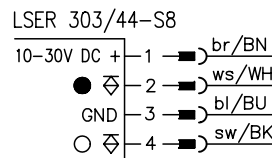
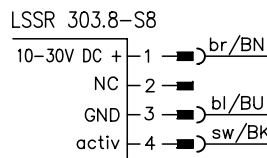


5m



- A²LS - active suppression of extraneous light
- Activation input for functional testing
- Complementary outputs for light/dark switching
- Visible red light

Electrical connection



Accessories:

(available separately • see page 60)

- M8 connectors (KD ...)
- Ready-made cables (KB ...)



We reserve the right to make changes • 303_a01e.fm

Specifications

Optical Data

Typ. operating range limit ¹⁾	5m
Operating range ²⁾	4m
Light source	LED (modulated light)
Wavelength	645nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 25mA
Switching output	2 PNP or 2 NPN complementary switching outputs
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	not adjustable

Indicators

LED green, transmitter	ready for operation
LED yellow, receiver	light path free
LED yellow flashing, receiver	light path free, no performance reserve

Mechanical data

Housing	polycarbonate
Optical cover	polycarbonate
Weight (plug/cable)	4g/45g
Connection type	M8 connector, 4-pin cable: 2000mm, 4x0.14 mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +75°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input	
active/not active	≥ 8V / ≤ 2V or not connected

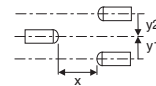
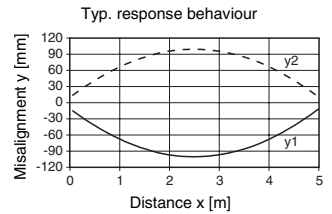
- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 V AC

Tables

0	4	5
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<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams



Order guide

Selection table		Order code →	LSR 303/44.8-S8 Part No. 500 82208 (Tr) Part No. 500 82209 (Re)	LSR 303/22.8-S8 Part No. 500 82208 (Tr) Part No. 500 82213 (Re)	LSR 303/44.8 Part No. 500 82210 (Tr) Part No. 500 82211 (Re)	LSR 303/22.8 Part No. 500 82210 (Tr) Part No. 500 82215 (Re)			
Equipment ↓									
Switching output	PNP transistor (Re)	●		●					
	NPN transistor (Re)		●		●				
Inputs	activation input (Tr)	●	●	●	●				
Connection	S8 plug connector	●	●						
	cable 5000mm								
	cable 2000mm			●	●				

Remarks

LSR = Pair consisting of
LSSR = Transmitter
LSER = Receiver

LSR 303/44.8-S8

LSSR 303.8-S8
LSER 303/44-S8

LSR 303/22.8-S8

LSSR 303.8-S8
LSER 303/22-S8

LSR 303/44.8

LSSR 303.8
LSER 303/44

LSR 303/22.8

LSSR 303.8
LSER 303/22

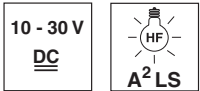


LS 303

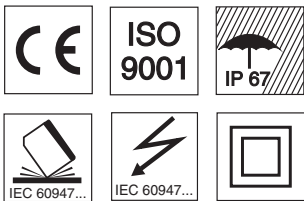
Throughbeam photoelectric sensor



7m



- A²LS - active suppression of extraneous light
- Activation input for functional testing
- Complementary outputs for light/dark switching
- Infrared light
- Frame optics

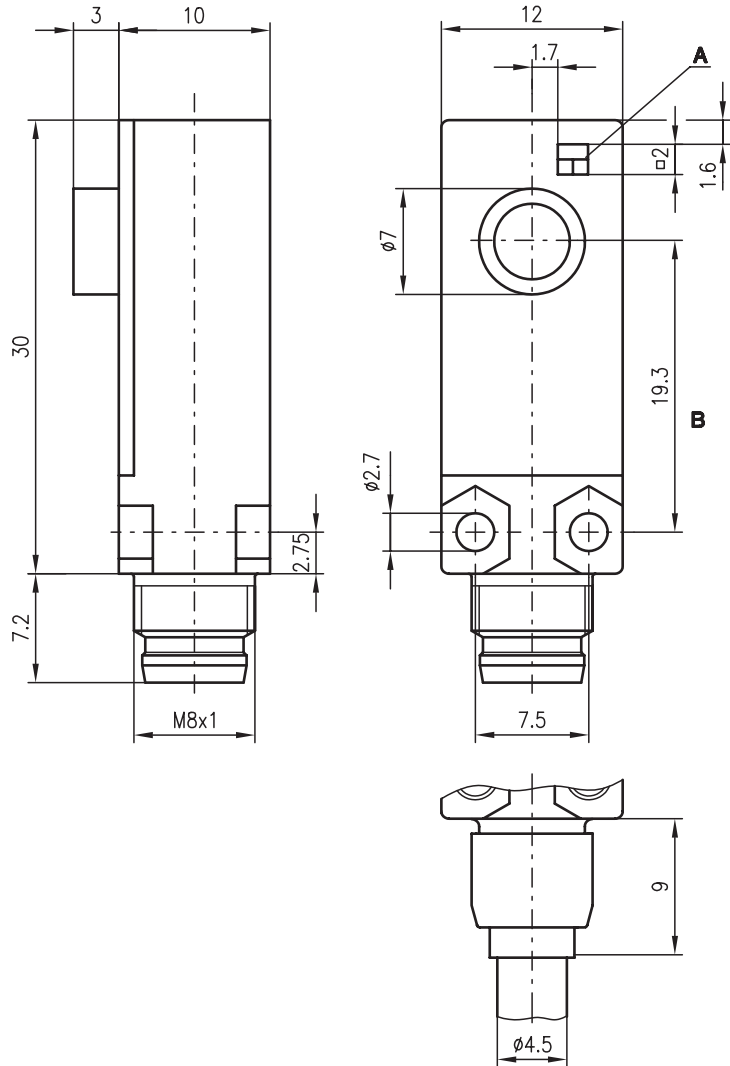


Accessories:

(available separately • see page 60)

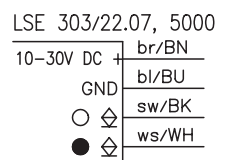
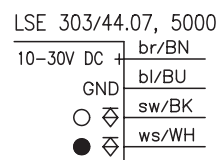
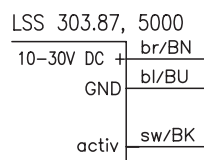
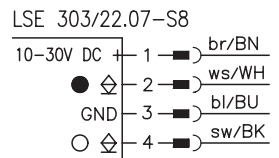
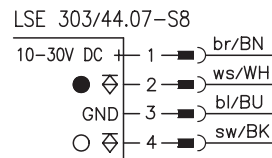
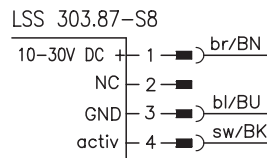
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection



We reserve the right to make changes • 303_a02e.fm

Specifications

Optical Data

Typ. operating range limit ¹⁾	7m
Operating range ²⁾	6m
Light source	LED (modulated light)
Wavelength	870nm (infrared)

Timing

Switching frequency	1000Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 25mA
Switching output	2 PNP or 2 NPN complementary switching outputs
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	not adjustable

Indicators

LED green, transmitter	ready for operation
LED yellow, receiver	light path free
LED yellow flashing, receiver	light path free, no performance reserve

Mechanical data

Housing	polycarbonate
Optical cover	polycarbonate
Weight (plug/cable)	4g/100g
Connection type	M8 connector, 4-pin cable: 5000mm, 4x0.14 mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +75°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input	
active/not active	≥ 8V / ≤ 2V or not connected

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 V AC

Order guide

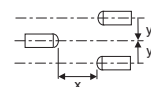
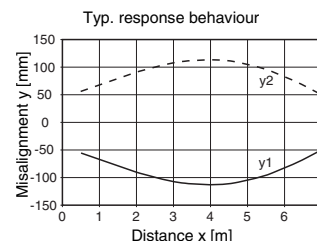
Selection table		Order code →						
Equipment ↓		LS 303/44.87-S8	LS 303/22.87-S8	LS 303/44.87, 5000	LS 303/22.87, 5000			
		Part No. 500 82202 (Tr) Part No. 500 82203 (Re)	Part No. 500 82202 (Tr) Part No. 500 82206 (Re)	Part No. 500 82204 (Tr) Part No. 500 82205 (Re)	Part No. 500 82204 (Tr) Part No. 500 82207 (Re)			
Switching output	PNP transistor (Re)	●		●				
	NPN transistor (Re)		●		●			
Inputs	activation input (Tr)	●	●	●	●			
Connection	S8 plug connector	●	●					
	cable 5000mm			●	●			
	cable 2000mm							
Features	frame optics	●	●	●	●			

Tables

0	6	7
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<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams



Remarks

LS = Pair consisting of
LSS = Transmitter
LSE = Receiver

LS 303/44.87-S8
LSS 303.87-S8
LSE 303/44.07-S8

LS 303/22.87-S8
LSS 303.87-S8
LSE 303/22.07-S8

LS 303/44.87, 5000
LSS 303.87, 5000
LSE 303/44.07, 5000

LS 303/22.87, 5000
LSS 303.87, 5000
LSE 303/22.07, 5000

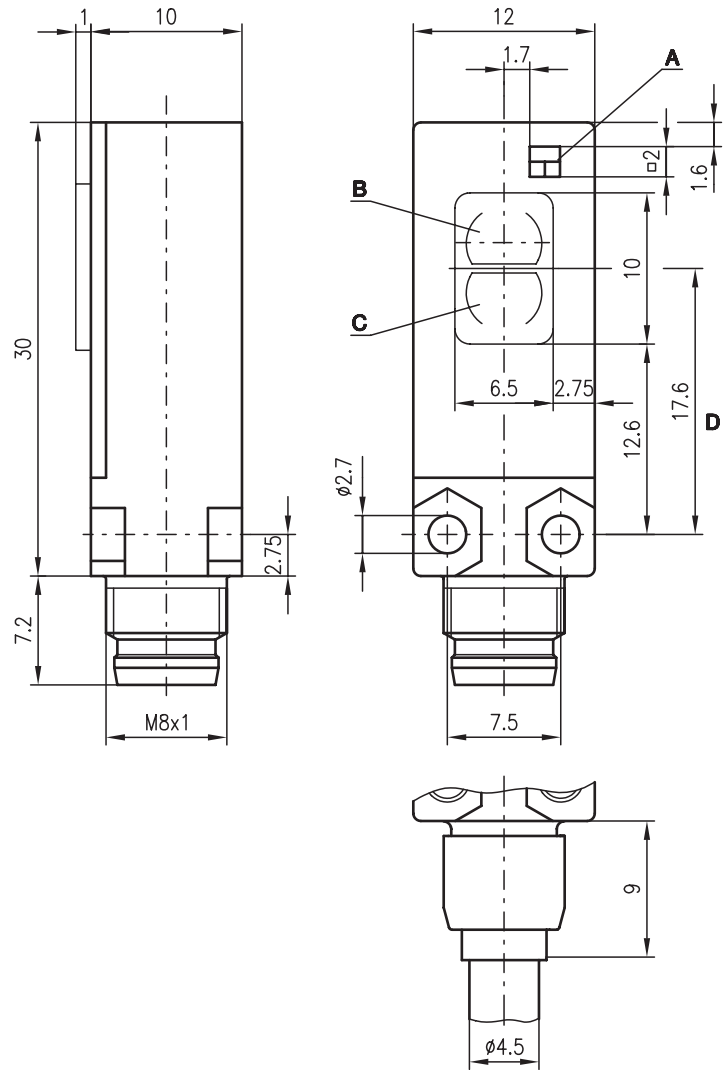


PRK 303

Retro-reflective photoelectric sensors with polarisation filter



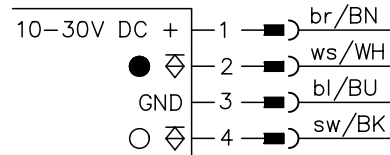
Dimensioned drawing



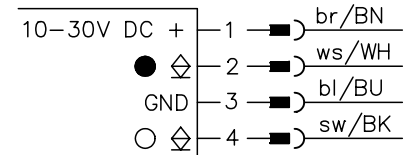
- A Indicator diode
- B Transmitter
- C Receiver
- D Optical axis

Electrical connection

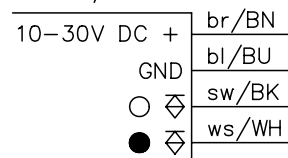
PRK 303/44-S8



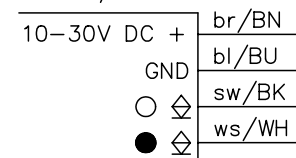
PRK 303/22-S8



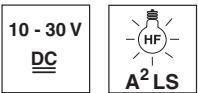
PRK 303/44



PRK 303/22



0.02 ... 2m



- A²LS - active suppression of extraneous light
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching
- Visible red light



Accessories:

(available separately • see page 60)

- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 303_b01e.fm

Specifications

Optical Data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 2m
Operating range ²⁾	see tables
Light source	LED (modulated light)
Wavelength	645nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 25mA
Switching output	2 PNP or 2 NPN complementary switching outputs
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	not adjustable

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	polycarbonate
Optical cover	Glass
Weight (plug/cable)	4g/45g
Connection type	M8 connector, 4-pin cable: 2000mm, 4x0.14 mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +75°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 V AC

Tables

Reflectors			Operating range
1	TK(S)	100x100	0.02 ... 1.6 m
2	MTK(S)	50x50	0.02 ... 1.2 m
3	TK(S)	30x50	0.02 ... 0.7 m
4	TK(S)	20x40	0.02 ... 0.6 m
5	Tape 2	100x100	0.03 ... 0.7 m

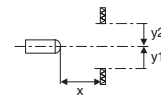
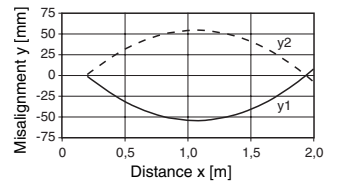
1	0.02		1.6		2
2	0.02		1.2		1.5
3	0.02	0.7			0.9
4	0.02	0.6			0.8
5	0.03	0.7			0.9

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

Selection table		Order code →					
Equipment ↓		PRK 303/44-S8 Part No. 500 82216	PRK 303/44 Part No. 500 82217	PRK 303/22-S8 Part No. 500 82218	PRK 303/22 Part No. 500 82219		
Switching output	PNP transistor	●	●				
	NPN transistor			●	●		
Connection	cable 2000mm		●		●		
	S8 plug connector	●		●			
Features	potentiometer						

Remarks

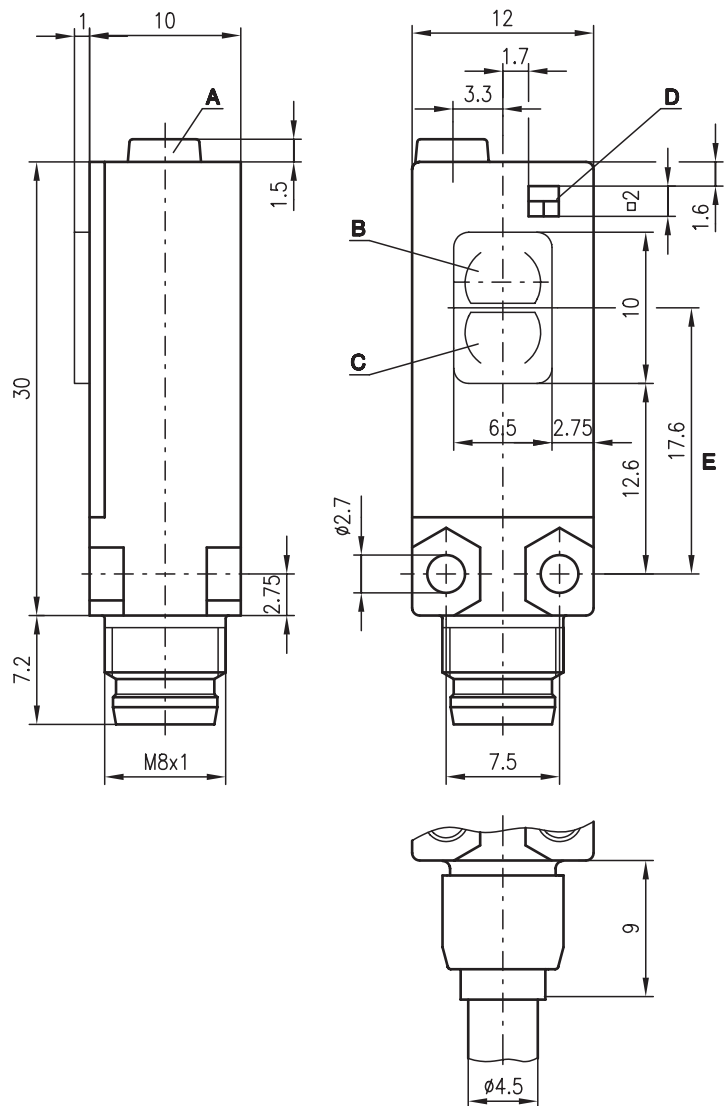


PRK 303

Retro-reflective photoelectric sensors with polarisation filter



Dimensioned drawing



- A Sensitivity adjustment
- B Transmitter
- C Receiver
- D Indicator diode
- E Optical axis



0.05 ... 1.2m



- Detection of transparent media (e. g. clear glass, PE, foil)
- A²LS - active suppression of extraneous light
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching
- Visible red light



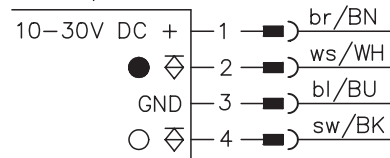
Accessories:

(available separately • see page 60)

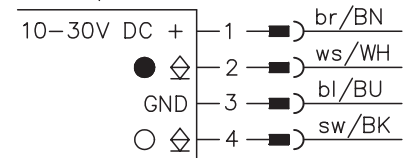
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Electrical connection

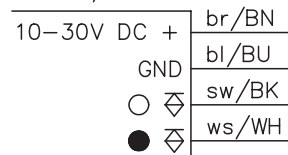
PRK 303/44.4-S8



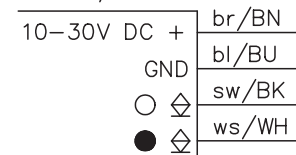
PRK 303/22.4-S8



PRK 303/44.4



PRK 303/22.4



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Specifications

Optical Data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 0.05 ... 1.2 m
 Operating range ²⁾ see tables
 Light source LED (modulated light)
 Wavelength 645nm (visible red light, polarised)

Timing

Switching frequency 1000Hz
 Response time 0.5 ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC
 Residual ripple ≤ 10% of U_B
 Bias current ≤ 25mA
 Switching output 2 PNP or 2 NPN complementary switching outputs
 Function characteristics light/dark switching
 Signal voltage high/low ≥ (U_B-2V) ≤ 2V
 Output current max. 100mA
 Sensitivity adjustable with 270° potentiometer

Indicators

LED yellow light path free
 LED yellow flashing light path free, detection of PE bottles

Mechanical data

Housing polycarbonate
 Optical cover Glass
 Weight (plug/cable) 4g/45g
 Connection type M8 connector, 4-pin
 cable: 2000mm, 4x0.14mm²

Environmental data

Ambient temp. (operation/storage) -25°C ... +60°C/-40°C ... +75°C
 Protective circuit ³⁾ 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 V AC

Tables

Reflectors			Operating range
1	TK(S)	100x100	0.05 ... 1.0 m
2	MTK(S)	50x50	0.15 ... 1.0 m
3	TK(S)	30x50	0.05 ... 0.5 m
4	TK(S)	20x40	0.05 ... 0.3 m
5	Tape 2	100x100	0.20 ... 0.6 m

1	0.05	1.0	1.2
2	0.15	1.0	1.5
3	0.05	0.5	0.9
4	0.05	0.3	0.8
5	0.20	0.6	0.9

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		PRK 303/44.4-S8 Part No. 500 82220	PRK 303/44.4 Part No. 500 82221	PRK 303/22.4-S8 Part No. 500 82222	PRK 303/22.4 Part No. 500 82223		
Switching output	PNP transistor	●	●				
	NPN transistor			●	●		
Connection	cable 2000mm		●		●		
	S8 plug connector	●		●			
Features	potentiometer	●	●	●	●		
	transparent media	●	●	●	●		

Remarks

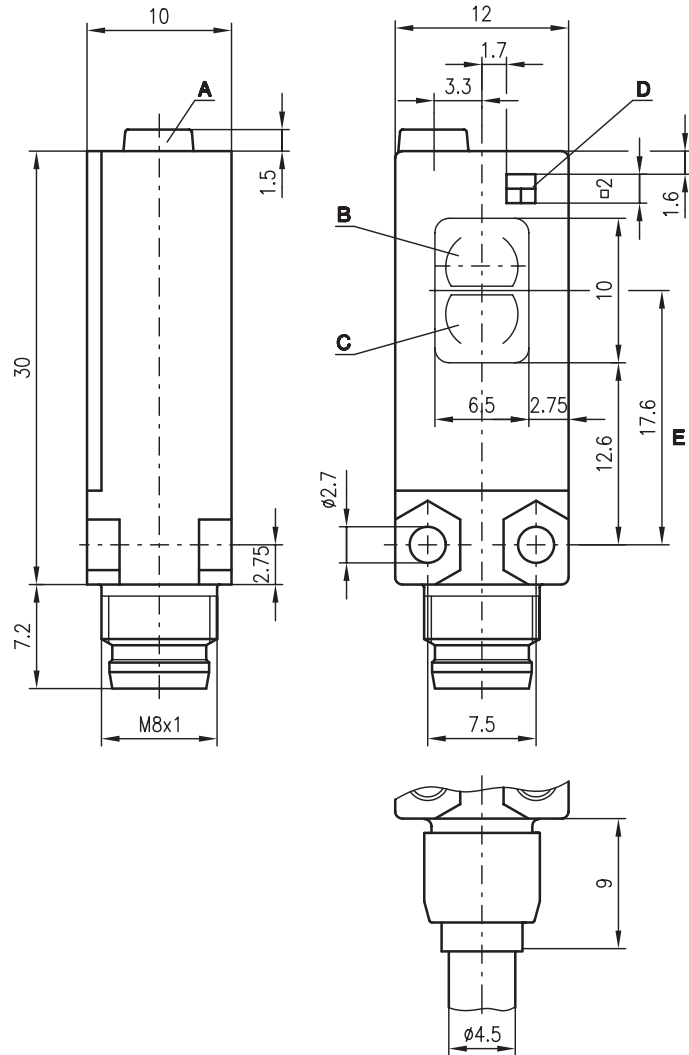


RTR 303

Energetic diffuse reflection light scanner

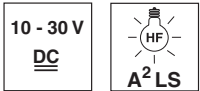


Dimensioned drawing



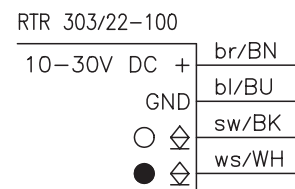
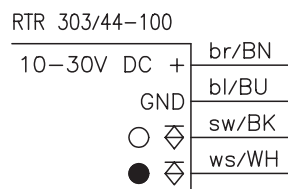
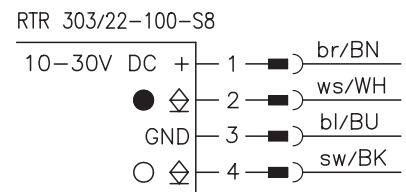
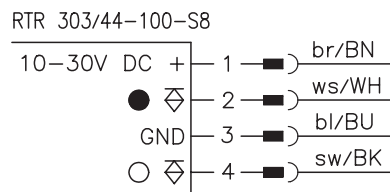
- A Sensitivity adjustment
- B Transmitter
- C Receiver
- D Indicator diode
- E Optical axis

0 ... 120mm



- A²LS - active suppression of extraneous light
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching
- Visible red light

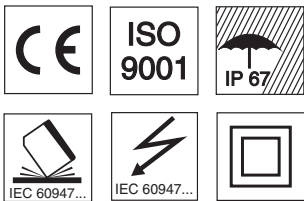
Electrical connection



Accessories:

(available separately • see page 60)

- M8 connectors (KD ...)
- Ready-made cables (KB ...)



We reserve the right to make changes • 303_c01e.fm



Specifications

Optical Data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 120mm
Scanning range ²⁾	see tables
Adjustment range	50 ... 120mm
Light source	LED (modulated light)
Wavelength	645nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 10% of U _B
Bias current	≤ 25mA
Switching output	2 PNP or 2 NPN complementary switching outputs
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 270° potentiometer

Indicators

LED yellow	object detected
LED yellow flashing	object detected, no performance reserve

Mechanical data

Housing	polycarbonate
Optical cover	polycarbonate
Weight (plug/cable)	4g/45g
Connection type	M8 connector, 4-pin cable 2000mm, 4x0.14 mm ² , PVC

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +75°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 V AC

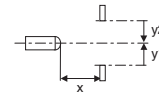
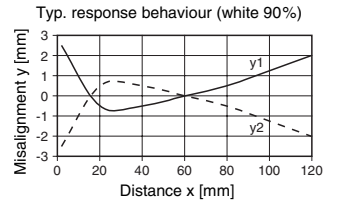
Tables

1	0	100	120
2	15	55	70
3	25	40	50

1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams



Order guide

Selection table		Order code →						
Equipment ↓		RTR 303/44-100-S8 Part No. 500 82224	RTR 303/44-100 Part No. 500 82225	RTR 303/22-100-S8 Part No. 500 82226	RTR 303/22-100 Part No. 500 82227			
Switching output	PNP transistor	●	●					
	NPN transistor			●	●			
Connection	cable 2000mm		●		●			
	S8 plug connector	●		●				
Features	potentiometer	●	●	●	●			

Remarks

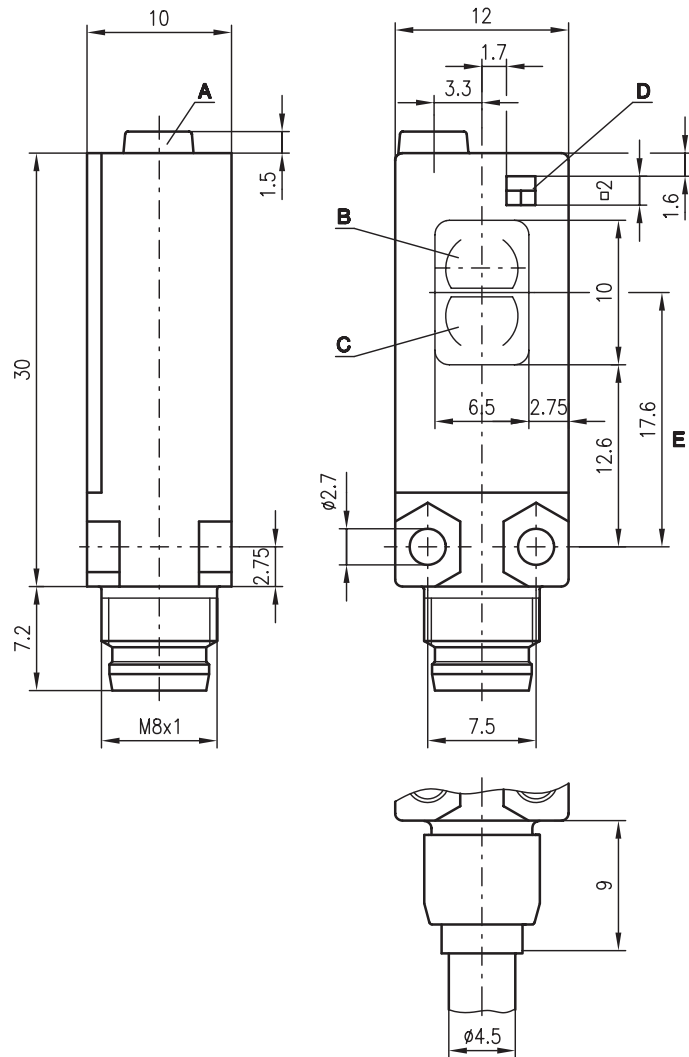


RTR 303

Energetic diffuse reflection light scanner

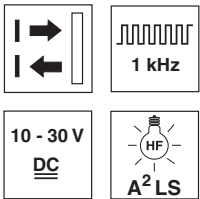


Dimensioned drawing



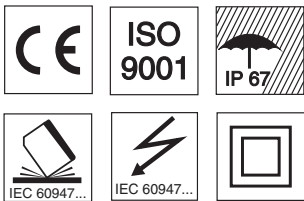
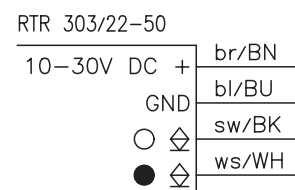
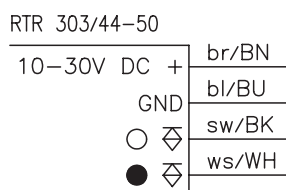
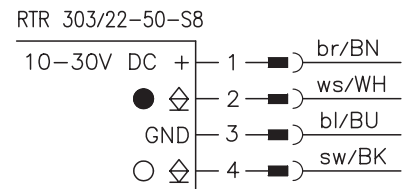
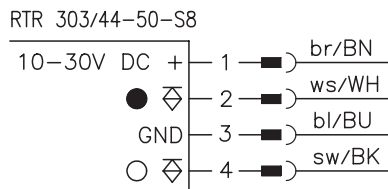
- A Sensitivity adjustment
- B Transmitter
- C Receiver
- D Indicator diode
- E Optical axis

0 ... 60mm



- A²LS - active suppression of extraneous light
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching
- Visible red light

Electrical connection



Accessories:

(available separately • see page 60)

- M8 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 303_c02e.fm



Specifications

Optical Data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 60mm
Scanning range ²⁾	see tables
Adjustment range	30 ... 80mm
Light source	LED (modulated light)
Wavelength	645nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 10% of U _B
Bias current	≤ 25mA
Switching output	2 PNP or 2 NPN complementary switching outputs
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 270° potentiometer

Indicators

LED yellow	object detected
LED yellow flashing	object detected, no performance reserve

Mechanical data

Housing	polycarbonate
Optical cover	polycarbonate
Weight (plug/cable)	4g/45g
Connection type	M8 connector, 4-pin cable 2000mm, 4x0.14 mm ² , PVC

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +75°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 V AC

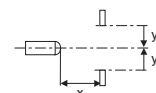
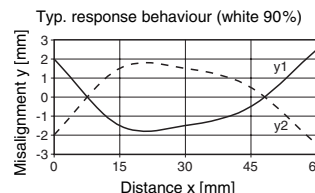
Tables

1	0	50	60
2	5	25	30

1	white 90%
2	grey 18%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams



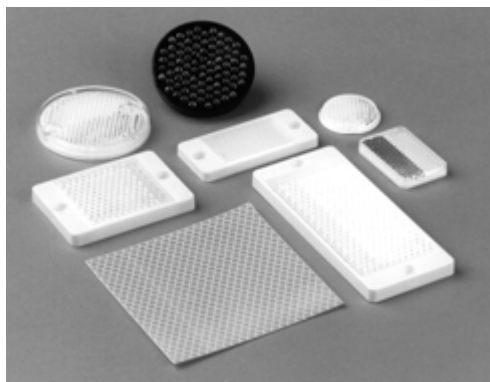
Order guide

Selection table		Order code →						
Equipment ↓		RTR 303/44-50-S8 Part No. 500 82228	RTR 303/44-50 Part No. 500 82229	RTR 303/22-50-S8 Part No. 500 82230	RTR 303/22-50 Part No. 500 82231			
Switching output	PNP transistor	●	●					
	NPN transistor			●	●			
Connection	cable 2000mm		●		●			
	S8 plug connector	●		●	●			
Features	potentiometer	●	●	●	●			

Remarks

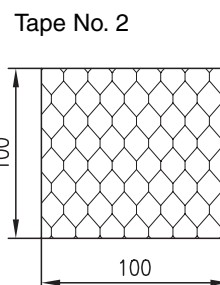
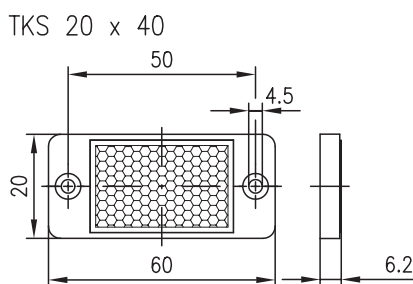
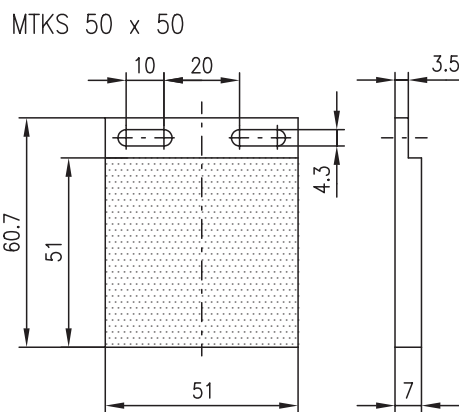
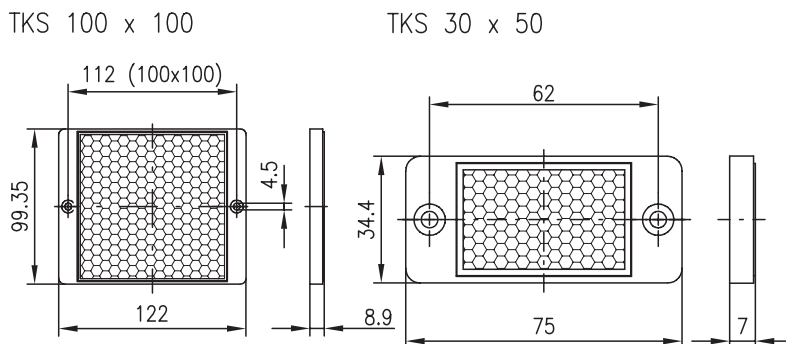


Reflectors



- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw-type models enable universal mounting.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

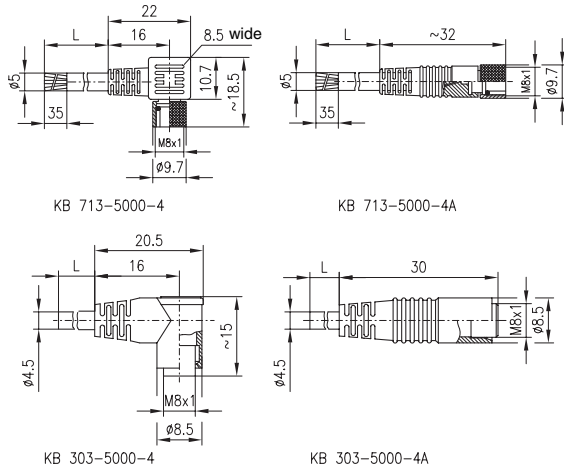




Additional information in section "Accessories" from page 925 onwards!

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Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 713-5000-4	500 29173
KB 713-5000-4A	500 29174
KB 303-5000-4	500 36152
KB 303-5000-4A	500 36153

Dimensioned drawings

Selection table

M8 connectors	
	
with cable (5m), 4-pin	
KB 713-5000-4	KB 713-5000-4A
KB 303-5000-4	KB 303-5000-4A

Connectors, plugs, cables


For devices with M 8 connectors, there are 2 connectors available with 5m cables.

Protection class (DIN 40050)
plugged or screwed: IP 67

Important:

For throughbeam photoelectric sensors, one connector is required for both the transmitter and the receiver.



3 Series

Overview and advantages



Small sensor series with robust plastic housing



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression



Visible red light for easy and quick alignment



High switching frequency 1000Hz for detection of fast events



10 ... 30VDC voltage with PNP transistor output

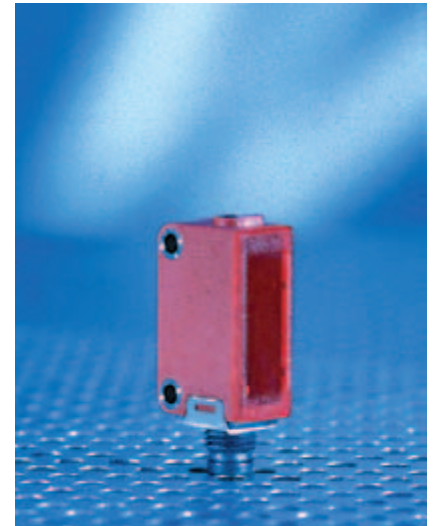


- M8/M12 connector for fast installation
- Cable models for limited installation space



Options:

- Warning output
- Activation input





Operating principle	Designation		Typ. oper. range limit/ typ. scan. range limit	Housing	Light source	Operating voltage	Output		Switching frequency
				Plastic	Red light		10 ... 30VDC	PNP transistor	
	LSR 3/44.8-S8	•	0 ... 8500mm	•	•	•	•		1000Hz
	LSR 3/44.8		0 ... 8500mm	•	•	•	•		1000Hz
	ILSR 3/4.8-S8	•	0 ... 8500mm	•	•	•	•		1000Hz
	LSR 3/44.8, 5000		0 ... 8500mm	•	•	•	•		1000Hz
	LSR 3/22.8-S8	•	0 ... 8500mm	•	•	•		•	1000Hz
	ILSR 3/4.8		0 ... 8500mm	•	•	•	•		1000Hz
	RKR 3/22		50 ... 5000mm	•	•	•		•	1000Hz
	RKR 3/22-S8	•	50 ... 5000mm	•	•	•		•	1000Hz
	RKR 3/22.3		50 ... 5000mm	•	•	•		•	1000Hz
	RKR 3/44		50 ... 5000mm	•	•	•	•		1000Hz
	RKR 3/44-S8	•	50 ... 5000mm	•	•	•	•		1000Hz
	PRK 3/44-S8	•	50 ... 4000mm	•	•	•	•		1000Hz
	PRK 3/44		50 ... 4000mm	•	•	•	•		1000Hz
	PRK 3/4.8-S8	•	50 ... 4000mm	•	•	•	•		1000Hz
	IPRK 3/4-S8	•	50 ... 4000mm	•	•	•	•		1000Hz
	PRK 3/22		50 ... 4000mm	•	•	•		•	1000Hz
	PRK 3/22-S8	•	50 ... 4000mm	•	•	•		•	1000Hz
	PRK 3/44, 5000		50 ... 4000mm	•	•	•	•		1000Hz
	PRK 3/44.1-S8		20 ... 5000mm	•	•	•	•		1000Hz
	PRK 3/44.1, 150-S12		20 ... 5000mm	•	•	•	•		1000Hz
		RTR 3/22-300-S8	•	5 ... 500mm	•	•	•		•
RTR 3/44-300-S8		•	5 ... 500mm	•	•	•	•		1000Hz
RTR 3/44-300			5 ... 500mm	•	•	•	•		1000Hz
	HRTR 3/44-150-S8	•	7 ... 300mm	•	•	•	•		1000Hz
	HRTR 3/44-150		7 ... 300mm	•	•	•	•		1000Hz
	HRTR 3/22-150		7 ... 300mm	•	•	•		•	1000Hz
	HRTR 3/22-150-S8	•	7 ... 300mm	•	•	•		•	1000Hz
	HRTR 3/44-150, 5000		7 ... 300mm	•	•	•	•		1000Hz
	HRTR 3/4-150, 200-S8		7 ... 300mm	•	•	•	•		1000Hz
	HRTR 3/44-150, 150-S12		7 ... 300mm	•	•	•	•		1000Hz



Switching		Connection			Options							Page
Light switching	Dark switching	Cable	M8 connector	M12 connector	Warning output	Activation input	Background suppression	Polarisation filter	Sensitivity adjustment	Transparent media	Focussed light beam	
•	•		•			•			•			67
•	•	•				•			•			67
•			•		•	•			•			67
•	•	•				•			•			67
•	•		•			•			•			67
•		•			•	•			•			67
•	•	•							•			69
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•	•			•				•	•			73
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•	•	•							•		•	77
•	•		•				•		•		•	79
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•	•	•					•		•		•	79
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•	•	•					•		•		•	79
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•	•			•			•		•		•	81
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LSR 3

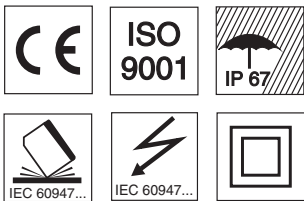
Throughbeam photoelectric sensors



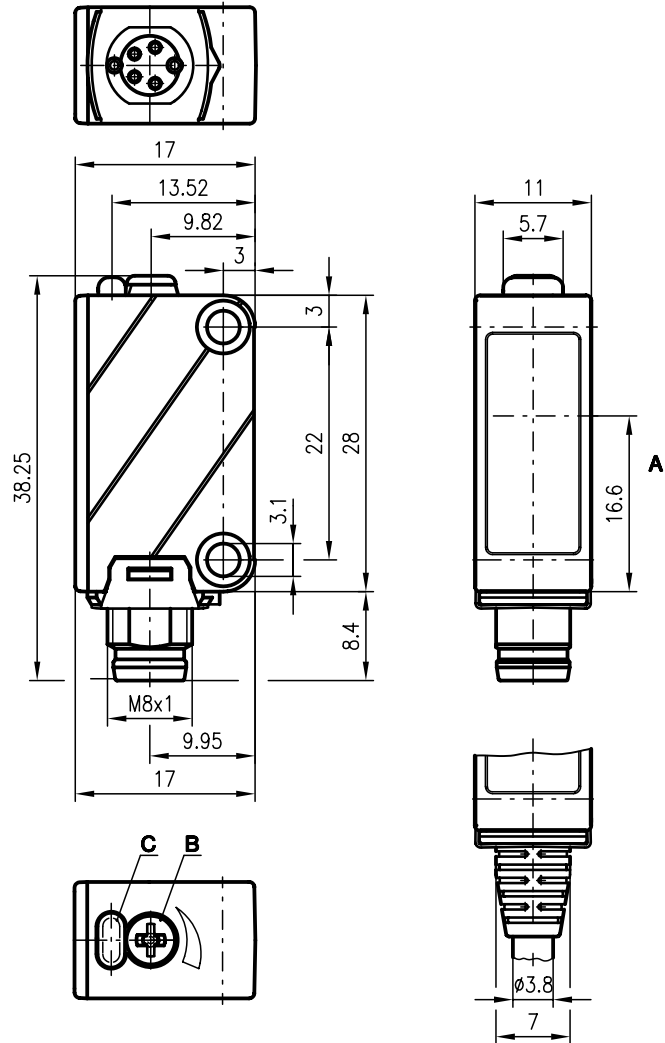
8.5m



- Throughbeam photoelectric sensor with high performance reserve in red light
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching or as a control function
- Warning output autoControl for increased availability

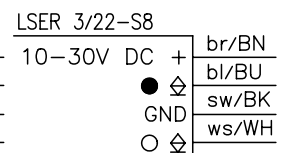
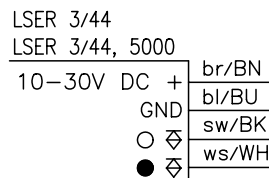
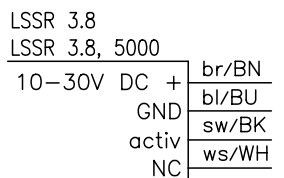
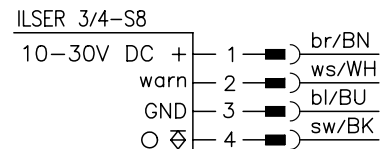
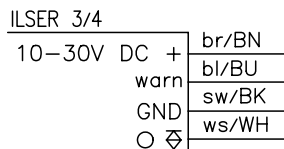
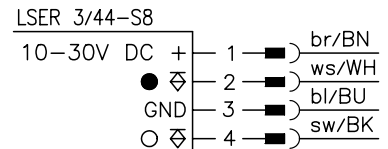
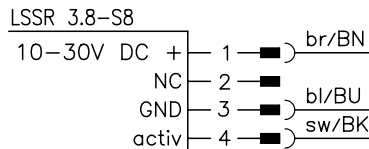


Dimensioned drawing



- A Optical axis
- B Adjustment screw only receiver
- C Indicator diode only receiver

Electrical connection



We reserve the right to make changes • 3_a01e.fm

Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 8.5m
Operating range ²⁾	0 ... 6m
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with multiturn potentiometer

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M8 connector (4-pin) or PUR cable 2m and 5m (cross section 4x0.2mm ²)

Environmental data

Ambient temp. (operation/storage)	-25 °C ... +55 °C / -40 °C ... +70 °C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7kΩ ± 10%
Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Order guide

Selection table		Order code →	LSR 3/44.8 Part No. 500 30996 (Se) Part No. 500 31276 (Re)	LSR 3/44.8, 5000 Part No. 500 33654 (Tr) Part No. 500 33653 (Re)	LSR 3/44.8-S8 Part No. 500 30995 (Tr) Part No. 500 31275 (Re)	ILSR 3/4.8-S8 Part No. 500 30995 (Tr) Part No. 500 30915 (Re)	LSR 3/22.8-S8 Part No. 500 30995 (Tr) Part No. 500 37975 (Re)	ILSR 3/4.8 Part No. 500 30996 (Tr) Part No. 500 30916 (Re)
Equipment ↓	Switching output	2xPNP transistor (Re)	●	●	●		●	
		2xNPN transistor (Re)					●	
		1xPNP transistor (Re)				●		●
		light/dark switching	●	●	●		●	
		light switching				●		●
Connection	M8 connector			●	●	●		
	cable 5000mm		●					
	cable 2000mm	●					●	
Features	activation input (Tr)	●	●	●	●	●	●	●
	warning output				●		●	

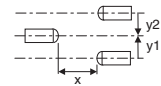
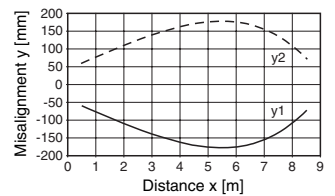
Tables

0	6.0	8.5
---	-----	-----

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

- [I]LSR = Pair consisting of
 LSSR = Transmitter
 [I]LSER = Receiver

LSR 3/44.8

LSSR 3.8
 LSER 3/44

LSR 3/44.8, 5000

LSSR 3.8, 5000
 LSER 3/44, 5000

LSR 3/44.8-S8

LSSR 3.8-S8
 LSER 3/44-S8

ILSR 3/4.8-S8

LSSR 3.8-S8
 ILSER 3/4-S8

LSR 3/22.8-S8

LSSR 3.8-S8
 LSER 3/22-S8

ILSR 3/4.8

LSSR 3.8
 ILSER 3/4



RKR 3

Retro-reflective photoelectric sensor

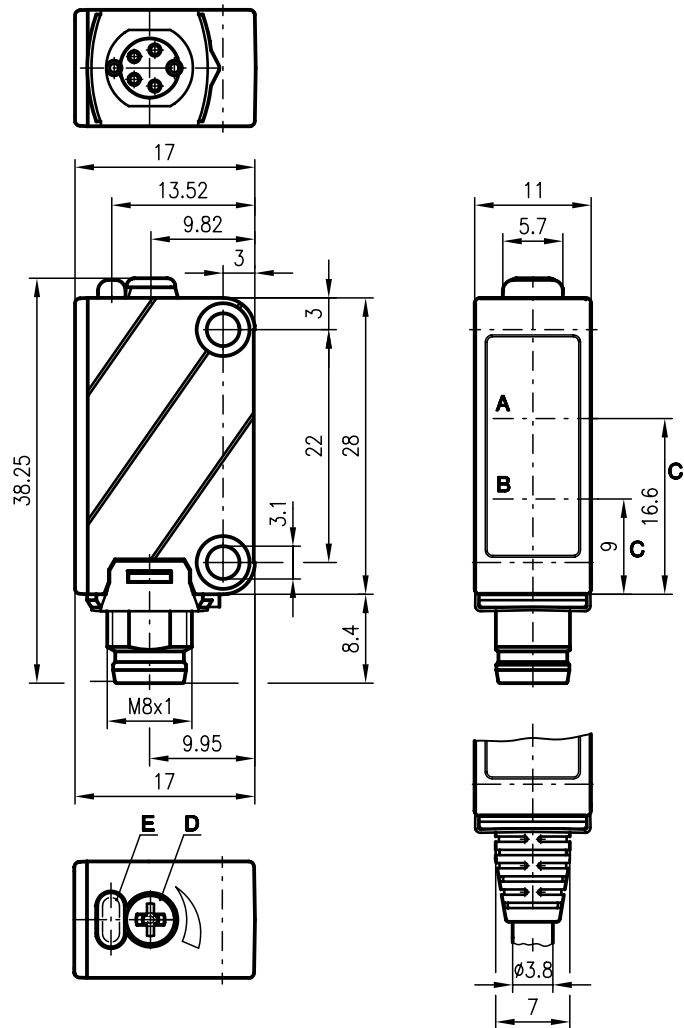


0.05 ... 5m



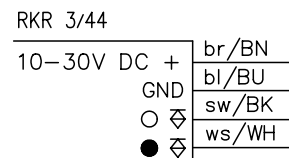
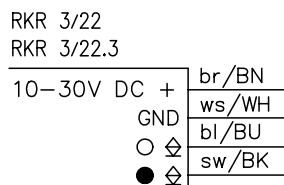
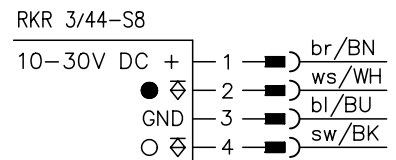
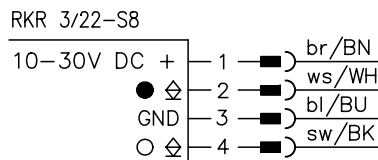
- Retro-reflective photoelectric sensor in visible red light
- Detection of glossy surfaces is possible in the short range
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching or as a control function
- Special version RKR 3/22.3 with focussed light beam Ø4mm at a distance of 80mm

Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection



Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

We reserve the right to make changes • 3_b02e.fm



Specifications

Optical data	RKR 3/44...	RKR 3/22...
Typ. operating range limit (TK(S) 100x100) ¹⁾	0.05 ... 5m	
Operating range ²⁾	0.05 ... 3.5m	
Light beam characteristic	divergent	
Light source	LED (modulated light)	
Wavelength	660nm (visible red light)	
Timing		
Switching frequency	1000Hz	
Response time	0.5 ms	
Delay before start-up	≤ 100ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 25mA	
Switching output	2 PNP transistor outputs, complementary	2 NPN transistor outputs, complementary
Function characteristics	light/dark switching	
Signal voltage high/low	≥ (U _B -2V)/≤ 2V	
Output current	max. 100mA	
Sensitivity	adjustable with multiturn potentiometer	
Indicators		
LED yellow	light path free	
LED yellow flashing	light path free, no performance reserve	
Mechanical data		
Housing	plastic	
Optics cover	plastic (PMMA)	
Weight	20g	
Connection type	M8 connector (4-pin) or PUR cable 2m (cross section 4x0.2mm ²)	
Environmental data		
Ambient temp. (operation/storage)	-25°C ... +55°C/-40°C ... +70°C	
Protective circuit ³⁾	2, 3	
VDE safety class ⁴⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	

Tables

0.05	3.5	5.0
------	-----	-----

- Operating range [m]
- Typ. operating range limit [m]

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		RKR 3/44 Part No. on request	RKR 3/22 Part No. 500 32369	RKR 3/22.3 Part No. 500 33243	RKR 3/44-S8 Part No. 500 33634	RKR 3/22-S8 Part No. on request	
Switching output	PNP transistor	●			●		
	NPN transistor		●	●		●	
	light/dark switching	●	●	●	●	●	
Connection	M8 connector				●	●	
	cable 2000mm	●	●	●			

Remarks



PRK 3

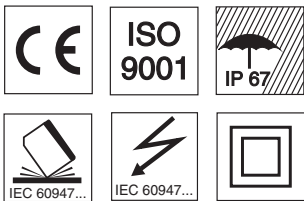
Retro-reflective photoelectric sensors with polarisation filter



0.05 ... 4 m

10 - 30 V
DC

- Polarised retro-reflective photoelectric sensor in visible red light
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events
- Polarisation filter blocks unwanted reflections
- Complementary PNP or NPN switching outputs for light/dark switching or as a control function

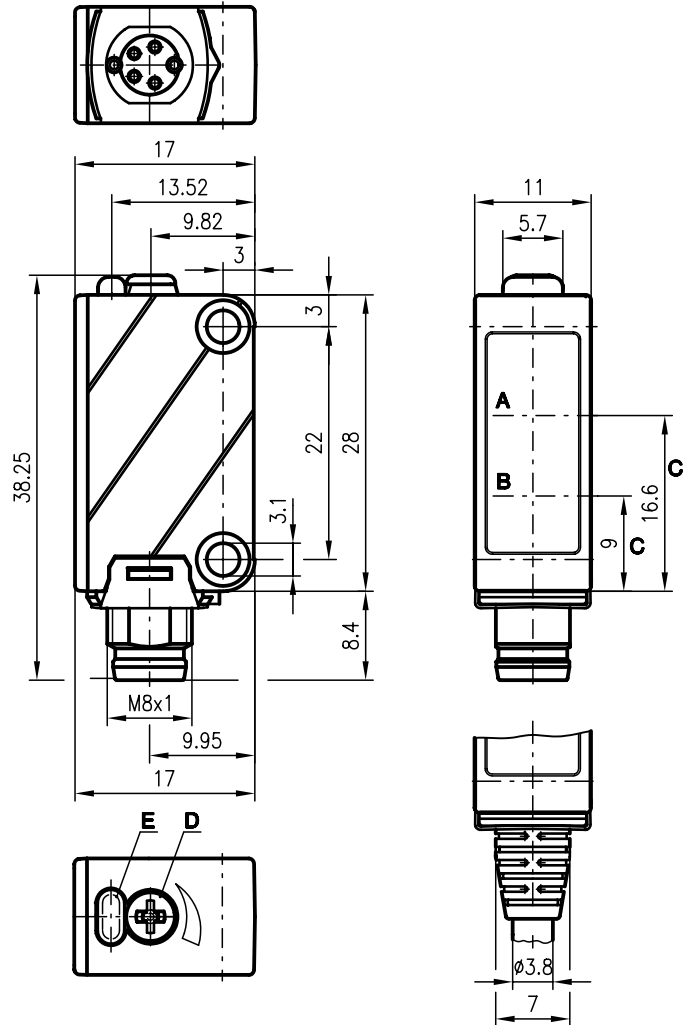


Accessories:

(available separately • see page 84)

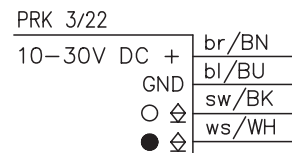
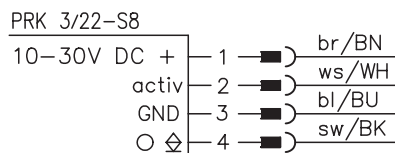
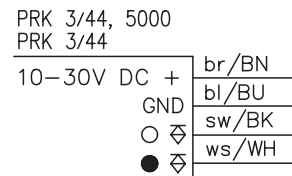
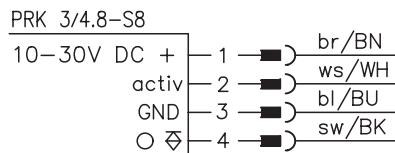
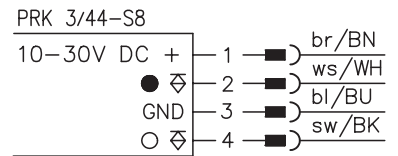
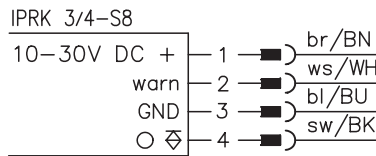
- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection



We reserve the right to make changes • 3_b01e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	PRK 3/22/44... 0.05 ... 4m	PRK 3/4.8..., IPRK 3/4...
Operating range ²⁾	see table	
Light beam characteristic	divergent	
Light source	LED (modulated light)	
Wavelength	660nm (visible red light, polarised)	

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 25mA	
Switching output	2 transistor outputs, complementary light/dark switching	1 PNP transistor output light switching
Function characteristics		
Signal voltage high/low	≥ (U _B -2V) ≤ 2V	
Output current	max. 100mA	
Sensitivity	adjustable with multiturn potentiometer	

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M8 connector (4-pin) or PUR cable 2m/5m (cross section 4x0.2mm ²)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7 kΩ ± 10%
Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	≥ (U _B -2V) ≤ 2V
Output current	max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Order guide

Selection table		PRK 3/44 Part No. 500 30918	PRK 3/22 Part No. 500 32559	PRK 3/44, 5000 Part No. 500 35727	PRK 3/44-S8 Part No. 500 30917	PRK 3/22-S8 Part No. 500 32558	IPRK 3/4-S8 Part No. 500 31140	PRK 3/4.8-S8 Part No. 500 30919	
Equipment ↓	Order code →								
	Switching output	PNP transistor	●		●	●		●	●
		NPN transistor		●			●		
		light/dark switching	●	●	●	●	●		
light switching							●	●	
Connection	M8 connector				●	●	●	●	
	cable 5000mm			●					
	cable 2000mm	●	●						
Features	activation input							●	
	warning output						●		

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.05 ... 2.5m
2 MTK(S) 50x50	0.05 ... 1.6m
3 TK(S) 30x50	0.05 ... 1.1m
4 TK(S) 20x40	0.05 ... 0.7m
5 Tape 2 100x100	0.1 ... 0.9m

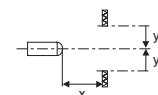
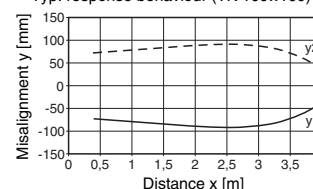
1	0.05		2.5	4.0
2	0.05	1.6	2.4	
3	0.05	1.1	1.7	
4	0.05	0.7	1.1	
5	0.1	0.9	1.4	

□ Operating range [m]
 □ Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



PRK 3

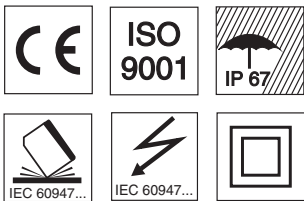
Retro-reflective photoelectric sensors with polarisation filter



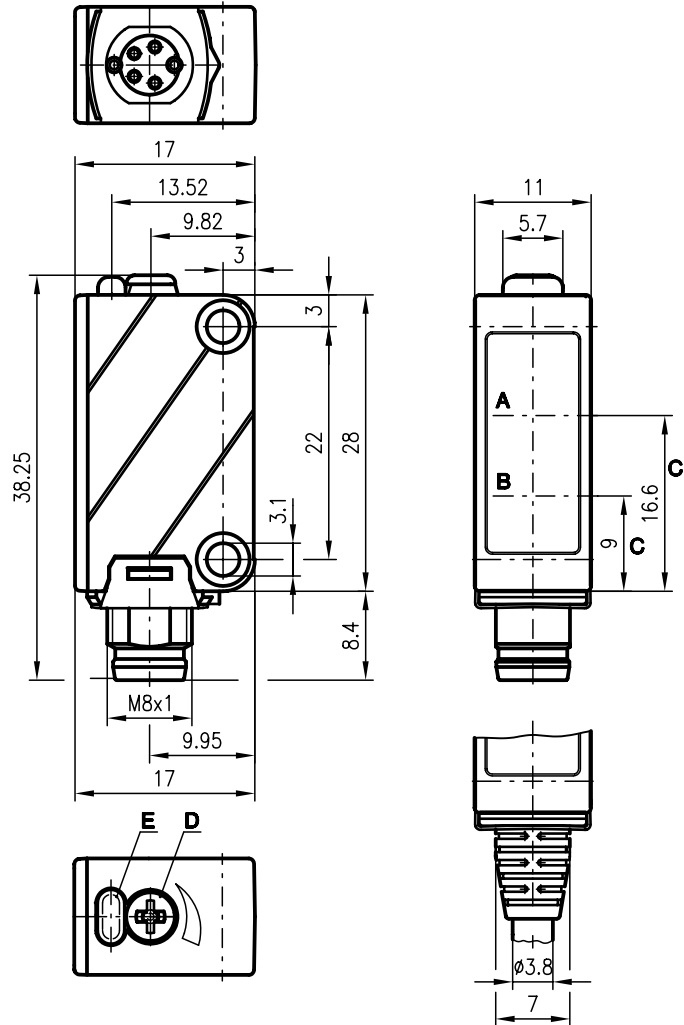
0.02 ... 5m



- Polarised retro-reflective photoelectric sensor in visible red light
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events
- Polarisation filter blocks unwanted reflections
- Complementary PNP switching outputs for light/dark switching or as a control function

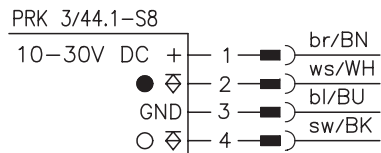


Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection



We reserve the right to make changes • 3_b03e.fm

Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.02 ... 5 m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	2 PNP transistor outputs, complementary light/dark switching
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with multiturn potentiometer

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M8 connector (4-pin)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 VAC

Tables

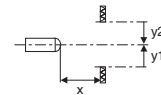
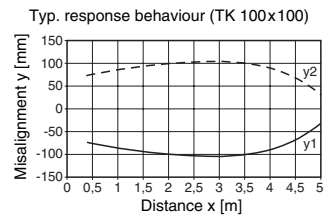
Reflectors			Operating range
1	TK(S)	100x100	0.02 ... 3.2m
2	MTK(S)	50x50	0.02 ... 2.1m
3	TK(S)	30x50	0.02 ... 1.4m
4	TK(S)	20x40	0.02 ... 1.2 m
5	Tape 2	100x100	0.02 ... 1.2 m

1	0.02			3.2	5
2	0.02		2.1	3.1	
3	0.02	1.4	2.1		
4	0.02	1.2	1.7		
5	0.02	1.2	1.8		

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams



Order guide

	Designation	Part No.
with complementary PNP switching outputs	PRK 3/44.1-S8	500 31598

Remarks



PRK 3

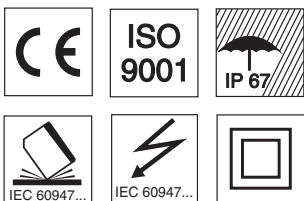
Retro-reflective photoelectric sensors with polarisation filter



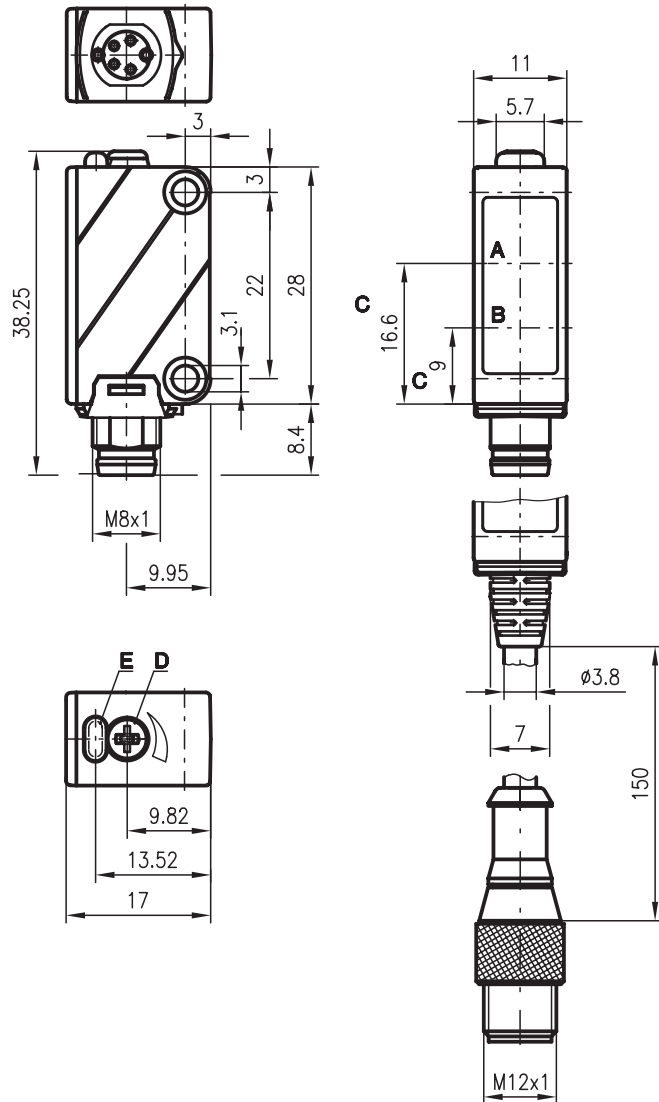
0.02 ... 5m



- Polarised retro-reflective photoelectric sensor in visible red light
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events
- Polarisation filter blocks unwanted reflections
- Complementary PNP switching outputs for light/dark switching or as a control function
- Cable tail with M12 connector for optimal mounting

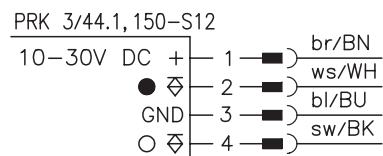


Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection



We reserve the right to make changes • 3_b04e.fm

Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.02 ... 5 m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	2 PNP transistor outputs, complementary light/dark switching
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with multiturn potentiometer

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M12 connector (4-pin) with 150mm cable tail (cross section 4x0.2mm ²)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Tables

Reflectors			Operating range
1	TK(S)	100x100	0.02 ... 3.2m
2	MTK(S)	50x50	0.02 ... 2.1m
3	TK(S)	30x50	0.02 ... 1.4m
4	TK(S)	20x40	0.02 ... 1.2 m
5	Tape 2	100x100	0.02 ... 1.2 m

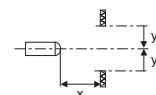
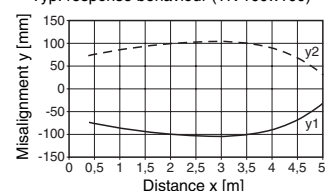
1	0.02			3.2	5
2	0.02		2.1	3.1	
3	0.02	1.4	2.1		
4	0.02	1.2	1.7		
5	0.02	1.2	1.8		

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

	Designation	Part No.
with complementary PNP switching outputs	PRK 3/44.1, 150-S12	500 37789

Remarks

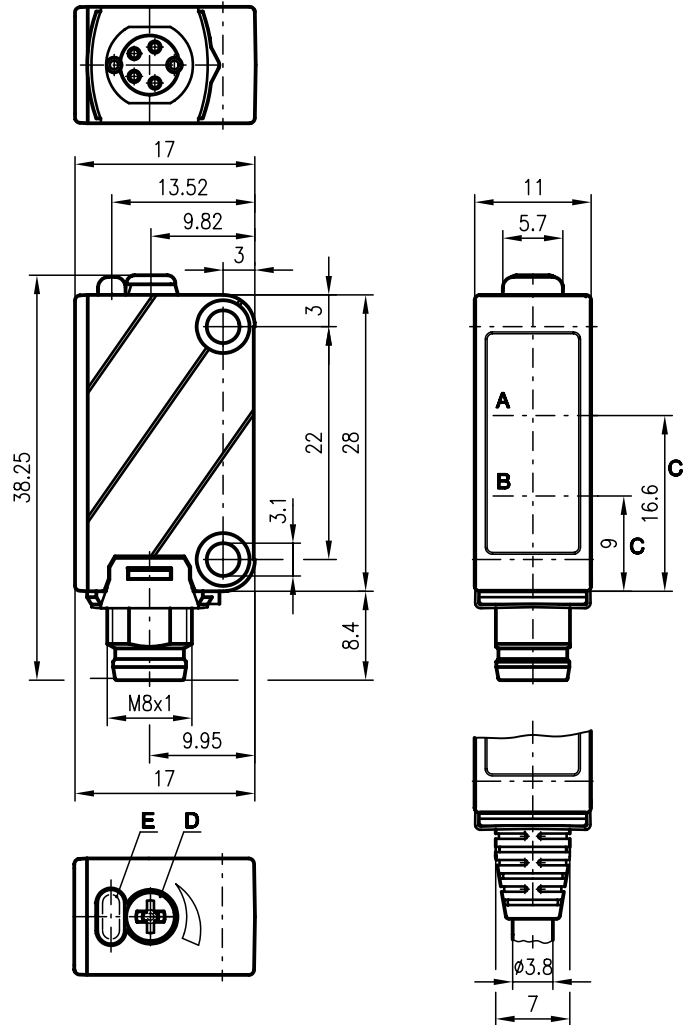


RTR 3

Energetic diffuse reflection light scanner



Dimensioned drawing



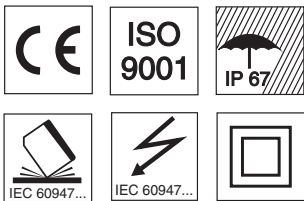
- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode



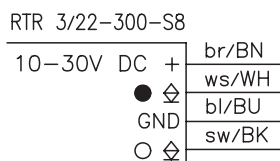
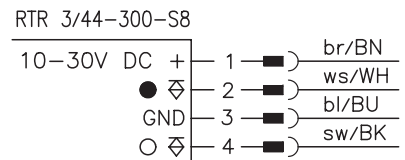
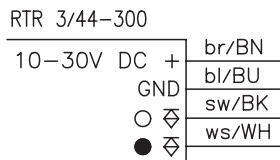
5 ... 500mm



- Energetic scanner with sensitivity adjustment
- Visible red light for easy and quick alignment
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching or as a control function



Electrical connection



Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 3_c01e.fm

Specifications

Optical data

Typ. scanning range limit ¹⁾	5 ... 500mm
Scanning range ²⁾	see table
Adjustment range	60 ... 500mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable with multiterm potentiometer

Indicators

LED yellow	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M8 connector (4-pin) or PUR cable 2m (cross section 4x0.2mm ²)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 VAC

Order guide

with cable

with complementary
PNP switching outputs

Designation	Part No.
RTR 3/44-300	500 30921

with M8 connector

with complementary
PNP switching outputs
with complementary
NPN switching outputs

RTR 3/44-300-S8	500 30920
RTR 3/22-300-S8	500 33310

Tables

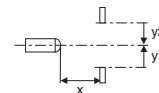
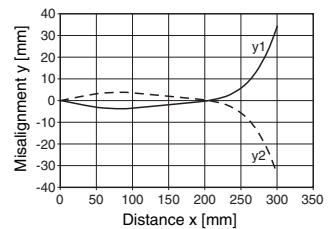
1	5	300	500
2	8	145	220
3	10	110	120

1	white 90%
2	grey 18%
3	black 6%

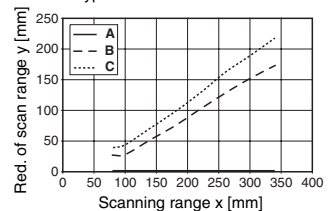
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

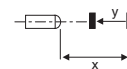
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A** white 90%
- B** grey 18%
- C** black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRTR 3

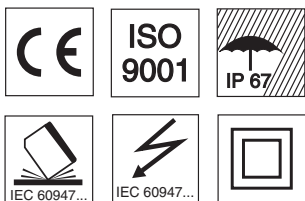
Diffuse reflection light scanner with background suppression



7 ... 300mm

10 - 30 V
DC

- Scanner with adjustable background suppression
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events

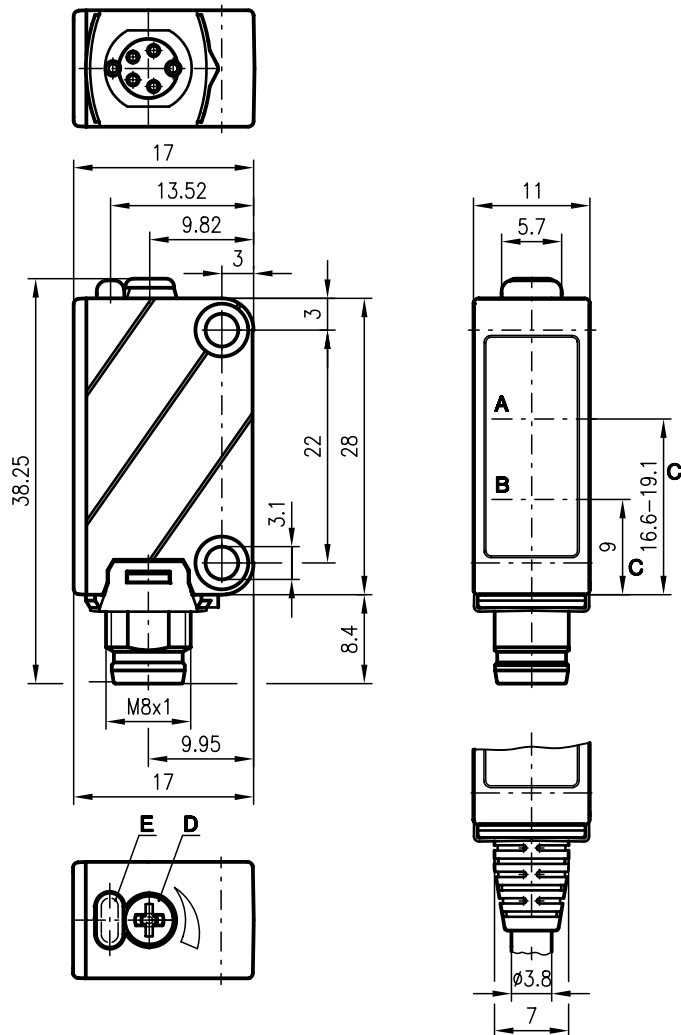


Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection

HRTR 3/44-150, 5000
HRTR 3/44-150

10-30V DC +	br/BN
GND	bl/BU
○	sw/BK
●	ws/WH

HRTR 3/22-150

10-30V DC +	br/BN
GND	bl/BU
○	sw/BK
●	ws/WH

HRTR 3/44-150-S8

10-30V DC +	1	br/BN
●	2	ws/WH
GND	3	bl/BU
○	4	sw/BK

HRTR 3/22-150-S8

10-30V DC +	1	br/BN
●	2	ws/WH
GND	3	bl/BU
○	4	sw/BK

We reserve the right to make changes • 3_d02e.fm

Specifications

Optical data

Typ. scanning range limit ¹⁾	7 ... 300mm
Scanning range ²⁾	see table
Adjustment range	25 ... 300mm
Light beam characteristic	focussed at 110mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M8 connector (4-pin) or PUR cable 2m/5m (cross section 4x0.2mm ²)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

Selection table		Order code →	HRTR 3/44-150 Part No. 500 30925	HRTR 3/44-150-S8 Part No. 500 30924	HRTR 3/44-150, 5000 Part No. 500 37144	HRTR 3/22-150 Part No. 500 32368	HRTR 3/22-150-S8 Part No. 500 82277		
Equipment ↓	Switching output	PNP transistor	●	●	●				
		NPN transistor				●	●		
		light/dark switching	●	●	●	●	●		
Connection	M8 connector			●			●		
	cable 5000mm				●				
	cable 2000mm		●			●			

Tables

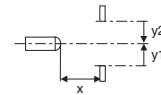
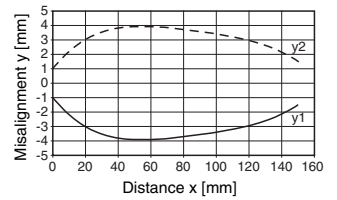
1	7	150	300
2	10	148	270
3	15	144	220

1	white 90%
2	grey 18%
3	black 6%

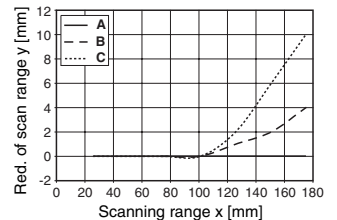
- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams

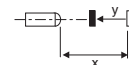
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



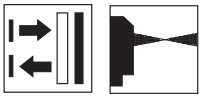
Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRTR 3

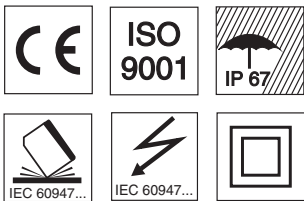
Diffuse reflection light scanner with background suppression



7 ... 300mm

10 - 30 V
DC

- Scanner with adjustable background suppression
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events

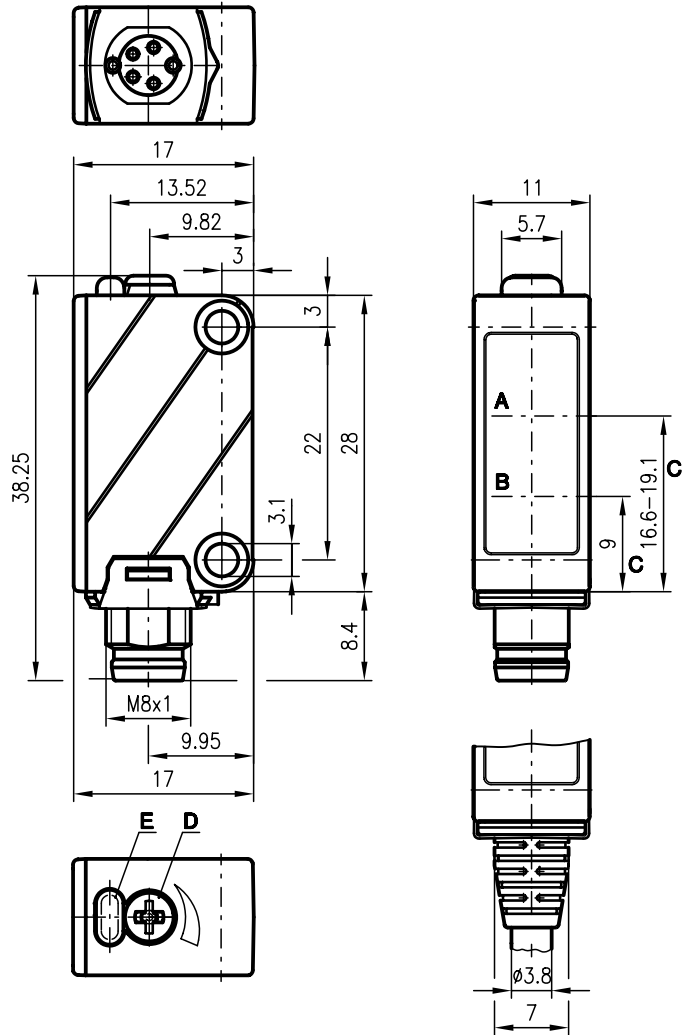


Accessories:

(available separately • see page 84)

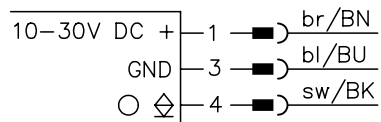
- Mounting systems (BT 3)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection



We reserve the right to make changes • 3_d01e.fm

Specifications

Optical data

Typ. scanning range limit ¹⁾	7 ... 300mm
Scanning range ²⁾	see table
Adjustment range	25 ... 300mm
Light beam characteristic	focussed at 110mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	1 PNP transistor output, complementary
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M8 connector (3-pin) with 200mm cable tail

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	acc. to IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 150VAC

Order guide

with 200mm cable and
M8 connector

Designation	Part No.
HRTR 3/4-150, 200-S8	500 33214

Tables

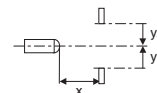
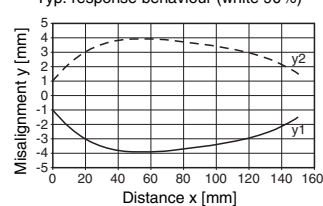
1	7	150	300
2	10	148	270
3	12	144	230

1	white 90%
2	grey 18%
3	black 6%

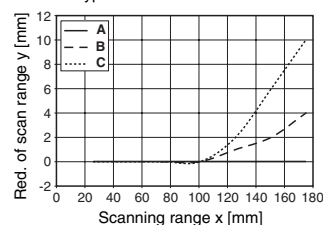
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

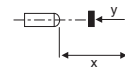
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A** white 90%
- B** grey 18%
- C** black 6%



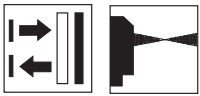
Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRTR 3

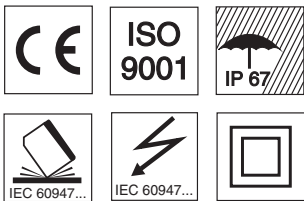
Diffuse reflection light scanner with background suppression



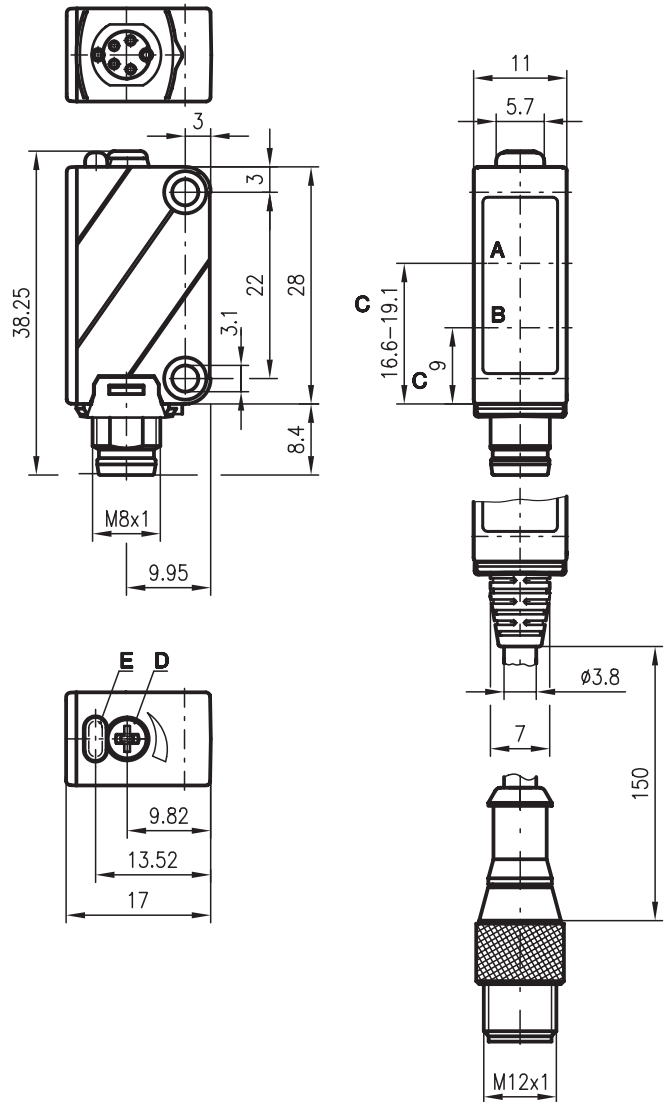
7 ... 300mm

10 - 30 V
DC

- Scanner with adjustable background suppression
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- High switching frequency for detection of fast events
- Cable tail with M12 connector for optimal mounting

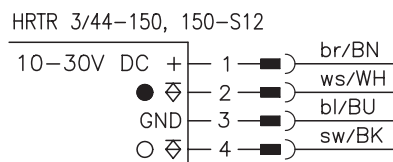


Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Adjustment screw
- E Indicator diode

Electrical connection



We reserve the right to make changes • 3_d04e.fm

Accessories:

(available separately • see page 84)

- Mounting systems (BT 3)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Specifications

Optical data

Typ. scanning range limit ¹⁾	7 ... 300mm
Scanning range ²⁾	see table
Adjustment range	25 ... 300mm
Light beam characteristic	focussed at 110mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 25mA
Switching output	2 PNP transistor outputs, complementary light/dark switching
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	plastic
Optics cover	plastic (PMMA)
Weight	20g
Connection type	M 12 connector (4-pin) with 150mm cable tail (cross section 4x0.2mm ²)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 VAC

Order guide

with complementary
PNP switching outputs

Designation	Part No.
HRTR 3/44-150, 150-S12	500 37789

Tables

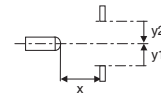
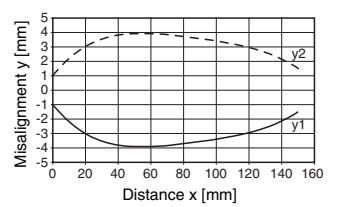
1	7	150	300
2	10	148	270
3	15	144	220

1	white 90%
2	grey 18%
3	black 6%

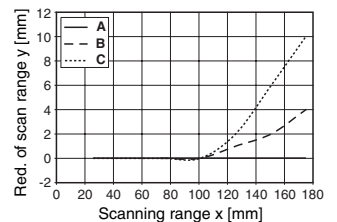
<input type="checkbox"/>	Scanning range [mm]
<input type="checkbox"/>	Typ. scanning range limit [mm]

Diagrams

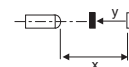
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A** white 90%
- B** grey 18%
- C** black 6%

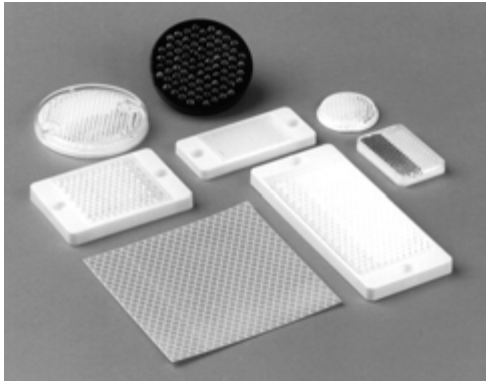


Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



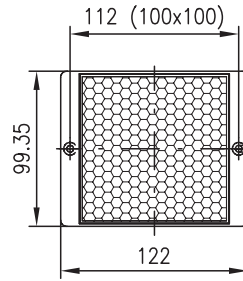
Reflectors



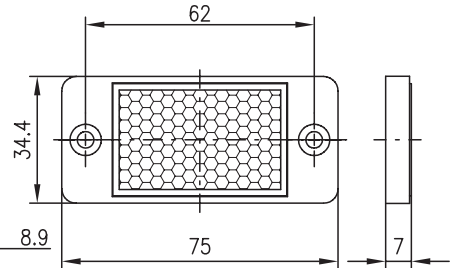
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

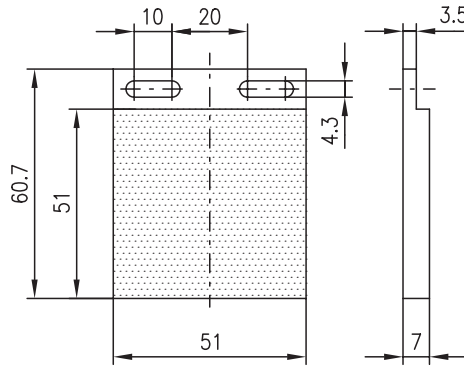
TKS 100 x 100



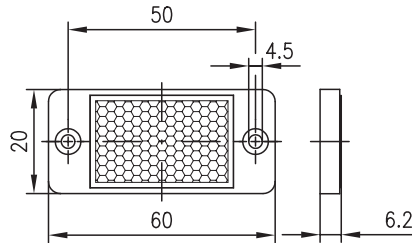
TKS 30 x 50



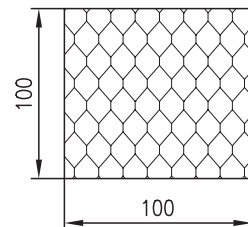
MTKS 50 x 50



TKS 20 x 40



Tape No. 2



Additional information in section "Accessories" from page 925 onwards!

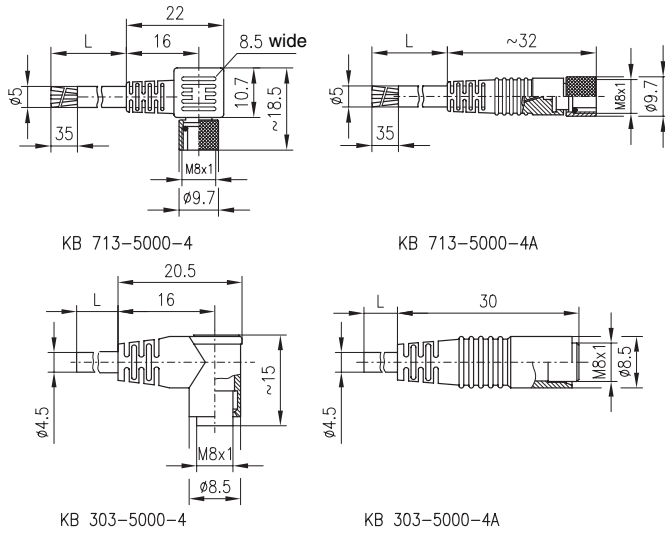
We reserve the right to make changes • 3_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 713-5000-4	500 29173
KB 713-5000-4A	500 29174
KB 303-5000-4	500 36152
KB 303-5000-4A	500 36153
BT 3	500 60511



Dimensioned drawings

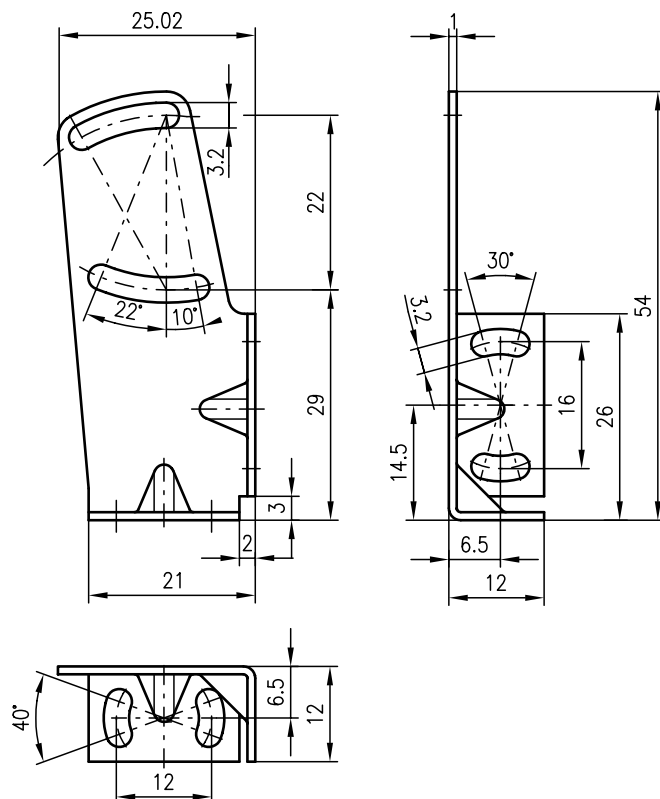


Selection table

M8 connectors	
with cable (5m cable length)	
KB 713-5000-4	KB 713-5000-4A
KB 303-5000-4	KB 303-5000-4A

Dimensioned drawings

BT 3



Connectors, plugs, cables



For devices with M8 connectors, 4 connectors with ready-made 5m cable are available.

KB 713 plugged and screwed: IP 67
KB 303 plugged: IP 65

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 3





406 Series

Overview and advantages

- Small sensor series with robust plastic housing
- Powerful through long operating ranges

Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners

10 ... 30VDC voltage with PNP transistor output

Light/dark switching via control line

- M12 connector for fast installation
- Cable models for limited installation space





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing	Light source		Operating voltage		Output		
				Red light	Infrared	10 ... 30VDC	AS-i system	PNP transistor	NPN transistor	AS-interface
	LS 406/4	0 ... 12000mm	•		•	•		•		
	LS 406/4,130-S12	0 ... 12000mm	•		•	•		•		
	PRK 406/4	10 ... 5000mm	•	•		•		•		
	PRK 406/4,130-S12	10 ... 5000mm	•	•		•		•		
	RT 406-400	10 ... 500mm	•		•	•		•		
	RT 406-400, 130-S12	10 ... 500mm	•		•	•		•		



Switching frequency	Switching	Connection			Options						Page
	Light/dark	Cable	M12 connector	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Transparent media	Focussed light beam	
500Hz	•	•									91
500Hz	•		•								91
500Hz	•	•			•						93
500Hz	•		•		•						93
500Hz	•	•						•			95
500Hz	•		•					•			95



LS 406

Throughbeam photoelectric sensors

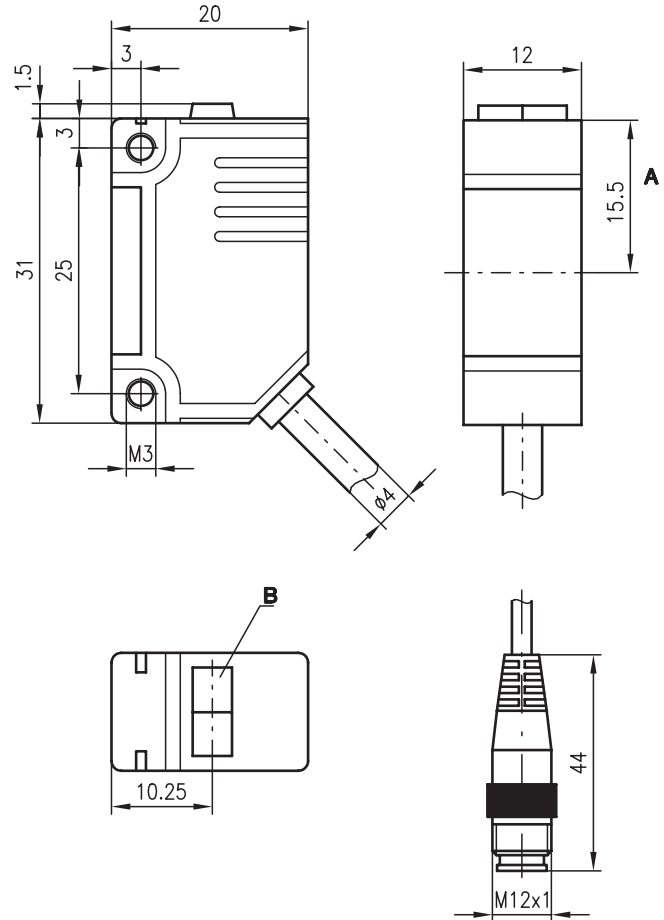


12m



- Throughbeam photoelectric sensor with high performance reserve in the infrared
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- Light/dark switching via control line for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status

Dimensioned drawing



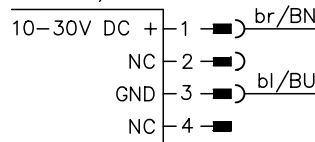
- A Optical axis
- B Indicator diodes

Electrical connection

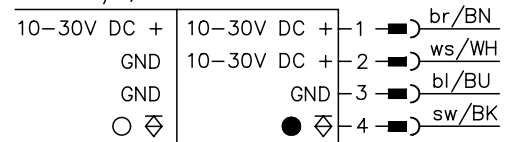
Transmitter

Receiver

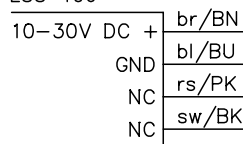
LSS 406, 130-S12



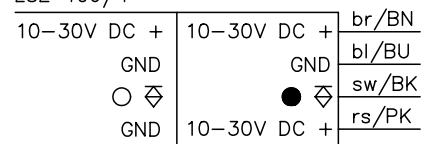
LSE 406/4, 130-S12



LSS 406



LSE 406/4



Accessories:

(available separately • see page 96)

- Mounting systems (BT 406)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 406_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	12 m
Operating range ²⁾	8m
Light source	LED (modulated light)
Wavelength	Infrared light

Timing

Switching frequency	500Hz
Response time	1 ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U _B
Bias current	≤ 50mA
Switching output	1 PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA

Indicators

LED red	switching state
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	10g (without cable)
Connection type	cable (130mm) with M12 connector (4-pin) or PUR cable 2m (4x0.25 mm ² cross section)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Light switching for: control line (pink): not connected or connected to GND
Dark switching for: control line (pink): U_B
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

0	8	12
---	---	----

- Operating range [m]
- Typ. operating range limit [m]

Diagrams

Order guide

	Designation	Part No.
with cable connection		
Transmitter and receiver	LS 406/4	500 31687
with cable (130mm) M12 connector		
Transmitter and receiver	LS 406/4,130-S12	500 31690

Remarks



PRK 406

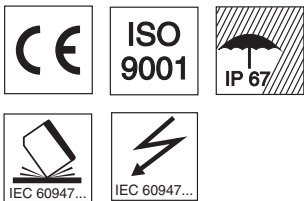
Retro-reflective photoelectric sensors with polarisation filter



0.01 ... 5m



- Polarised retro-reflective photoelectric sensor with high performance reserve in visible red light
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- Polarisation blocks unwanted reflections.
- Light/dark switching via control line for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status

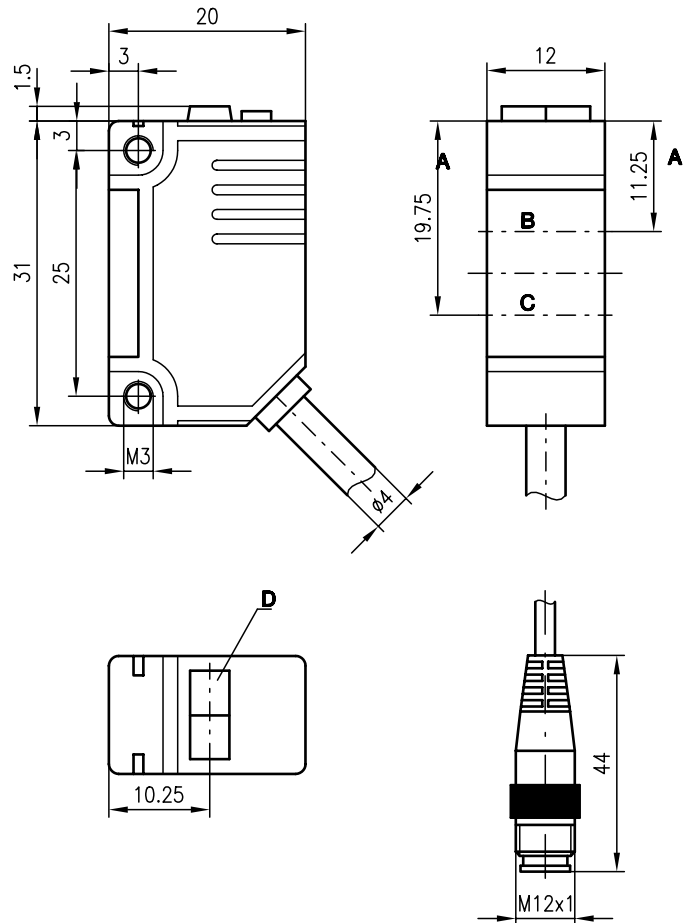


Accessories:

(available separately • see page 96)

- Mounting systems (BT 406)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

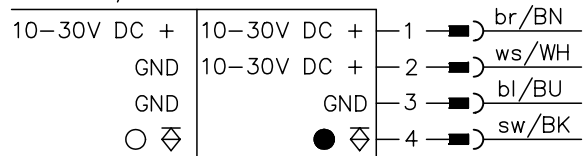
Dimensioned drawing



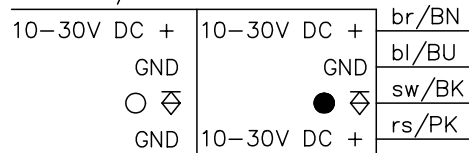
- A Optical axis
- B Transmitter
- C Receiver
- D Indicator diodes

Electrical connection

PRK 406/4, 130-S12



PRK 406/4



We reserve the right to make changes • 406_b01e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.01 ... 5 m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	visible red light, polarised

Timing

Switching frequency	500Hz
Response time	1 ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 10\%$ of U_B
Bias current	≤ 50 mA
Switching output	1 PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 100mA

Indicators

LED red	switching state
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	10g (without cable)
Connection type	cable (130mm) with M12 connector (4-pin) or PUR cable 2m (4x0.25 mm ² cross section)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) Light switching for: control line (pink): not connected or connected to GND
 Dark switching for: control line (pink): U_B
 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors		Operating range
TK(S)	100x100	0.01 ... 3.0m
TK(S)	50x100	0.01 ... 2.2m
TK(S)	50x50	0.01 ... 1.6m
TK(S)	30x50	0.01 ... 1.5m
TK(S)	20x40	0.01 ... 1.3m
TK	82	0.15 ... 2.3m
TK	60	0.02 ... 1.4m
TK	45	0.02 ... 1.3m
TK	35	0.01 ... 1.1m
Tape 2	50x50	0.15 ... 0.9m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

	Designation	Part No.
with cable connection		
Transmitter and receiver	PRK 406/4	500 31693
with cable (130mm) M12 connector		
Transmitter and receiver	PRK 406/4,130-S12	500 31694

Remarks

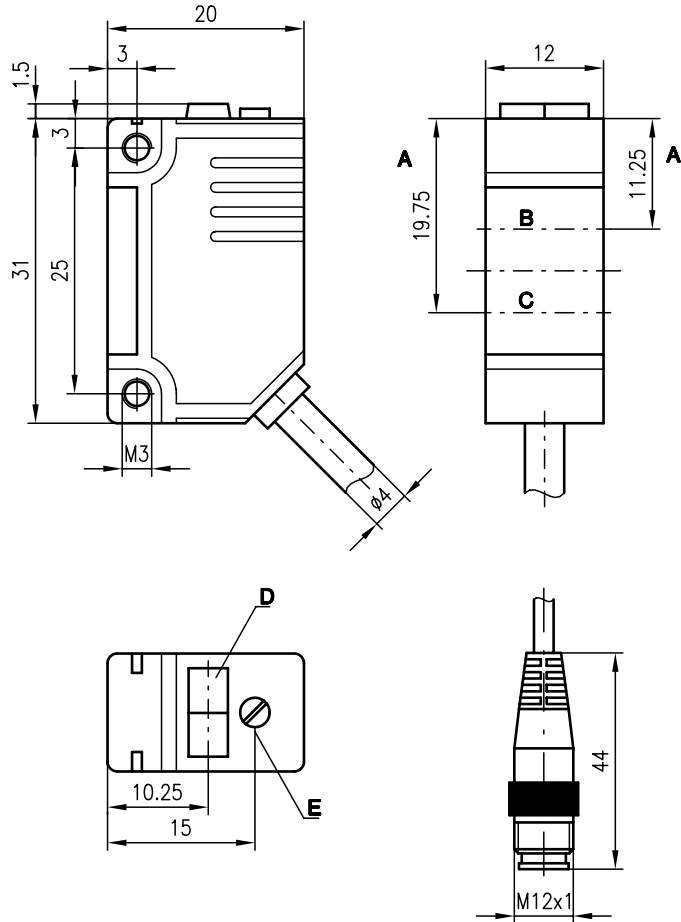


RT 406

Energetic diffuse reflection light scanner



Dimensioned drawing



- A Optical axis
- B Transmitter
- C Receiver
- D Indicator diodes
- E Sensitivity adjustment

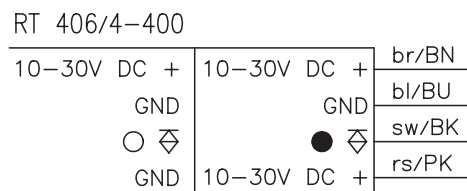
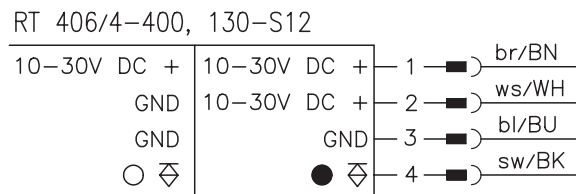


0.01 ... 0.5m



- Energetic scanner with sensitivity adjustment
- Small construction with robust plastic housing, protection class IP 67 for industrial application
- Light/dark switching via control line for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status

Electrical connection



Accessories:

- (available separately • see page 96)
- Mounting systems (BT 406)
 - M12 connectors (KD ...)
 - Ready-made cables (KB ...)

We reserve the right to make changes • 406_c01e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	10 ... 500mm
Scanning range ²⁾	10 ... 400mm
Light source	LED (modulated light)
Wavelength	Infrared light

Timing

Switching frequency	500Hz
Response time	1 ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 10\%$ of U_B
Bias current	≤ 50 mA
Switching output	1 PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	switching state
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	10g
Connection type	cable (13mm) with M12 connector (4-pin) or PUR cable 2m (4x0.25 mm ² cross section)

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) Light switching for: control line (pink): not connected or connected to GND
 Dark switching for: control line (pink): U_B
 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with cable connection		
Transmitter and receiver	RT 406-400	500 31695
with cable (130mm) M12 connector		
Transmitter and receiver	RT 406-400, 130-S12	500 31696

Tables

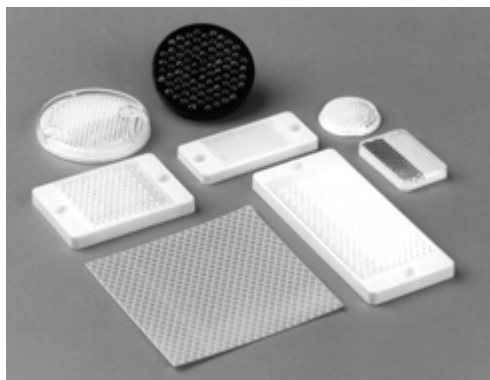
10	400	500
----	-----	-----

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Reflectors


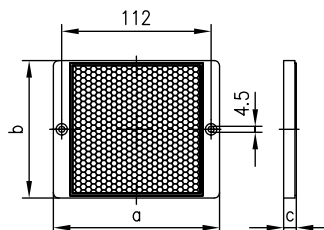
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Order codes:

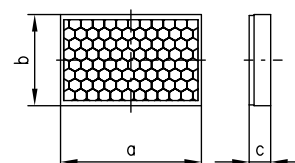
Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 50x100	500 22814
TKS 30x100	500 23525
TK 30x100	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
Tape 2	500 11523
TG 60	500 03179
TG 29	500 09374
TG 6	500 03176
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
BT 406	500 34073

Dimensioned drawings

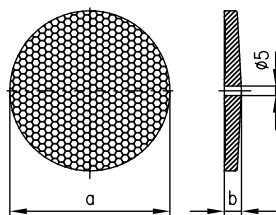
TKS 100 x 100



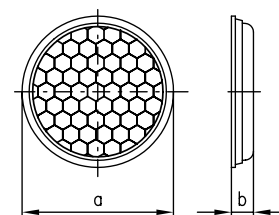
TK 30 x 50



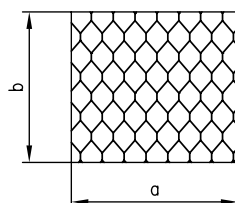
TK 82



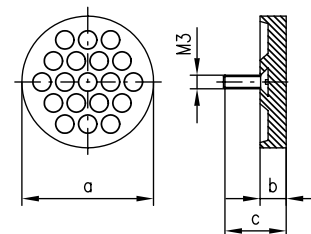
TK 35



Tape No. 2



TG 29


Selection table

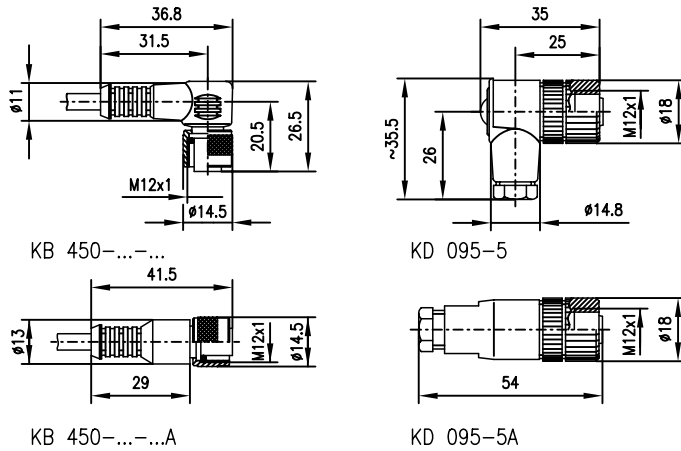
Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 ²⁾	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 ²⁾	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 ²⁾	-20°C/+60°C	48	32	6.8	○	●
TK 82 ¹⁾	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
TK 45	-20°C/+60°C	46	8			●
TK 35	-20°C/+60°C	35.5	5			●
Tape 2	-20°C/+60°C	100	100			●
TG 60	-20°C/+120°C	60	9	24	●	
TG 29	-20°C/+120°C	29	6.5	14.5	●	
TG 6	-20°C/+120°C	6	5			●

1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket



 Additional information in section "Accessories" from page 925 onwards!
 We reserve the right to make changes • 406_zu_e.fm



Dimensioned drawings

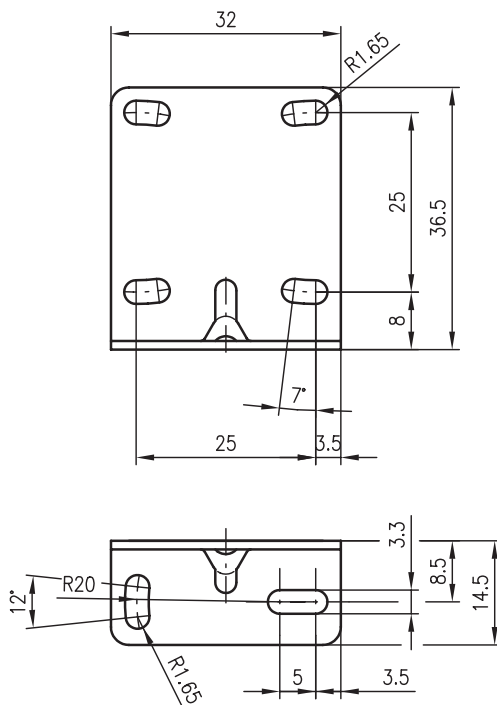


Selection table

M12 connectors			
			
with 4-wire cable		without cable	
2m cable length		KD 095-5	KD 095-5A
KB 450-2000-4	KB 450-2000-4A		
5m cable length			
KB 450-5000-4	KB 450-5000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings

BT 406



M12 connectors



For devices with M12 connectors, there are available: connectors with ready made cables and 2 connectors with screw connection.

Protection class (DIN 40050) plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 406





408 Series

Overview and advantages

- Small sensor series with robust plastic housing
- Powerful through long operating ranges
- Universal application by means of vertical or horizontal light exit

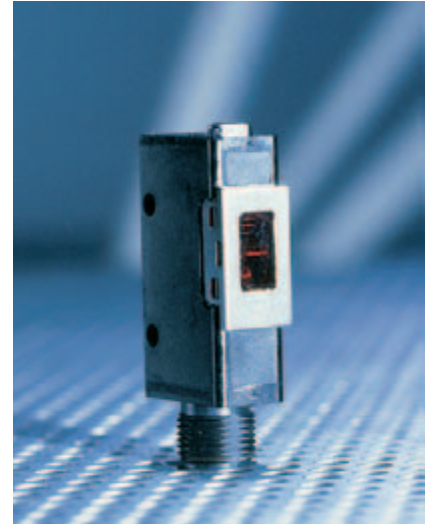
Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners




Interference protection for up to 3 devices

10 ... 30VDC voltage with PNP transistor output

- M12 connector for fast installation
- Cable models for limited installation space





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing			Light source		Output	
			Plastic	Vertical	Axial	Red light	Infrared light	PNP transistor	NPN transistor
	LS 408/4	0 ... 14000mm	•	•			•	•	
	LS 408/4-S12	0 ... 14000mm	•	•			•	•	
	LS 408A/4	0 ... 14000mm	•		•		•	•	
	LS 408A/4-S12	0 ... 14000mm	•		•		•	•	
	PRK 408/4	10 ... 5000mm	•	•		•		•	
	PRK 408/4-S12	10 ... 5000mm	•	•		•		•	
	PRK 408A/4	10 ... 5000mm	•		•	•		•	
	PRK 408A/4-S12	10 ... 5000mm	•		•	•		•	
	RT 408/4-600	20 ... 700mm	•	•			•	•	
	RT 408/4-600-S12	20 ... 700mm	•	•			•	•	
	RT 408A/4-600	20 ... 700mm	•		•	•		•	
	RT 408A/4-600-S12	20 ... 700mm	•		•	•		•	



Switching frequency	Connection		Options							Page
	M12 connector	Cable, 2m	Adjustment	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Transparent media	Focussed light beam	
1000Hz		•	•							103
1000Hz	•		•							103
1000Hz		•	•							105
1000Hz	•		•							105
500Hz		•	•	•						107
500Hz	•		•	•						107
500Hz		•	•	•						109
500Hz	•		•	•						109
100Hz		•	•							111
100Hz	•		•							111
100Hz		•	•							113
100Hz	•		•							113



LS 408

Throughbeam photoelectric sensors

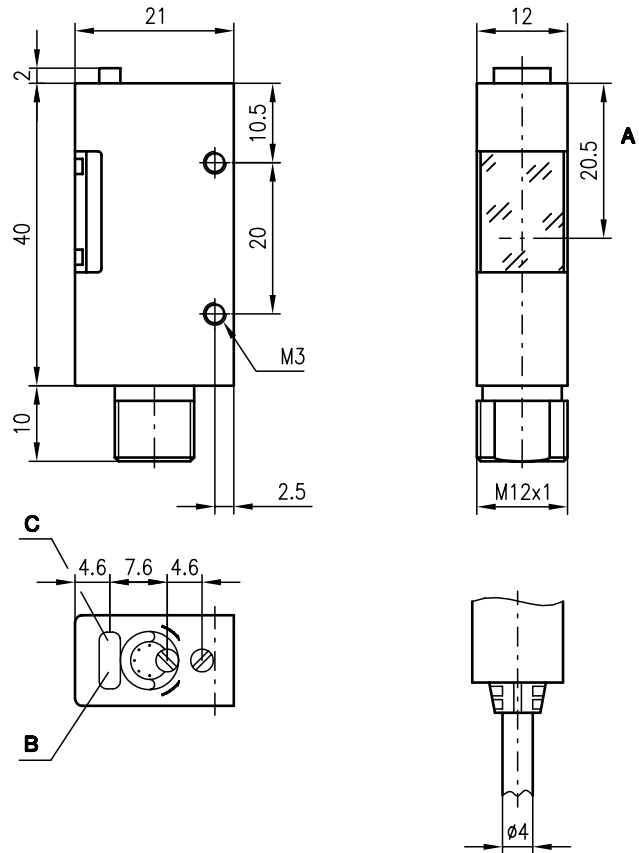


0 ... 14m

10 - 30 V
DC

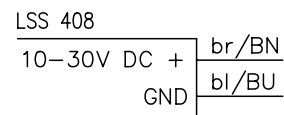
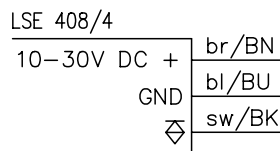
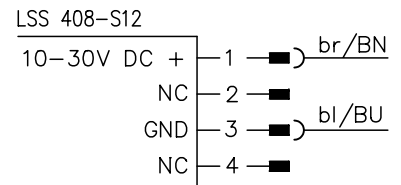
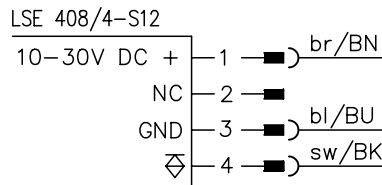
- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Comfortable multiturn sensitivity adjustment with integrated display
- Light/dark switching via selector switch for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status
- Protection of up to 3 sensors against mutual interference

Dimensioned drawing



- A Optical axis
- B Indicator diode green
- C Indicator diode red

Electrical connection



Accessories:

(available separately • see page 114)

- Mounting systems (BT 408)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 408_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 14m
Operating range ²⁾	0 ... 10m
Light source	LED (modulated light)
Wavelength	infrared light

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 50mA
Switching output	1 transistor output
Function characteristics	light/dark switching via selector switch
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	12g (without cable)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

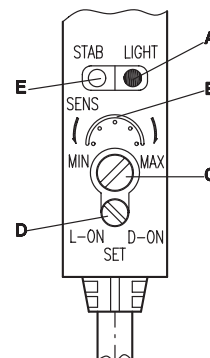
- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

0	10	14
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	Operating range [m]
	Typ. operating range limit [m]

Adjustment



- A Indicator diode red
- B Sensitivity display
- C Sensitivity adjustment
- D Operating mode switch
- E Indicator diode green

Diagrams

Order guide

	Designation	Part No.
with cable connection, PNP switching output		
Transmitter and receiver	LS 408/4	500 61186
with M12 connector, PNP switching output		
Transmitter and receiver	LS 408/4-S12	500 61189

Remarks

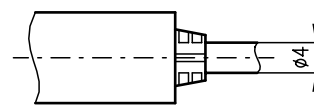
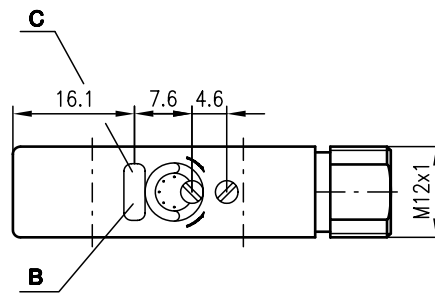
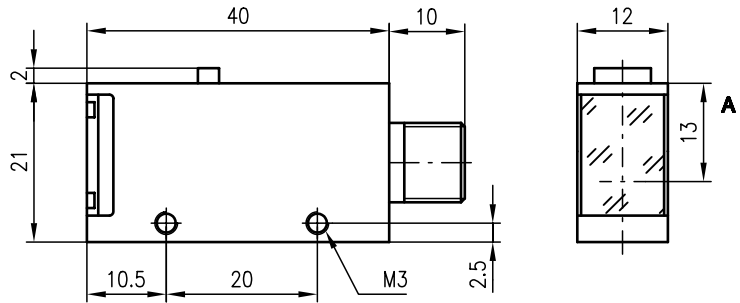


LS 408

Throughbeam photoelectric sensors



Dimensioned drawing



- A Optical axis
- B Indicator diode green
- C Indicator diode red



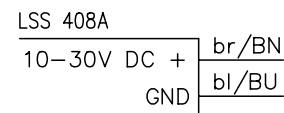
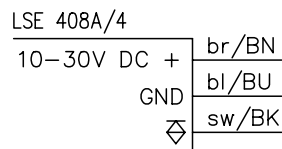
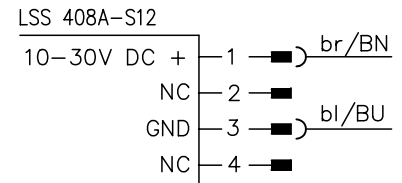
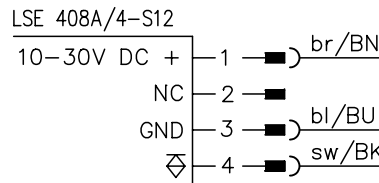
0 ... 14m



- Throughbeam photoelectric sensors, axial version, with high performance reserve in infrared light
- Comfortable multiturn sensitivity adjustment with integrated display
- Light/dark switching via selector switch for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status
- Protection of up to 3 sensors against mutual interference



Electrical connection



We reserve the right to make changes • 408_a02e.fm

Accessories:

(available separately • see page 114)

- Mounting systems (BT 408)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 14m
Operating range ²⁾	0 ... 10m
Light source	LED (modulated light)
Wavelength	infrared light

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 50mA
Switching output	1 transistor output
Function characteristics	light/dark switching via selector switch
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	12g (without cable)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

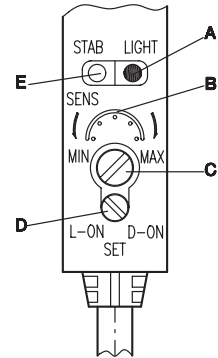
3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

0	10	14
---	----	----

	Operating range [m]
	Typ. operating range limit [m]

Adjustment



- A Indicator diode red
- B Sensitivity display
- C Sensitivity adjustment
- D Operating mode switch
- E Indicator diode green

Diagrams

Order guide

	Designation	Part No.
with cable connection, PNP switching output		
Transmitter and receiver	LS 408A/4	500 61192
with M12 connector, PNP switching output		
Transmitter and receiver	LS 408A/4-S12	500 61195

Remarks



PRK 408

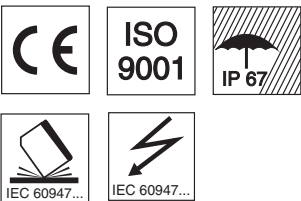
Retro-reflective photoelectric sensors with polarisation filter



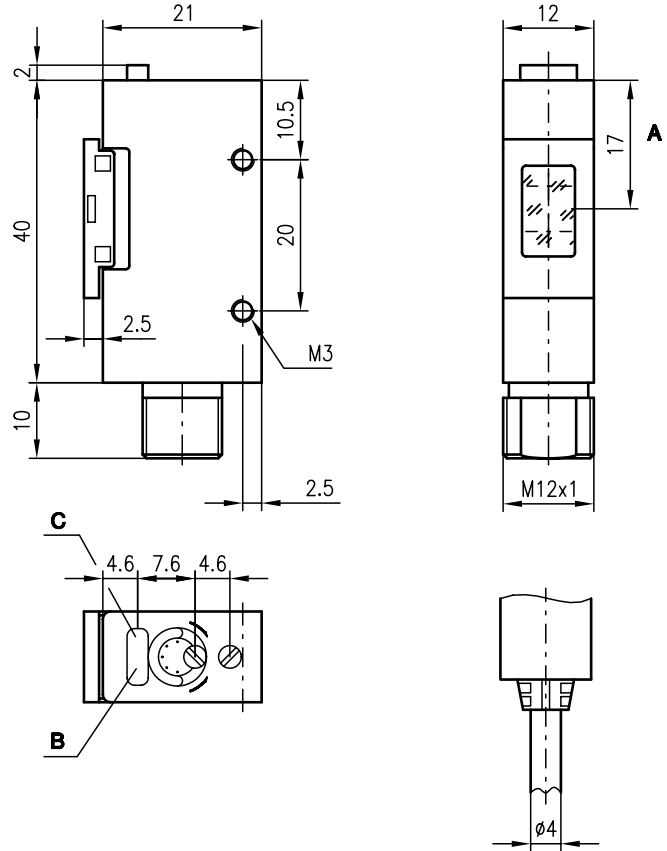
0.01 ... 5.0m



- Polarised retro-reflective photoelectric sensors with high performance reserve in red light
- Comfortable multiturn sensitivity adjustment with integrated display
- Light/dark switching via selector switch for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status
- Protection of up to 3 sensors against mutual interference

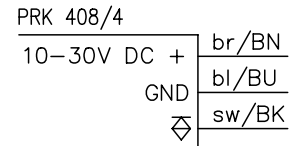
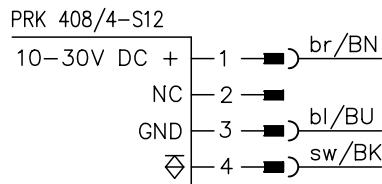


Dimensioned drawing



- A Optical axis
- B Indicator diode green
- C Indicator diode red

Electrical connection



We reserve the right to make changes • 408_b01e.fm

Accessories:

(available separately • see page 114)

- Mounting systems (BT 408)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.01 ... 5 m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	visible red light, polarised

Timing

Switching frequency	500Hz
Response time	1.0ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 40mA
Switching output	1 transistor output
Function characteristics	light/dark switching via selector switch
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	12g (without cable)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

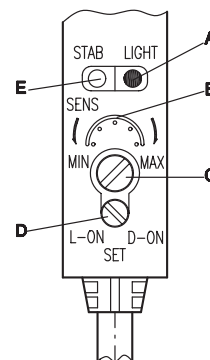
- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors		Operating range
TK(S)	100x100	0.01 ... 4.0m
TK(S)	50x100	0.01 ... 2.9m
TK(S)	50x50	0.01 ... 2.4m
TK(S)	30x50	0.01 ... 2.0m
TK(S)	20x40	0.01 ... 1.5m
TK	82.2	0.10 ... 3.2m
TK	60	0.01 ... 2.1m
TK	45	0.01 ... 1.8m
TK	35	0.01 ... 1.6m
Tape 2	50x50	0.05 ... 1.3m

TK ... = adhesive
 TK(S) ... = screw type
 Tape 2 = adhesive

Adjustment



- A Indicator diode red
 B Sensitivity display
 C Sensitivity adjustment
 D Operating mode switch
 E Indicator diode green

Order guide

	Designation	Part No.
with cable connection, PNP switching output		
Transmitter and receiver	PRK 408/4	500 61198
with M12 connector, PNP switching output		
Transmitter and receiver	PRK 408/4-S12	500 61199

Remarks



PRK 408

Retro-reflective photoelectric sensors with polarisation filter



0.01 ... 5.0m



- Polarised retro-reflective photoelectric sensors, axial version, with high performance reserve in red light
- Comfortable multiturn sensitivity adjustment with integrated display
- Light/dark switching via selector switch for optimal adaptation to the application
- Perfectly visible indicator LEDs for switching and operating status
- Protection of up to 3 sensors against mutual interference

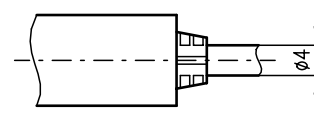
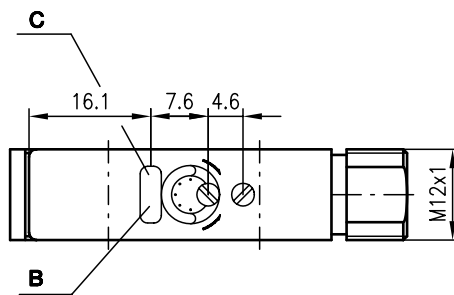
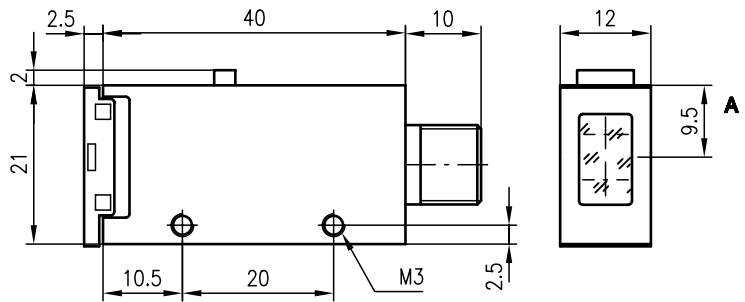


Accessories:

(available separately • see page 114)

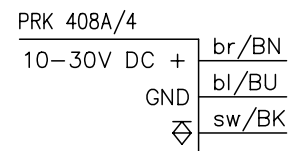
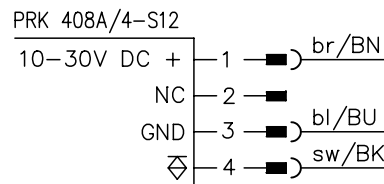
- Mounting systems (BT 408)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Dimensioned drawing



- A Optical axis
- B Indicator diode green
- C Indicator diode red

Electrical connection



We reserve the right to make changes • 408_b02e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.01 ... 5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	visible red light, polarised

Timing

Switching frequency	500Hz
Response time	1.0ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 40mA
Switching output	1 transistor output
Function characteristics	light/dark switching via selector switch
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	12g (without cable)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

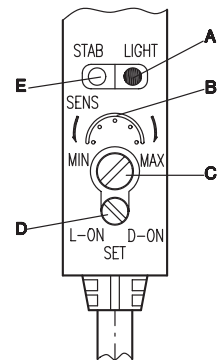
3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors		Operating range
TK(S)	100x100	0.01 ... 4.0m
TK(S)	50x100	0.01 ... 2.9m
TK(S)	50x50	0.01 ... 2.4m
TK(S)	30x50	0.01 ... 2.0m
TK(S)	20x40	0.01 ... 1.5m
TK	82.2	0.10 ... 3.2m
TK	60	0.01 ... 2.1m
TK	45	0.01 ... 1.8m
TK	35	0.01 ... 1.6m
Tape 2	50x50	0.05 ... 1.3m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Adjustment



- A Indicator diode red
- B Sensitivity display
- C Sensitivity adjustment
- D Operating mode switch
- E Indicator diode green

Order guide

	Designation	Part No.
with cable connection, PNP switching output		
Transmitter and receiver	PRK 408A/4	500 61200
with M12 connector, PNP switching output		
Transmitter and receiver	PRK 408A/4-S12	500 61201

Remarks



RT 408

Energetic diffuse reflection light scanner

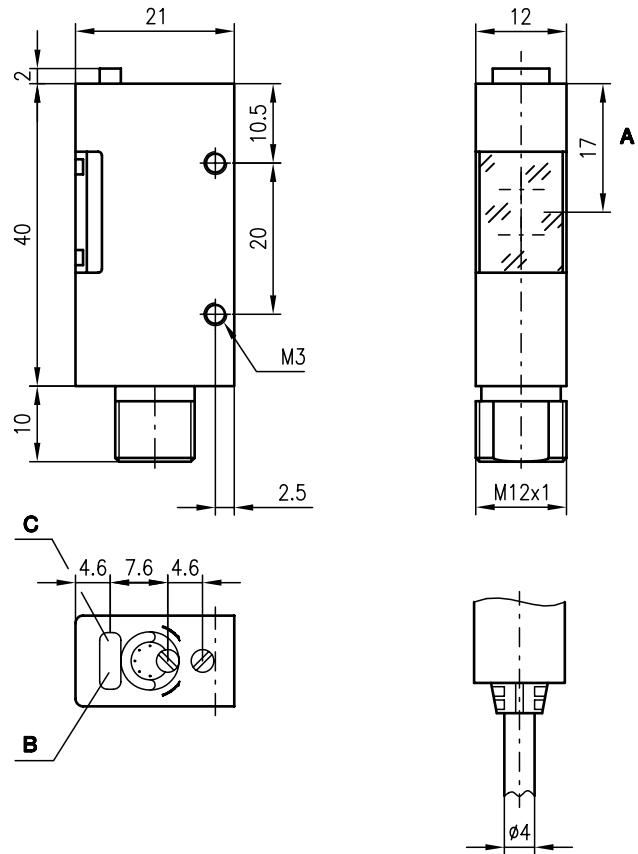


0.02 ... 0.7 m



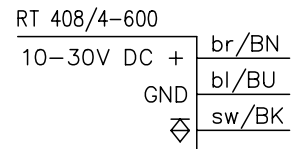
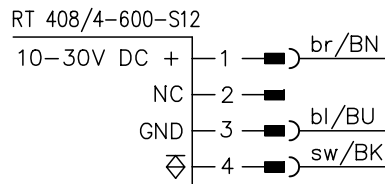
- Diffuse reflection light scanners with long operating range in infrared light
- Small and compact construction with robust plastic housing, protection class IP 67 for industrial application
- Comfortable multiturn sensitivity adjustment with integrated display
- Light/dark switching via selector switch for optimal adaptation to the application
- Protection of up to 3 sensors against mutual interference

Dimensioned drawing



- A Optical axis
- B Indicator diode green
- C Indicator diode red

Electrical connection



Accessories:

(available separately • see page 114)

- Mounting systems (BT 408)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

We reserve the right to make changes • 408_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	20 ... 700mm
Scanning range ²⁾	20 ... 600mm
Light source	LED (modulated light)
Wavelength	infrared light

Timing

Switching frequency	100Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 40mA
Switching output	1 transistor output
Function characteristics	light/dark switching via selector switch
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	12g (without cable)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Typ. scanning range limit: max. attainable range without performance reserve

2) Scanning range: recommended range with performance reserve

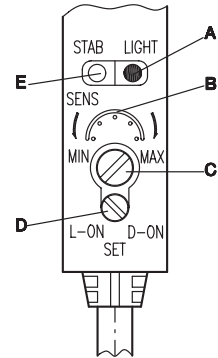
3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

20	600	700
----	-----	-----

<input type="checkbox"/>	Scanning range [mm] (white 90%)
<input type="checkbox"/>	Typ. scanning range limit (white 90%)

Adjustment



- A Indicator diode red
- B Sensitivity display
- C Sensitivity adjustment
- D Operating mode switch
- E Indicator diode green

Diagrams

Order guide

	Designation	Part No.
with cable connection, PNP switching output		
Transmitter and receiver	RT 408/4-600	500 61202
with M12 connector, PNP switching output		
Transmitter and receiver	RT 408/4-600-S12	500 61203

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.

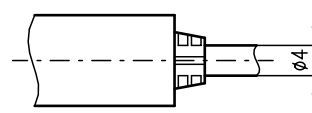
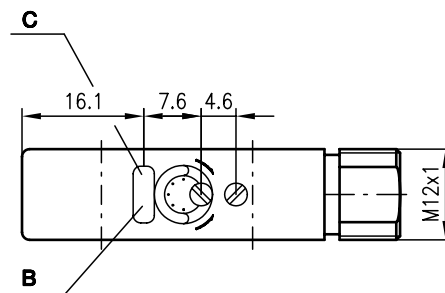
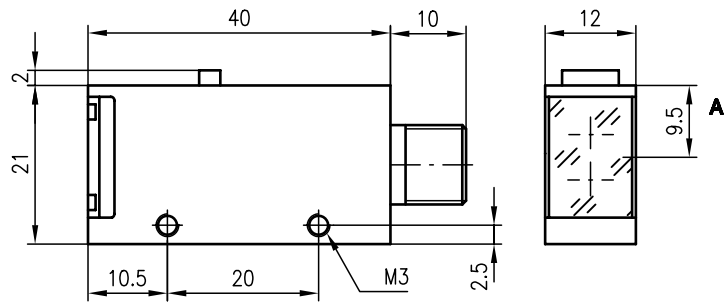


RT 408

Energetic diffuse reflection light scanner



Dimensioned drawing



- A Optical axis
- B Indicator diode green
- C Indicator diode red

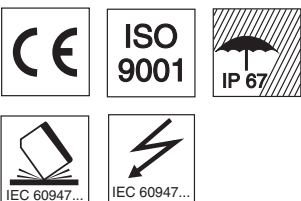


0.02 ... 0.7m



- Diffuse reflection light scanners, axial version, with long operating range in infrared light
- Small and compact construction with robust plastic housing, protection class IP 67 for industrial application
- Comfortable multiturn sensitivity adjustment with integrated display
- Light/dark switching via selector switch for optimal adaptation to the application
- Protection of up to 3 sensors against mutual interference

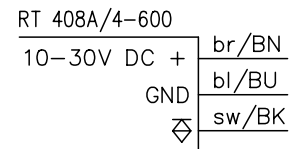
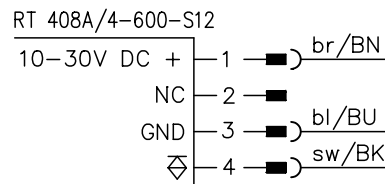
Electrical connection



Accessories:

(available separately • see page 114)

- Mounting systems (BT 408)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)



We reserve the right to make changes • 408_c02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	20 ... 700mm
Scanning range ²⁾	20 ... 600mm
Light source	LED (modulated light)
Wavelength	Infrared light

Timing

Switching frequency	100Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 40mA
Switching output	1 transistor output
Function characteristics	light/dark switching via selector switch
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED green	high performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	12g (without cable)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2

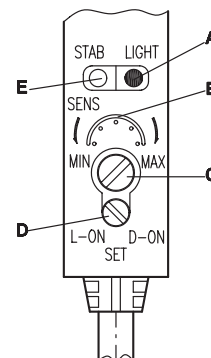
- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

20	600	700
----	-----	-----

- Scanning range [mm] (white 90%)
- Typ. scanning range limit (white 90%)

Adjustment



- A Indicator diode red
- B Sensitivity display
- C Sensitivity adjustment
- D Operating mode switch
- E Indicator diode green

Diagrams

Order guide

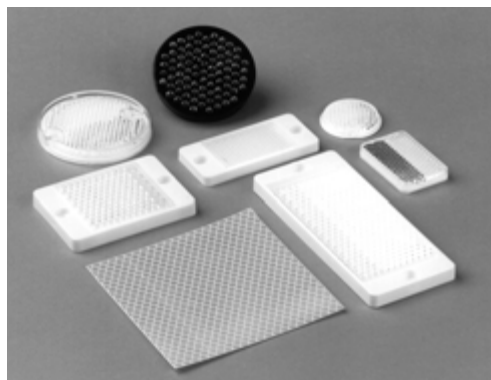
	Designation	Part No.
with cable connection, PNP switching output Transmitter and receiver	RT 408A/4-600	500 61204
with M12 connector, PNP switching output Transmitter and receiver	RT 408A/4-600-S12	500 61205

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.



Reflectors



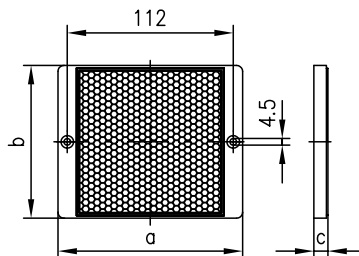
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Order codes:

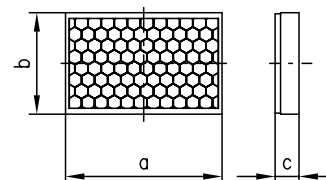
Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 30x100	500 23525
TK 30x100	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
Tape 2	500 11523
TG 60	500 03179
TG 29	500 09374
TG 6	500 03176
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
BT 408	500 34072
BT 408.1	500 34398

Dimensioned drawings

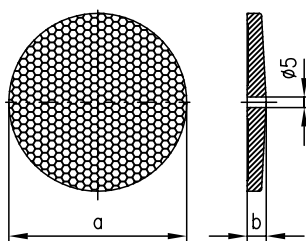
TKS 100 x 100



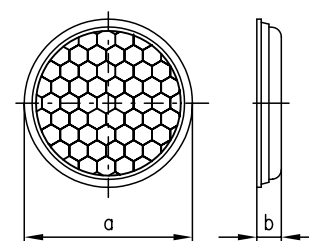
TK 30 x 50



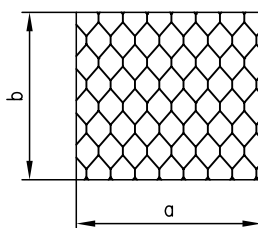
TK 82



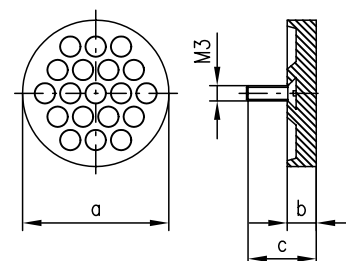
TK 35



Tape No. 2



TG 29



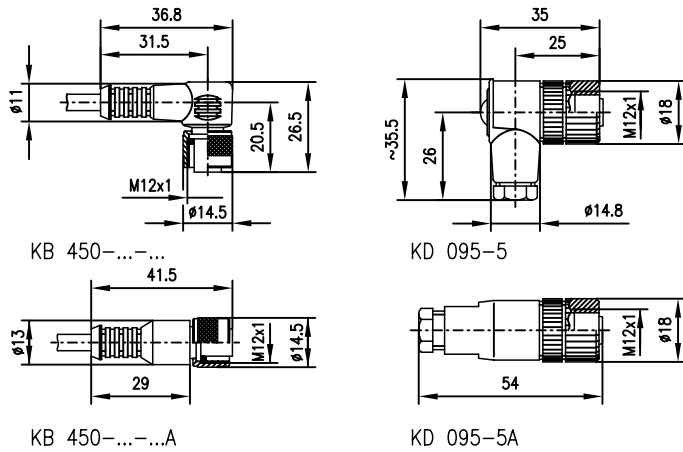
Selection table

Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 ²⁾	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 ²⁾	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 ²⁾	-20°C/+60°C	48	32	6.8	○	●
TK 82 ¹⁾	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
TK 45	-20°C/+60°C	46	8			●
TK 35	-20°C/+60°C	35.5	5			●
Tape 2	-20°C/+60°C	100	100			●
TG 60	-20°C/+120°C	60	9	24	●	
TG 29	-20°C/+120°C	29	6.5	14.5	●	
TG 6	-20°C/+120°C	6	5			●

1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket

Additional information in section "Accessories" from page 925 onwards!
 We reserve the right to make changes • 408_zu_e.fm

Dimensioned drawings

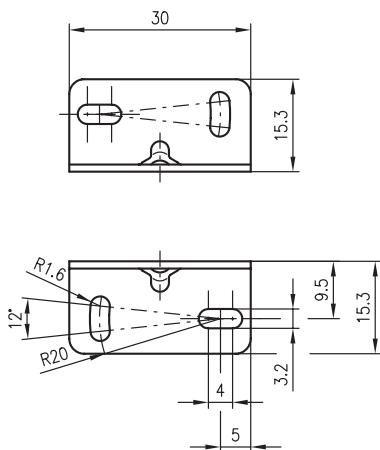


Selection table

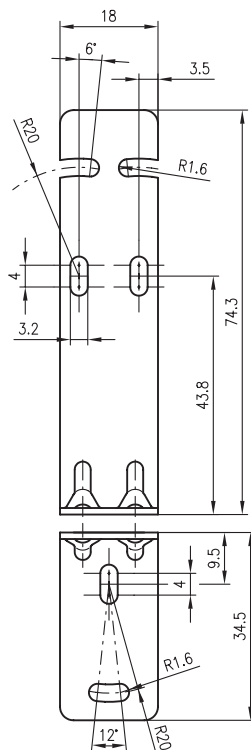
M12 connectors			
with 4-wire cable		without cable	
2m cable length		KD 095-5	KD 095-5A
KB 450-2000-4	KB 450-2000-4A		
5m cable length			
KB 450-5000-4	KB 450-5000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings

BT 408.1



BT 408



M12 connectors



For devices with M12 connectors, there are available: connectors with ready made cables and 2 connectors with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 408



BT 408 for devices with vertical optics,
BT 408.1 for axial optics (...408A...).



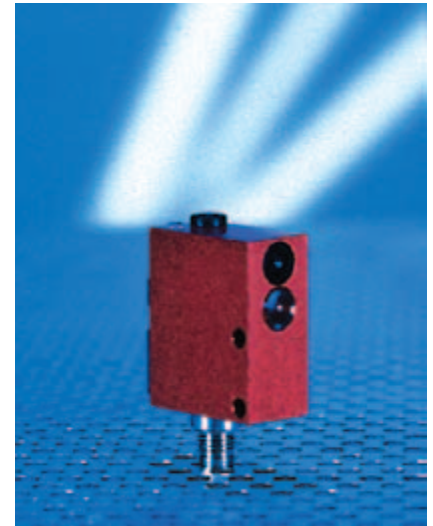
713 Series

Overview and advantages

Miniature series in robust metal housing with glass cover

Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Diffuse reflection light scanners
- Diffuse reflection light scanners with lustre function
- Diffuse reflection light scanners with background suppression
- Laser devices of all operating principles



Visible red light for easy alignment or red light laser for detection of smallest objects

High switching frequency 2500/5000Hz for detection of extremely fast events

10 ... 30VDC voltage with PNP- (NPN) transistor output

200 mA switching output for the direct switching of higher loads

Options:

- Scanners with lustre function for detection of shiny objects
- Laser devices with adjustable focus through collimator



Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage		Output			Other features
			Metal	Red light	Red light laser	10 ... 30VDC	AS-i system	PNP transistor	NPN transistor	AS-interface	Lustre detection	
	LSR 713/44	0 ... 9m	•	•		•		•				
	LSR 713/44 L8	0 ... 9m	•	•		•		•				
	LSR 713/44 L8.3	0 ... 9m	•	•		•		•				
	LSRL 713/44.8	0 ... 65m	•		•	•		•				
	LSRL 713/44.8 L8	0 ... 65m	•		•	•		•				
	LSRL 713/44.8 L8.3	0 ... 65m	•		•	•		•				
	PRK 713/44	0 ... 5m	•	•		•		•				
	PRK 713/44 L8	0 ... 5m	•	•		•		•				
	PRK 713/44 L8.1	0 ... 5m	•	•		•		•				
	PRKL 713/24 L8.1	0 ... 4.5m	•		•	•		•	•			
	PRKL 713/24 DL8	0 ... 17m	•		•	•		•	•			
	PRKL 713/24 D	0 ... 17m	•		•	•		•	•			
	PRKL 713/24	0 ... 17m	•		•	•		•	•			
	PRKL 713/24 L8	0 ... 17m	•		•	•		•	•			
	RK 713/44.1	50 ... 150mm	•	•		•		•			•	
	RK 713/44.1 L8	50 ... 150mm	•	•		•		•			•	
	RK 713/22.1	50 ... 150mm	•	•		•			•		•	
	RK 713/44.1 L8	50 ... 150mm	•	•		•			•		•	
	RKLR 713/4 L8.1	20 ... 200mm	•		•	•		•			•	
	FRKR 713/24-100 L8	0 ... 120mm	•	•		•		•	•			
	FRKR 713/24-100	0 ... 120mm	•	•		•		•	•			
	FRKL 713/24-100 L8	0 ... 150mm	•		•	•		•	•			
	FRKL 713/24-100	0 ... 150mm	•		•	•		•	•			



Switching frequency	Switching			Connection		Options						Page
	Light/dark	Light	Dark	M8 connector	Cable	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Focussed light beam	Pulse stretching	
5000Hz	•				•				•			121
5000Hz	•			•					•			121
5000Hz	•			•					•		•	121
5000Hz	•				•			•	•	•		123
5000Hz	•			•				•	•	•		123
5000Hz	•			•				•	•	•	•	123
2500Hz	•				•	•			•			125
2500Hz	•			•		•			•			125
2500Hz	•			•		•			•			125
5000Hz		•		•		•			•	•		127
5000Hz			•	•		•			•	•		127
5000Hz			•		•	•			•	•		127
5000Hz		•			•	•			•	•		127
5000Hz		•		•		•			•	•		127
2500Hz	•				•				•	•		129
2500Hz	•			•					•	•		129
2500Hz	•				•				•	•		129
2500Hz	•			•					•	•		129
5000Hz	•	•		•					•	•		131
1000Hz		•		•			•		•	•		133
1000Hz		•			•		•		•	•		133
5000Hz		•		•			•		•	•		135
5000Hz		•			•		•		•	•		135

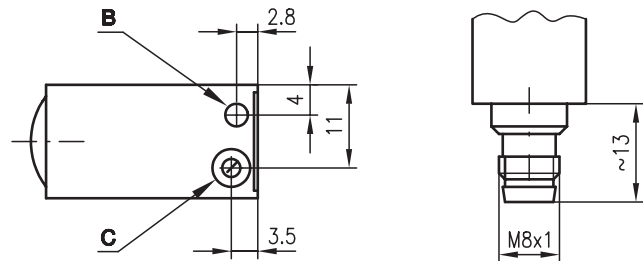
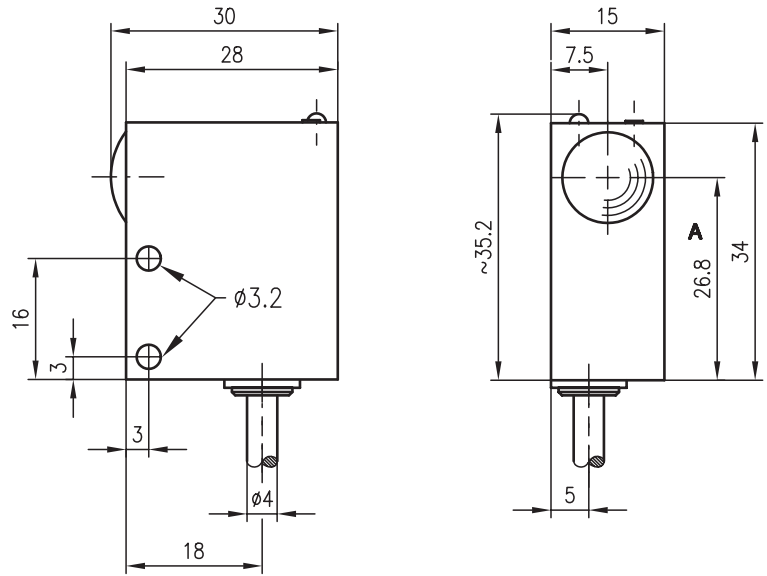


LSR 713

Throughbeam photoelectric sensors



Dimensioned drawing



- A Optical axis
- B Indicator diode
- C Sensitivity adjustment

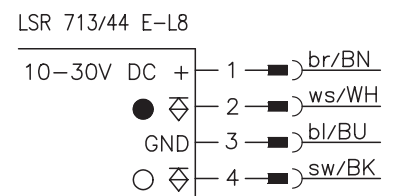
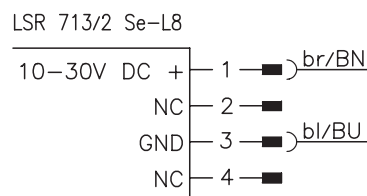
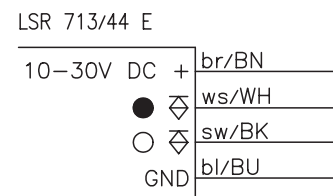
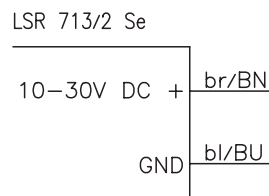


0 ... 9m



- Throughbeam photoelectric sensor with high performance reserve in red light
- High switching frequency of 5 kHz
- Slow operation

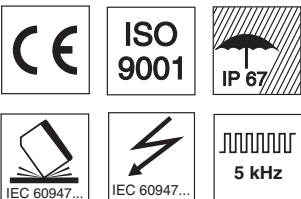
Electrical connection



Accessories:

(available separately • see page 136)

- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- Diaphragm BL 713
- M8 connectors (KD ...)
- Ready-made cables (KB ...)



We reserve the right to make changes • 713_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 9m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1 kHz
Switching frequency limit ³⁾	5 kHz
Response time	0.5ms
Response time limit ³⁾	0.1 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	2 PNP switching outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA
Sensitivity	adjustable with 270° potentiometer
Slow operation (see order guide)	pin 4: 100ms (light switching)

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin) or cable: 2000mm, 2x0.14mm ² for transmitter; 2000mm, 4x0.14mm ² for receiver

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Maximum switching frequency/minimum response time with sensitivity adaptation
- 4) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

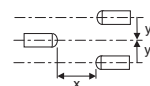
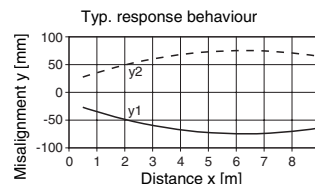
Tables

1	0	7	9
2	0	1.1	1.4

1	Without diaphragm
2	With BL 713 at receiver

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

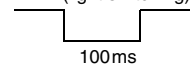


Order guide

Selection table		Order code →					
Equipment ↓		LSR 713/44 Part No. 500 25818 (Tr) Part No. 500 25819 (Re)	LSR 713/44 L8 Part No. 500 80315 (Tr) Part No. 500 80316 (Re)	LSR 713/44 L8.3 Part No. 500 80315 (Tr) Part No. 500 35150 (Re)			
Light spot	divergent	●	●	●			
LED	on top	●	●	●			
Connection	cable	●					
	M8 connector		●	●			
Features	collimator short range						
	collimator distant range						
	slow operation			●			

Remarks

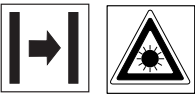
- Pulse stretching for:
LSR713/44 E-L8.3
Pin 4 (light switching)





LSRL 713

Laser throughbeam photoelectric sensors

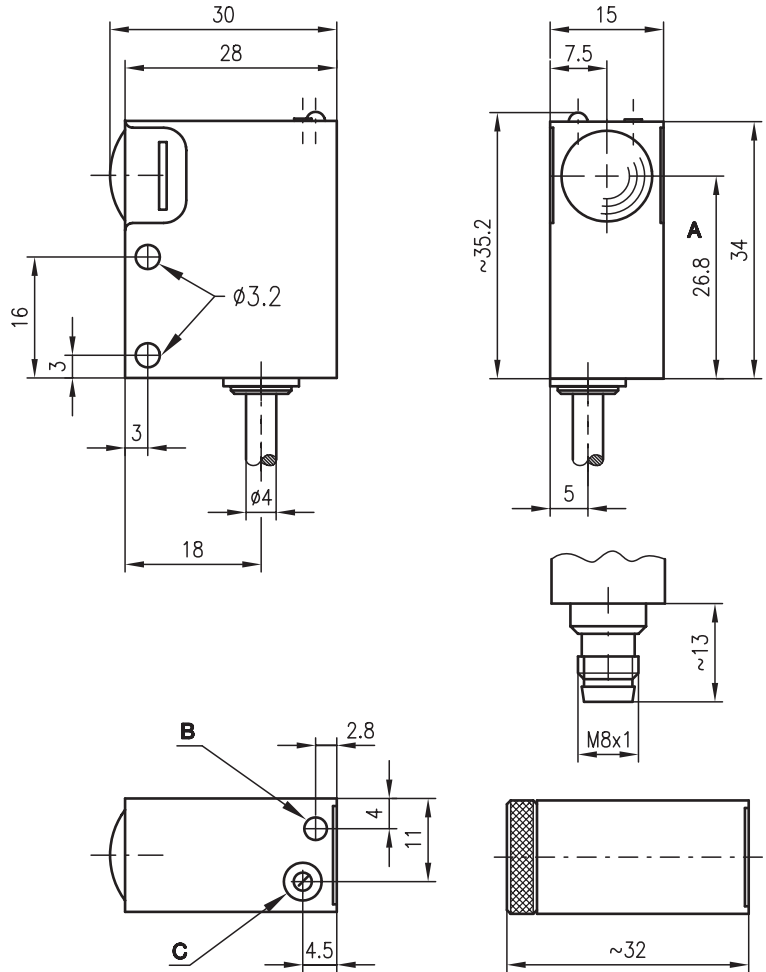


0 ... 65m

10 - 30 V
DC

- Throughbeam photoelectric laser sensor with high performance reserve in red light
- Adjustable laser collimator for adaptation of the light beam to the application
- Detection of small objects or gaps
- High switching frequency of 5 kHz
- Activation input for interlinking a number of sensors or standby of the laser system

Dimensioned drawing

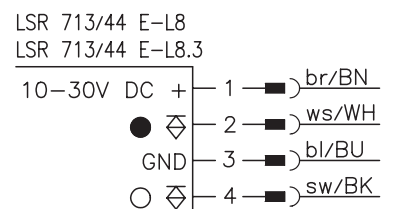
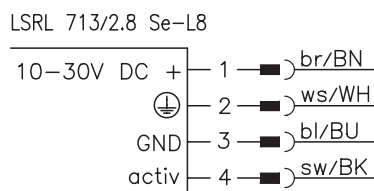
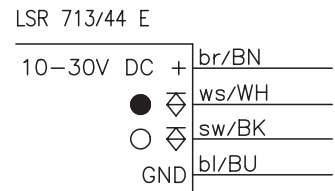
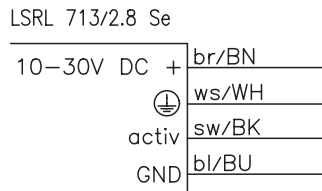


LSR 713/44 E

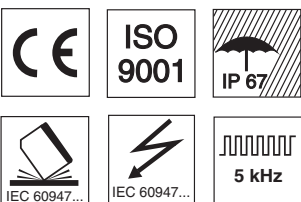
LSRL 713/2.8 Se

- A Optical axis
- B Indicator diode
- C Sensitivity adjustment

Electrical connection



We reserve the right to make changes • 713_a02e.fm



Accessories:

(available separately • see page 136)

- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- Diaphragm BL 713
- M8 connectors (KD ...)
- Ready-made cables (KB ...)



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 65m
Operating range ²⁾	see table
Adjustment range	focussing adjustable in the range of 200mm ... 50m
Light source	laser/pulsed (modulated light)
Wavelength	670nm (visible red light)
Laser warning notice	see remarks

Timing

Switching frequency	1 kHz
Switching frequency limit ³⁾	5 kHz
Response time	0.5 ms
Response time limit ³⁾	0.1 ms
Delay before start-up	≤ 100 ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 50mA
Switching output	2 PNP switching outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 200mA
Sensitivity	adjustable with 270° potentiometer

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin) or cable: 2000mm, 3x0.14mm ² for transmitter; 2000mm, 4x0.14mm ² for receiver

Environmental data

Ambient temp. (operation/storage)	-20°C ... +40°C/-40°C ... +70°C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	≥ 8V/≤ 2V
Transmitter active/not active	≤ 0.5ms
Activation/disable delay	10KΩ ± 10%
Input resistance	

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Maximum switching frequency/minimum response time with sensitivity adaptation
- 4) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

Selection table		Order code →					
Equipment ↓		LSRL 713/44.8 Part No. 500 27053 (Tr) Part No. 500 25819 (Re)	LSRL 713/44.8 L8 Part No. 500 80317 (Tr) Part No. 500 80316 (Re)	LSRL 713/44.8 L8.3 Part No. 500 80317 (Tr) Part No. 500 35150 (Re)			
Light source	laser	●	●	●			
Light spot	adjustable	●	●	●			
LED	on top	●	●	●			
Connection	cable	●					
	M8 connector		●	●			
Features	collimator short range						
	collimator distant range	●	●	●			
	slow operation			●			

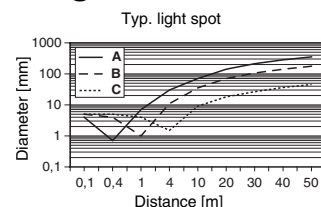
Tables

1	0	50	65
2	0	18	22

1	Without diaphragm
2	With BL 713 at receiver

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

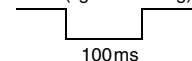
Diagrams



- A focus = 0.4m
- B focus = 1m
- C focus = 4m

Remarks

- Functional earth must be connected.
- Pulse stretching for: LSR713/44 E-L8.3
Pin 4 (light switching)



LASERSTRAHLUNG / LASER LIGHT
NICHT IN DEN STRAHL BLICKEN
DO NOT STARE INTO BEAM
LASERKLASSE 2
CLASS 2 LASER PRODUCT
IEC 60825-1-am2 (2001-01)

713 Series
Pulse duration 4–12µs
Quiescent period 4–55µs
P_{max} ≤ 0.9mW ± 10%
λ = 670nm



PRK 713

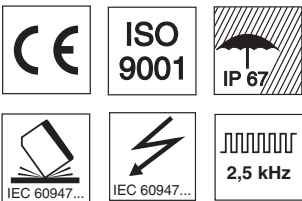
Retro-reflective photoelectric sensors with polarisation filter



0 ... 5m



- Retro-reflective photoelectric sensors using visible red light
- High switching frequency of 2.5kHz for detection of fast events
- Sensitivity adjustment

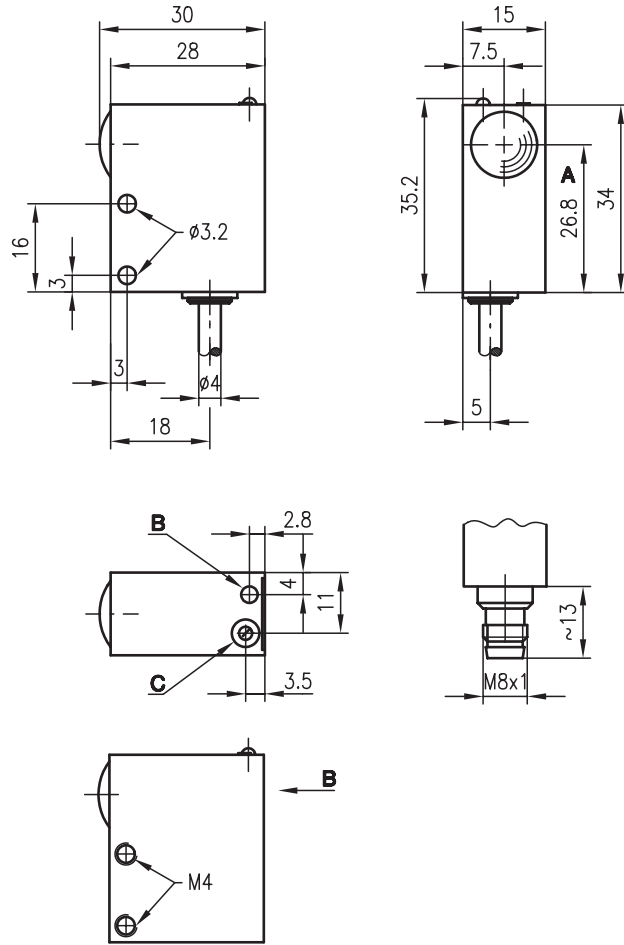


Accessories:

(available separately • see page 136)

- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

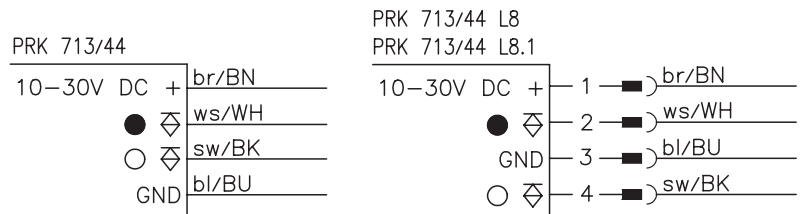
Dimensioned drawing



PRK 713/xx L8.1

- A Optical axis
- B Indicator diode
- C Sensitivity adjustment

Electrical connection



We reserve the right to make changes • 713_b01e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	2.5kHz
Response time	0.2ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	2 PNP switching outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA
Sensitivity	see order guide

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin) cable 2000mm, 4x0.14 mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +80°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking

Tables

Reflectors			Operating range
1	TK(S) 100x100		0 ... 4.0m
2	TK(S) 47x47		0 ... 3.5 m
3	TK(S) 30x50		0 ... 1.7m
4	TK(S) 20x40		0 ... 1.5 m
5	Tape 2	100x100	0 ... 0.7m

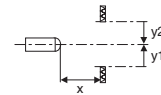
1	0.01		4	5
2	0.01		3.5	4
3	0.01	1.7	2.2	
4	0.01	1.5	2	
5	0.01	0.7	1	

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



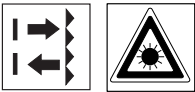
Order guide

Selection table		Order code →								
Equipment ↓		PRK 713/44 Part No. 500 25820	PRK 713/44 L8 Part No. 500 80320	PRK 713/44 L8.1 Part No. 500 80691						
Light spot	divergent	●	●	●						
	focussed									
LED	on top	●	●							
	at the back			●						
Connection	cable	●								
	M8 connector		●	●						
Features	shiny reflection			●						
	polarisation	●	●	●						
	sensitivity adjustment	●	●							

Remarks



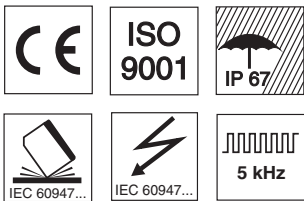
PRKL 713 Laser retro-reflective photoelectric sensors with polarisation filter



0 ... 17m
0 ... 4.5m

10 - 30 V
DC

- Laser retro-reflective photoelectric sensor
- Adjustable laser collimator for adaptation of the light beam (focus) to the application
- Detection of smallest objects or gaps
- High switching frequency of 5 kHz

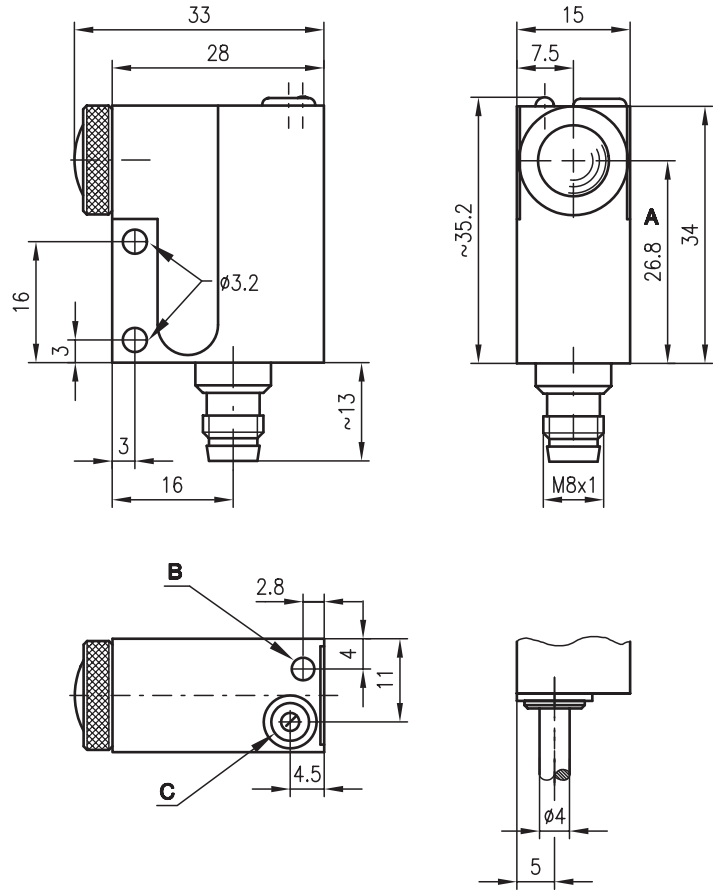


Accessories:

(available separately • see page 136)

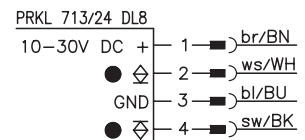
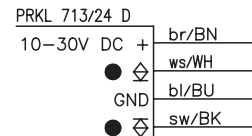
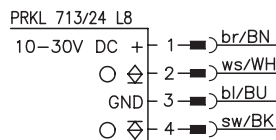
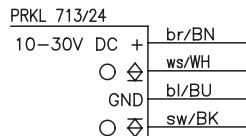
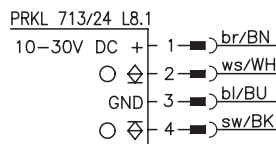
- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Optical axis
- B Indicator diode
- C Sensitivity adjustment

Electrical connection



We reserve the right to make changes • 713_b02e.fm



Specifications

Optical data

Typ. operating range limit (MTK(S) 50x50) ¹⁾ 0 ... 17m (distant focus) 0 ... 4.5m (close focus)
 Operating range ²⁾ see table
 Light spot diameter < 1mm adjustable via collimator (see diagrams)
 Light source laser (modulated light)
 Wavelength 670nm (visible red light, polarised)
 Laser warning notice see remarks

Timing

Switching frequency 5kHz
 Response time 0.1ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 16mA
 Switching output PNP and NPN transistor output
 Function characteristics light/dark switching
 Signal voltage high/low ≥ (U_B-2V)/≤ 2V
 Output current max. 200mA
 Sensitivity adjustable with 270° potentiometer

Indicators

LED yellow light path free

Mechanical data

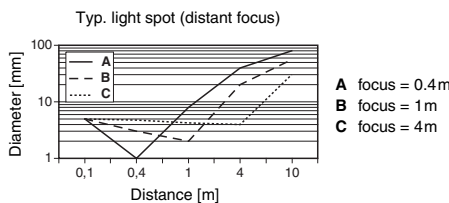
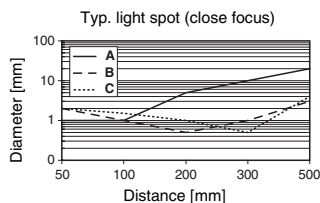
Housing metal
 Optics glass
 Weight 100g
 Connection type M8 connector (4-pin)
 cable 2000mm, 4x0.14 mm²

Environmental data

Ambient temp. (operation/storage) -20°C ... +40°C/-40°C ... +80°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class III
 Protection class IP 67
 Standards applied IEC 60947-5-2

1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Diagrams



Order guide

Selection table		Order code →				
Equipment ↓		PRKL 713/24 L8 Part No. 500 37120	PRKL 713/24 DL8 Part No. 500 37118	PRKL 713/24 Part No. 500 37119	PRKL 713/24 D Part No. 500 36954	PRKL 713/24 L8.1 Part No. 500 38541
Light source	laser	●	●	●	●	●
Light spot	adjustable	●	●	●	●	●
LED	on top	●	●	●	●	●
Connection	cable			●	●	
	M8 connector	●	●			●
Switching output	PNP					●
	PNP and NPN	●	●	●	●	
Function characteristics	light switching	●		●		●
	dark switching		●		●	
Features	short range focussing					●
	distant range focussing	●	●	●	●	

Tables

Distant range focussing

Reflectors	Operating range
1 TK(S) 100x100	0 ... 11m
2 MTK(S) 50x50	0 ... 13m
3 TK(S) 30x50	0 ... 5m
4 TK(S) 20x40	0 ... 5m
5 Tape 2 100x100	0 ... 1.5m

1	0	11	14
2	0	13	17
3	0	5	7
4	0	5	7
5	0	1.5	2

Short range focussing

Reflectors	Operating range
1 TK(S) 100x100	0 ... 3m
2 MTK(S) 50x50	0 ... 3.5m
3 TK(S) 30x50	0 ... 1.5m
4 TK(S) 20x40	0 ... 1.5m
5 Tape 2 100x100	0 ... 0.4m

1	0	3	4
2	0	3.5	4.5
3	0	1.5	2
4	0	1.5	2
5	0	0.4	0.5

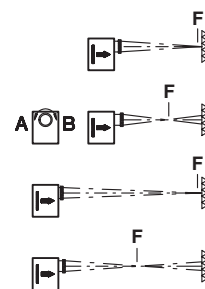
□ Operating range [m] *
 ▒ Typ. operating range limit [m] *

* for focus adjusted to ∞

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Remarks

- Use reflectors with small triple structures – MTK(S).
- A conductive connection between sensor housing and machine is to be established in order to discharge electrostatic charges.



A close
 B distant
 F focal plane

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

713 Series
 Pulse duration 4–12µs
 Quiescent period 4–55µs
 P_{max} ≤ 0.9mW ± 10%
 λ = 670nm

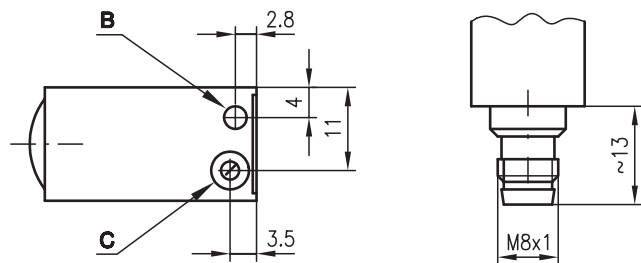
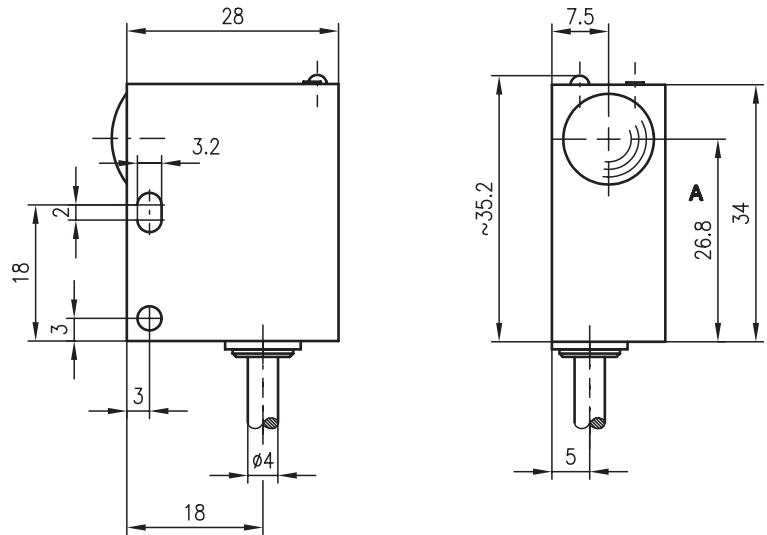


RK 713

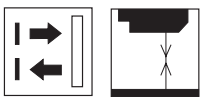
Diffuse reflection light scanner with lustre function



Dimensioned drawing



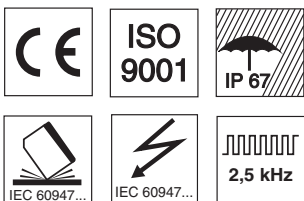
- A Optical axis
- B Indicator diode
- C Sensitivity adjustment



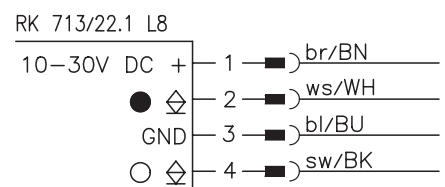
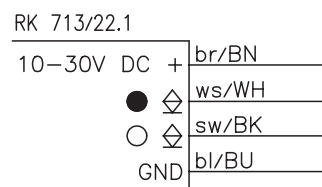
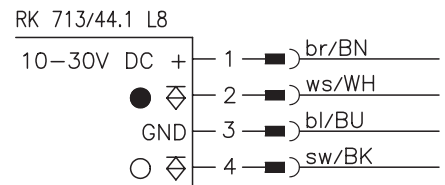
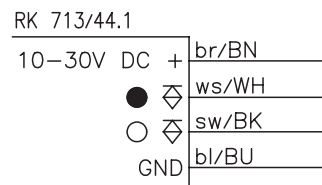
50 ... 150mm

10 - 30 V
DC

- Detection of objects with metallic lustre
- Focussed light spot at 90mm scanning distance
- High switching frequency of 2.5kHz



Electrical connection



Accessories:

(available separately • see page 136)

- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 713_c01e.fm



Specifications

Optical data

Typ. scanning range limit (for stainless steel) ¹⁾	50 ... 150mm
Scanning range ²⁾	80 ... 120mm
Light spot diameter	approx. 2mm at a distance of 90mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	2.5kHz
Response time	0.2ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 30mA
Switching output	
.../44-...	2 PNP transistor outputs, complementary
.../22-...	2 NPN transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -2V) ≤ 2V
Output current	max. 200mA
Sensitivity	adjustable with 270° potentiometer

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin) cable 2000mm, 4x0.14 mm ²

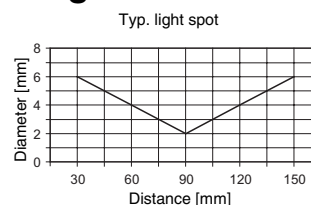
Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking

Tables

Diagrams



Order guide

Selection table		Order code →	RK 713/22.1 Part No. 500 22812	RK 713/22.1 L8 Part No. 500 80318	RK 713/44.1 Part No. 500 22813	RK 713/44.1 L8 Part No. 500 80319				
Equipment ↓										
Light spot	divergent									
	focussed	●	●	●	●					
LED	on top	●	●	●	●					
	at the back									
Connection	cable	●		●						
	M8 connector		●		●					
Features	shiny reflection	●	●	●	●					
	polarisation									
	sensitivity adjustment	●	●	●	●					

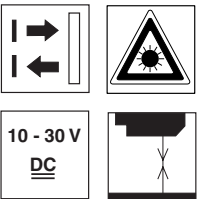
Remarks

- Light spot focussed at 90mm. Shiny surfaces (e.g. polished metal) can be used as reflective surface at distances of approx. 80mm to approx. 120mm.



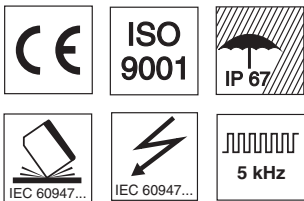
RKLR 713

Laser diffuse reflection light scanner with lustre function



20 ... 200 mm

- Laser diffuse reflection light scanner for detection of shiny objects
- Adjustable laser collimator for adaptation of the light beam (focus) to the application
- Detection of smallest objects or gaps
- High switching frequency of 5 kHz

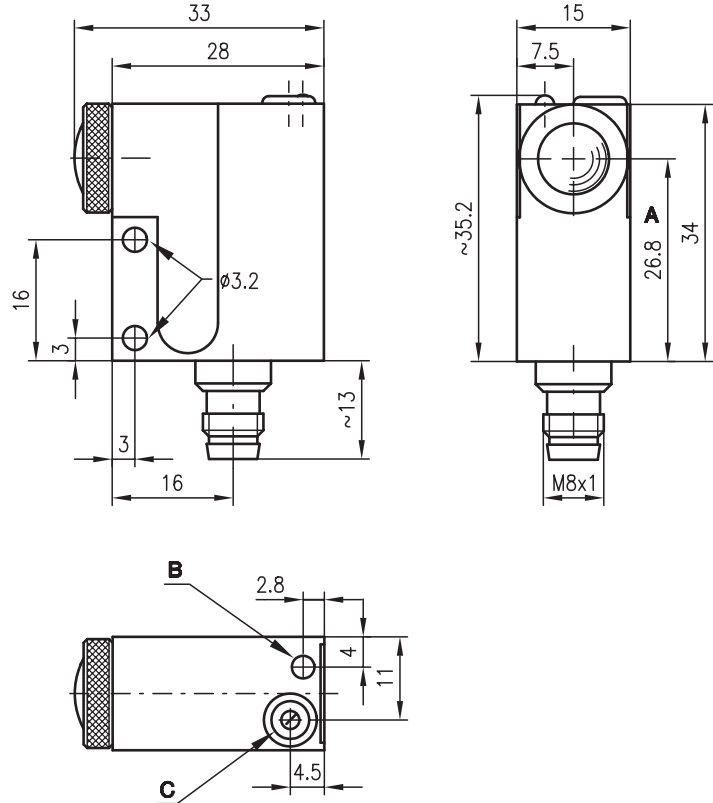


Accessories:

(available separately • see page 136)

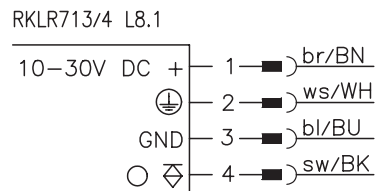
- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- M8 connectors (KD ...)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Optical axis
- B Indicator diode
- C Sensitivity adjustment

Electrical connection



We reserve the right to make changes • 713_c02e.fm

Specifications

Optical data

Typ. scanning range limit (for stainless steel) ¹⁾	0 ... 200mm
Scanning range ²⁾	20 ... 120mm
Light spot diameter	< 1 mm adjustable via collimator
Light source	laser (modulated light)
Wavelength	670nm (visible red light, polarised)
Laser warning notice	see remarks

Timing

Switching frequency	5kHz
Response time	0.1 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 16mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 200mA
Sensitivity	adjustable with 270° potentiometer

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +40°C/-40°C ... +80°C
Protective circuit ³⁾	1, 2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

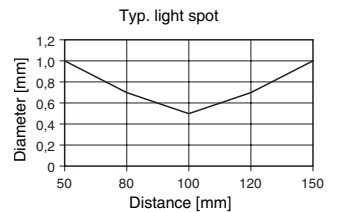
- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

Designation	Part No.
RKLR 713/4 L8.1	500 37167

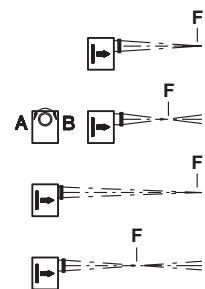
Tables

Diagrams



Remarks

- Functional earth must be connected.



- A** close
B distant
F focal plane

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

713 Series
 Pulse duration 4–12µs
 Quiescent period 4–55µs
 Pmax ≤ 0.9mW ± 10%
 $\lambda = 670\text{nm}$

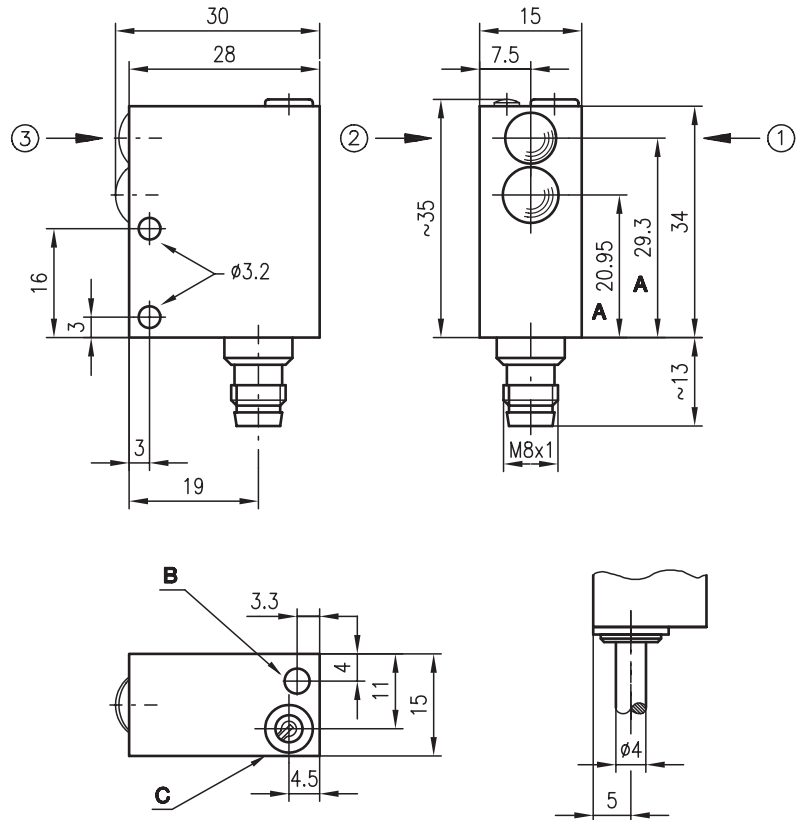


FRKR 713

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Optical axis
 - B Indicator diode
 - C Sensitivity adjustment
- Preferred entry direction for objects ① + ② + ③



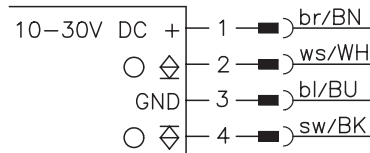
0 ... 120 mm



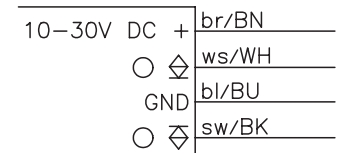
- Scanner with electrically adjustable background suppression using visible red light
- Small visible light spot for detection of small parts ≥ 1 mm

Electrical connection

FRKR 713/24-100 L8



FRKR 713/24-100

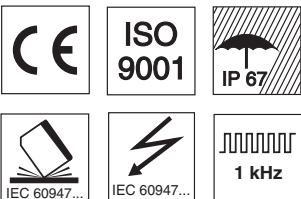


Accessories:

(available separately • see page 136)

- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 713_d01e.fm





Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 120mm
Scanning range ²⁾	see table
Adjustment range	25 ... 120mm
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1 kHz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP and NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA
Scanning range adjustment	adjustable with 270° potentiometer

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin) cable 2000mm, 4x0.14 mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +80°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking

Tables

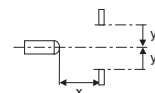
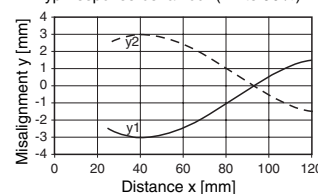
1	25	100	120
2	25	95	110
3	25	85	95

1	white 90%
2	grey 18%
3	black 6%

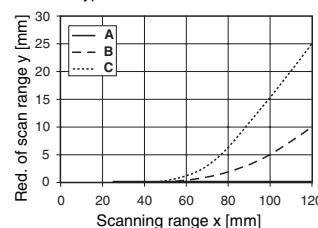
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

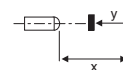
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Order guide

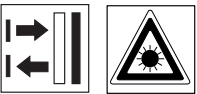
Selection table		FRKR 713/24-100 Part No. 500 38475	FRKR 713/24-100 L8 Part No. 500 38476				
Order code →							
Equipment ↓							
Light source	red light	●	●				
Light spot	divergent						
	adjustable						
	focussed	●	●				
LED	on top	●	●				
Connection	cable	●					
	M8 connector		●				
Features	electrical background suppression	●	●				

Remarks

- Install sensor inclined at angle of approx. 10° if used to detect objects with shiny surfaces.



FRKL 713 Laser diffuse reflection light scanners with background suppression

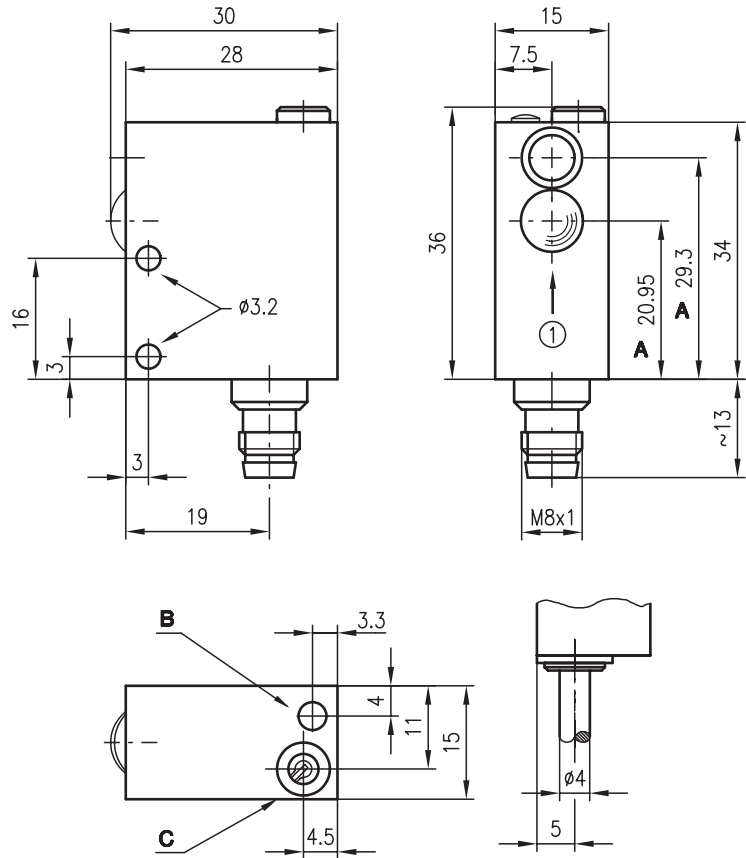


0 ... 150mm



- Scanner with electrically adjustable background suppression using visible red laser light
- Reflection dependent laser power regulation for detection of metal surfaces
- Very small visible light spot for detection of small parts $\geq 0.2\text{mm}$
- High switching frequency of 5kHz for detection of fast events

Dimensioned drawing

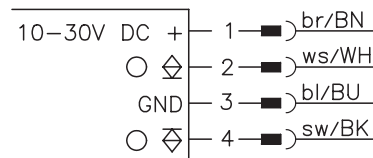


- A** Optical axis
- B** Indicator diode
- C** Sensitivity adjustment

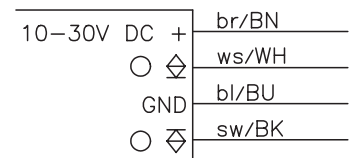
Scanning direction ① see remarks

Electrical connection

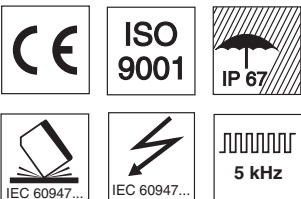
FRKL 713/24-100 L8



FRKL 713/24-100



We reserve the right to make changes • 713_d02e.fm



Accessories:

(available separately • see page 136)

- Mounting system (BT 713)
- Wobble plate (SET BT 713-66 + BT 66)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 150mm
Scanning range ²⁾	see table
Adjustment range	25 ... 150mm
Scanning range hysteresis	≤ 10% (relative to white 90%)
Light beam characteristic	divergent
Light source	laser (modulated light)
Wavelength	670nm (visible red light)
Laser warning notice	see remarks

Timing

Switching frequency	5kHz
Response time	0.1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 25mA
Switching output	PNP and NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 200mA
Scanning range adjustment	adjustable with 270° potentiometer

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	metal
Optics	glass
Weight	100g
Connection type	M8 connector (4-pin) cable 2000mm, 4x0.14 mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +40°C/-40°C ... +80°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking

Order guide

Selection table		FRKL 713/24-100 Part No. 500 38473	FRKL 713/24-100 L8 Part No. 500 38474				
Order code →							
Equipment ↓							
Light source	laser	●	●				
Light spot	divergent						
	adjustable						
	focussed	●	●				
LED	on top	●	●				
Connection	cable	●					
	M8 connector		●				
Features	electrical background suppression	●	●				

Tables

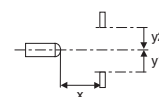
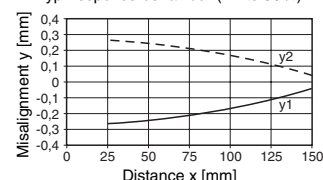
1	25	100	150
2	25	95	130
3	25	87	100

1	white 90%
2	grey 18%
3	black 6%

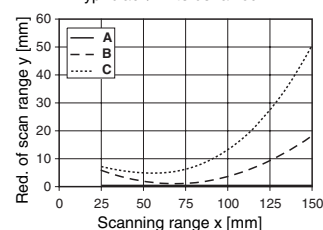
- Scanning range [m]
- Typ. scanning range limit [m]

Diagrams

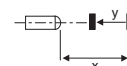
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

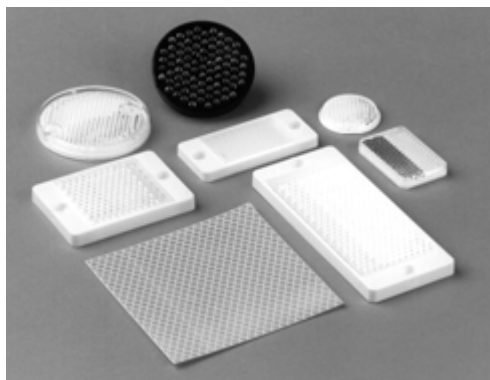
- A conductive connection between sensor housing and machine is to be established in order to discharge electrostatic charges.
- Use scanning direction ① for detection of objects ≤ 0.5mm.
- Scanning ranges ≥ 50mm require a background for detections ≤ 0.5mm.
- Install sensor inclined at angle of approx. 10° if used to detect objects with shiny surfaces.

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

713 Series
 Pulse duration 4-12µs
 Quiescent period 4-55µs
 Pmax ≤ 0.9mW ± 10%
 λ = 670nm

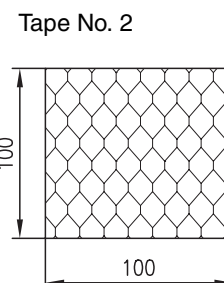
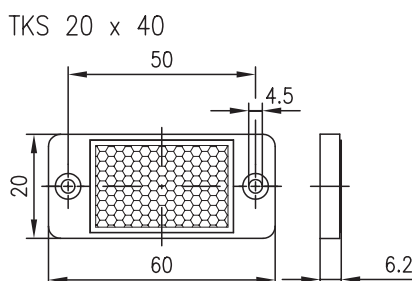
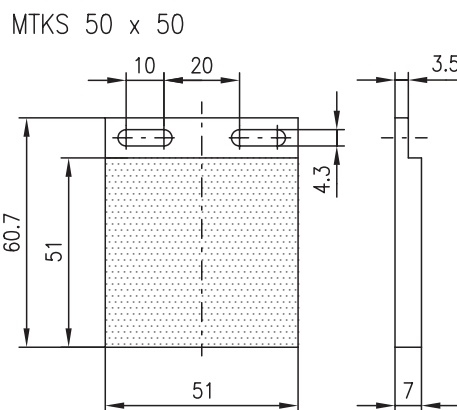
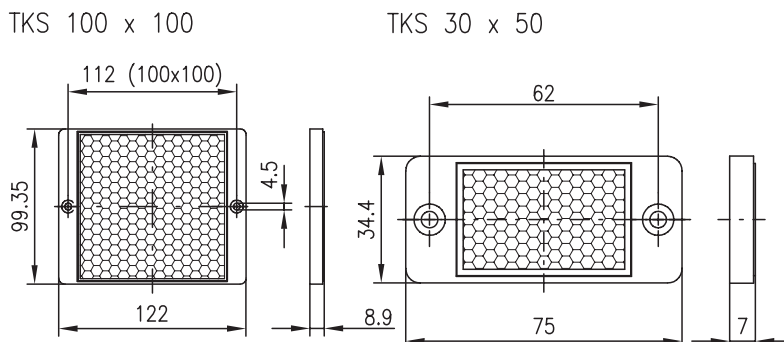


Reflectors



- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings



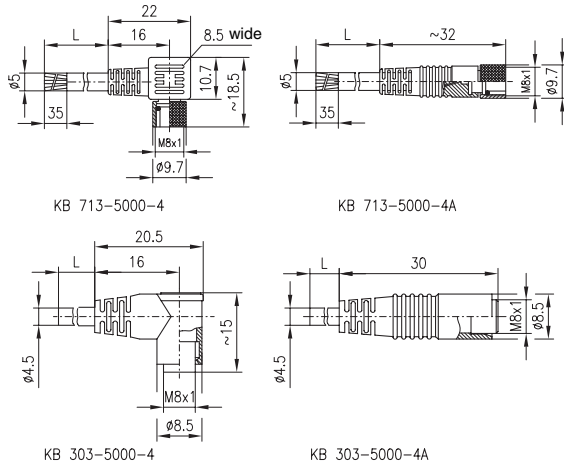
Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 713-5000-4	500 29173
KB 713-5000-4A	500 29174
KB 303-5000-4	500 36152
KB 303-5000-4A	500 36153
BT 713	500 80776
BT 66	500 16515
BL 713	500 80741
SET BT 713-66+BT 66	500 30891

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes * 713_zu_e.fm

Dimensioned drawings



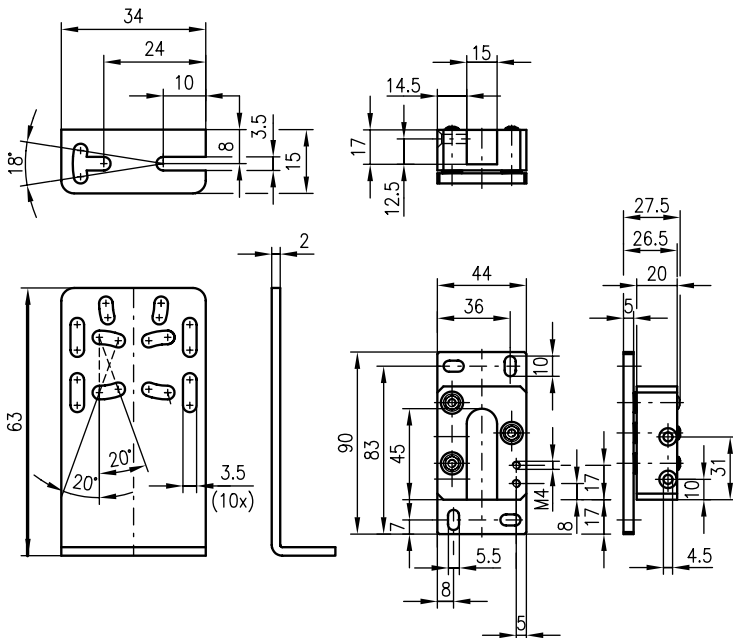
Selection table

M8 connectors	
with cable (5m cable length)	
KB 713-5000-4	KB 713-5000-4A
KB 303-5000-4	KB 303-5000-4A

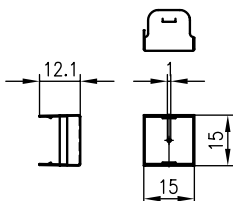
Dimensioned drawings

BT 713

BT 66



BL 713



Connectors, plugs, cables



For devices with M8 connectors, 4 connectors with ready-made 5m cable are available.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 713



Wobble plate SET BT 713-66+BT 66



BL 713





18 Series

Overview and advantages

Detection of transparent media like PE, glass, foil

Small sensor series with many different models in robust metal or stainless steel housing and glass lens

Operating principles:

- Retro-reflective photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter

- 10 ... 30VDC voltage with PNP (NPN) transistor output,
- alternatively AS-interface bus connection

Connection via M8 respectively M12 connectors or cable

Options:

- User guidance
- Automatic contamination compensation (tracking function)
- Light/dark switching versions
- Gap detection
- Stainless steel housing
- Red light





Operating principle	Designation	Typ. oper. range limit	Housing		Light source		Operating voltage		Output			Switching frequency	Switching	
			Metal	Stainless steel	Red light	Infrared	20 ... 28VDC	10 ... 30VDC	PNP transistor	NPN transistor	AS-interface		Light	Dark
	RK 18/4 GL.4	0 ... 1000mm	•			•		•				1000Hz	•	
	RK 18/4 GL.41	0 ... 1800mm	•			•		•				1000Hz	•	
	RK 18/4 GDL.4	0 ... 1000mm	•			•		•				1000Hz		•
	RK 18/4 GDL.41	0 ... 1800mm	•			•		•				1000Hz		•
	RK 18/2 GDL.4	0 ... 1000mm	•			•		•		•		1000Hz		•
	RK 18/4 GDL.42	0 ... 600mm	•			•		•				1000Hz		•
	RK 18/4 GL 8.4	0 ... 1000mm	•			•		•				1000Hz	•	
	RK 18/2 G	0 ... 2500mm	•			•		•		•		1000Hz	•	
	RK 18/4 G	0 ... 2500mm	•			•		•		•		1000Hz	•	
	RK 18/4 GDL	0 ... 2500mm	•			•		•		•		1000Hz		•
	RK 18/4 GL8.43	0 ... 2500mm		•		•		•		•		1000Hz	•	
	RK 18/4 GL8.5	0 ... 2500mm	•			•		•		•		1000Hz	•	
	PRK 18/4 DL.4	0 ... 3000mm	•			•		•	•			1500 Hz	•	•
	PRK 18/2 DL.4	0 ... 3000mm	•			•		•	•	•		1500 Hz	•	•
	RK 18/4 DL.45	0 ... 3000mm	•			•		•	•			1500 Hz	•	•
	PRK 18/4 L	0 ... 5000 mm	•			•		•	•			1000Hz	•	•
	PRK 18/4, 6000	0 ... 5000 mm	•			•		•	•			1000Hz	•	•
	PRK 18/24 DL.46	0 ... 4000mm	•			•		•	•	•		1000Hz	•	•
	IPRK 18/4 DL.41	0 ... 4000mm	•			•		•	•			1000Hz	•	•
	IPRK 18/2 DL.41	0 ... 4000mm	•			•		•		•		1000Hz	•	•
	PRK 18/24 DL.42	0 ... 4000mm	•			•		•	•	•		1000Hz	•	
	PRK 18/44 L.44	0 ... 4000mm	•			•		•	•			1000Hz	•	•
	IPRK 18/A.1 L.4	0 ... 3000mm	•			•		•			•	1500 Hz	•	•
	IPRK 18/A L.4	0 ... 3000mm	•			•		•			•	1500 Hz	•	•



Connection			Options										Page
M12 connector	M8 connector	Cable	Sensitivity adjustment with 270° potentiometer	Sensitivity adjustment with 10-turn potentiometer	Increased sensitivity	Light beam focussing	Polarisation filter	User guidance	Transparent media	Depolarising tapes	Teach-in with Tracking	Warning output	
•			•						•	•			143
•			•						•	•			143
•			•						•	•			143
•			•			•			•	•			143
•			•		•				•	•			143
	•		•						•	•			143
		•											145
		•											145
•													145
	•		•						•				145
	•		•						•				145
•				•				•	•	•			147
•				•				•	•	•			147
•				•				•	•	•			147
•								•					149
		•						•					149
•								•	•		•		153
•								•	•		•	•	153
•								•	•		•	•	153
•								•	•		•		153
•								•	•		•		153
•				•				•	•			•	155
•				•				•	•			•	155



RK 18

Retro-reflective photoelectric sensors

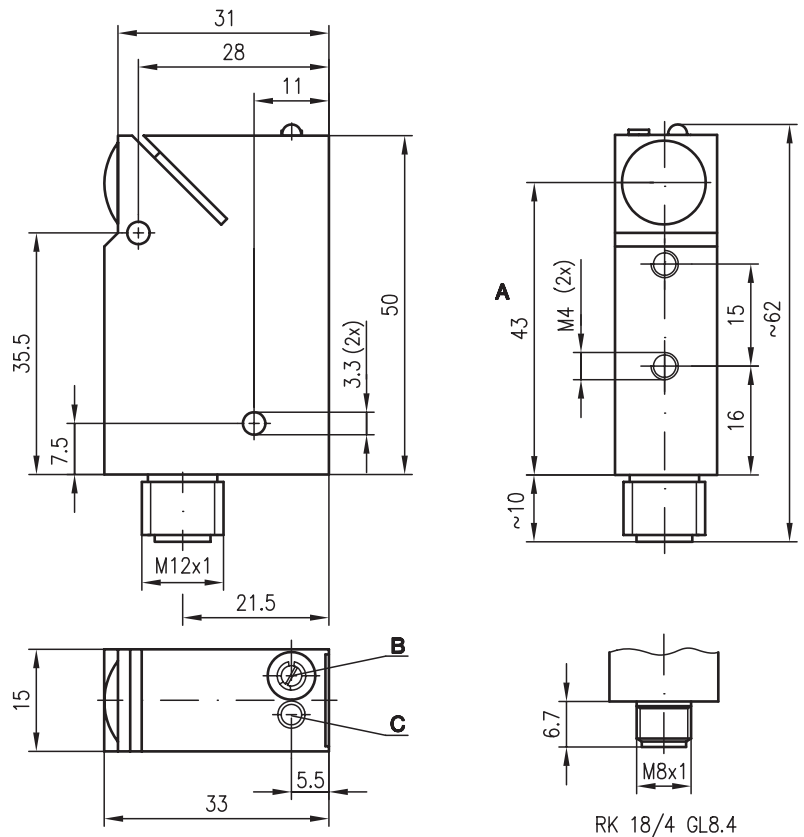


0 ... 600 mm
0 ... 1000 mm
0 ... 1800 mm



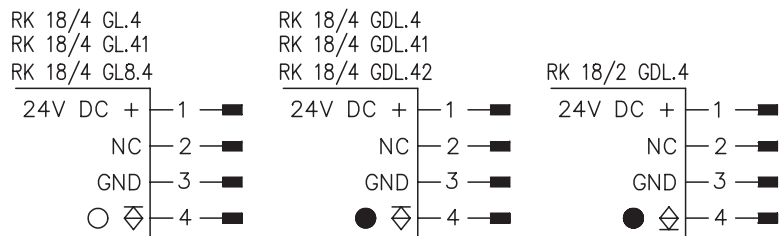
- Retro-reflective photoelectric sensors for safe detection of transparent media (e.g. clear glass, PE, foil)
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Electrical connection with M8/M12 connectors

Dimensioned drawing



- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection



Accessories:

(available separately • see page 156)

- Mounting system (BT 95)
- M12 connectors (KD ...)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

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Specifications

Optical data	RK 18/... .42	RK 18/... .4	RK 18/... .41
Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 600mm	0 ... 1000mm	0 ... 1800mm
Operating range ²⁾	see table		
Recommended reflector	MTK(S) 50x50		
Light source	LED (constant light)		
Wavelength	880nm (infrared)		
Timing			
Switching frequency	1000Hz		
Response time	0.5ms		
Delay before start-up	≤100ms		
Electrical data			
Operating voltage U_B ³⁾	24VDC filtered ± 10%		
Residual ripple	≤ 15% of U_B		
Power consumption	≤ 1.3W		
Switching output	PNP or NPN transistor output		
Function characteristics	light or dark switching		
Signal voltage high/low	≥ (U_B -2V) ≤ 2V		
Output current	max. 100mA		
Indicators			
LED red	light path free		
Mechanical data			
Housing	diecast aluminium		
Optics	glass		
Weight	120g		
Connection type	M12 connector 4-pin or M8 connector 3-pin or plug 4-pin		
Environmental data			
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C		
Protective circuit ⁴⁾	2, 3		
VDE safety class	III		
Protection class	IP 67		
Standards applied	IEC 60947-5-2		

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

Selection table		Order code →							
		RK 18/4 GL.4 Part No. 500 20245	RK 18/4 GL.41 Part No. 500 20396	RK 18/4 GDL.4 Part No. 500 19704	RK 18/4 GDL.41 Part No. 500 20397	RK 18/2 GDL.4 Part No. 500 22702	RK 18/4 GDL.42 Part No. 500 25750	RK 18/4 GL 8.4 Part No. 500 16838	
Equipment ↓	Light source	infrared light	●	●	●	●	●	●	
		red light							
Application	transparent media	●	●	●	●	●	●	●	
	Operating range	500mm					●		
		800mm	●		●		●	●	
	1400mm		●		●		●		
Switching output	PNP transistor	●	●	●	●		●	●	
	NPN transistor					●			
Connection	M12 connector	●	●	●	●	●	●		
	M8 connector							●	
	plug								
Switching	light	●	●					●	
	dark			●	●	●	●		
Features	sensitivity setting 270°	●	●	●	●	●	●	●	
	sensitivity setting 10-turn								
	increased sensitivity						●		
	light beam focussing				●				

Tables

RK 18/... .42

Reflectors	Operating range
1 TK(S) 100x100	0 ... 500mm
2 MTK(S) 50x50	0 ... 400mm
3 TK(S) 30x50	0 ... 200mm
4 TK(S) 20x40	0 ... 150mm
5 Tape 2 100x100	–

1	0	500	600
2	0	400	500
3	0	200	250
4	0	150	200
5	0		

RK 18/... .4

Reflectors	Operating range
1 TK(S) 100x100	0 ... 800mm
2 MTK(S) 50x50	0 ... 600mm
3 TK(S) 30x50	0 ... 450mm
4 TK(S) 20x40	0 ... 300mm
5 Tape 2 100x100	0 ... 80mm

1	0	800	1000
2	0	600	800
3	0	450	600
4	0	300	400
5	0	80	100

RK 18/... .41

Reflectors	Operating range
1 TK(S) 100x100	0 ... 1400mm
2 MTK(S) 50x50	0 ... 1200mm
3 TK(S) 30x50	0 ... 700mm
4 TK(S) 20x40	0 ... 500mm
5 Tape 2 100x100	0 ... 400mm

1	0	1400	1800
2	0	1200	1600
3	0	700	900
4	0	500	700
5	0	400	500

- Operating range [mm]
- Typ. operating range limit [mm]
- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Remarks

- Preferably use MTK(S) 50x50.



RK 18

Retro-reflective photoelectric sensors

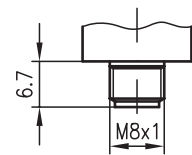
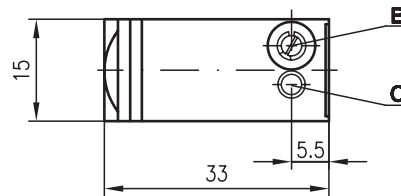
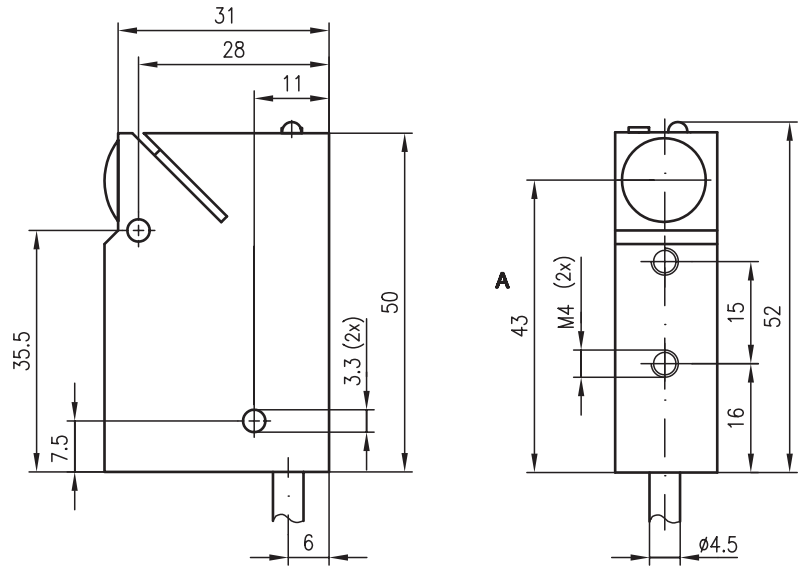


0 ... 2.5m

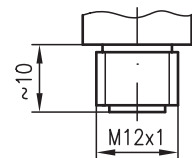


- Retro-reflective photoelectric sensors for safe detection of transparent media (e.g. clear glass, PE, foil)
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Electrical connection with M8/M12 connectors or cable

Dimensioned drawing



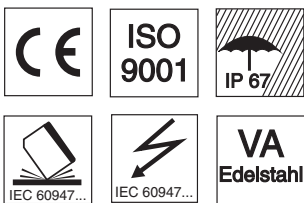
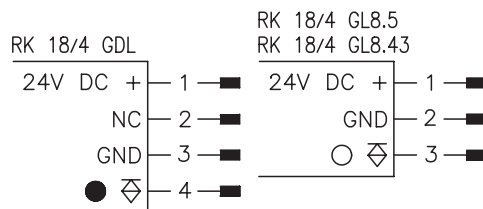
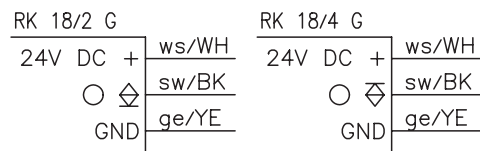
RK 18/4 GL8.5
RK 18/4 GL8.43



RK 18/4 GDL

- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection



Accessories:

(available separately • see page 156)

- Mounting system (BT 95)
- M12 connectors (KD ...)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 18_b02e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 2.5m
Operating range ²⁾	see table
Recommended reflector	MTK(S) 50x50
Light source	LED (constant light)
Wavelength	880nm (infrared)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤100ms

Electrical data

Operating voltage U_B ³⁾	24VDC filtered ± 10%
Residual ripple	≤ 15% of U_B
Power consumption	≤ 1.3W
Switching output	PNP or NPN transistor output
Function characteristics	light or dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED red	light path free
Mechanical data	
Housing	diecast aluminium
Optics	glass
Weight	120g
Connection type	M12 connector 4-pin or M8 connector 3-pin or plug 4-pin or cable 2000mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors			Operating range
1	TK(S)	100x100	0 ... 2.0 m
2	MTK(S)	50x50	0 ... 1.6m
3	TK(S)	30x50	0 ... 0.8 m
4	TK(S)	20x40	0 ... 0.6 m
5	Tape 2	100x100	0 ... 0.8 m

1	0	2.0	2.5
2	0	1.6	2.0
3	0	0.8	1.0
4	0	0.6	0.8
5	0	0.8	1.0

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		RK 18/2 G Part No. 500 00369	RK 18/4 G Part No. 500 00379	RK 18/4 GDL Part No. 500 18838	RK 18/4 GL8.43 Part No. 500 26481	RK 18/4 GL8.5 Part No. 500 17346	
Application	transparent media				●	●	
Switching output	PNP transistor		●	●	●	●	
	NPN transistor	●					
Connection	M12 connector			●			
	M8 connector				●	●	
	cable 2m	●	●				
	plug						
Switching	light	●	●		●	●	
	dark			●			
Features	sensitivity setting 270°				●	●	
	stainless steel housing				●		

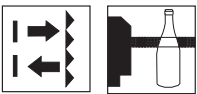
Remarks

- Preferably use MTK(S) 50x50.



PRK 18

Retro-reflective photoelectric sensors with polarisation filter

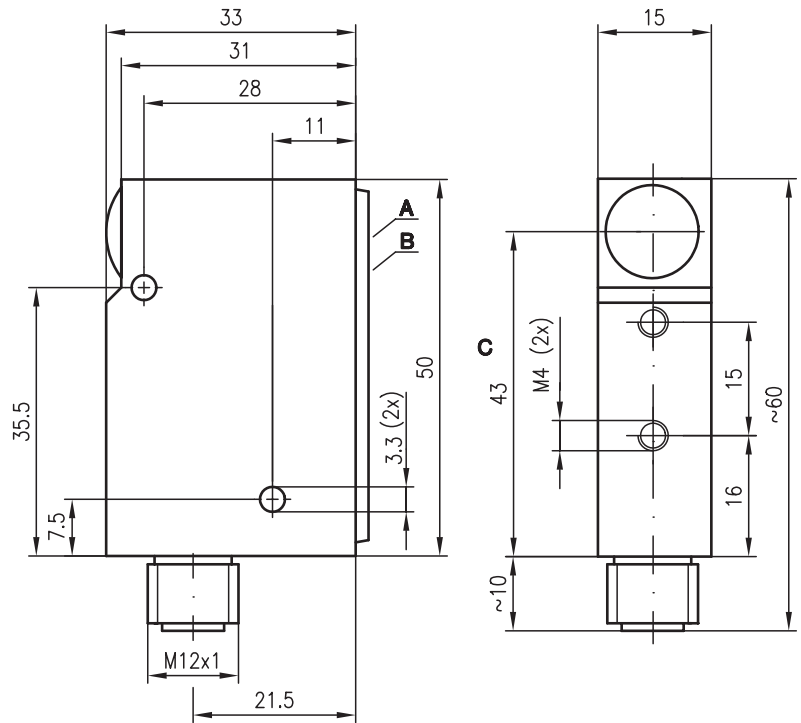


0 ... 3m

10 - 30 V
DC

- Retro-reflective photoelectric sensor for safe detection of transparent media (e.g. clear glass, PE, foil)
- User controlled sensitivity adjustment with high resolution allows detection of transparent objects
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)

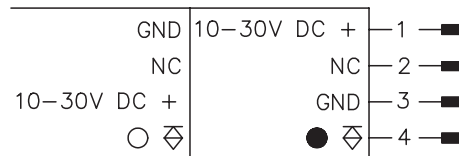
Dimensioned drawing



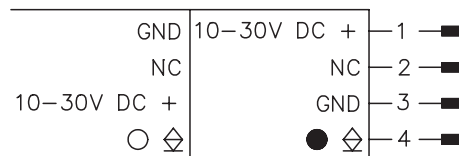
- A Indicator diodes
- B Sensitivity adjustment
- C Optical axis

Electrical connection

RK 18/4 DL.45
PRK 18/4 DL.4



PRK 18/2 DL.4



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Accessories:

(available separately • see page 156)

- Mounting system (BT 95)
- M12 connectors (KD ...)
- M8 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 3m
Operating range ²⁾	see table
Recommended reflector	MTK(S) 50x50
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1500Hz
Response time	0.333ms
Delay before start-up	≤100ms

Electrical data

Operating voltage U_B ³⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	PNP transistor
Function characteristics	dark or light switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 12-turn potentiometer

Indicators

LED yellow	switching output
LED green, slowly flashing	operating point 1 clear glass – transition from quickly flashing to slowly flashing
LED green, quickly flashing	operating point 2 coloured glass – transition from cont. illuminated to quickly flashing
LED green, continuous light	operating point 3 non transparent media – continuous light

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	150g
Connection type	M12 connector, 4-pin, stainless steel

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

Selection table		PRK 18/4 DL4 Part No. 500 80153	PRK 18/2 DL4 Part No. 500 81153	RK 18/4 DL45 Part No. 500 81364					
Equipment ↓		Order code →							
Application	transparent media	●	●	●					
	foils > 5µm			●					
Switching output	PNP transistor	●		●					
	NPN transistor		●						
Switching	light	●	●	●					
	dark	●	●	●					
LED	sensor back	●	●	●					
Adjustment	12-turn (sensor back)	●	●	●					
Features	polarisation filter	●	●						

Tables

PRK 18/4 DL.4
RK 18/4 DL.45

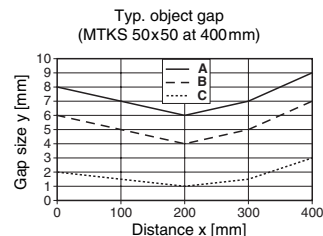
Reflectors	Operating range
1 TK(S) 100x100	0 ... 2.4 m
2 MTK(S) 50x50	0 ... 2.0 m
3 TK(S) 30x50	0 ... 0.8 m
4 TK(S) 20x40	0 ... 0.8 m
5 Tape 2 100x100	0 ... 0.4 m

1	0	2.4	3.0
2	0	2.0	2.5
3	0	0.8	1.0
4	0	0.8	1.0
5	0	0.4	0.6

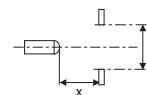
- Operating range [m] *
- Typ. operating range limit [m] *

*) For sensitivity set to operating point 3

Diagrams



- A Operating point 1
- B Operating point 2
- C Operating point 3



Remarks

Objects	Adjustment (indicator LED yellow)
Clear glass, PE, foil	operating point 1
Coloured glass	operating point 2
Opaque objects	operating point 3

- The light spot may not exceed the reflector.
- RK 18/4 DL.45
The sensor has to be mounted approx. 5° angular towards the object.
- Preferably use MTK(S) 50x50.



PRK 18

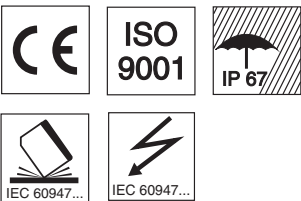
Retro-reflective photoelectric sensors with polarisation filter



0 ... 5m



- Polarised retro-reflective photoelectric sensor using visible red light
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Polarisation filter blocks unwanted reflections
- Light or dark switching by reversing the polarity of the operating voltage
- Mounting holes and M4 threaded holes for easy installation



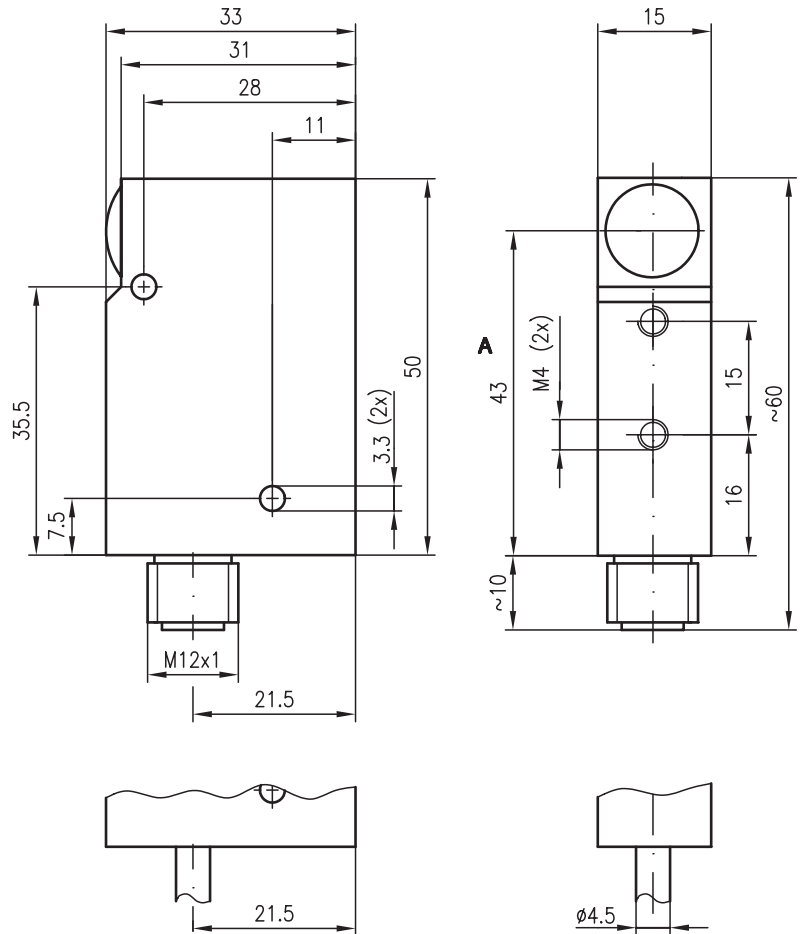
We reserve the right to make changes • 18_b06e.fm

Accessories:

(available separately • see page 156)

- M12 connectors (KD ...)
- Reflectors

Dimensioned drawing



A Optical axis

Electrical connection

PRK 18/4, 6000
PRK 18/4 L

GND	10-30V DC +	1	■
NC	NC	2	■
10-30V DC +	GND	3	■
● ⊕	○ ⊕	4	■

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤100ms

Electrical data

Operating voltage U_B ³⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	PNP transistor output
Function characteristics	dark or light switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ (U_B -2V)/≤ 2V
Output current	max. 100mA

Indicators

LED yellow (sensor back)	switching output
--------------------------	------------------

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	150g
Connection type	M12 connector, 4-pin, stainless steel, or cable, 6000mm

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors			Operating range
1	TK(S)	100x100	0 ... 4.0m
2	MTK(S)	50x50	0 ... 3.5m
3	TK(S)	30x50	0 ... 2.0m
4	TK(S)	20x40	0 ... 1.5m
5	Tape 2	100x100	0 ... 0.8m

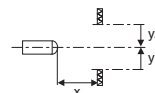
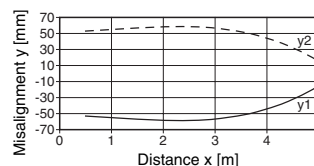
1	0	4.0	5.0
2	0	3.5	4.5
3	0	2.0	2.5
5	0	1.5	2.0
5	0	0.8	1.1

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

	Designation	Part No.
with 6m cable	PRK 18/4, 6000	500 33244
M12 connector	PRK 18/4 L	500 81254

Remarks



IPRK 18

Retro-reflective photoelectric sensors with polarisation filter

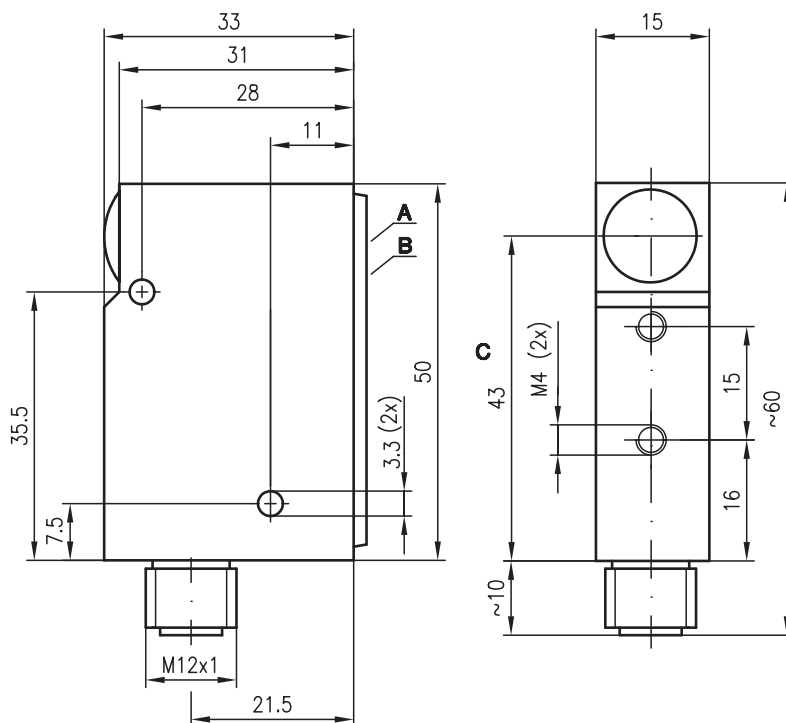


0 ... 4m



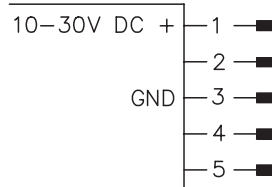
- Intelligent sensor for detection of transparent objects (e.g. clear glass, PE, foil)
- Automatic contamination compensation (tracking function) for longer intervals between cleanings
- Adjustment via teach-in

Dimensioned drawing



- A** Step switch for object adjustment
- B** Indicator diodes
- C** Optical axis

Electrical connection



	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5
PRK 18/24 DL.46	+	NPN	GND	PNP	L/D
PRK 18/24 DL.42	+	NPN	GND	PNP	Teach
IPRK 18/4 DL.41	+	Warn	GND	PNP	L/D
IPRK 18/2 DL.41	+	Warn	GND	NPN	L/D
PRK 18/44 L.44	+	PNP	GND	PNP	Teach



Accessories:

(available separately • see page 156)

- Mounting system (BT 95)
- M12 connectors (KD ...)
- Reflectors

We reserve the right to make changes • 18_b05e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 4m
Operating range ²⁾	see table
Recommended reflector	MTK(S) 50x50
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1 kHz
Response time	0.5ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	see section 6. Preferred types (page 153)
Function characteristics	see section 6. Preferred types (page 153)
Signal voltage high/low ³⁾	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 2x100 mA
Sensitivity	see section 6. Preferred types (page 153)

Switch positions

Position teach-in	activation of the teach procedure
Position 1 (PE bottle)	operating point PE bottle
Position 2 (clear glass bottle)	operating point clear glass bottle
Position 3 (coloured glass bottle)	operating point coloured glass bottle
Position Auto	tracking ON/OFF

Indicators

LED green continuous light	ready
LED green flashing	teach mode active with performance reserve
LED red continuous light	operation without performance reserve
LED red flashing	teaching without performance reserve
LED green/red flashing	device defective, no performance reserve
LED 1 yellow	light path free
LED 2 yellow	tracking ON

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	150g
Connection type	M12 connector, 5-pin, stainless steel

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

see section 6. Preferred types (page 153)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section 6. Preferred types (page 153)

Tables

Reflectors			Operating range
1	TK(S)	100x100	0 ... 3.0m
2	MTK(S)	50x50	0 ... 2.4 m
3	TK(S)	30x50	0 ... 1.6m
4	TK(S)	20x40	0 ... 1.4m
5	Tape 2	100x100	0 ... 0.6 m

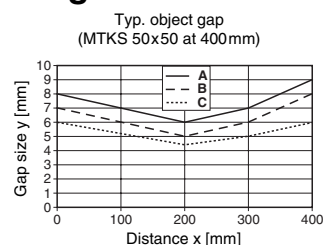
1	0	3.0	4.0
2	0	2.4	3.0
3	0	1.6	2.0
4	0	1.4	1.8
5	0	0.6	0.8

- Operating range [m] *
- Typ. operating range limit [m] *

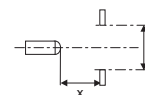
*) for sensitivity setting at switch position 3

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams



- A Switch position 1
- B Switch position 2
- C Switch position 3



Remarks

Objects	Switch position
Multilayer foil, PE bottles, transparent glass pane	1
Clear glass bottle	2
Coloured glass bottle	3

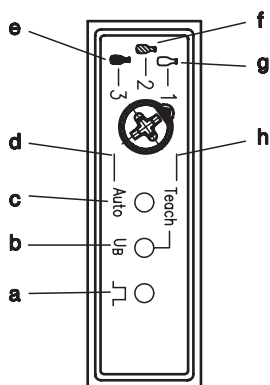
- The light spot may not exceed the reflector.
- Teaching may only be performed with free light path.
- A change of the operating point is always possible and does not require a new teach-in.
- The red LED signals an insecure operating status.
- For activation of the single functions you have to remain in the respective switch position for approx. 2ms.
- In switch positions "Teach" and "Auto" the switching outputs are active.
- Preferably use MTK(S) 50x50.

IPRK 18
1. Operating principle of contamination compensation (tracking function)

This transparency sensor (clear-glass sensor) is a device which automatically compensates system contamination at the reflector and sensor by means of continuous measurement of the receiving level. The control rate depends on the number of gaps in the process. This tracking function increases the interval between cleaning sessions considerably.

The control limit is indicated by a warning output. The sensor does not need to be recalibrated after the system has been cleaned. In typical applications, cleaning can be performed during system operation. This means higher system efficiency.

The system is calibrated ("teach-in") once only at initial setup. The appropriate object is then selected (PE, clear glass or coloured glass). The "teach-in" process does not have to be performed again if a different object is selected.

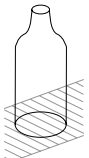
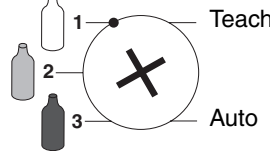
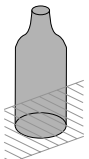
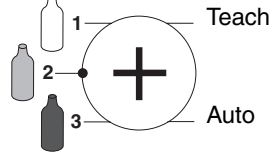
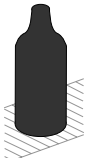
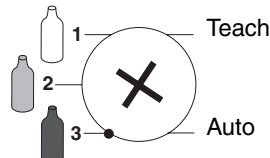
2. Controls and indicators


- a Light path free (LED1 yellow)
- b Operation and teach indicator (LED green/red)
- c Tracking ON (LED2 yellow)
- d Switch position tracking
- e Switch position 3 (coloured-glass bottle)
- f Switch position 2 (clear-glass bottle)
- g Switch position 1 (PE bottle, glass pane, foil)
- h Switch position Teach

3. Adjustment procedure (teach-in) via step switch

	Correct adjustment procedure:	Important to note:
	<ol style="list-style-type: none"> 1. There must be no objects in the beam path between the retro-reflective photoelectric sensor and the reflector during the adjustment procedure. 2. Align the sensor with the reflector so that the beam is visible in the middle of the reflector 	<p>The Teach-in procedure must be conducted without any objects !</p> <p>The beam must not fall outside the reflector area. The mounted reflector should always be larger than the visible beam!</p>
	<ol style="list-style-type: none"> 3. Turn the step switch to the "Teach" position for about 2s. 4. Turn the step switch back to positions 1, 2 or 3. 5. To turn the tracking function on/off, turn the step switch to "Auto" for about 2s. 6. Turn the step switch back to positions 1, 2 or 3. 	<p>The adjustment procedure must be conducted without objects!</p> <p>The step switch must be turned to positions 1, 2 or 3 during operation!</p>

4. Setting operating mode

Object to be identified	Material, e.g.:	Switch position	Correct adjustment procedure:
① Transparent objects 	<ul style="list-style-type: none"> ● PE bottle ● PEN bottle ● Clear plate glass ● Foil 		<ol style="list-style-type: none"> 1. Turn the step switch to the "Teach" position for about 2s. 2. Turn the step switch back to position 1 <p>Tracking can be turned on or off by switching to "Auto"</p>
② Less transparent objects 	<ul style="list-style-type: none"> ● Clear glass bottle ● Coloured plate glass 		<ol style="list-style-type: none"> 1. Turn the step switch to the "Teach" position for about 2s. 2. Turn the step switch back to position 2 <p>Tracking can be turned on or off by switching to "Auto"</p>
③ Opaque objects 	<ul style="list-style-type: none"> ● Coloured glass bottle ● Opaque objects 		<ol style="list-style-type: none"> 1. Turn the step switch to the "Teach" position for about 2s. 2. Turn the step switch back to position 3 <p>Tracking can be turned on or off by switching to "Auto"</p>

5. Calibration procedure (teach-in) by wire

1. Set step switch to desired operating mode (PE, clear-glass or coloured-glass bottle).
2. Activate teach-in wire (pin 5) (high active). Teach-in procedure takes max. 1s.
3. Deactivate teach-in wire (pin 5).

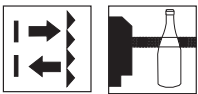
6. Preferred types

Selection table		Order code →							
Equipment ↓		PRK 18/24 DL.46 Part No. 500 32798	PRK 18/24 DL.42 Part No. 500 33554	IPRK 18/4 DL.41 Part No. 500 33552	IPRK 18/2 DL.41 Part No. 500 33553	PRK 18/4 L.44 Part No. 500 61251			
Application	PE	●	●	●	●	●			
	clear glass	●	●	●	●	●			
	coloured glass	●	●	●	●	●			
Switching outputs	2 PNP transistors			●		●			
	2 NPN transistors				●				
	1 NPN + 1 PNP transistor	●	●						
Function characteristics	complementary					●			
	light switching	●		●	●				
	dark switching	●	●	●	●				
Adjustment	step switch	●	●	●	●	●			
Options	contamination compensation (step tracking)	●	●	●	●	●			
	cleaning compensation (peak tracking)	●	●	●	●	●			
	tracking ON/OFF	●	●	●	●	●			
	warning output			●	●				
	teach-in via step-switch	●	●	●	●	●			
	teach-in via control line		●			●			
	light/dark commutation via control line	●		●	●				



IPRK 18

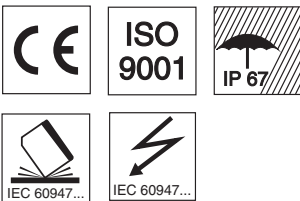
Retro-reflective photoelectric sensors with polarisation filter



0 ... 3m



- Polarised retro-reflective photoelectric sensor using visible red light for safe detection of transparent media (e.g. clear glass, PE, foil) with integrated AS-i slave
- Selection of the detection range via AS-i profile (e.g. from clear glass to coloured glass or non transparent media) without new user access
- Gap detection $\geq 5\text{mm}$ (see table)
- Warning function autoControl for increased availability and for checking of the correct base setting
- Extended switching pulse for reliable transmission via AS-interface

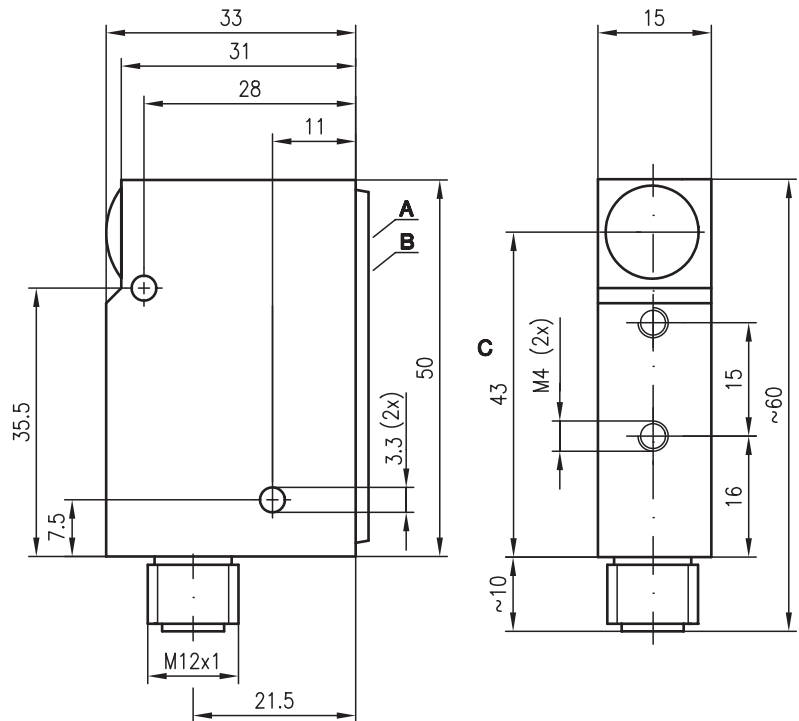


Accessories:

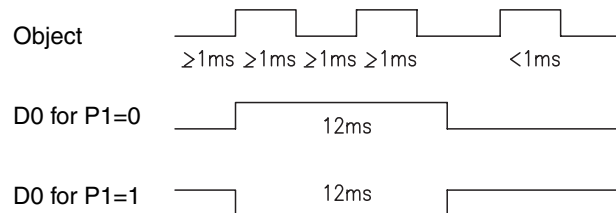
(available separately • see page 156)

- Mounting system (BT 95)
- M12 connectors (KD ...)
- M8 connectors (KD ...)
- Reflectors
- Reflective tapes

Dimensioned drawing

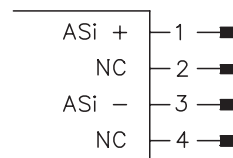


Minimum switching pulse for IPRK 18/A.1 L.4



- A Indicator diode
- B Sensitivity adjustment
- C Optical axis

Electrical connection



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Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 0 ... 3m
 Operating range ²⁾ see table
 Recommended reflector MTK(S) 50x50
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency (sensor) acc. to AS-i specification
 internal 1000Hz
 Response time (sensor) acc. to AS-i specification
 internal 0.5ms
 Delay before start-up ≤ 300ms

Electrical data

Operating voltage U_B 26.5 ... 31.6V (according to AS-interface specifications)
 Bias current ≤ 35mA
 Sensitivity **base setting:** clear glass via 12-turn potentiometer
selection: clear/coloured/non transparent glass via AS-i profile

Indicators

LED yellow

LED green

continuous light, switching output
slowly flashing, sensor identification
 - activation via AS-i profile
slowly flashing, operating point 1, clear glass
 - manual adjustment (see remarks)
 - activation via AS-i profile
flashing fast, operating point 2, coloured glass
 - activation via AS-i profile
continuous light, operating point 3, non transparent media
 - activation via AS-i profile

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 150g
 Connection type M12 connector, 4-pin, stainless steel

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-30°C ... +70°C
 Protective circuit ³⁾ 2, 3
 VDE safety class III
 Protection class IP 67
 Standards applied IEC 60947-5-2

AS-i data

I/O code 3
 ID code F
 Address programmed by the user in the range of 1 to 31 (default=0)
 max. 5ms
 S-3.F
 Cycle time acc. to AS-i specification
 AS-i standard according to profile

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	P ₀	NC	∅	system parameter
		1 reflection	system input				
D ₁	warning output autoControl	∅ active	system input	P ₁	light/dark switching	∅ dark switching	system parameter
		1 not active	system input			*1 light switching	system parameter
D ₂	ready output	x performance reserve	system input	P ₂	NC	∅	system parameter
D ₃	activation input	x performance reserve	system output	P ₃	NC	∅	system parameter

* default = 1

Order guide

	Designation	Part No.
	IPRK 18/A L.4	500 30077
with pulse stretching 12ms	IPRK 18/A.1 L.4	500 34119

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 2.4 m
2 MTK(S) 50x50	0 ... 2.0 m
3 TK(S) 30x50	0 ... 0.8 m
4 TK(S) 20x40	0 ... 0.8 m
5 Tape 2 100x100	0 ... 0.4 m

1	0	2.4	3.0
2	0	2.0	2.5
3	0	0.8	1.0
4	0	0.8	1.0
5	0	0.4	0.6

- Operating range [m] *
- Typ. operating range limit [m] *

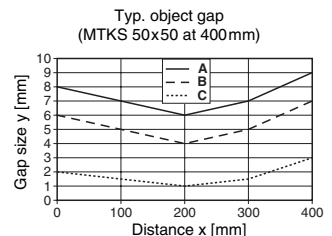
*) For sensitivity set to operating point 3

D ₂	D ₃	performance reserve
#0	#0	sensor identification
1	0	parameter for clear glass
0	1	parameter for coloured glass
1	1	parameter for non transparent objects

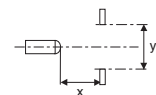
Base setting (see remarks)

D ₂	D ₃	autoControl (D ₁ =0)
0	0	wrong base setting
1	0	system out of alignment
0	1	system out of alignment
1	1	system out of alignment

Diagrams



- A Operating point 1
- B Operating point 2
- C Operating point 3



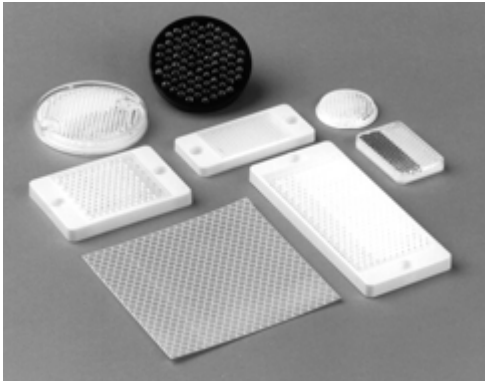
Remarks

Objects	Adjustment (green indicator LED)
Clear glass, PE, foil	operating point 1

- The potentiometer may only be used in base setting (D₂=0, D₃=0).
- At autoControl (D₁=0), clean the system and align optimally to reflector. If necessary apply default settings.
- With ranges ≤ 200mm reflectors with small tripod structures are required.
- Preferably use MTK(S) 50x50.



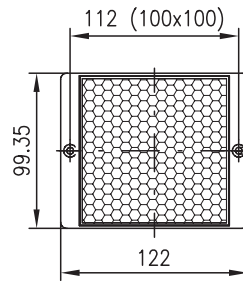
Reflectors



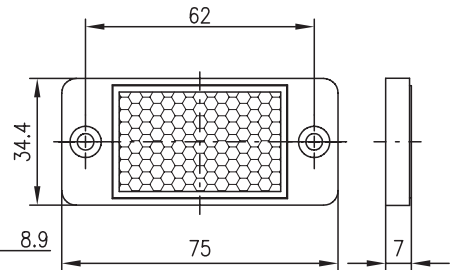
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

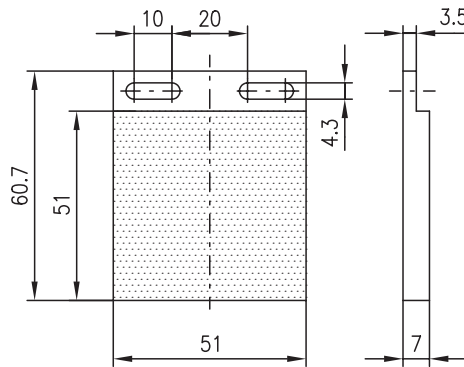
TKS 100 x 100



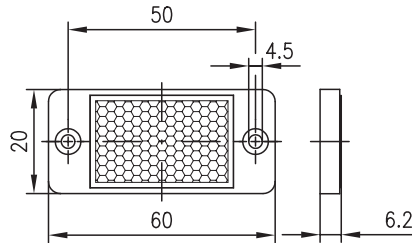
TKS 30 x 50



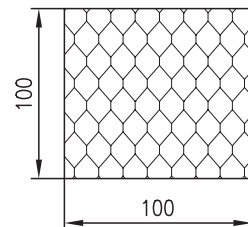
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

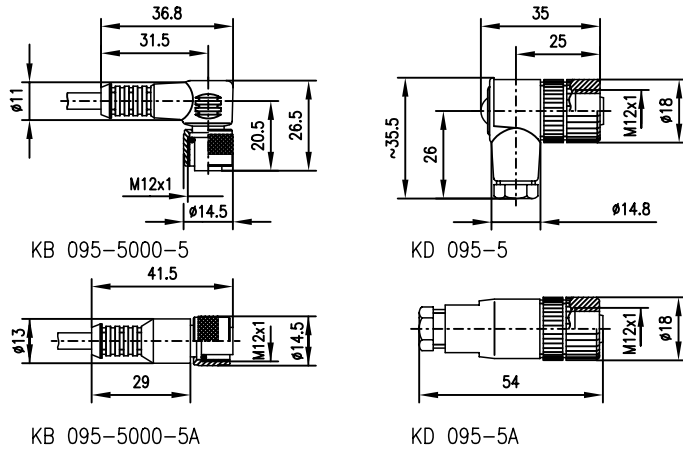


Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 18_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 95	500 20833
US 18	500 80987

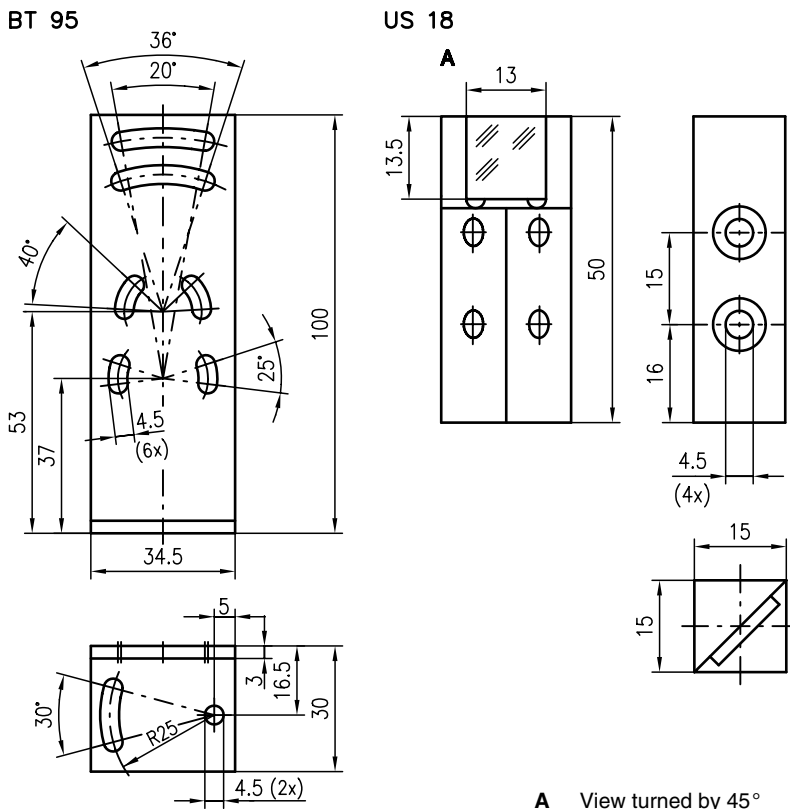
Dimensioned drawings

M12 connectors


For devices with M12 connectors, there are available: connectors with ready-made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

Selection table

M12 connectors			
 with cable (5m cable length)		 without cable	
KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A

Dimensioned drawings

Mounting systems

BT 95



US 18





8 Series

Overview and advantages

Multifunctional series with metal housing featuring all operating principles

Operating principles:

- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Laser throughbeam photoelectric sensors with adjustable light spot
- Retro-reflective photoelectric sensors with polarisation filter
- Retro-reflective photoelectric sensors for transparent media
- Retro-reflective photoelectric sensors with tracking function for transparent media
- Laser retro-reflective photoelectric sensors with adjustable light spot
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with analogue output
- Diffuse reflection light scanners with background suppression
- Diffuse reflection light scanners with foreground suppression
- Laser diffuse reflection light scanners with background suppression
- Fiber optic cable control devices for glass fiber optic cable
- Fiber optic cable control devices for plastic fiber optic cable
- Contrast scanner
- Contrast scanner for glass fiber optic cable
- Measuring CCD sensor
- Ultrasonic throughbeam photoelectric sensor
- Ultrasonic diffuse reflection scanner
- Ultrasonic diffuse reflection scanner with background suppression

Switching outputs:

- Low impedance push-pull outputs with very high immunity to interference
- PNP and NPN compatible (All-In-One)
- Symmetric response behaviour

Increased temperature range -40°C ... +60°C



Switching frequency up to 10kHz

Housing materials:

- Safe to use in applications involving foodstuffs
- No diffusion leakage
- Resistant to chemicals

Various mounting options:

- Mounting holes
- Blind holes
- Dovetail

Various mounting accessories:

- Clamp for rod mounting
- Wobble fixture for rod mounting
- Mounting block
- Mounting on DIN rail
- Wobble plate with integrated alignment aid



Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Operating voltage		Light source			Output		
			Metal		10 ... 30VDC	AS-i system	Red light	Green light	Laser, red light	PNP transistor	NPN transistor	Push-pull transistor
	LSR 8/44-S12	0 ... 20m	•		•		•			•		
	LSR 8/44	0 ... 20m	•		•		•			•		
	LSR 8/66-S12	0 ... 20m	•		•		•					•
	LSR 8/66	0 ... 20m	•		•		•					•
	LSRL 8/24.91-S12	0 ... 100m	•		•				•	•	•	
	LSRL 8/24.91	0 ... 100m	•		•				•	•	•	
	PRK 8/44-S12	0.05 ... 8m	•		•		•			•		
	PRK 8/44	0.05 ... 8m	•		•		•			•		
	PRK 8/66-S12	0.05 ... 8m	•		•		•					•
	PRK 8/66	0.05 ... 8m	•		•		•					•
	PRK 8/66.11-S12	0 ... 7m	•		•		•					•
	PRK 8/66.41-S12	0 ... 2.4m	•		•		•					•
	PRK 8/66.42-S12	0 ... 2.4m	•		•		•					•
	PRKL 8/24.91-S12	0 ... 21m	•		•				•	•	•	
	PRKL 8/24.91	0 ... 21m	•		•				•	•	•	
	RTR 8/44-800-S12	5 ... 800mm	•		•		•			•		
	RTR 8/44-800	5 ... 800mm	•		•		•			•		
	RTR 8/66-800-S12	5 ... 800mm	•		•		•					•
	RTR 8/66-800	5 ... 800mm	•		•		•					•
	HRTR 8/44-350-S12	5 ... 400mm	•		•		•			•		
	HRTR 8/44-350	5 ... 400mm	•		•		•			•		
	HRTR 8/66-350-S12	5 ... 400mm	•		•		•					•
	HRTR 8/66-350	5 ... 400mm	•		•		•					•
	HRTL 8/24-350-S12	5 ... 400mm	•		•				•	•	•	
	HRTL 8/24-350	5 ... 400mm	•		•				•	•	•	
	HRTL 8/24-150-S12	10 ... 200mm	•		•				•	•	•	
	HRTL 8/24-150	10 ... 200mm	•		•				•	•	•	
	VRTR 8/44-250-S12	0 ... 250mm	•		•		•			•		
	VRTR 8/44-250	0 ... 250mm	•		•		•			•		
	LVSR 8/24-KF-S12	500mm/80mm	•		•		•			•	•	
	LVSR 8/24-KF	500mm/80mm	•		•		•			•	•	
	LVSR 8/24-GF-S12	500mm/80mm	•		•		•			•	•	
	LVSR 8/24-GF	500mm/80mm	•		•		•			•	•	
	KRTG 8/24-10-S12	10mm	•		•			•		•	•	



Switching			Connection		Fiber optic cable		Options										Page
Light/dark, complementary	Light	Dark	Cable	M12 connector, turning	Plastic	Glass	Activation input	Background suppression	Foreground suppression	Light spot diameter adjustable	Polarisation filter	Autocollimation (single lens)	Sensitivity adjustment via potentiometer	Sensitivity adjustment via teach-in	Mechanical sensitivity adjustment	Transparent media (signal loss > 8%)	
•				•													163
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•				•													163
•			•														163
	•			•						•				•			165
	•			•						•				•			165
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																	193
	•			•										•			193

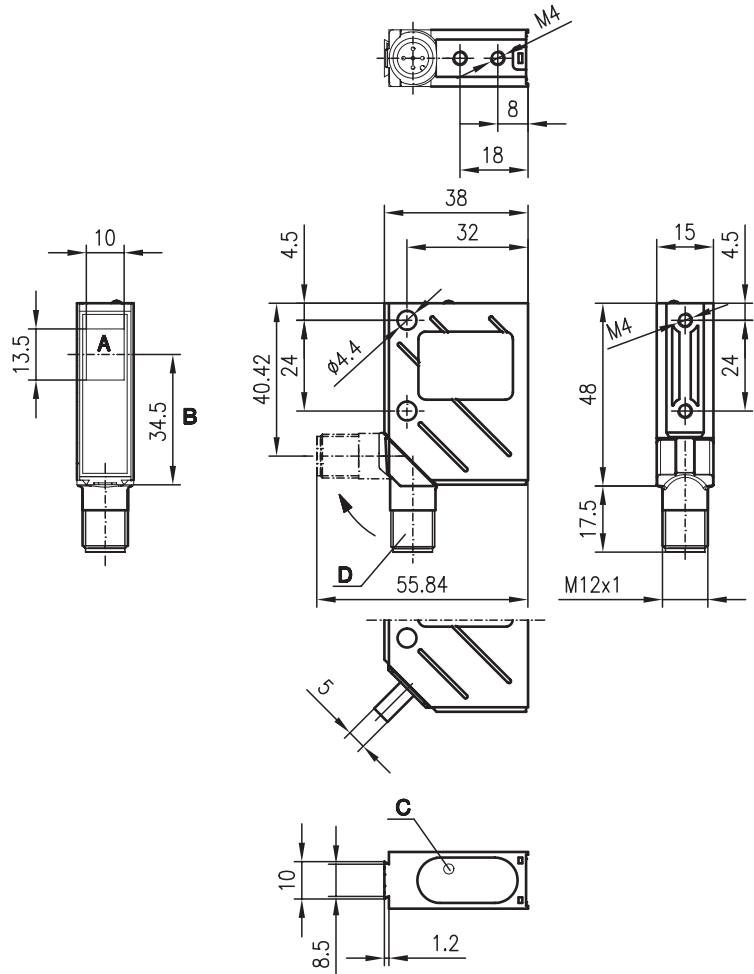


LSR 8

Throughbeam photoelectric sensors



Dimensioned drawing



- A Transmitter/receiver
- B Optical axis
- C LED yellow
- D 90° turning connector

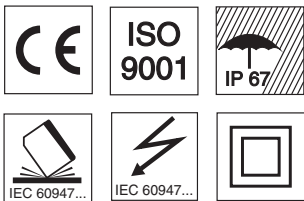
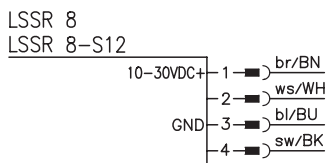
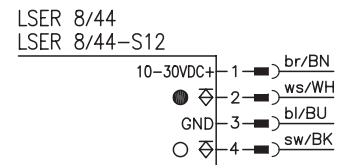
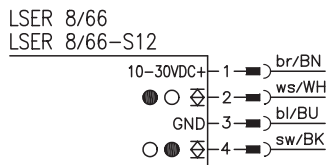


20m



- A²LS - active suppression of extraneous light
- Push-pull switching outputs
- M12 turning connector or cable connection
- Visible red light

Electrical connection



Accessories: (available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

We reserve the right to make changes • 8_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	20m
Operating range ²⁾	12m
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1500Hz
Response time	0.33 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	.../66 2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
	.../44 2 PNP switching outputs pin 2: dark switching pin 4: light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Sensitivity	not adjustable

Indicators

LED yellow, receiver	light path free
LED yellow flashing, receiver	light path free, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M 12 connector, 5-pin (turning), or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	LSR 8/44-S12	
Transmitter	LSSR 8-S12	500 36354
Receiver	LSER 8/44-S12	500 36356
with 2m cable		
Transmitter and receiver	LSR 8/44	
Transmitter	LSSR 8	500 36355
Receiver	LSER 8/44	500 36357
with M12 connector		
Transmitter and receiver	LSR 8/66-S12	
Transmitter	LSSR 8-S12	500 36354
Receiver	LSER 8/66-S12	500 36569
with 2m cable		
Transmitter and receiver	LSR 8/66	
Transmitter	LSSR 8	500 36355
Receiver	LSER 8/66	500 36570

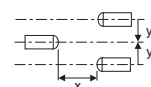
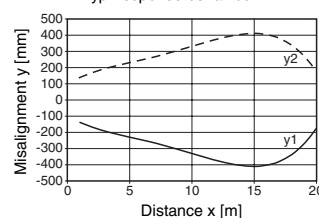
Tables

0	12	20
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	Operating range [m]
	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

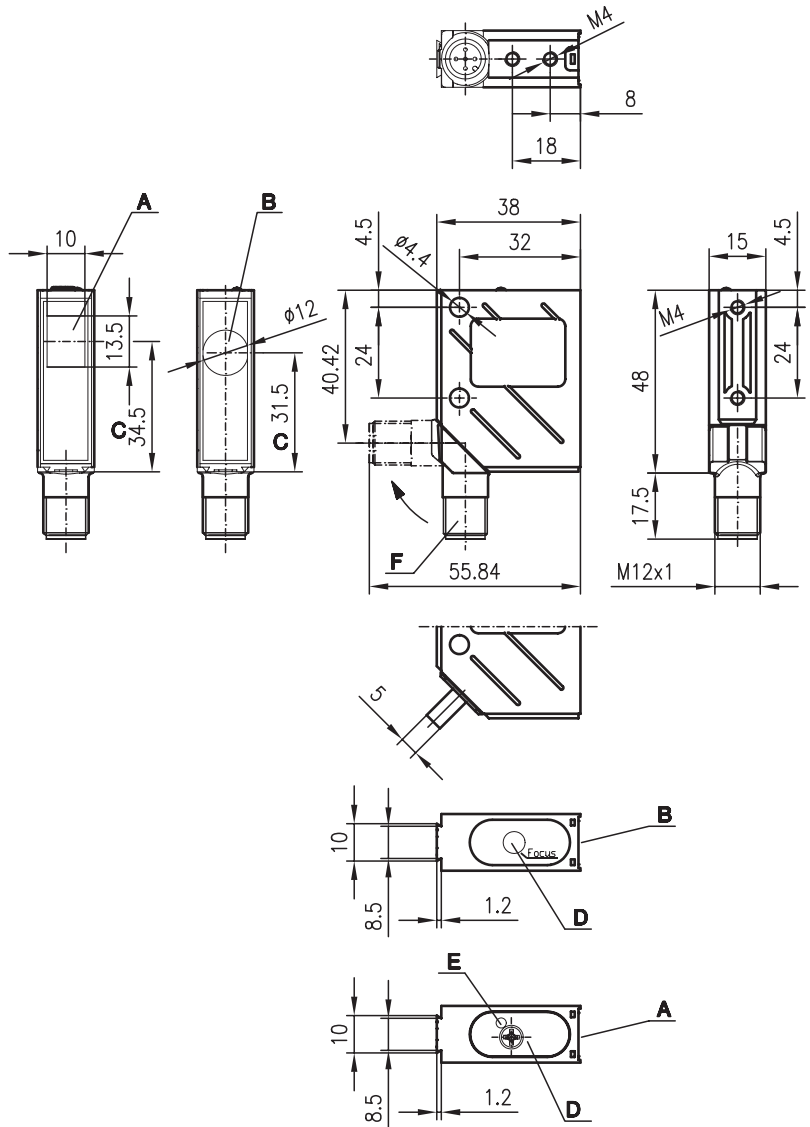


LSRL 8

Laser throughbeam photoelectric sensors



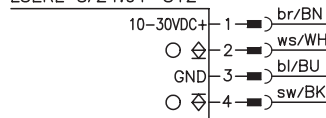
Dimensioned drawing



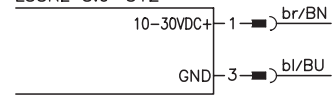
- A Receiver
- B Transmitter
- C Optical axis
- D Operational control
- E LED yellow
- F 90° turning connector

Electrical connection

LSRL 8/24.01
LSRL 8/24.01-S12



LSSRL 8.9
LSSRL 8.9-S12



100m

- Laser, red light
- A²LS - active suppression of extraneous light
- Adjustable focus
- M12 turning connector or cable connection

Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

We reserve the right to make changes • 8_a02e.fm



Specifications

Optical data	
Typ. operating range limit ¹⁾	100m
Operating range ²⁾	60m
Light spot diameter	≥ 0.1 mm adjustable (see diagrams)
Focus adjustment range	140mm ... ∞ (see diagrams)
Light source	laser, class 2
Wavelength	670nm (visible red light, polarised)
Laser warning notice	see remarks
Timing	
Switching frequency	2800Hz
Response time	0.18ms
Delay before start-up	≤ 100ms
Electrical data	
Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 15% of U _B
Bias current	≤ 35mA
Switching output	PNP and NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ (U _B -2V) ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 270° potentiometer
Indicators	
LED yellow, receiver	light path free
LED yellow flashing, receiver	light path free, no performance reserve
Mechanical data	
Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M12 connector, 5-pin (turning), or cable: 2000mm, 5x0.25mm ²
Environmental data	
Ambient temp. (operation/storage)	-10°C ... +40°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class ⁵⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve, focus = ∞
- 2) Operating range: recommended range with performance reserve, focus = 2m
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC
- 5) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	LSRL 8/24.91-S12	
Transmitter	LSSRL 8.9-S12	500 36358
Receiver	LSERL 8/24.01-S12	500 36359
with 2m cable		
Transmitter and receiver	LSRL 8/24.91	
Transmitter	LSSRL 8.9	500 37083
Receiver	LSERL 8/24.01	500 37084

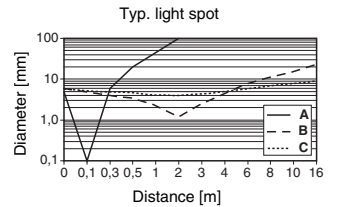
Tables

0	60	100
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- Operating range [m] *
- Typ. operating range limit [m] **

* for focus adjusted to 2m
 ** for focus adjusted to ∞

Diagrams



- A** focus = 0.125m
- B** focus = 2m
- C** focus = 16m

Remarks

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

LSSRL 8
 Pulse duration < 5.2µs
 Quiescent period > 34µs
 P_{max} ≤ 2.6mW
 λ = 670nm

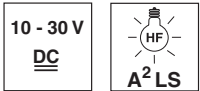


PRK 8

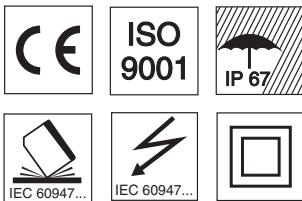
Retro-reflective photoelectric sensors



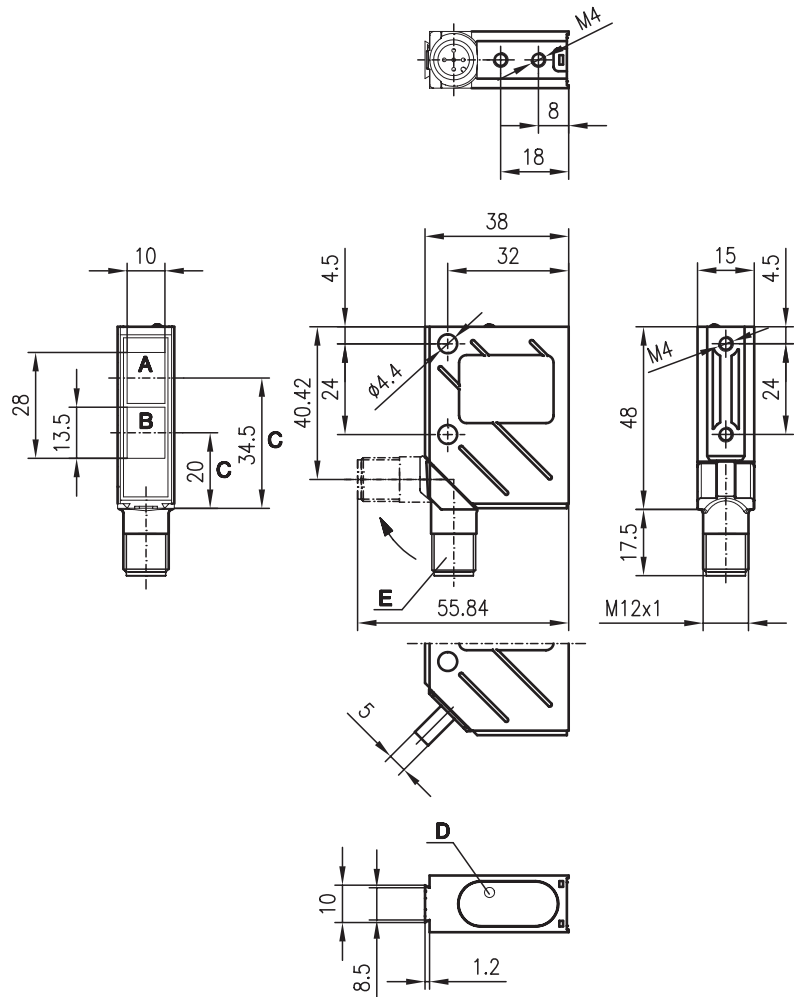
0.05 ... 8m



- A²LS - active suppression of extraneous light
- Push-pull switching outputs
- M12 turning connector or cable connection
- Visible red light

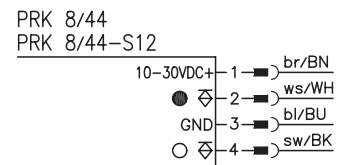
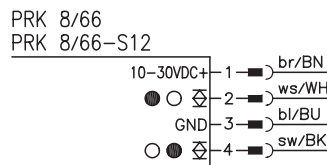


Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D LED yellow
- E 90° turning connector

Electrical connection



We reserve the right to make changes • 8_b01e.fm

Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Reflectors
- Reflective tapes



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.05 ... 8m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1500Hz
Response time	0.33 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	.../66 2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
	.../44 2 PNP switching outputs pin 2: dark switching pin 4: light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	not adjustable

Indicators

LED yellow, receiver	light path free
LED yellow flashing, receiver	light path free, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M 12 connector, 5-pin (turning), or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector	PRK 8/44-S12	500 36360
with 2m cable	PRK 8/44	500 36361
with M12 connector	PRK 8/66-S12	500 36362
with 2m cable	PRK 8/66	500 36363

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.10 ... 6.4m
2 MTK(S) 50x50	0.12 ... 4.8m
3 TK(S) 30x50	0.10 ... 2.8m
4 TK(S) 20x40	0.13 ... 2.4m
5 Tape 2 100x100	0.15 ... 2.8m

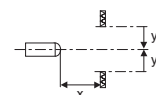
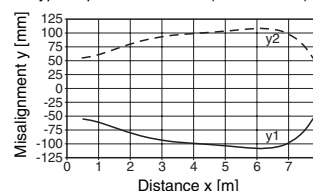
1	0.10	6.4	8
2	0.12	4.8	6
3	0.10	2.8	3.5
4	0.13	2.4	3
5	0.15	2.8	3.5

□ Operating range [m]
 □ Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)

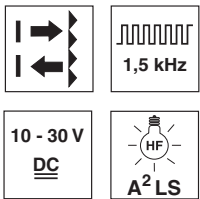


Remarks



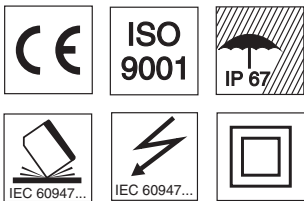
PRK 8

Retro-reflective photoelectric sensors with autocollimation

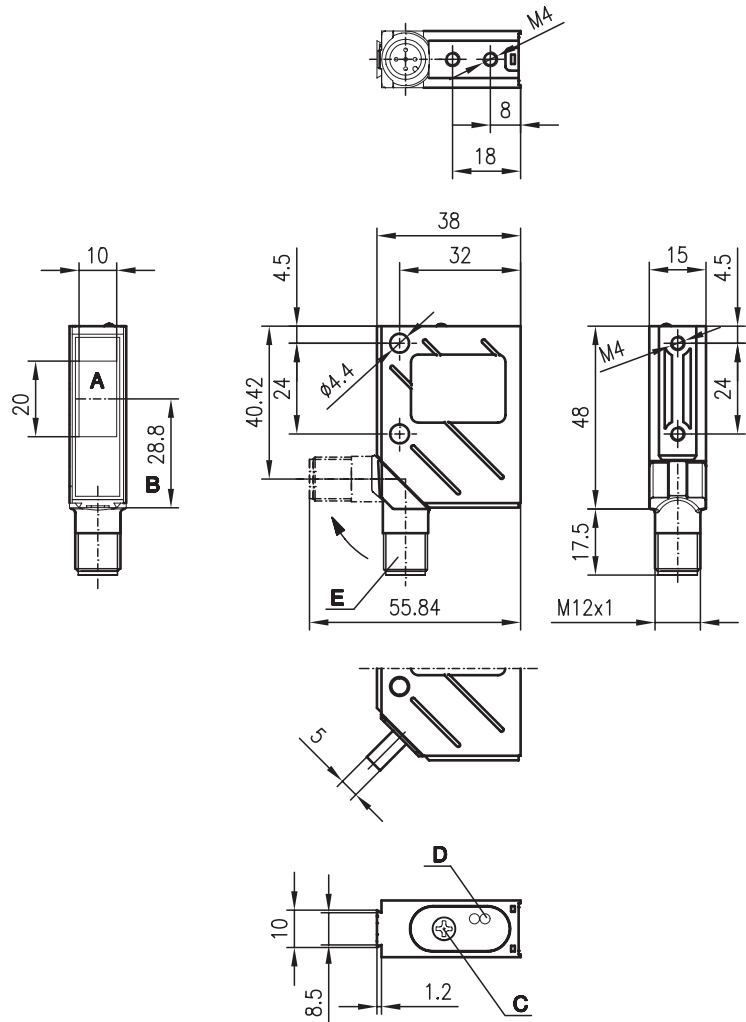


0 ... 7m

- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- A²LS - active suppression of extraneous light
- Push-pull switching outputs
- M12 turning connector or cable connection
- Visible red light

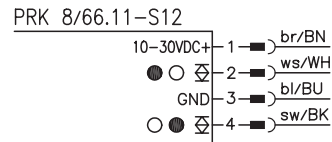


Dimensioned drawing



- A Transmitter/receiver
- B Optical axis
- C Operational control
- D LED yellow
- E 90° turning connector

Electrical connection



We reserve the right to make changes • 8_b04e.fm

Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 7m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1500Hz
Response time	0.33 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 12-turn potentiometer

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M 12 connector, 5-pin (turning)

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Tables

Reflector	Operating range
1 TK(S) 100x100	0 ... 5.0m
2 MTK(S) 50x50	0 ... 3.5m
3 TK(S) 30x50	0 ... 2.0m
4 TK(S) 20x40	0 ... 1.5m
5 Tape 2 100x100	0 ... 1.0m

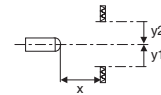
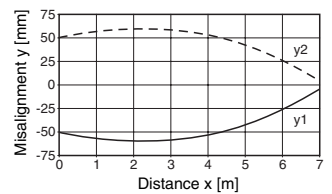
1	0	5.0	7.0
2	0	3.5	4.5
3	0	2.0	2.4
4	0	1.5	2.0
5	0	1.0	1.3

- Operating range [m]
- Typ. operating range limit [m]

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

	Designation	Part No.
with M12 connector	PRK 8/66.11-S12	500 37133

Remarks

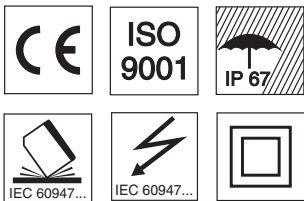


PRK 8

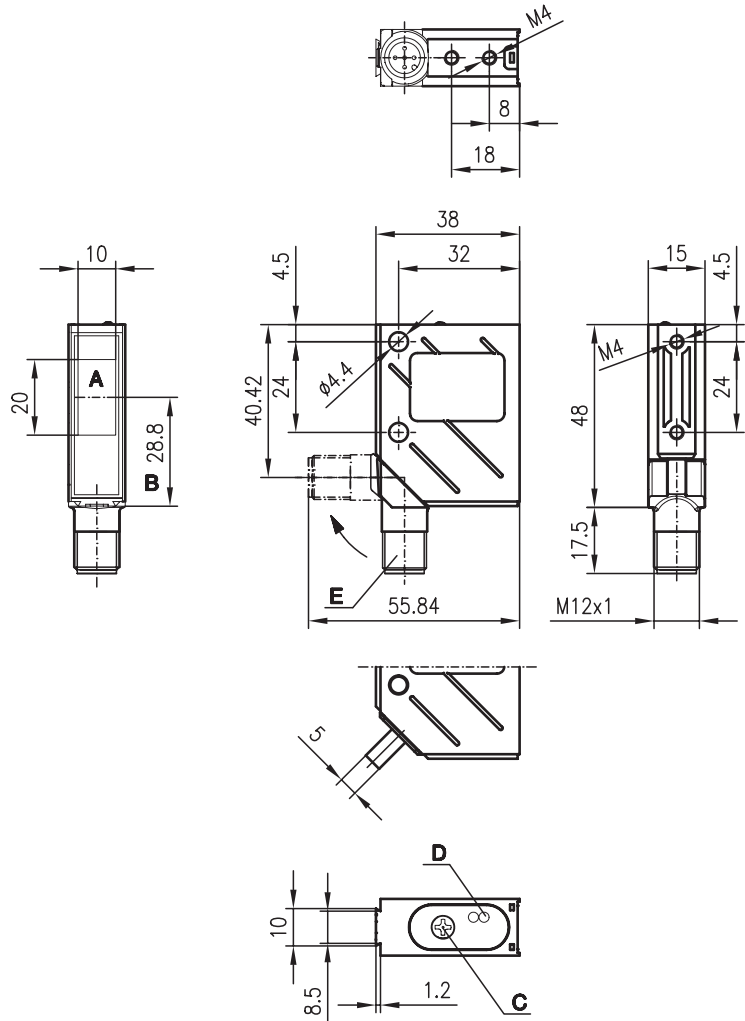
Retro-reflective photoelectric sensors



- Detection of transparent media (e. g. clear glass, PE, foil)
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Push-pull switching outputs
- M12 turning connector
- Visible red light
- Square light spot

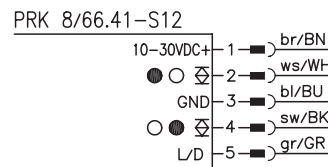


Dimensioned drawing



- A Transmitter/receiver
- B Optical axis
- C Operational control
- D LED yellow
- E 90° turning connector

Electrical connection



We reserve the right to make changes • 8_b03e.fm

Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Reflectors
- Reflective tapes



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 2.4 m
Operating range ²⁾	see table
Recommended reflector	MTK(S) 50x50
Light source	LED (modulated light)
Wavelength	660nm (visible red light)
Light spot	square, focussed at 200mm

Timing

Switching frequency	1500Hz
Response time	0.33 ms
Delay before start-up	≤ 650ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 12-turn potentiometer

Indicators

LED yellow	light path free operating point of tape, PE – transition from flashing to continuous light light path free, no performance reserve
LED yellow flashing	

Mechanical data

Housing	metal
Optics cover	glass
Weight	70g
Connection type	M12 connector, 5-pin (turning)

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

Options

L/D input	
Dark switching/light switching	$U_B/0V$ or not connected
L/D delay	< 0.5 ms

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector	PRK 8/66.41-S12	500 37134

Tables

Reflectors			Operating range
1	TK(S)	100x100	0 ... 2.0m
2	MTK(S)	50x50	0 ... 1.5m
3	TK(S)	30x50	0 ... 0.6m
4	TK(S)	20x40	0 ... 0.6m
5	Tape 2	100x100	0 ... 0.3m

1	0		2.0	2.4
2	0		1.5	1.8
3	0	0.6	0.8	
4	0	0.6	0.8	
5	0	0.3	0.6	

Operating range [m] *

Typ. operating range limit [m] *

*) For sensitivity set to operating point 3

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Remarks

- preferably use MTK(S) 50x50.



PRK 8

Retro-reflective photoelectric sensors with Tracking function



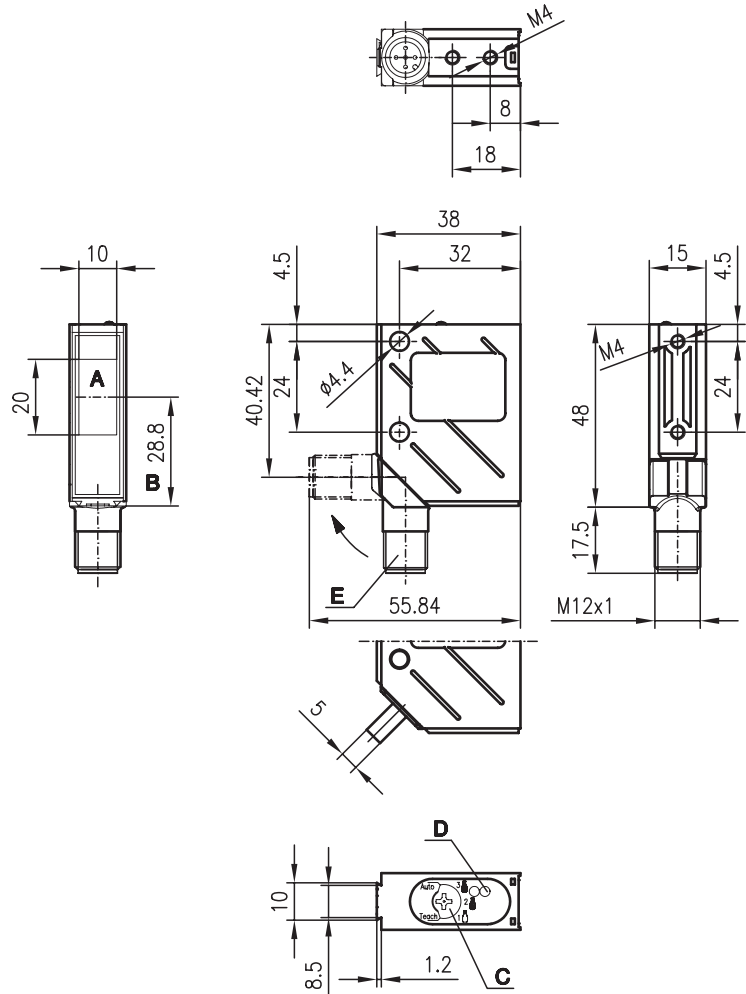
0 ... 2.4m
 1 kHz
Tracking
 PET
 Glas
10 - 30 V
DC

- Detection of transparent media (e. g. clear glass, PE, foil)
- Automatic contamination compensation (tracking function) for longer intervals between cleanings
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Push-pull switching outputs
- M12 turning connector
- Visible red light

Accessories:
 (available separately • see page 196)

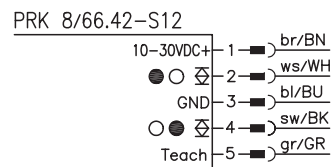
- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Reflectors
- Reflective tapes

Dimensioned drawing



- A** Receiver
- B** Optical axis
- C** Operational control
- D** LED yellow, LED green
- E** 90° turning connector

Electrical connection



We reserve the right to make changes • 8_b05e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 2.4 m
Operating range ²⁾	see table
Recommended reflector	MTK(S) 50x50
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 650ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with step switch

Switch positions

Position teach-in	Activation of the teach procedure
Position 1 (PE bottle)	Operating point PE bottle
Position 2 (clear glass bottle)	Operating point clear glass bottle
Position 3 (coloured glass bottle)	Operating point coloured glass bottle
Position Auto	Tracking ON/OFF

Indicators

LED green	see section 6. LED functions (page 175)
LED yellow	

Mechanical data

Housing	metal
Optics cover	glass
Weight	70g
Connection type	M 12 connector, 5-pin (turning)

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

Options

Teach input	
active/not active	$U_B/0V$ or not connected
Teach delay	< 0.5 ms

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250 VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector	PRK 8/66.42-S12	500 37135

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 2.0m
2 MTK(S) 50x50	0 ... 1.5m
3 TK(S) 30x50	0 ... 0.6m
4 TK(S) 20x40	0 ... 0.6m
5 Tape 2 100x100	0 ... 0.3m

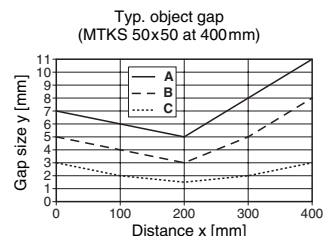
1	0	2.0	2.4
2	0	1.5	1.8
3	0	0.6	0.8
4	0	0.6	0.8
5	0	0.3	0.5

- Operating range [m] *
- Typ. operating range limit [m] *

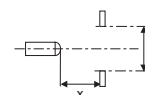
*) For sensitivity set to operating point 3

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams



- A** Operating point 1
- B** Operating point 2
- C** Operating point 3



Remarks

PRK 8

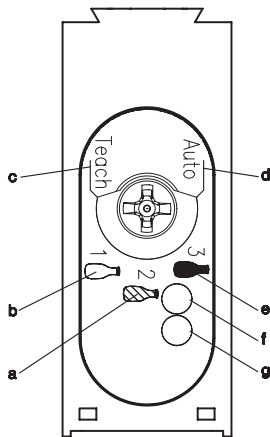
1. Operating principle of contamination compensation (tracking function)

This transparency sensor (clear-glass sensor) is a device which automatically compensates system contamination at the reflector and sensor by means of continuous measurement of the receiving level. The control rate depends on the number of gaps in the process. This tracking function increases the interval between cleaning sessions considerably.

The sensor does not need to be recalibrated after the system has been cleaned. In typical applications, cleaning can be performed during system operation. This means higher system efficiency.

The system is calibrated ("teach-in") once only at initial setup. The appropriate object is then selected (PE, clear glass or coloured glass). The "teach-in" process does not have to be performed again if a different object is selected.

2. Controls and indicators

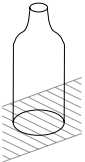
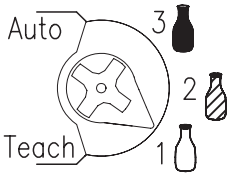
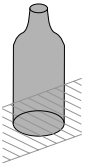
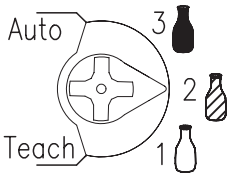
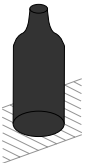
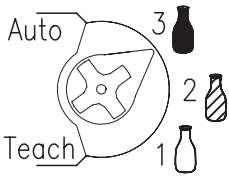


- a Switch position 2 (clear-glass bottle)
- b Switch position 1 (PE bottle, glass pane, foil)
- c Switch position, Teach
- d Switch position, Tracking ON/OFF
- e Switch position 3 (coloured-glass bottle)
- f Operation and teach indicator (LED green)
- g Light path free (LED yellow)

3. Adjustment procedure (teach-in) via step switch

	Correct adjustment procedure:	Important to note:
	1. There must be no objects in the beam path between the retro-reflective photoelectric sensor and the reflector during the adjustment procedure.	The Teach-in procedure must be conducted without any objects !
	2. Align the sensor with the reflector so that the beam is visible in the middle of the reflector	The beam must not fall outside the reflector area. The mounted reflector should always be larger than the visible beam!
	3. Turn the step switch to the "Teach" position for about 2s. 4. Turn the step switch back to positions 1, 2 or 3.	The adjustment procedure must be conducted without objects!
	5. To turn the tracking function on/off, turn the step switch to "Auto" for about 2s. 6. Turn the step switch back to positions 1, 2 or 3.	The step switch must be turned to positions 1, 2 or 3 during operation!

4. Setting operating mode

Object to be identified	Material, e.g.:	Switch position	Correct adjustment procedure:
① Transparent objects 	<ul style="list-style-type: none"> ● PE bottle ● PEN bottle ● Clear plate glass ● Foil 		<ol style="list-style-type: none"> 1. Turn the step switch to the "Teach" position for about 2s. 2. Turn the step switch back to position 1 <p>Tracking can be turned on or off by switching to "Auto"</p>
② Less transparent objects 	<ul style="list-style-type: none"> ● Clear glass bottle ● Coloured plate glass 		<ol style="list-style-type: none"> 1. Turn the step switch to the "Teach" position for about 2s. 2. Turn the step switch back to position 2 <p>Tracking can be turned on or off by switching to "Auto"</p>
③ Opaque objects 	<ul style="list-style-type: none"> ● Coloured glass bottle ● Opaque objects 		<ol style="list-style-type: none"> 1. Turn the step switch to the "Teach" position for about 2s. 2. Turn the step switch back to position 3 <p>Tracking can be turned on or off by switching to "Auto"</p>

5. Calibration procedure (teach-in) by wire

1. Set step switch to desired operating mode (PE, clear-glass or coloured-glass bottle).
2. Activate teach-in wire (pin 5) (high active). Teach-in procedure takes max. 1s.
3. Deactivate teach-in wire (pin 5).

6. LED functions

LED colour		Function	Active in switch position
LED green	ON	Tracking ON	1, 2, 3
	OFF	Tracking OFF	1, 2, 3
	Flashing	Teach-in is running	Teach
LED yellow	ON	Light path free	1, 2, 3
	OFF	Light path interrupted	1, 2, 3
	Flashing	Uncertain detection	1, 2, 3

PRKL 8
Laser retro-reflective photoelectric sensor


	 2,8 kHz		0 ... 21 m
10 - 30 V DC	 A ² LS		

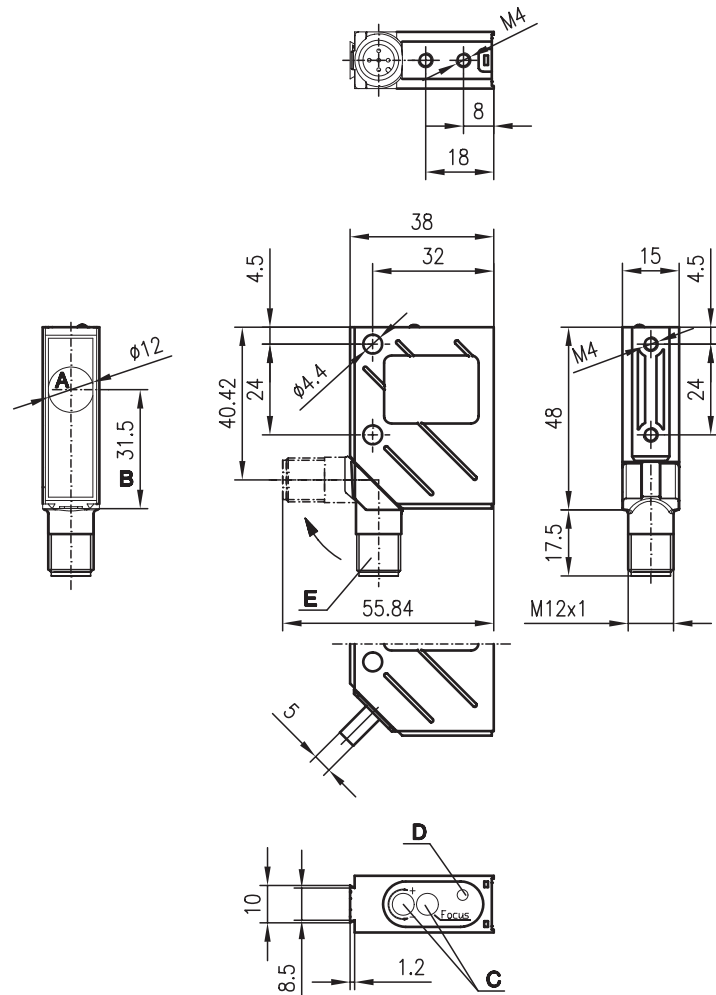
- Laser, red light
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- A²LS - active suppression of extraneous light
- Adjustable focus
- M12 turning connector or cable connection

	ISO 9001	

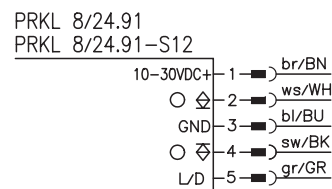
Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Reflectors
- Reflective tapes

Dimensioned drawing


- A** Transmitter and receiver
- B** Optical axis
- C** Operational control
- D** LED yellow
- E** 90° turning connector

Electrical connection


Specifications

Optical data

Typ. operating range limit (MTK(S) 50x50) ¹⁾	0 ... 21 m
Operating range ²⁾	see table
Light spot diameter	≥ 0.1 mm adjustable (see diagrams)
Focus adjustment range	140 mm ... ∞ (see diagrams)
Light source	laser, class 2
Wavelength	670 nm (visible red light, polarised)
Laser warning notice	see remarks

Timing

Switching frequency	2800 Hz
Response time	0.18 ms
Delay before start-up	≤ 100 ms

Electrical data

Operating voltage U_B	10 ... 30 VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35 mA
Switching output	PNP and NPN transistor output
Function characteristics	light switching (dark switching for + U_B connected to pin 5)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100 mA
Sensitivity	adjustable with 12-turn potentiometer

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70 g / 140 g
Connection type	M 12 connector, 5-pin or cable: 2000 mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-10 °C ... +40 °C / -40 °C ... +70 °C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class ⁵⁾	IP 67
Standards applied	IEC 60947-5-2

Options

L/D input	
Dark switching/light switching	U_B /0V or not connected
L/D delay	< 0.5 ms

- 1) Typ. operating range limit: max. attainable range without performance reserve, focus = 16 m
- 2) Operating range: recommended range with performance reserve, focus = 16 m
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 VDC
- 5) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector	PRKL 8/24.91-S12	500 36364
with 2m cable	PRKL 8/24.91	500 36365

Tables

Reflectors		Operating range
1	TK(S) 100x100	0 ... 16.0 m
2	MTK(S) 50x50	0 ... 17.0 m
3	TK(S) 30x50	0 ... 6.0 m
4	TK(S) 20x40	0 ... 7.0 m
5	Tape 2 100x100	0 ... 1.5 m

1	0	16	20
2	0	17	21
3	0	6	8
4	0	7	9
5	0	1.5	2

□ Operating range [m] *

▒ Typ. operating range limit [m] *

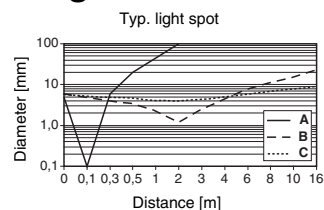
* for focus adjusted to 16 m

TK ... = adhesive

TKS ... = screw type

Tape 2 = adhesive

Diagrams



A focus = 0.144 m

B focus = 2 m

C focus = 16 m

Remarks

- Use reflectors with small triple structures – MTK(S)

LASERSTRAHLUNG / LASER LIGHT
NICHT IN DEN STRAHL BLICKEN
DO NOT STARE INTO BEAM
LASERKLASSE 2
CLASS 2 LASER PRODUCT
IEC 60825-1-am2 (2001-01)

PRKL 8
Pulse duration < 6 μs
Quiescent period > 29 μs
P_{max} ≤ 1.1 mW
λ = 670 nm

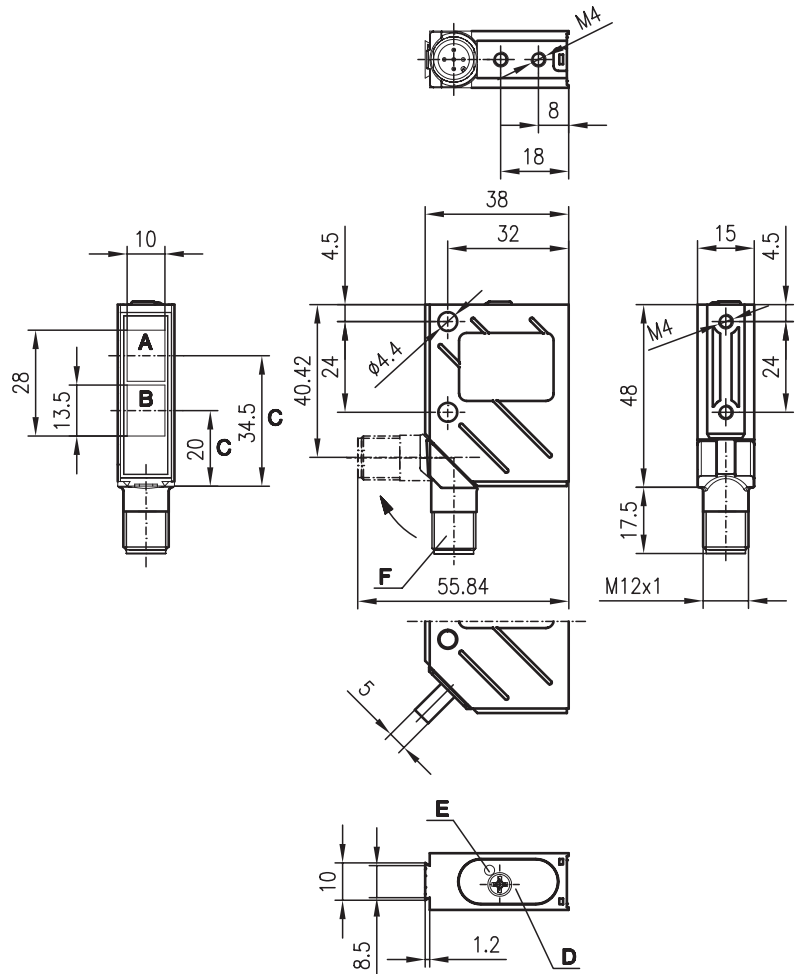


RTR 8

Energetic diffuse reflection light scanner



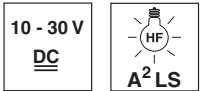
Dimensioned drawing



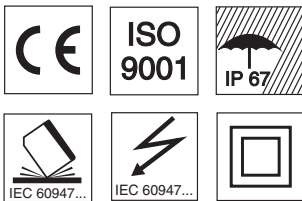
- A Receiver
- B Transmitter
- C Optical axis
- D Operational control
- E LED yellow
- F 90° turning connector



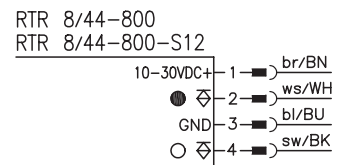
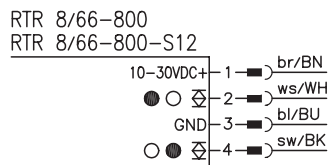
5 ... 800 mm



- A²LS - active suppression of extraneous light
- Push-pull switching outputs
- M12 turning connector or cable connection
- Visible red light



Electrical connection



Accessories:
(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

We reserve the right to make changes • 8_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 800mm
Scanning range ²⁾	see table
Electrical adjustment range	0 ... 800mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1500Hz
Response time	0.33 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	.../66 2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
	.../44 2 PNP switching outputs pin 2: dark switching pin 4: light switching $\geq (U_B - 2V) \leq 2V$ max. 100mA adjustable with 270° potentiometer
Signal voltage high/low	
Output current	
Sensitivity	

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M12 connector, 5-pin (turning), or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M12 connector	RTR 8/44-800-S12	500 36366
with 2m cable	RTR 8/44-800	500 36367
with M12 connector	RTR 8/66-800-S12	500 36368
with 2m cable	RTR 8/66-800	500 36369

Tables

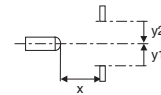
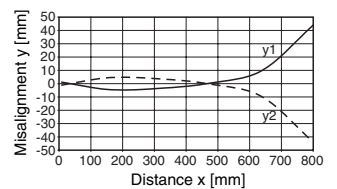
1	10	600	800
2	15	210	320
3	25	-	220

1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams

Typ. response behaviour (white 90%)



Remarks

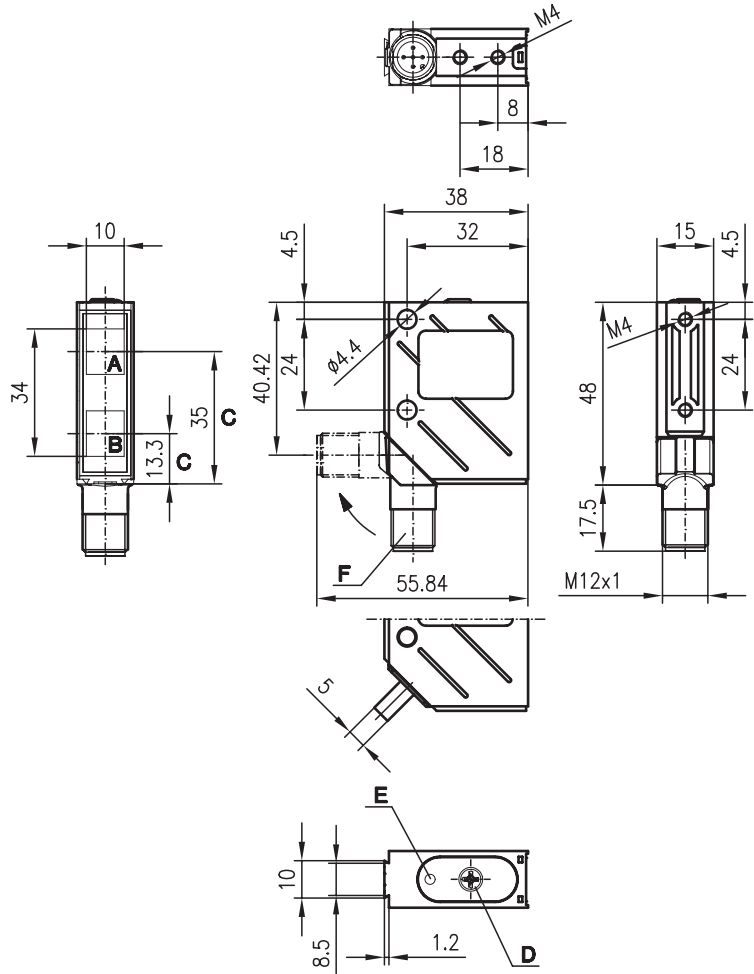


HRTR 8

Diffuse reflection light scanner with background suppression

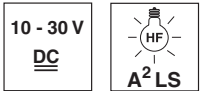


Dimensioned drawing



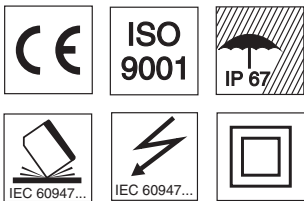
- A Receiver
- B Transmitter
- C Optical axis
- D Operational control
- E LED yellow
- F 90° turning connector

5 ... 400mm



- Adjustable background suppression
- A²LS - active suppression of extraneous light
- Push-pull switching outputs
- M12 turning connector or cable connection
- Visible red light

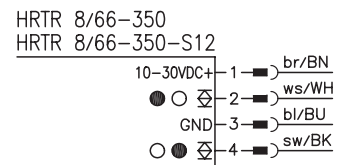
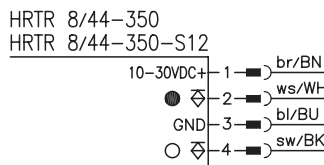
Electrical connection



Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems



We reserve the right to make changes • 8_d01e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 400mm
Scanning range ²⁾	see table
Mechanical adjustment range	50 ... 400mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	.../66 2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
	.../44 2 PNP switching outputs pin 2: dark switching pin 4: light switching
	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA
Scanning range adjustment	mechanical via multiturn potentiometer

Signal voltage high/low	
Output current	
Scanning range adjustment	

Indicators

LED yellow	Object detected
------------	-----------------

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M 12 connector, 5-pin or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M 12 connector	HRTR 8/44-350-S12	500 36350
with 2m cable	HRTR 8/44-350	500 36351
with M 12 connector	HRTR 8/66-350-S12	500 36352
with 2m cable	HRTR 8/66-350	500 36353

Tables

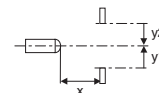
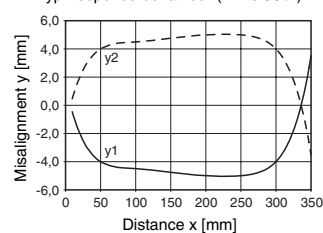
1	7	350	400
2	10	330	370
3	12	300	340

1	white 90%
2	grey 18%
3	black 6%

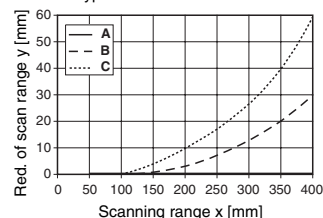
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

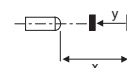
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



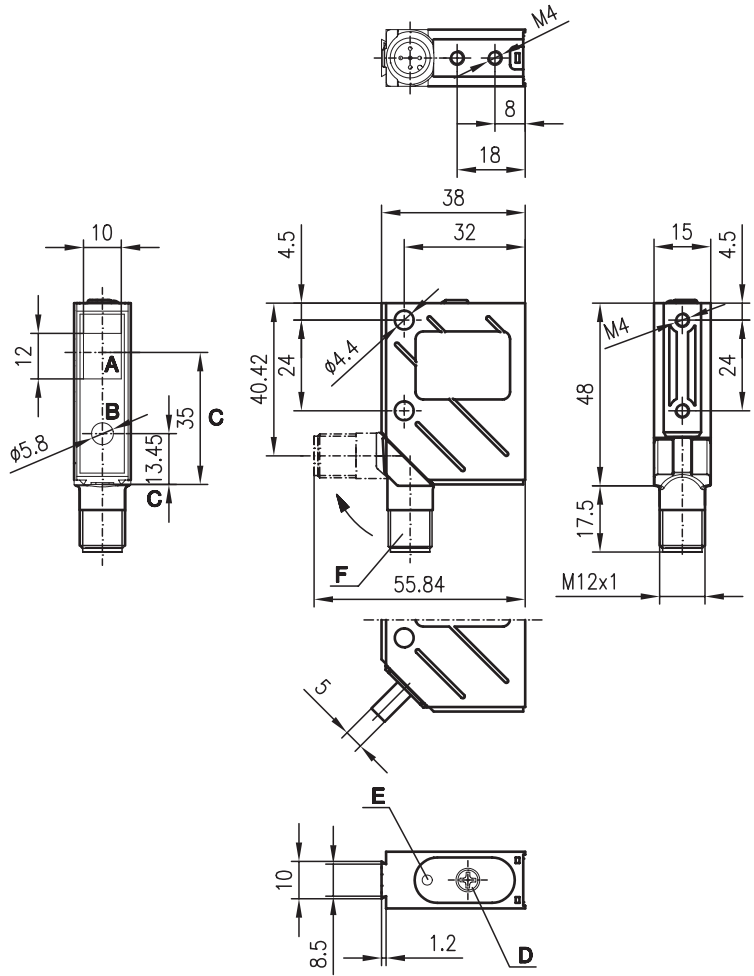
Remarks



HRTL 8 Laser diffuse reflection light scanner with background suppression



Dimensioned drawing



5 ... 400mm
 2 kHz

10 - 30 V DC
 A²LS

- Laser, red light
- Adjustable background suppression
- A²LS - active suppression of extraneous light
- M12 turning connector or cable connection

- A Receiver
- B Transmitter
- C Optical axis
- D Operational axis control
- E LED yellow
- F 90° turning connector

Electrical connection

CE
 ISO 9001
 IP 67
 IEC 60947...
 IEC 60947...

- Accessories:**
(available separately • see page 196)
- M12 connectors (KD ...)
 - Cable (KB ...)
 - Mounting systems

HRTL 8/24-350	
HRTL 8/24-350-S12	
10-30VDC+	1 — br/BN
○	2 — ws/WH
GND	3 — bl/BU
○	4 — sw/BK

We reserve the right to make changes • 8_d02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 400mm
Scanning range ²⁾	see table
Mechanical adjustment range	50 ... 400mm
Light beam characteristic	focussed
Light source	laser, class 2
Wavelength	670nm (visible red light)
Laser warning notice	see remarks

Timing

Switching frequency	2000Hz
Response time	0.25ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	PNP and NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Scanning range adjustment	mechanical via multiturn potentiometer

Indicators

LED yellow	Object detected
------------	-----------------

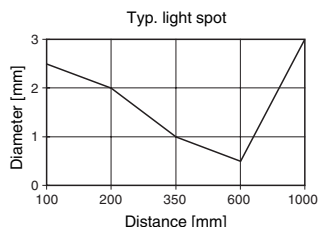
Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M12 connector, 5-pin or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-10°C ... +40°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class ⁵⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC
- 5) In stop position of the turning connector (turning connector locked)



Order guide

with M12 connector
with 2m cable

Designation

HRTL 8/24-350-S12
HRTL 8/24-350

Part No.

500 36370
500 36371

Tables

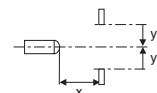
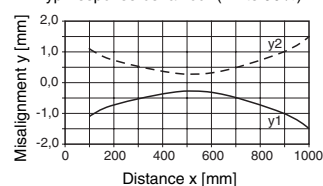
1	7	350	400
2	10	330	370
3	12	300	340

1	white 90%
2	grey 18%
3	black 6%

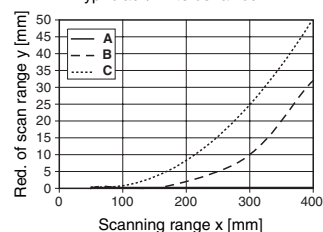
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

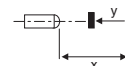
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
B grey 18%
C black 6%



Remarks

- Install sensor inclined at angle of approx. 10° if used to detect objects with shiny surfaces.

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

HRTL 8
 Pulse duration < 8µs
 Quiescent period > 53µs
 $P_{max} \leq 2.6mW$
 $\lambda = 670nm$



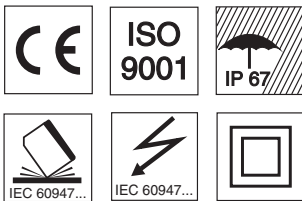
HRTL 8 Laser diffuse reflection light scanner with background suppression



10 ... 200mm



- Laser, red light
- Adjustable background suppression
- A²LS - active suppression of extraneous light
- M12 turning connector or cable connection

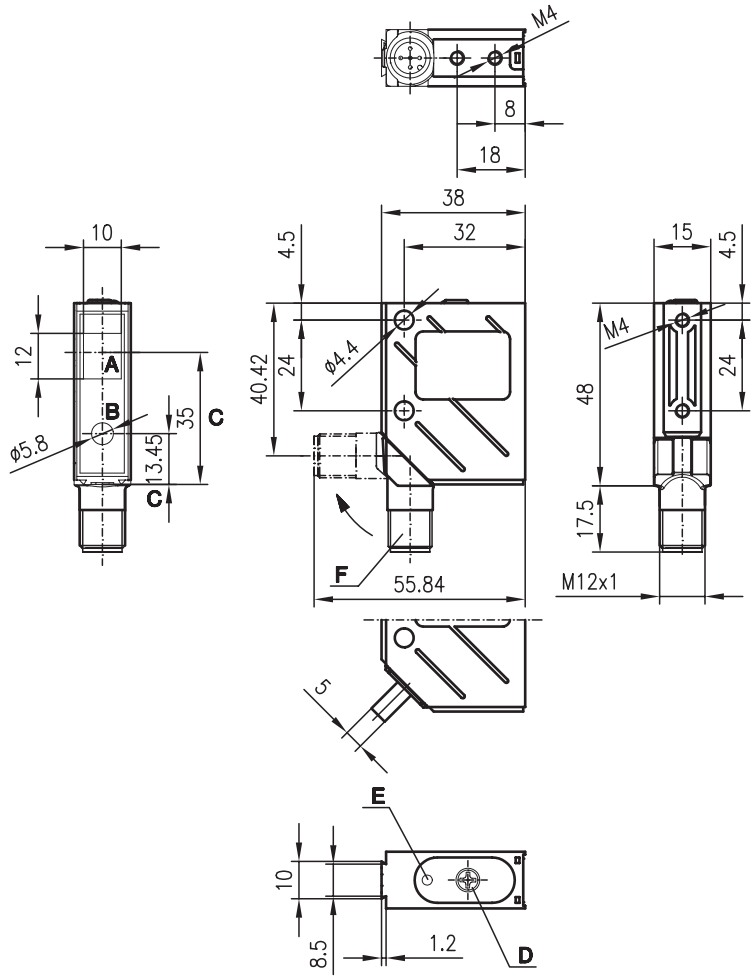


Accessories:

(available separately • see page 196)

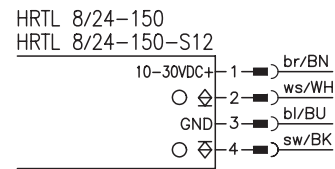
- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Operational control
- E LED yellow
- F 90° turning connector

Electrical connection



We reserve the right to make changes • 8_d03e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	10 ... 200mm
Scanning range ²⁾	see table
Mechanical adjustment range	50 ... 200mm
Light beam characteristic	focused
Light source	laser, class 2
Wavelength	670nm (visible red light)
Laser warning notice	see remarks

Timing

Switching frequency	2000Hz
Response time	0.25ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	PNP and NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA
Scanning range adjustment	mechanical via multiturn potentiometer

Indicators

LED yellow	Object detected
------------	-----------------

Mechanical data

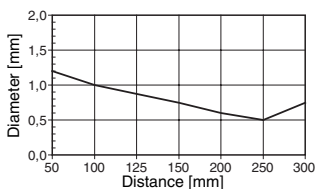
Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M12 connector, 5-pin or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-10°C ... +40°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class ⁵⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC
- 5) In stop position of the turning connector (turning connector locked)

Typ. light spot



Order guide

with M12 connector
with 2m cable

Designation

HRTL 8/24-150-S12
HRTL 8/24-150

Part No.

500 38482
500 38483

Tables

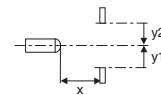
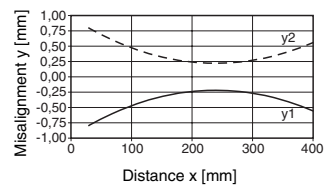
1	10	150	200
2	25	148	190
3	30	143	175

1	white 90%
2	grey 18%
3	black 6%

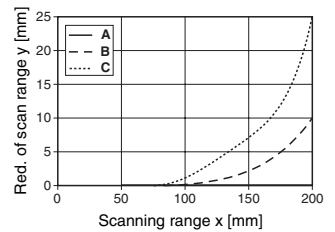
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

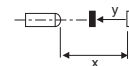
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

- Install sensor inclined at angle of approx. 10° if used to detect objects with shiny surfaces.

LASERSTRAHLUNG / LASER LIGHT
NICHT IN DEN STRAHL BLICKEN
DO NOT STARE INTO BEAM
LASERKLASSE 2
CLASS 2 LASER PRODUCT
IEC 60825-1-am2 (2001-01)

HRTL 8
Pulse duration < 8µs
Quiescent period > 53µs
Pmax ≤ 2.6mW
λ = 670nm

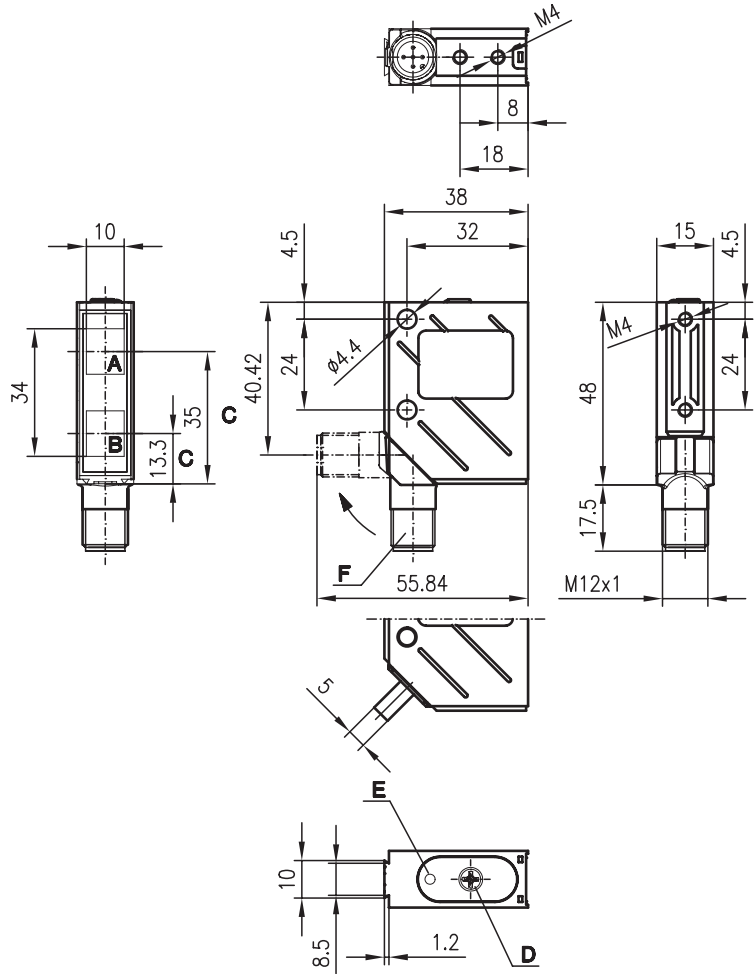


VRTR 8

Diffuse reflection light scanner with foreground suppression



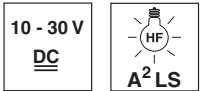
Dimensioned drawing



- A Receiver
- B Transmitter
- C Optical axis
- D Operational control
- E LED yellow
- F 90° turning connector

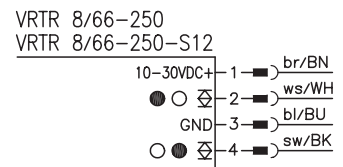
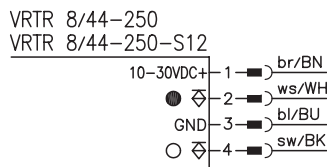
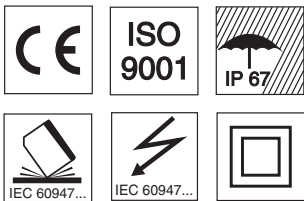


0 ... 250mm



- Adjustable foreground suppression
- A²LS - active suppression of extraneous light
- Push-pull switching outputs
- M12 turning connector or cable connection
- Visible red light

Electrical connection



Accessories:
(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

We reserve the right to make changes • 8_d04e.fm



Specifications

Optical data

Typ. scanning range limit ¹⁾	0 ... 250mm
Scanning range ²⁾	see table
Mechanical adjustment range	50 ... 250mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output/function	.../66 2 push-pull switching outputs ³⁾ pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching
	.../44 2 PNP switching outputs pin 2: dark switching pin 4: light switching
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA
Scanning range adjustment	mechanical via multiturn potentiometer

Indicators

LED yellow	Object detected
------------	-----------------

Mechanical data

Housing	metal
Optics cover	glass
Weight (plug/cable)	70g/140g
Connection type	M 12 connector, 5-pin or cable: 2000mm, 5x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class ⁶⁾	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) The push-pull switching outputs must not be connected in parallel
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC
- 6) In stop position of the turning connector (turning connector locked)

Order guide

	Designation	Part No.
with M 12 connector	VRTR 8/44-250-S12	500 36372
with 2m cable	VRTR 8/44-250	500 36373
with M 12 connector	VRTR 8/66-250-S12	500 36374
with 2m cable	VRTR 8/66-250	500 36375

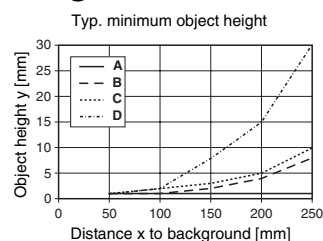
Tables

1	0	250	250
2	0	250	250
3	0	250	250

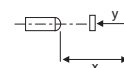
1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams



- A Background/object 90%/6%
- B Background/object 90%/90%
- C Background/object 6%/6%
- D Background/object 6%/90%



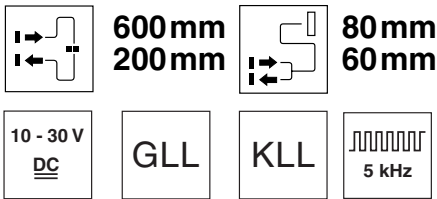
Remarks

- **Adjustment:**
 1. Mount sensor at distance of max. 250mm away from constant background. Yellow LED must be OFF.
 2. Keep turning adjusting screw clockwise until stop is reached (25 turns).
 3. Turn adjusting screw anticlockwise until yellow LED lights up.
- Distance between sensor and background must not change.

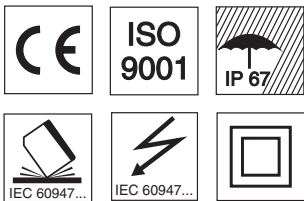


LVSR 8

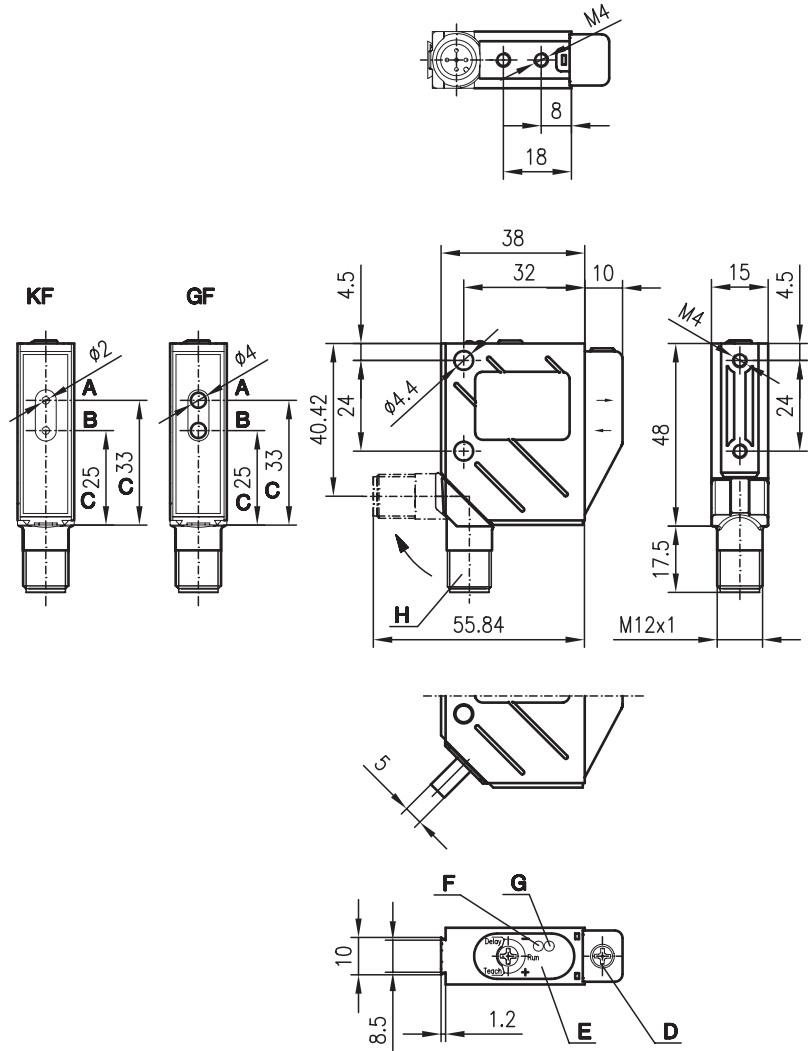
Fiber optic cable control devices



- Fiber optic cables made of plastic and glass
- Light/dark switching
- M12 turning connector or cable connection
- Adjustment via teach-in
- Adjustable sensitivity



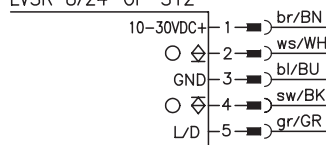
Dimensioned drawing



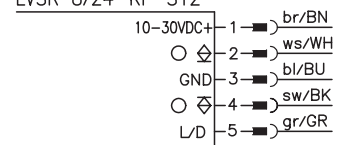
- A Receiver
- B Transmitter
- C Optical axis
- D Straining screw
- E Operational control
- F LED green
- G LED yellow
- H 90° turning connector

Electrical connection

LVSR 8/24-GF
LVSR 8/24-GF-S12



LVSR 8/24-KF
LVSR 8/24-KF-S12



We reserve the right to make changes • 8_e01e.fm

Accessories:

(available separately • see page 196)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Fiber optic cable accessories (from page 693)
 - Glass fiber optic cable
 - Plastic fiber optic cable



Specifications

Optical data	Throughbeam operation	Scanning operation
Operating range/scanning range ¹⁾	600mm (glass FOC) 200mm (plastic FOC)	80mm (glass FOC) 60mm (plastic FOC)
Light source	LED (modulated light)	
Wavelength	660nm (visible red light)	
Timing		
Switching frequency	5000Hz	
Response time	100µs	
Delay before start-up	≤ 650ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 35mA	
Switching output	1 PNP and 1 NPN switching output	
Function characteristics	light/dark reversible	
Signal voltage high/low	≥ (U _B -2V)/≤ 2V	
Output current	max. 100mA	
Indicators		
LED green	ready	
LED green flashing	teaching in progress	
LED yellow	object detected	
LED yellow flashing	device or teach error	
Mechanical data		
Housing	metal	
Optics cover	glass	
Weight (plug/cable)	70g/140g	
Connection type	M 12 connector, 5-pin or cable: 2000mm, 5x0.25 mm ²	
Environmental data		
Ambient temp. (operation/storage)	-40°C ... +60°C/-40°C ... +70°C	
Protective circuit ²⁾	2, 3	
VDE safety class ³⁾	II, all-insulated	
Protection class ⁴⁾	IP 67	
Standards applied	IEC 60947-5-2	
Options		
L/D input ⁵⁾		
Dark switching/light switching	U _B /0V or not connected	
L/D delay	< 0.5ms	
Pulse delay	10ms, can be activated via step switch	

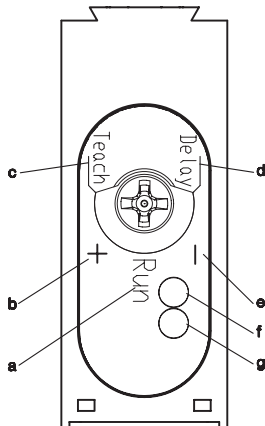
Tables

Diagrams

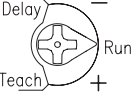
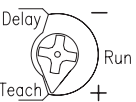
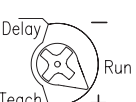
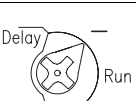
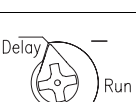
Remarks

Order guide

	Designation	Part No.
	Plastic fiber optic cable	
with M12 connector	LVSr 8/24-KF-S12	500 36378
with 2m cable	LVSr 8/24-KF	500 36379
	Glass fiber optic cable	
with M12 connector	LVSr 8/24-GF-S12	500 36380
with 2m cable	LVSr 8/24-GF	500 36381

LSVR 8
Controls and indicators


- a Switch position **Run**
- b Switch position **+**
- c Switch position **Teach**
- d Switch position **Delay**
- e Switch position **-**
- f Operation and teach indicator (LED green)
- g Object/light path (LED yellow)

Step switch		Function
	Run	Operating position
	Teach	Sensor detects background and object
	+	Switching threshold is increased by 5%
	-	Switching threshold is reduced by 5%
	Delay	Activation/deactivation of 10ms pulse stretching



Teach-in

	Step switch	Scanning operation	Throughbeam operation	LED green	LED yellow
Normal operation	Run	Operating position	Operating position	ON	Q
Activated	Run -> Teach	Immediately	Immediately	OFF	OFF
Time lock	Teach	> 2s	> 2s	3Hz	OFF
Teaching phase 1	Teach	Accept value 1 (background)	Accept value 1 (free light path)	3Hz	OFF
Teaching phase 2	Teach -> Run	Accept value 2 (object)	Accept value 2 (object)	3Hz	OFF
Normal operation	Run	Operating position	Operating position	ON	Q

The step switch must be set to >500ms to allow the individual functions to be activated.

Changing the switching threshold

	Step switch	Scanning operation	Throughbeam operation	LED green	LED yellow
Normal operation	Run	Operating position	Operating position	ON	Q
Activated	Run -> (+/-)	Immediately	Immediately	OFF	OFF
Time lock	(+/-)	> 2s	> 2s	1Hz	Q
Change	(+/-)	Switching threshold (increase/decrease)	Switching threshold (increase/decrease)	1Hz	Q
Normal operation	(+/-) -> Run	Operating position	Operating position	ON	Q

At switch position (+/-), the switching threshold is increased by 5% every second.

Maximum value LED green = ON

Minimum value LED green = OFF

Pulse stretching on/off

	Step switch	Scanning operation	Throughbeam operation	LED green	LED yellow
Normal operation	Run	Operating position	Operating position	ON	Q
Activated	Run -> Delay	Immediately	Immediately	OFF	OFF
Time lock	Delay	> 2s	> 2s	10Hz	Status
Change	Delay	> 10s pulse stretching On <-> Off	Pulse stretching On <-> Off	10Hz	New
Normal operation	Delay -> Run	Operating position	Operating position	ON	Q



KRTG 8

Green light contrast scanner



10mm



- Static teach-in procedure
- Switching frequency 10,000 Hz
- Green transmission LED
- M12 turning connector

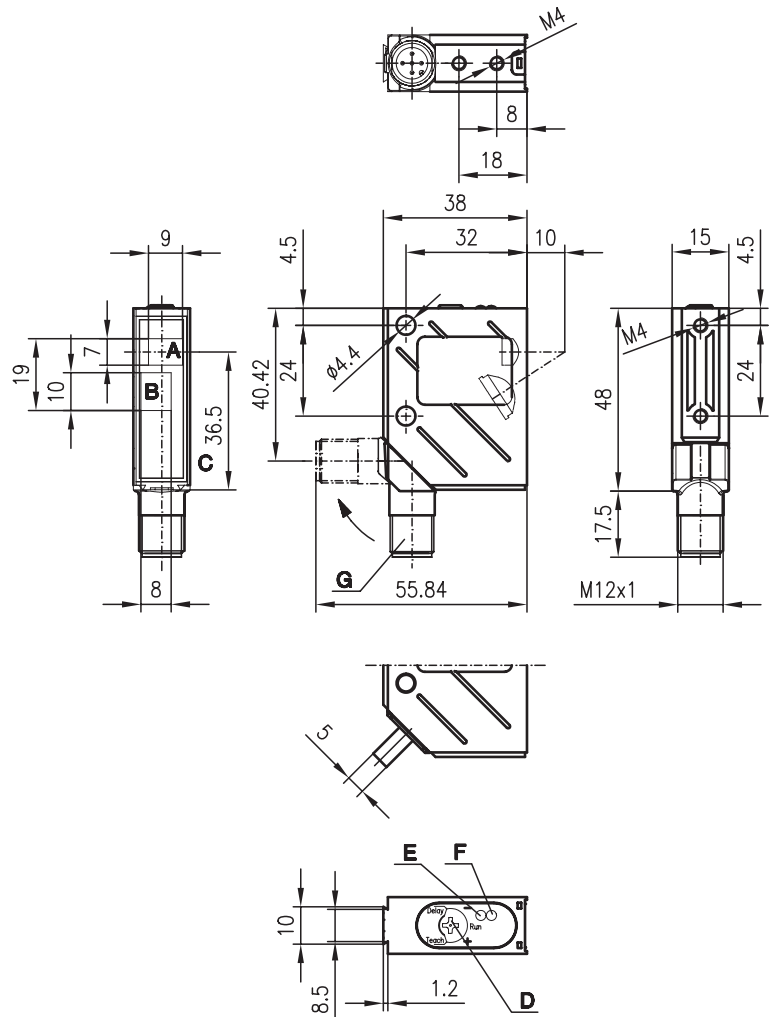


Accessories:

(available separately • see page 196)

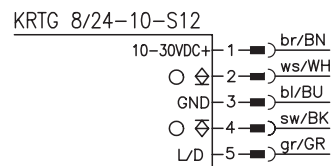
- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

Dimensioned drawing



- A Transmitter
- B Receiver
- C Optical axis
- D Operational control
- E LED green
- F LED yellow
- G 90° turning connector

Electrical connection



We reserve the right to make changes • 8_e02e.fm



Specifications

Optical data

Scanning range ¹⁾	10mm ± 1 mm
Light spot dimensions	2mmx2mm
Light source	LED green

Timing

Switching frequency	10kHz
Response time	50µs
Delay before start-up	≤ 650ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	1 PNP and 1 NPN switching output
Function characteristics	light/dark reversible
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED green	ready
LED green flashing	teaching in progress
LED yellow	object detected
LED yellow flashing	device or teach error

Mechanical data

Housing	metal
Optics cover	glass
Weight	70g
Connection type	M12 connector, 5-pin

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit ²⁾	2, 3
VDE safety class ³⁾	II, all-insulated
Protection class ⁴⁾	IP 67
Electromagnetic compatibility	IEC60947-5-2

Options

L/D input ⁵⁾	
Dark switching/light switching	$U_B/0V$ or not connected
L/D delay	< 0,5 ms
Pulse delay ⁶⁾	10ms, can be activated via step switch

- 1) Scanning range: recommended range with performance reserve
 2) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 3) Rating voltage 250VDC
 4) In stop position of the turning connector (turning connector locked)
 5) L/D switching is activated after "teach-in" or "power on"
 6) Relative to object

Tables

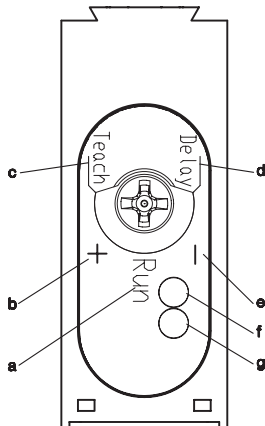
Diagrams

Remarks

- With shiny objects, the sensor is to be mounted perpendicular to the object surface.

Order guide

Designation	Part No.
KRTG 8/24-10-S12	500 36376

KRTG 8
Controls and indicators


- a Switch position **Run**
- b Switch position **+**
- c Switch position **Teach**
- d Switch position **Delay**
- e Switch position **-**
- f Operation and teach indicator (LED green)
- g Object/light path (LED yellow)

Step switch		Function
	Run	Teach and Run position for marker contrast
	Teach	Teach position for background contrast
	+	Switching threshold is increased by +5%
	-	Switching threshold is reduced by -5%
	Delay	Activate/deactivate 10ms pulse stretching

The step switch must be set to > 1 s to allow the individual functions to be activated.

Signal propagation




Teach procedure for statical teach-in

	Operation	Transmitter	LED green	LED yellow
1	Position the light spot on the background	Green light spot visible	ON	ON/OFF
2	Switch the step switch from Run -> Teach	Green light spot visible	3Hz	OFF
3	Position the light spot on the marker	Green light spot visible	3Hz	OFF
4	Switch the step switch from Teach -> Run	Green light spot visible	3Hz	OFF
	Teach-in successful	Green light spot visible	ON	ON
	Teach-in error	Green light spot flashes with 3Hz	OFF	3Hz

The step switch must be set to > 1 s to allow the individual functions to be activated.

Changing the switching threshold

	Operation	Transmitter	LED green	LED yellow
1	Step switch in position Run	Green light spot visible	ON	ON/OFF
2	Switch the step switch from Run -> (+/-)	Green light spot visible	OFF	OFF
3	Sensitivity is changed in steps of 5% each	Green light spot visible	1 Hz	OFF
4	Switch the step switch from (+/-) -> Run	Green light spot visible	ON	ON/OFF

In switch position (+), the switching threshold is increased by 5% every second.

In switch position (-), the switching threshold is increased by 5% every second.

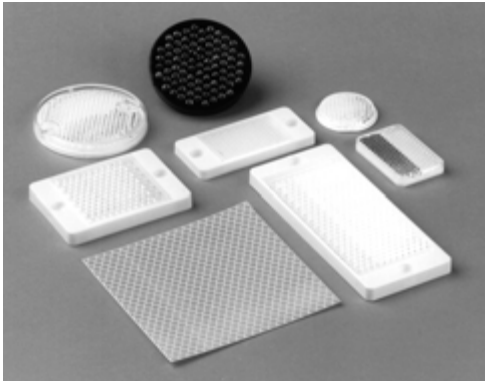
Modification of switching threshold activated:green LED = 1 Hz

Maximum value switching threshold reached:LED green = ON

Minimum value switching threshold reached:LED green = OFF

Pulse stretching on/off

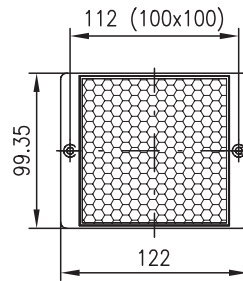
	Operation	Transmitter	LED green	LED yellow
1	Step switch in position Run	Green light spot visible	ON	ON/OFF
2	Switch the step switch from Run -> Delay	Green light spot visible	OFF	ON/OFF
3	Status display of the pulse stretching	Green light spot OFF	10Hz	Status display: ON=Delay active OFF=Delay not active
4	10s waiting time before switching After 10s delay value modified	Green light spot OFF	10Hz	Status display: ON=Delay active OFF=Delay not active
5	Switch the step switch from Delay -> Run	Green light spot visible	ON	ON/OFF

Reflectors


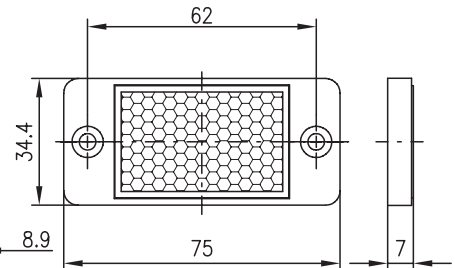
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

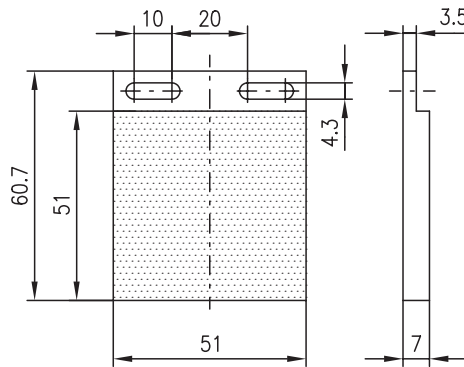
TKS 100 x 100



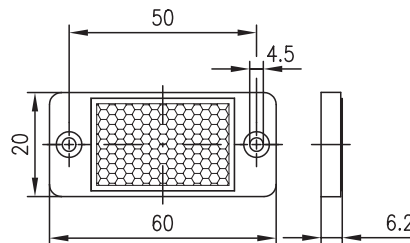
TKS 30 x 50



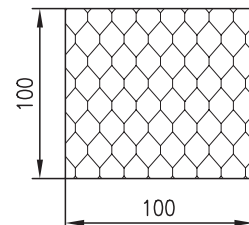
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

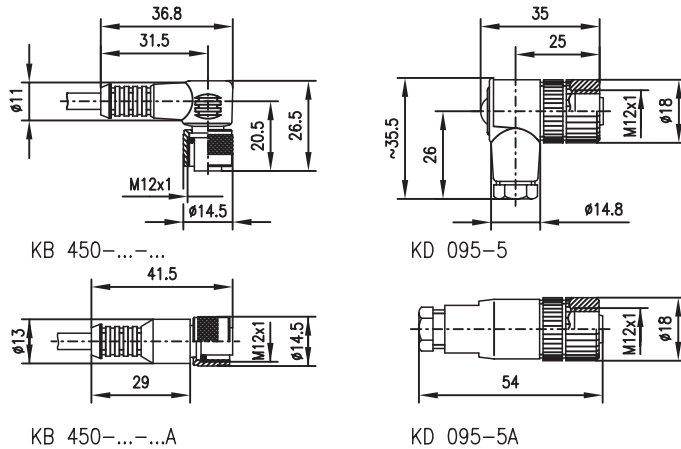

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 8_zu_e.fm

Dimensioned drawings

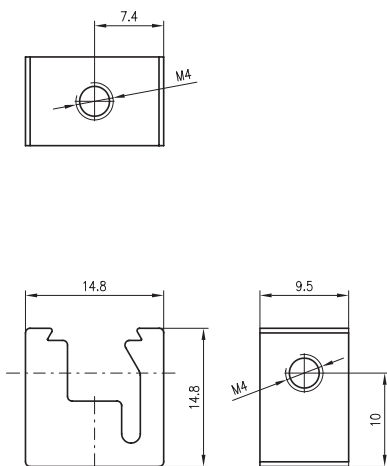


Selection table

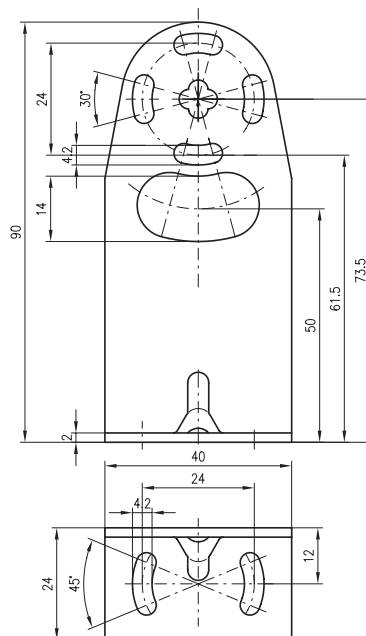
M12 connectors				
with cable		without cable		
M12	KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A
M12	KB 450-2000-4	KB 450-2000-4A		
M12	KB 450-5000-4	KB 450-5000-4A		
M12	KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings

BT 8-0



BT 8



Connectors, plugs, cables



There are 2 connectors available for devices with M12 connectors: angled or straight, with and without cable.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 8-0 (Part No. 500 36196)



BT 8 (Part No. 500 36195)





8 Series

Mounting systems

UMS 8-D10 (Ø10mm, Part No. 500 35020)
UMS 8-D12 (Ø12mm, Part No. 500 35021)
UMS 8-D14 (Ø14mm, Part No. 500 35022)



UMS 8.1-D10 (Ø10mm, Part No. 500 35023)
UMS 8.1-D12 (Ø12mm, Part No. 500 35024)
UMS 8.1-D14 (Ø14mm, Part No. 500 35025)



UMS 8.2-D10 (Ø10mm, Part No. 500 35026)
UMS 8.2-D12 (Ø12mm, Part No. 500 35027)
UMS 8.2-D14 (Ø14mm, Part No. 500 35028)

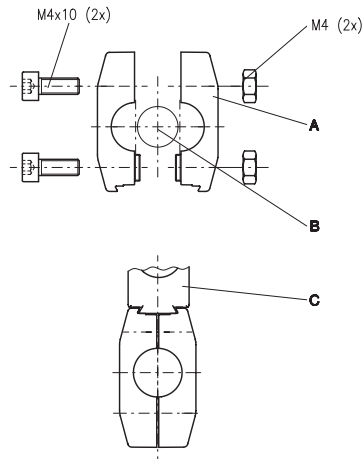


BT 8-ARH (Part No. 500 35030)



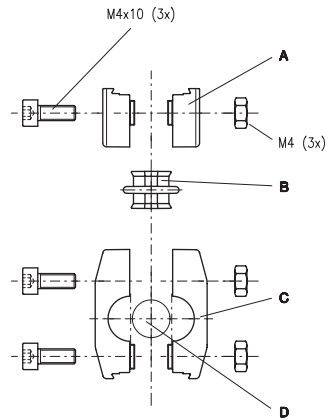
Dimensioned drawings

UMS 8-D...



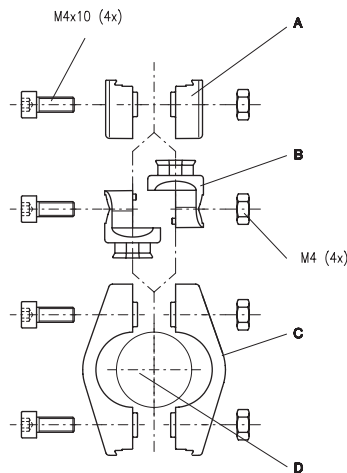
- A Clamp
- B Rod
- C Sensor

UMS 8.1-D...



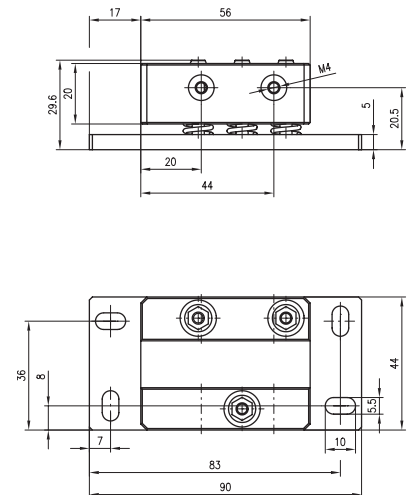
- A Mount
- B Joint
- C Clamp
- D Rod
- E Sensor

UMS 8.2-D...



- A Mount
- B Joint
- C Clamp
- D Rod
- E Sensor

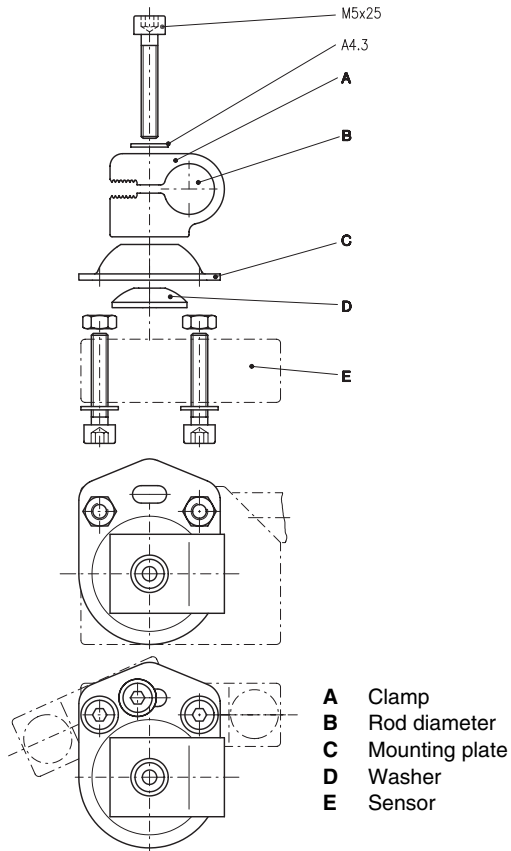
BT 8-ARH





Dimensioned drawings

BT 8-D...

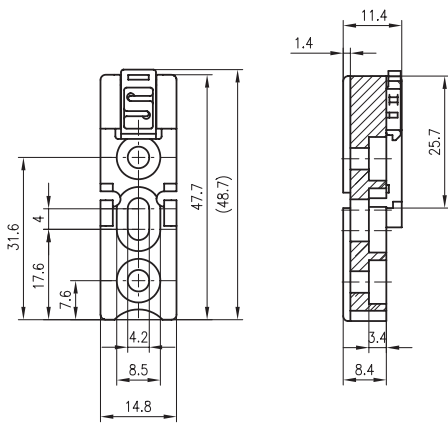


Mounting systems

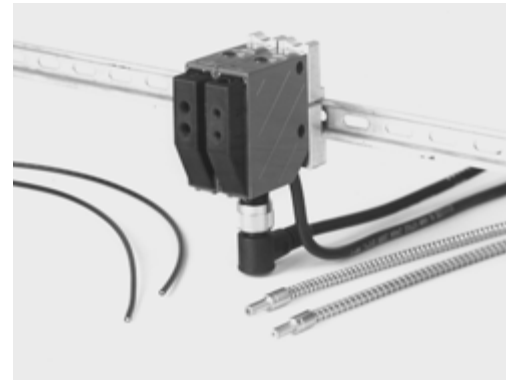
- BT 8-D10 (Ø10mm, Part No. 500 35017)
- BT 8-D12 (Ø12mm, Part No. 500 35018)
- BT 8-D14 (Ø14mm, Part No. 500 35019)



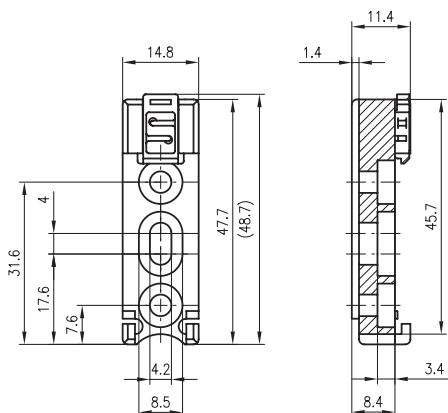
BT 8-C15



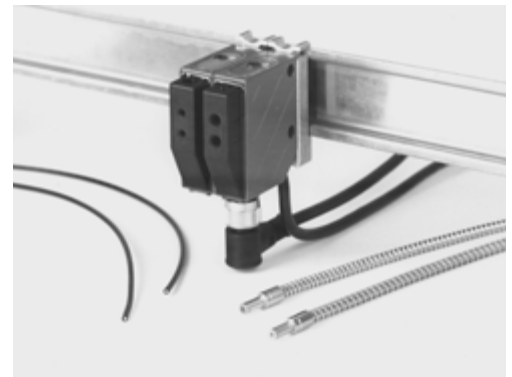
BT 8-C15 (Part No. 500 35016)



BT 8-C35x7,5



BT 8-C35x7,5 (Part No. 500 35015)





525 Series

Overview and advantages

Compact and powerful sensor series with many different models in robust plastic housing

Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners

Visible red light for easy alignment, infrared light to prevent interference from extraneous light

High switching frequency 1000Hz for detection of fast events

10 ... 30VDC voltage with complementary PNP or NPN transistor outputs

Connection via M12 connectors for fast mounting, or with cable connection

Options:

- Activation input
- Universal sensitivity adjustment





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage	Output	
			Plastic		Red light	Infrared		10 ... 30VDC	PNP transistor
	LS 525 K/P-S12	0 ... 11000mm	•			•	•	•	
	LS 525 K/P	0 ... 11000mm	•				•	•	
	LS 525 K/N	0 ... 11000mm	•				•		•
	PRK 525 K/P-S12	100 ... 6000mm	•		•		•	•	
	PRK 525 K/P	100 ... 6000mm	•		•		•	•	
	PRK 525 K/N	100 ... 6000mm	•		•		•		•
	PRK 525 K/P-9002-S12	100 ... 6000mm	•		•		•	•	
	PRK 525 K/P-4000	100 ... 6000mm	•		•		•	•	
	RT 525 K/P-100-S12	10 ... 100mm	•			•	•	•	
	RT 525 K/P-100	10 ... 100mm	•			•	•	•	
	RT 525 K/N-100	10 ... 100mm	•			•	•		•
	RT 525 K/P-400-S12	20 ... 400mm	•			•	•	•	
	RT 525 K/P-400	20 ... 400mm	•			•	•	•	
	RT 525 K/N-400	20 ... 400mm	•			•	•		•
	RT 525 K/P-400-9002-S12	20 ... 400mm	•			•	•	•	
	RT 525 K/P-200-60-S12	10 ... 200mm	•			•	•	•	



Switching frequency	Switching	Connection		Options					Page
	Light/dark	M12 connector	Cable	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	
1000Hz	•	•					•	•	205
1000Hz	•		•				•	•	205
1000Hz	•		•				•	•	205
1000Hz	•	•			•			•	207
1000Hz	•		•		•			•	207
1000Hz	•		•		•			•	207
1000Hz	•	•			•			•	207
1000Hz	•		•		•			•	207
1000Hz	•	•						•	209
1000Hz	•		•					•	209
1000Hz	•		•					•	209
1000Hz	•	•						•	209
1000Hz	•		•					•	209
1000Hz	•	•						•	209
1000Hz	•	•						•	211



LS 525

Throughbeam photoelectric sensors

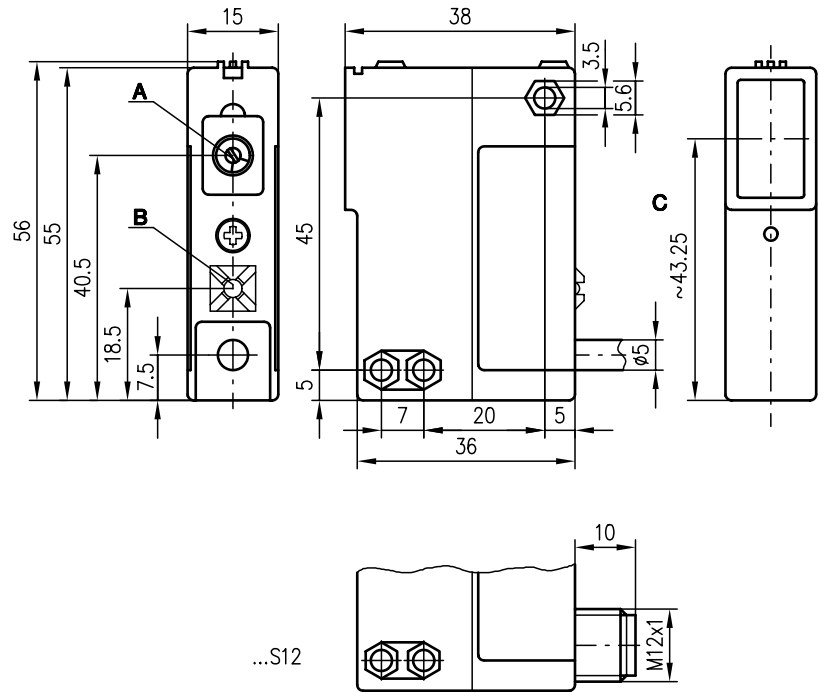


0 ... 11 m



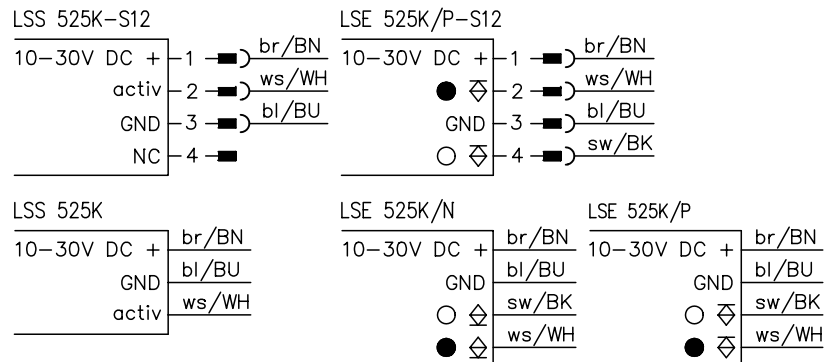
- Throughbeam photoelectric sensor with high performance reserve in the infrared
- High switching frequency for detection of fast events
- Sensitivity adjustment for optimal adaptation to the application
- Activation input for testing and interlinking
- Complementary outputs for light/dark switching or as a control function
- Mounting holes for fast installation

Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 212)

- Mounting system (BT 525)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 525_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 11 m
Operating range ²⁾	0 ... 8 m
Light source	LED (modulated light)
Wavelength	880 nm

Timing

Switching frequency	1000 Hz
Response time	0.5 ms
Delay before start-up	≤ 30 ms

Electrical data

Operating voltage U_B	10 ... 30 VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 15 mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200 mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100 g (cable), 35 g (M12)
Connection type	M12 connector (4-pin) cable 2 m, 4x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-20 °C ... +65 °C / -20 °C ... +65 °C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 65

Options

Activation input active	
Transmitter active/not active	+ U_B or not connected

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 VAC

Tables

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output		
Transmitter and receiver	LS 525 K/P-S12	
Transmitter	LSS 525 K-S12	500 80538
Receiver	LSE 525 K/P-S12	500 80539
with cable connection, PNP switching output		
Transmitter and receiver	LS 525 K/P	
Transmitter	LSS 525 K	500 80541
Receiver	LSE 525 K/P	500 80542
with cable connection, NPN switching output		
Transmitter and receiver	LS 525 K/N	
Transmitter	LSS 525 K	500 80541
Receiver	LSE 525 K/N	500 80545

Remarks

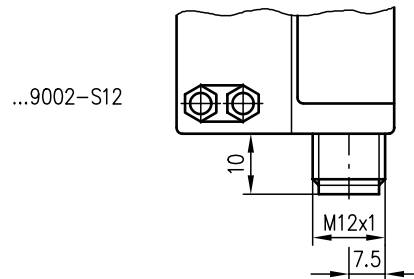
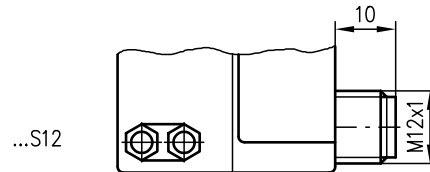
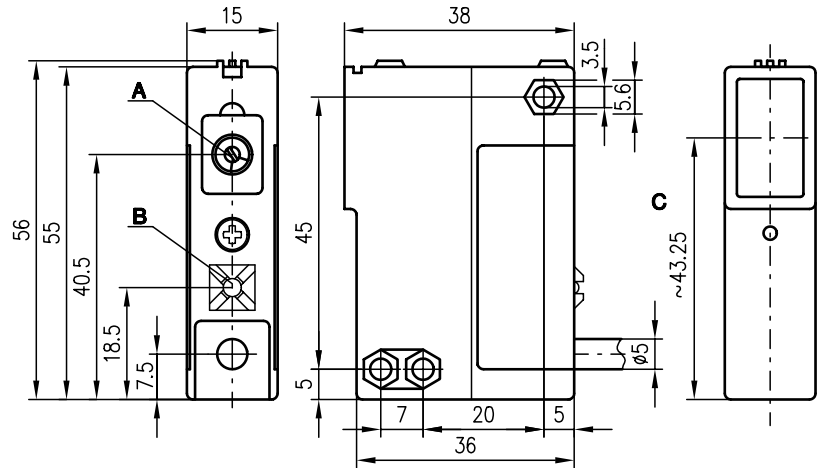


PRK 525

Retro-reflective photoelectric sensors with polarisation filter

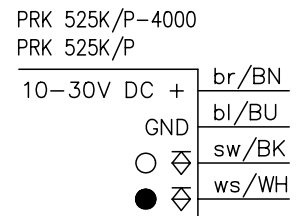
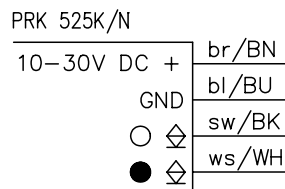
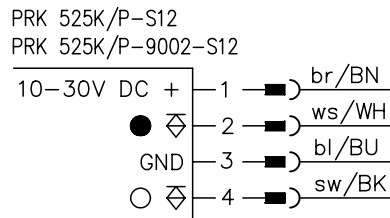


Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection



0.1 ... 6m



- Polarised retro-reflective photoelectric sensor using visible red light
- High switching frequency for detection of fast events
- Sensitivity adjustment for optimal adaptation to the application
- Polarisation filter blocks unwanted reflections
- Complementary outputs for light/dark switching or as a control function



Accessories:

(available separately • see page 212)

- Mounting system (BT 525)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

We reserve the right to make changes • 525_b01e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 6m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	100g (cable), 35g (M12)
Connection type	M12 connector, 4-pin cable 2m/4m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +65°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 65

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 4.5m
TK(S)	50x100	0.1 ... 3.6m
TK(S)	50x50	0.1 ... 2.6m
TK(S)	30x50	0.1 ... 2.3m
TK	82	0.1 ... 3.6m
TK	60	0.1 ... 2.3m
TK	45	0.1 ... 2.2m
TK	35	0.1 ... 1.8m
Tape 2	100x100	0.1 ... 2.0m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output	PRK 525 K/P-S12	500 80546
with 2m cable, PNP switching output	PRK 525 K/P	500 80547
with 2m cable, NPN switching output	PRK 525 K/N	500 80548
with M12 connector, at the bottom, PNP switching output	PRK 525 K/P-9002-S12	500 81483
with 4m cable, NPN switching output	PRK 525 K/P-4000	500 32309

Remarks



RT 525

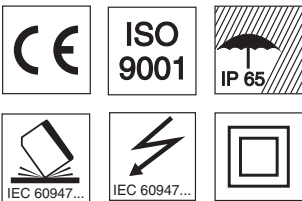
Energetic diffuse reflection light scanner



10 ... 100mm
20 ... 400mm



- Energetic diffuse reflection light scanner using infrared light
- Models with 100mm scanning range have special background suppression
- High switching frequency for detection of fast events
- Sensitivity adjustment for optimal adaptation to the application
- Complementary outputs for light/dark switching or as a control function
- Mounting holes for fast installation

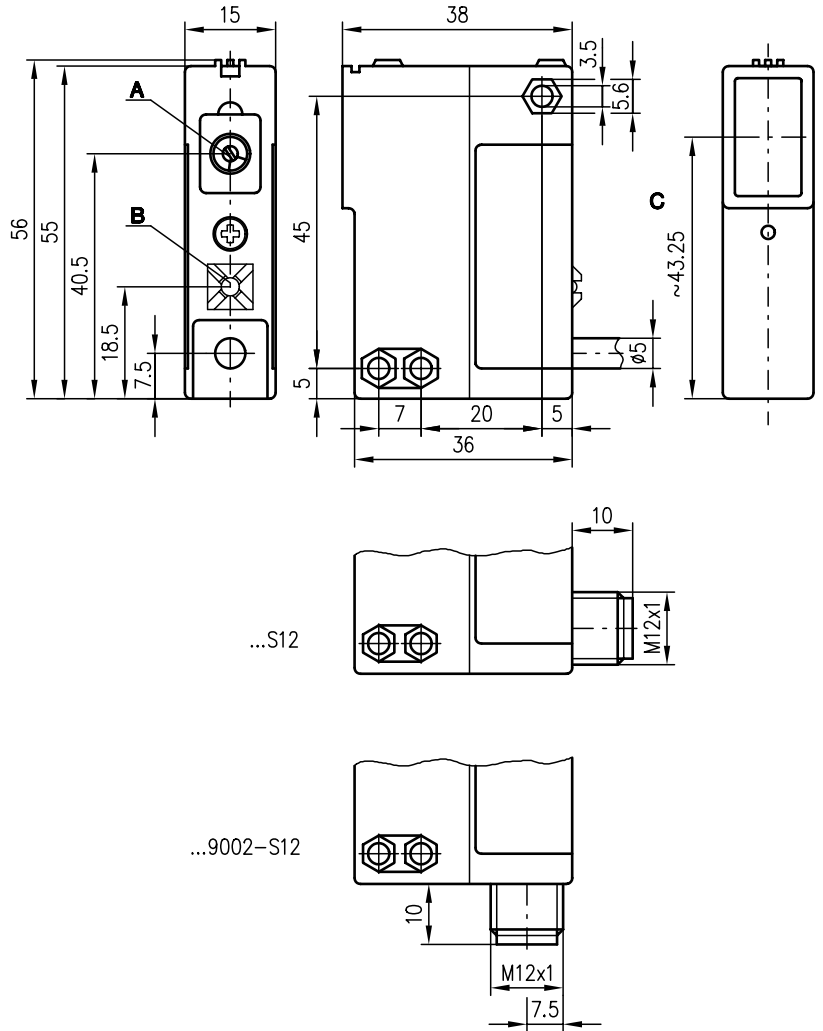


Accessories:

(available separately • see page 212)

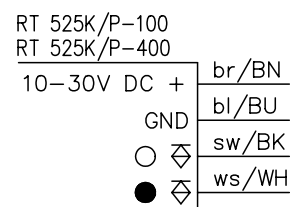
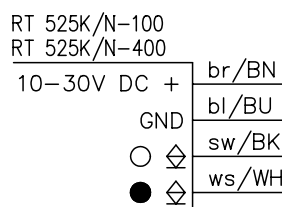
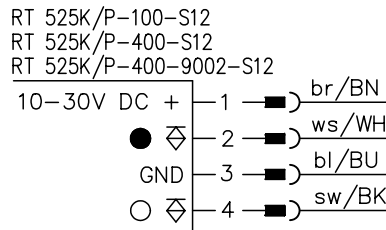
- Mounting system (BT 525)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection



We reserve the right to make changes • 525_c01e.fm



Specifications

	RT 525...-100...	RT 525...-400...
Optical data		
Typ. scanning range limit (white 90%)	10 ... 100mm	20 ... 400mm
Light source	LED (modulated light)	
Wavelength	880nm	
Timing		
Switching frequency	1000Hz	
Response time	0.5ms	
Delay before start-up	≤ 30ms	
Electrical data		
Operating voltage U_B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 10% of U_B	
Bias current	≤ 15mA	
Switching output	2 PNP transistor outputs, complementary	
Function characteristics	light/dark switching	
Signal voltage high/low	$\geq (U_B - 1.6V) / \leq 1.6V$	
Output current	max. 200mA	
Sensitivity	adjustable	
Indicators		
LED red	light path free	
LED red flashing	light path free, no performance reserve	
Mechanical data		
Housing	plastic	
Optics cover	glass	
Weight	100g (cable), 35g (M12)	
Connection type	M12 connector (4-pin), cable 2m, 4x0.25 mm ²	
Environmental data		
Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +65°C	
Protective circuit ¹⁾	2, 3	
VDE safety class ²⁾	II, all-insulated	
Protection class	IP 65	

- 1) 2=polarity reversal protection, 3=short-circuit protection for all outputs
2) Rating voltage 250VAC

Tables

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output		
100mm scanning range, background suppression	RT 525 K/P-100-S12	500 80552
400mm scanning range	RT 525 K/P-400-S12	500 80549
with cable connection, PNP switching output		
100mm scanning range, background suppression	RT 525 K/P-100	500 80553
400mm scanning range	RT 525 K/P-400	500 80550
with cable connection, NPN switching output		
100mm scanning range, background suppression	RT 525 K/N-100	500 80554
400mm scanning range	RT 525 K/N-400	500 80551
with M12 connector at the bottom, PNP switching output		
400mm scanning range	RT 525 K/P-400-9002-S12	500 31331

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.
- Models with 100mm scanning range have special background suppression.

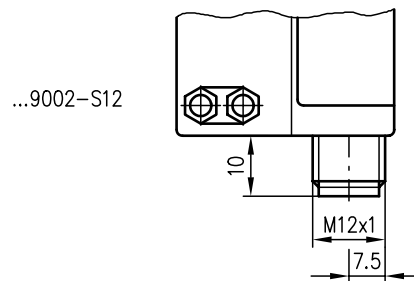
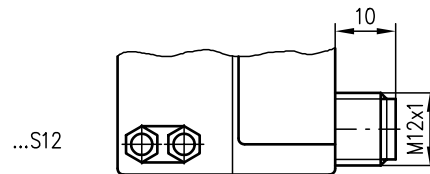
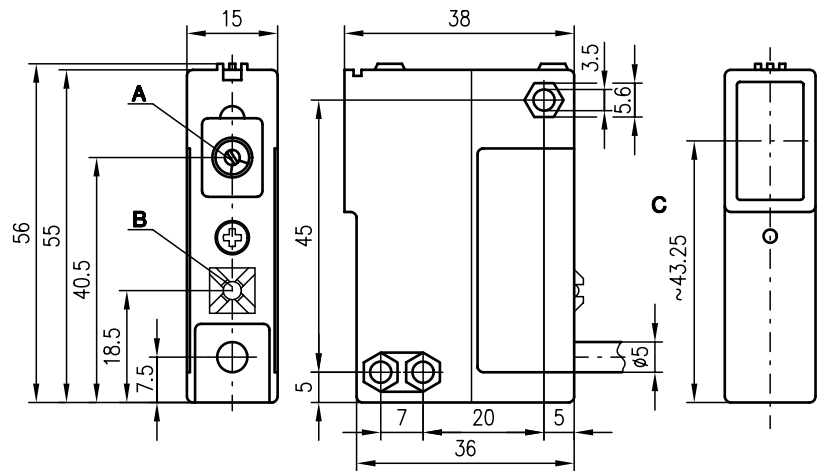


RT 525

Energetic diffuse reflection light scanner

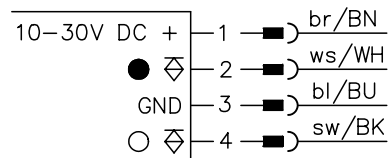


Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

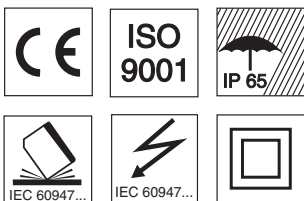
Electrical connection



10 ... 200mm



- Energetic diffuse reflection light scanner using infrared light
- Special wide-angle scanner with large light spot
- High switching frequency for detection of fast events
- Sensitivity adjustment for optimal adaptation to the application
- Complementary outputs for light/dark switching or as a control function
- Mounting holes for fast installation



Accessories:

(available separately • see page 212)

- Mounting system (BT 525)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 525_c02e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%)	10 ... 200mm
Light beam characteristic	divergent
Light spot size	approx. 150mm at a distance of 200mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 1.6V) / \leq 1.6V$
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	100g (cable), 35g (M12)
Connection type	M12 connector (4-pin) cable 2m, 4x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / - 40°C ... +65°C
Protective circuit ¹⁾	2, 3
VDE safety class ²⁾	II, all-insulated
Protection class	IP 65

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs
2) Rating voltage 250 VAC

Tables

Diagrams

Order guide

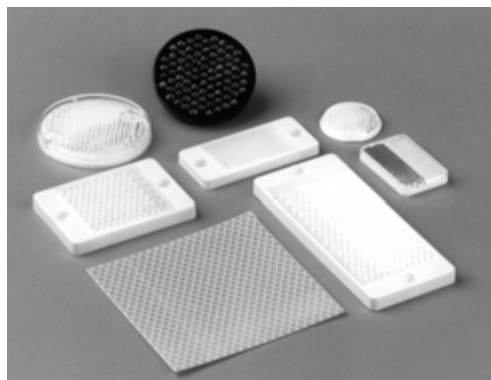
Designation	Part No.
RT 525 K/P-200-60-S12	500 30052

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.



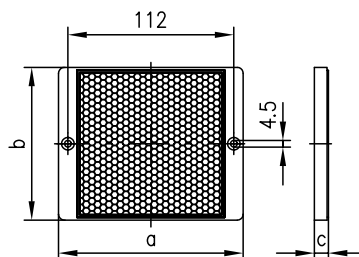
Reflectors



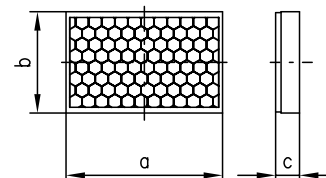
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

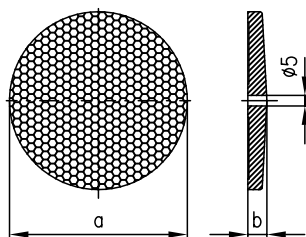
TKS 100 x 100



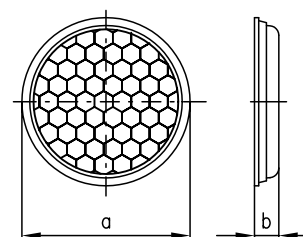
TK 30 x 50



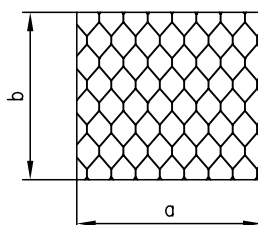
TK 82



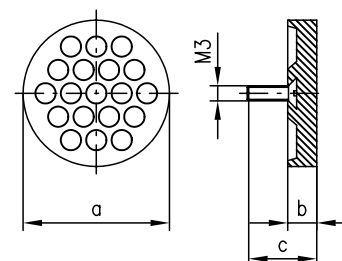
TK 35



Tape No. 2



TG 29



Order codes:

Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 50x50	500 22814
TKS 30x50	500 23525
TK 30x50	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
Tape 2	500 11523
TG 60	500 03179
TG 29	500 09374
TG 6	500 03176
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
BT 525.1	500 80535
BT 525.2	500 80536

Selection table

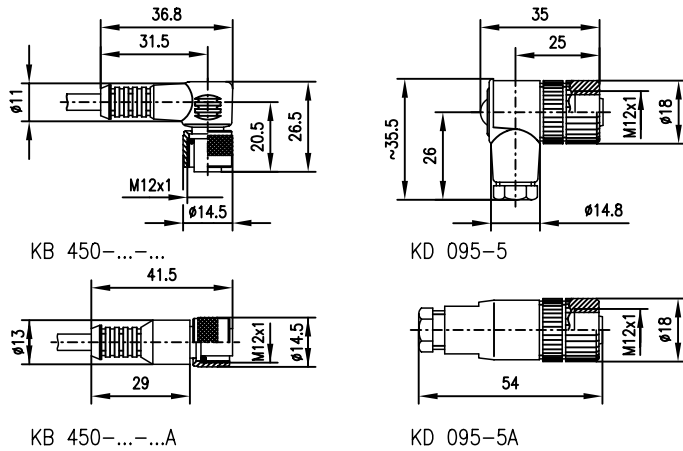
Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 2)	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 2)	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 2)	-20°C/+60°C	48	32	6.8	○	●
TK 82 1)	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
TK 45	-20°C/+60°C	46	8			●
TK 35	-20°C/+60°C	35.5	5			●
Tape 2	-20°C/+60°C	100	100			●
TG 60	-20°C/+120°C	60	9	24	●	
TG 29	-20°C/+120°C	29	6.5	14.5	●	
TG 6	-20°C/+120°C	6	5			●

1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 525_zu_e.fm

Dimensioned drawings

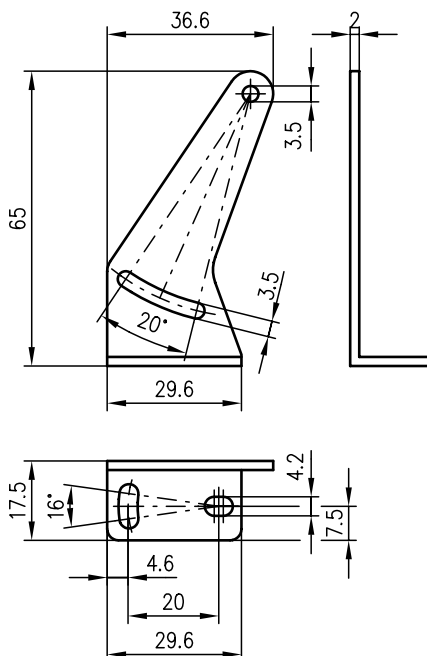


Selection table

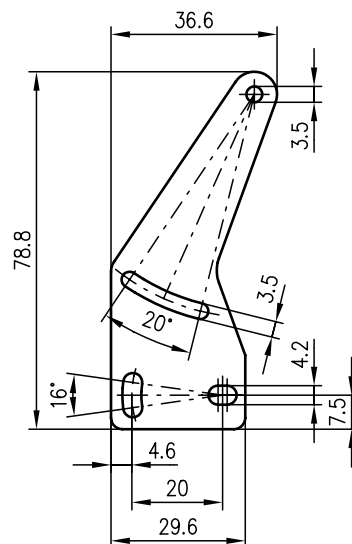
M12 connectors			
 with 4-wire cable		 without cable	
2m cable length		KD 095-5	KD 095-5A
KB 450-2000-4	KB 450-2000-4A		
5m cable length			
KB 450-5000-4	KB 450-5000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings

BT 525.1



BT 525.2



M12 connectors



For devices with M12 connectors, there are available: connectors with ready-made cable and connectors with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 525.1/2





95 Series Overview and advantages

Compact sensor series with many different models in robust metal housing and glass cover

Operating principles:

- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression
- Diffuse reflection light scanners with foreground suppression

Visible red light for easy alignment, infrared light to prevent interference from extraneous light

High switching frequency 1000Hz for detection of fast events

- 10 ... 30VDC voltage with PNP- (NPN) transistor output
- alternatively AS-interface bus connection

M12 connector for fast installation

Options:

- Detection of transparent media, e.g. clear glass
- Warning output
- Activation input





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing	Light source			Operating voltage			Output		Switching frequency
				Diecast zinc	Red light	Infrared	10 ... 30VDC	18 ... 30 V DC	AS-i system	PNP transistor	NPN transistor	
	ILS 95/44.8 L.1	0 ... 20m	•		•	•			•		1000Hz	
	ILSR 95/44.8 L	0 ... 20m	•	•		•			•		1000Hz	
	LSR 95/4 L	0 ... 10m	•	•			•		•		200Hz	
	ILSR 95/44.8 L.1	0 ... 18m	•	•		•			•		1000Hz	
	SLSR 95/44.8 L	0 ... 10m	•	•		•			•		1000Hz	
	ILSR 95/A.8 L	0 ... 20m	•	•				•			1000Hz	
	PRK 95/4 L.2	0 ... 5m	•	•			•		•		200Hz	
	PRK 95/44 L.4	0 ... 3m	•	•		•			•		1000Hz	
	PRK 95/22 L.4	0 ... 3m	•	•		•				•	1000Hz	
	IPRK 95/4.8 L.2	0 ... 6m	•	•		•			•		1000Hz	
	IPRK 95/22 L.2	0 ... 6m	•	•		•				•	1000Hz	
	IPRK 95/44 L.2	0 ... 6m	•	•		•			•		1000Hz	
	IPRK 95/44 L.3	0 ... 0.3m	•	•		•			•		1000Hz	
	IPRK 95/4 DL.41	0 ... 1.8m	•	•		•			•		1000Hz	
	PRK 95/44 L	0.15 ... 9m	•	•		•			•		1000Hz	
	IPRK 95/44 L.5	0.15 ... 9m	•	•		•			•		1000Hz	
	VPRK 95/44 L	1.0 ... 12m	•	•		•			•		1000Hz	
	IPRK 95/A L.2	0 ... 6m	•	•				•			1000Hz	
	PRK 95/A L.4	0 ... 3m	•	•				•			1000Hz	
		IRK 95/44-250 L	10 ... 400mm	•		•	•			•		1000Hz
IRKR 95/44-250 L		10 ... 400mm	•	•		•			•		1000Hz	
RKR 95/44-600 L		20 ... 900mm	•	•		•			•		1000Hz	
	FRKR 95/4-130 L	20 ... 200mm	•	•			•		•		200Hz	
	FRK 95/44-150 L	20 ... 230mm	•		•	•			•		1000Hz	
	FRK 95/22-150 L	20 ... 230mm	•		•	•				•	1000Hz	
	FRKR 95/44-150 L	20 ... 190mm	•	•		•			•		1000Hz	
	FRK 95/44-350 L	20 ... 500mm	•		•	•			•		1000Hz	
	FRKR 95/44-350 L	20 ... 500mm	•	•		•			•		1000Hz	
	FRKR 95/A-150 L	20 ... 190mm	•	•				•			1000Hz	
	VRKR 95/44-150 L	0 ... 150mm	•	•		•			•		1000Hz	
	VRKR 95/22-150 L	0 ... 150mm	•	•		•				•	1000Hz	
	VRKR 95/A-150 L	0 ... 150mm	•	•				•			1000Hz	



Switching			Conne- ction	Options										Page
Light/dark	Light	Dark		M12 connector	Warning output	Polarisation filter	Background suppression	Foreground suppression	Activation input	Sensitivity adjustment	Transparent media	Focussed light beam	Remote adjustment	
•			•	•				•						219
•			•	•				•						219
	•		•	•										221
•			•	•				•	•					223
•			•	•				•						225
•			•	•	•			•						227
	•		•	•		•								229
•			•	•		•			•	•				231
•			•	•		•			•	•	•			231
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•			•	•		•			•					249
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•			•	•		•			•					251
•			•	•		•		•			•			253
•			•	•			•		•					255
•			•	•			•		•					255
•			•	•			•		•					257



ILS 95

Throughbeam photoelectric sensors

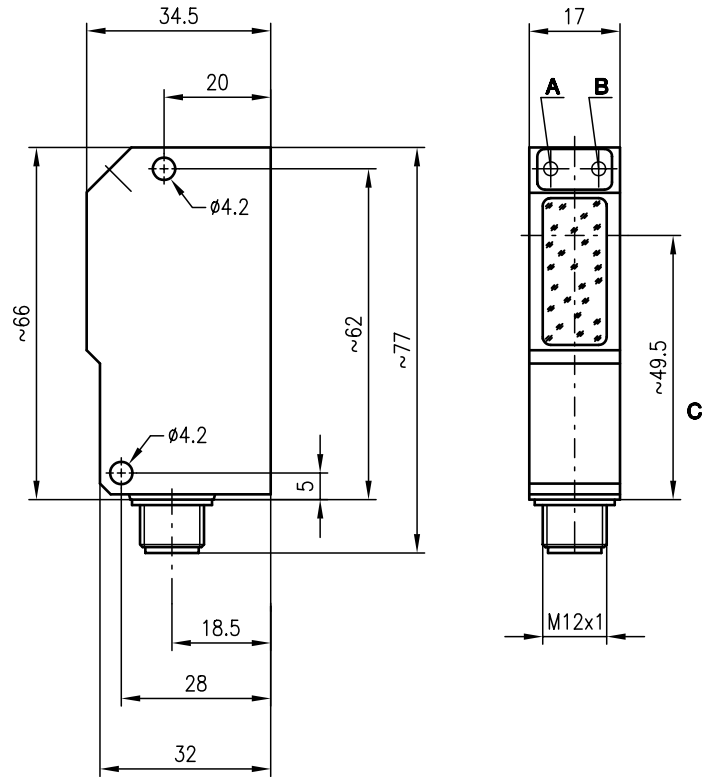


0 ... 20m



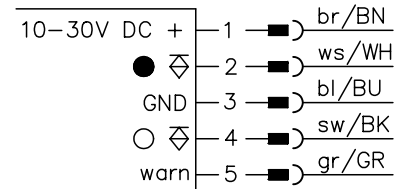
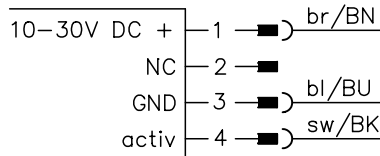
- Throughbeam photoelectric sensor with high performance reserve using visible red light or infrared light
- High switching frequency for detection of fast events
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

Dimensioned drawing



- A Switching indicator yellow
- B Operation indicator green
- C Optical axis

Electrical connection

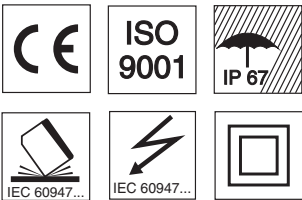


Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

ILS 95/44.8 L.1

Infrared light
 0 ... 20m
 0 ... 12m
 LED (modulated light)
 880nm

ILSR 95/44.8 L

Red light
 0 ... 20m
 0 ... 12m
 LED (modulated light)
 660nm

Timing

Switching frequency 1000Hz
 Response time 0.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 35mA
 Switching output 2 PNP transistor outputs, complementary
 Function characteristics light/dark switching
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

Indicators

LED green ready
 LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M 12 connector, stainless steel
 receiver 5-pin, transmitter 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾ -25°C (-30°C) ... +60°C/-40°C ... +70°C
 Protective circuit ⁴⁾ 2, 3
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Activation input active
 Transmitter active/not active $\geq 8V / \leq 2V$ or not connected
 Activation/disable delay ≤ 1ms
 Input resistance 4.7 k Ω ± 10%
Warning output autoControl warn
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

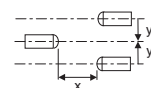
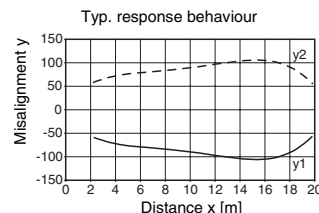
	Designation	Part No.
Infrared light		
Transmitter and receiver	ILS 95/44.8 L.1	
Transmitter	LS 95/2.8 SE-L.1	500 26835
Receiver	ILS 95/44 E-L.1	500 26836
Red light		
Transmitter and receiver	ILSR 95/44.8 L	
Transmitter	LSR 95/2.8 SE-L	500 25606
Receiver	ILSR 95/44 E-L	500 25608

Tables

0	12	20
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Operating range [m]
 Typ. operating range limit [m]

Diagrams



Remarks

- The throughbeam photoelectric sensor using visible red light is also available with integrated AS-i chip for direct connection to the AS-i system.



LSR 95

Throughbeam photoelectric sensors

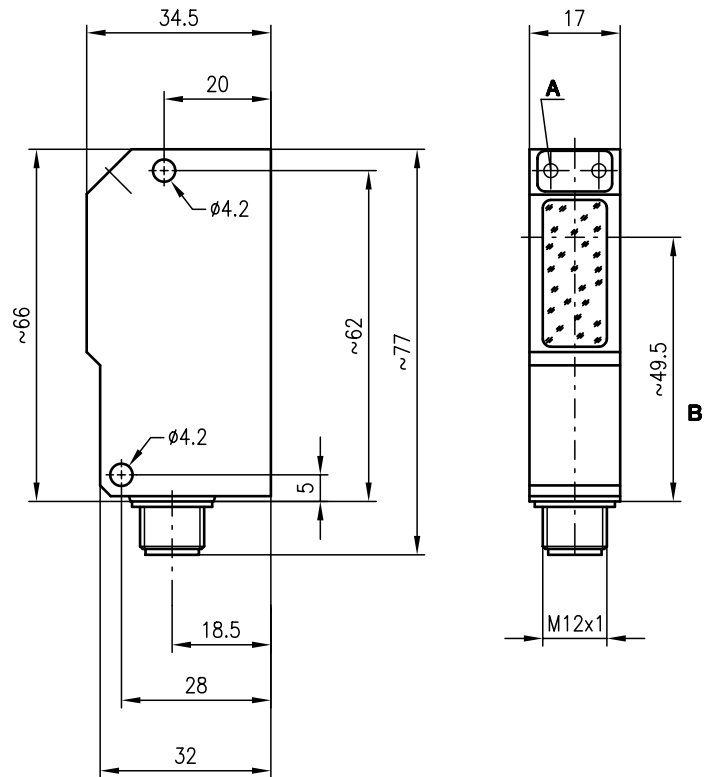


0 ... 10m



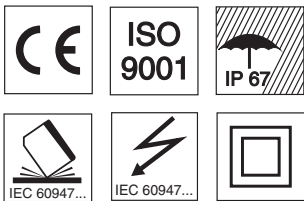
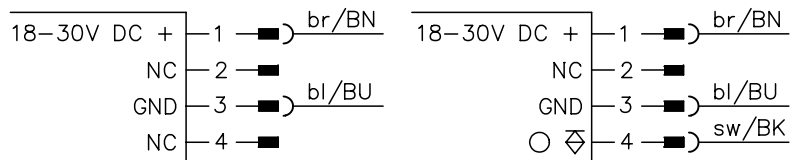
- Throughbeam photoelectric sensor with high performance reserve in red light
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Mounting holes and M12 connector for fast installation

Dimensioned drawing



- A Switching indicator yellow
- B Optical axis

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_a02e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

LSR 95/4 L

0 ... 10m
 0 ... 6m
 LED (modulated light)
 660nm (visible red light)

Timing

Switching frequency 200Hz
 Response time 2.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 18 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output 1 PNP transistor output
 Function characteristics light switching
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

Indicators

LED yellow light path free

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M 12 connector, stainless steel receiver 4-pin, transmitter 4-pin

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -30°C ... +70°C
 Protective circuit ³⁾ 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

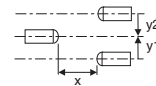
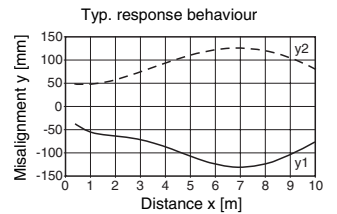
- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 VAC

Tables

0	6	10
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Operating range [m]
 Typ. operating range limit [m]

Diagrams



Order guide

	Designation	Part No.
Transmitter and receiver	LSR 95/4 L	
Transmitter	LSR 95/2 SE-L	500 27991
Receiver	LSR 95/4 E-L	500 27992

Remarks



ILSR 95

Throughbeam photoelectric sensors

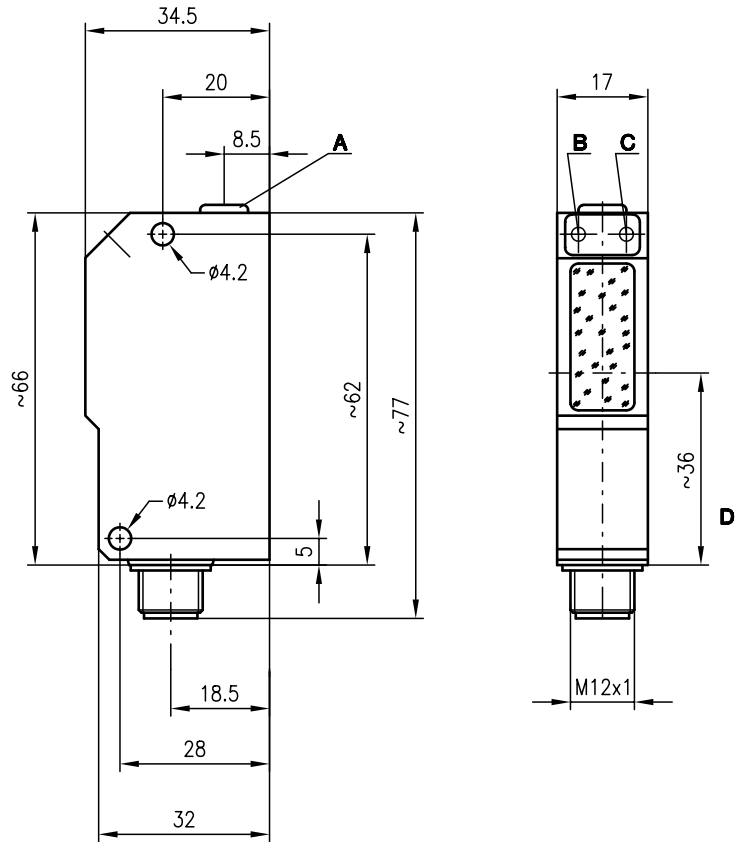


0 ... 18m

10 - 30 V
DC

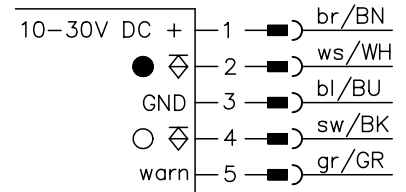
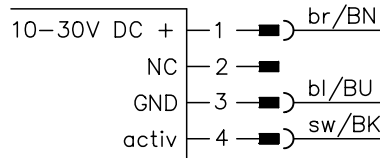
- Throughbeam photoelectric sensor with high performance reserve in red light
- High switching frequency for detection of fast events
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very good alignment through wide switching lobe
- Sensitivity adjustment for optimal adaptation to the application

Dimensioned drawing



- A Sensitivity adjustment
- B Switching indicator yellow
- C Operation indicator green
- D Optical axis

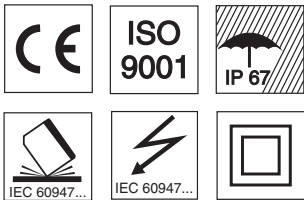
Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)



We reserve the right to make changes • 95_a05e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 18m
Operating range ²⁾	0 ... 12m
Light source	LED (modulated light)
Wavelength	660nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with multiturn potentiometer

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M 12 connector, stainless steel receiver 4-pin, transmitter 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾	25°C (-30°C) ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 1 ms
Input resistance	4.7 kΩ ± 10%
Warning output autoControl warn	
Signal voltage high/low	PNP transistor, counting principle
Output current	≥ ($U_B - 2V$) / ≤ 2V max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

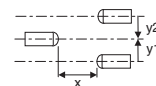
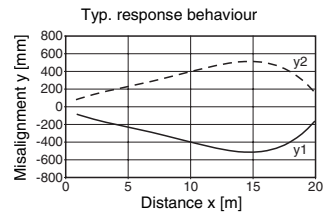
	Designation	Part No.
Transmitter and receiver	ILSR 95/44.8 L.1	
Transmitter	LSR 95/2.8 SE-L.1	500 34509
Receiver	ILSR 95/44 E-L	500 34510

Tables

0	12	18
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<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams



Remarks



SLSR 95

Protective throughbeam photoelectric sensors



0 ... 10m



- Protective throughbeam photoelectric sensor with high performance reserve in visible red light
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

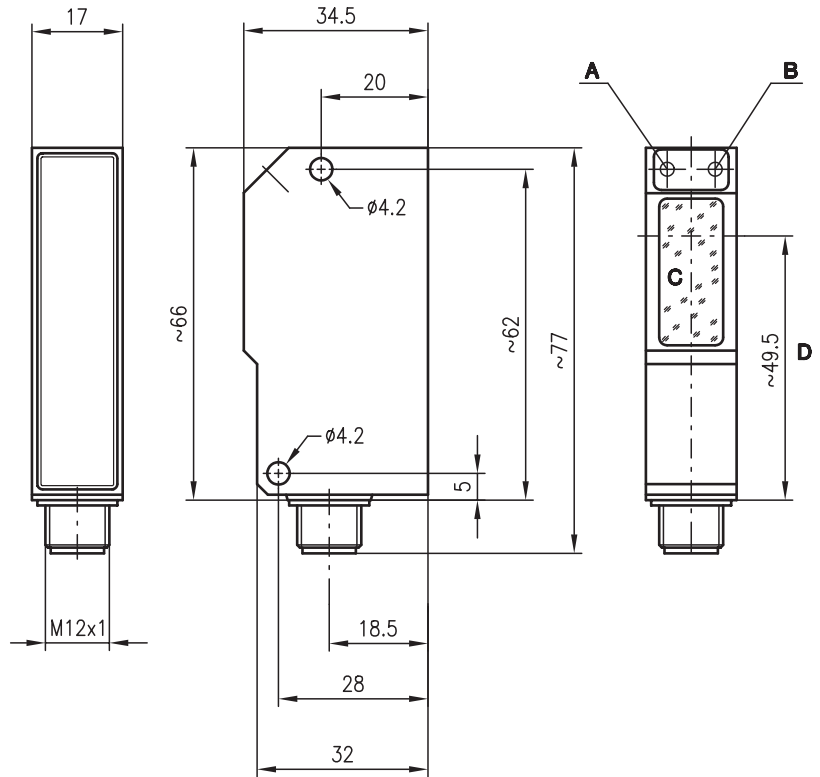


Accessories:

(available separately • see page 258)

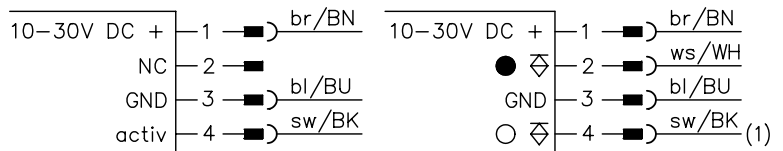
- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables in straight or angular versions, length 5m (KB ...)
- Test-monitoring unit:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

Dimensioned drawing



- A Switching indicator yellow
- B Operation indicator green
- C Transmitter/receiver
- D Optical axis

Electrical connection



(1) For operation with Leuze test-monitoring units, the photoelectric sensor must be connected in light switching mode (pin 4)

We reserve the right to make changes • 95_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 10m
Operating range ²⁾	0 ... 8m
Light source	LED (modulated light)
Wavelength	660nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 35mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED green	ready
LED yellow	transmitter ON

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	90g
Connection type	M 12 connector, stainless steel receiver 4-pin, transmitter 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active

Transmitter active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7kΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) -30°C with operating voltage continuously applied

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

5) Rating voltage 250VAC

Order guide

	Designation	Part No.
Transmitter and receiver	SLSR 95/44.8 L	
Transmitter	SLSR 95/2.8 SE-L	500 80183
Receiver	SLSR 95/44 E-L	500 80184

Tables

Diagrams

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object dia: Ø 13mm.



ILSR 95

Throughbeam photoelectric sensors

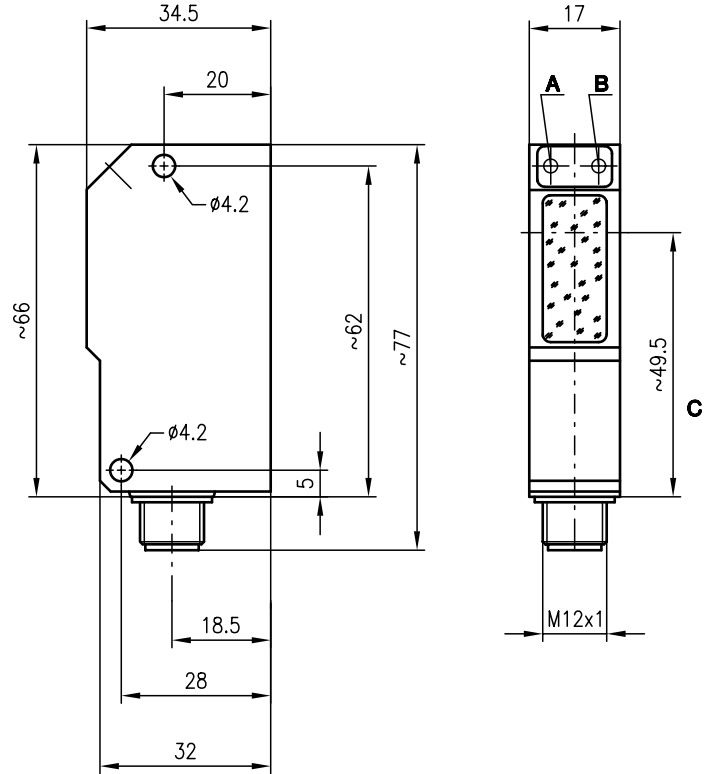


0 ... 20m



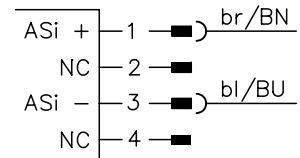
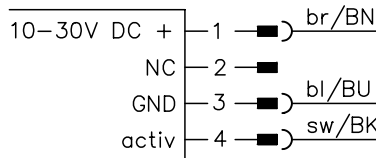
- Throughbeam photoelectric sensor with high performance reserve using visible red light for fast and easy alignment
- Receiver with integrated AS-i slave - the transmitter needs a separate operating voltage
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application

Dimensioned drawing



- A Switching indicator yellow
- B Operation indicator green
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 95_a04e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 20m
Operating range ²⁾	0 ... 12m
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Sensor switching frequency	1000Hz
Sensor response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data receiver

Operating voltage U_B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 30mA

Electrical data transmitter

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M12 connector, stainless steel

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +60°C/-40°C ... +70°C	
Protective circuit ⁴⁾	receiver: 1,4	transmitter: 2
VDE safety class ⁵⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	

Activation input active

Transmitter active/not active	≥ 8V/≤ 2V or not connected
-------------------------------	----------------------------

AS-i data for receiver

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 4=interference blanking
- 5) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D0	switching output	Ø no reflection 1 light path free	system input	D2	ready output	Ø sensor not ready 1 sensor ready	system input
D1	warning output autoControl	Ø active 1 not active	system input	D3	NC	Ø 1	system output

Order guide

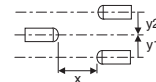
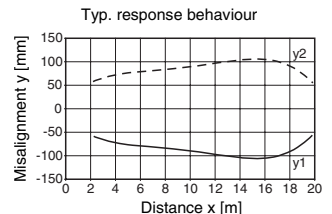
	Designation	Part No.
Transmitter and receiver	ILSR 95/A.8 L	
Transmitter	LSR 95/2.8 SE-L	500 25606
Receiver	ILSR 95/A E-L	500 27093

Tables

0	12	20
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Operating range [m]
 Typ. operating range limit [m]

Diagrams



Remarks

- Transmitter cannot be directly connected to the AS-i system.



PRK 95

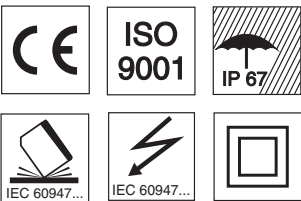
Retro-reflective photoelectric sensors with polarisation filter



0 ... 5 m



- Polarised retro-reflective photoelectric sensor using visible red light
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Polarisation filter blocks unwanted reflections
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Mounting holes and M12 connector for fast installation

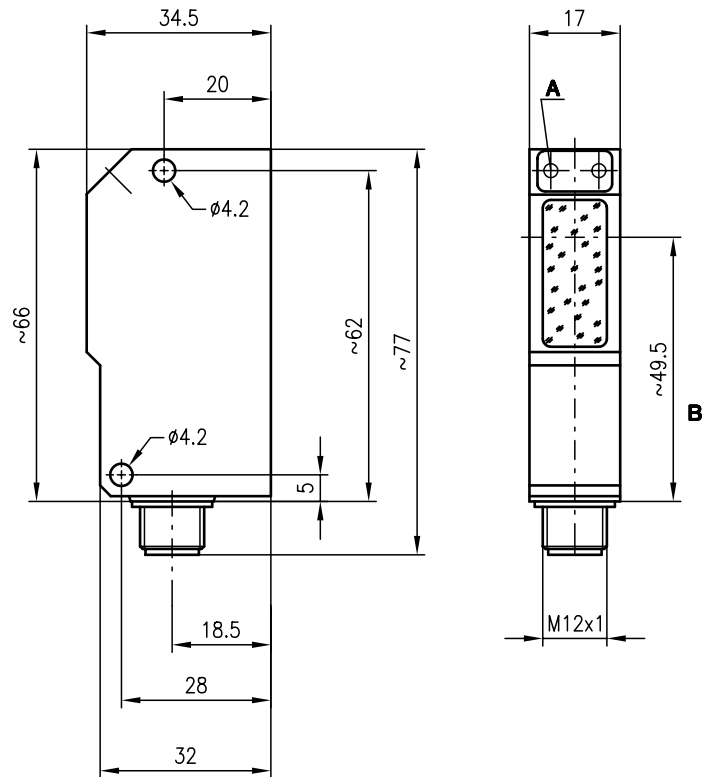


Accessories:

(available separately • see page 258)

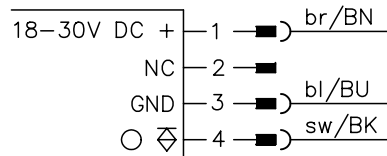
- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Switching indicator yellow
- B Optical axis

Electrical connection



We reserve the right to make changes • 95_b01e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 5m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	200Hz
Response time	2.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	1 PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M12 connector, stainless steel, 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... 60°C / -30°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 VAC

Tables

Reflectors			Operating range	
1	TK(S)	100x100	0 ... 3.4m	
2	MTK(S)	50x50	0 ... 2.7m	
3	TK(S)	30x50	0 ... 1.5m	
4	TK(S)	20x40	0 ... 1.4m	
5	Tape 2	100x100	0 ... 0.8m	

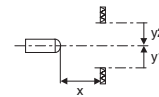
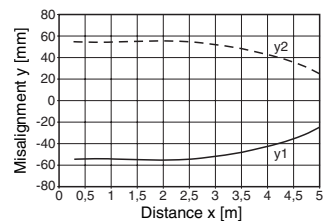
1	0		3.4	5
2	0		2.7	4.5
3	0	1.5	2.5	
4	0	1.4	2.4	
5	0	0.8	1.2	

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

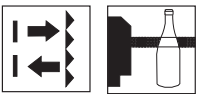
Designation	Part No.
PRK 95/4 L.2	500 27993

Remarks



PRK 95

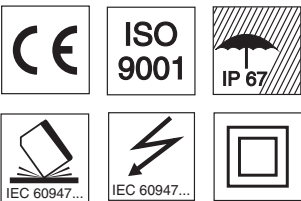
Retro-reflective photoelectric sensors with polarisation filter



0 ... 3m

10 - 30 V
DC

- Retro-reflective photoelectric sensors for safe detection of transparent media (e.g. clear glass, PE, foil)
- User controlled sensitivity adjustment with high resolution allows detection of transparent objects
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Polarisation filter blocks unwanted reflections

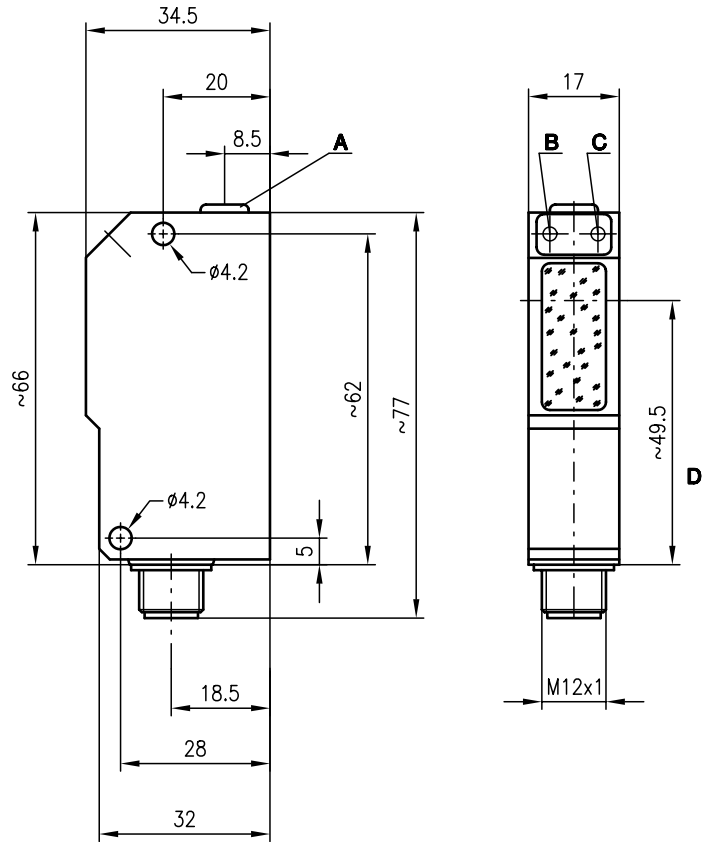


Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1, UMS 96-95)
- M 12 connectors (KD ...)
- Reflectors
- Reflective tapes

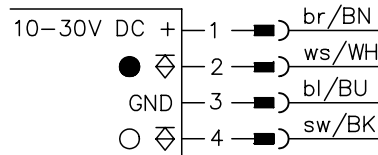
Dimensioned drawing



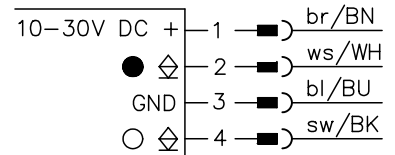
- A Sensitivity adjustment
- B Switching indicator yellow
- C Operation indicator green
- D Optical axis

Electrical connection

PRK 95/44 L.4



PRK 95/22 L.4



We reserve the right to make changes • 95_b02e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 3m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)
Gap detection	≤ 5mm in the range between 0 ... 300mm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 PNP or 2 NPN transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 10 turn potentiometer

Indicators

LED green	ready
LED yellow, slowly flashing	operating point 1 clear glass transition from quickly flashing to slowly flashing / light path free
LED yellow, quickly flashing	operating point 2 coloured glass transition from continuous light to quickly flashing / light path free
LED yellow, continuous light	operating point 3 non transparent media continuous light/light path free

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M12 connector, stainless steel, 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +55°C / -40°C ... +55°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250 VAC

Order guide

	Designation	Part No.
with PNP switching output	PRK 95/44 L.4	500 25609
with NPN switching output	PRK 95/22 L.4	500 29051

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 1.8m
2 MTK(S) 50x50	0 ... 1.8m
3 TK(S) 30x50	0 ... 1.1m
4 TK(S) 20x40	0 ... 1.0m
5 Tape 2 100x100	0 ... 0.4m

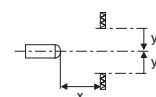
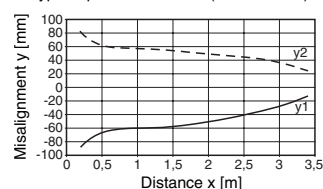
1	0	1.8	3
2	0	1.8	3
3	0	1.1	1.8
4	0	1.0	1.7
5	0	0.4	0.7

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks

- The retro-reflective photoelectric sensor is also available with integrated AS-i chip for direct connection to the AS-i system.

Objects	Adjustment (indicator LED yellow)
Clear glass, PE, foil	operating point 1
Coloured glass	operating point 2
Opaque objects	operating point 3



IPRK 95

Retro-reflective photoelectric sensors with polarisation filter

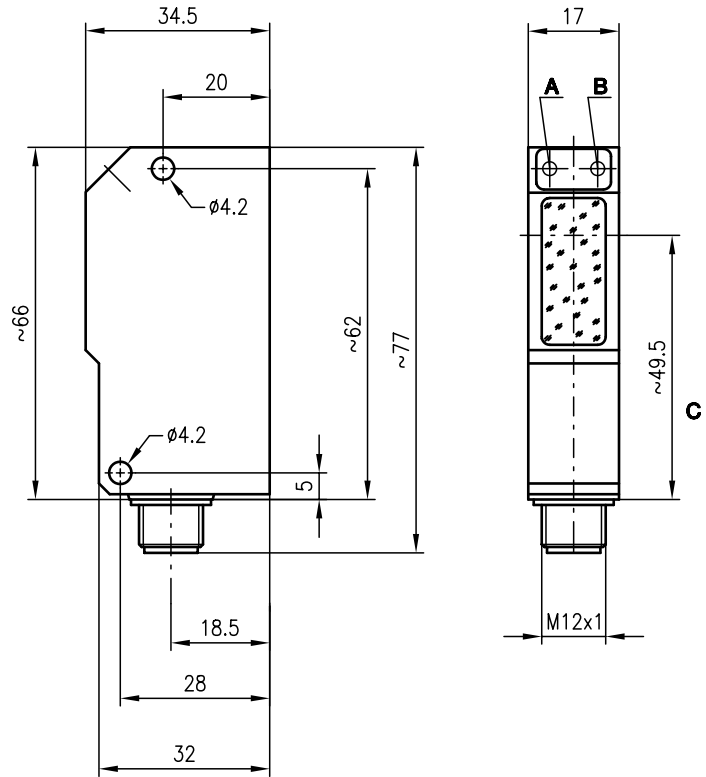


0 ... 6m



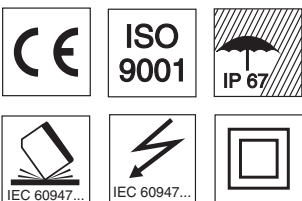
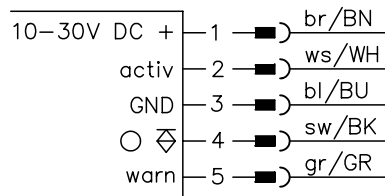
- Polarised retro-reflective photoelectric sensor in visible red light
- High switching frequency for detection of fast events
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Activation input for testing and interlinking

Dimensioned drawing



- A Switching indicator yellow
- B Operation indicator green
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1, UMS 96-95)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 95_b03e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 6m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	1 PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M 12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +55°C/-40°C ... +55°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	$\geq 8V / \leq 2V$ or not connected
Activation/disable delay	≤ 1ms
Input resistance	$4.7 k\Omega \pm 10\%$
Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

Designation	Part No.
IPRK 95/4.8 L.2	500 30257

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 4.2m
2 MTK(S) 50x50	0 ... 3.2m
3 TK(S) 30x50	0 ... 1.8m
4 TK(S) 20x40	0 ... 1.7 m
5 Tape 2 100x100	0 ... 1.2m

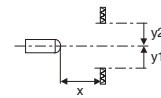
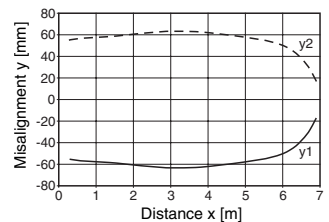
1	0	4.2	6
2	0	3.2	5.4
3	0	1.8	3.0
4	0	1.7	2.9
5	0	1.2	1.7

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



IPRK 95 Retro-reflective photoelectric sensors with polarisation filter

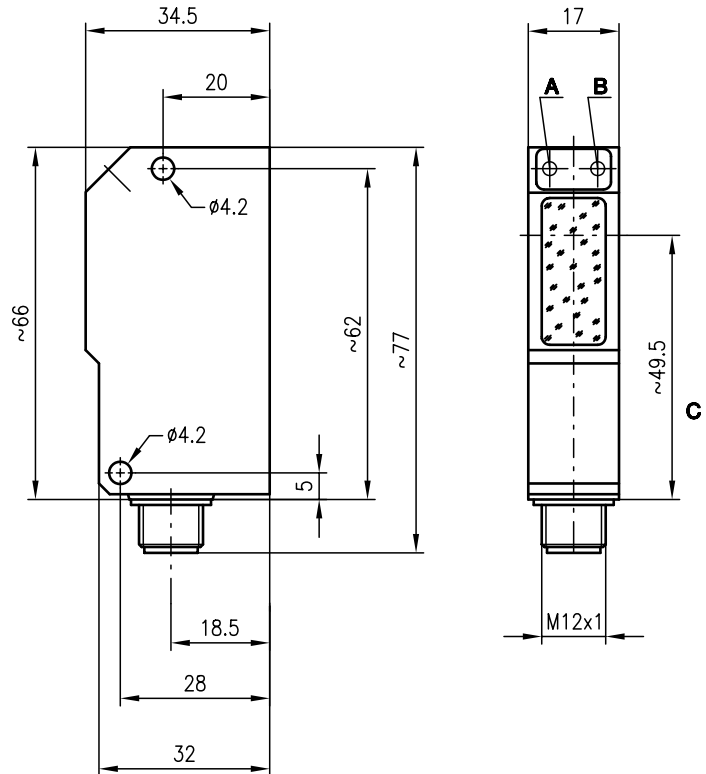


0 ... 6.0m
0 ... 0.3m



- Polarised retro-reflective photoelectric sensor using visible red light
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Polarisation filter blocks unwanted reflections
- Complementary outputs for light/dark switching or as a control function
- IPRK 95/44 L.3 uses a focussed light beam for maximum switching and positioning accuracy

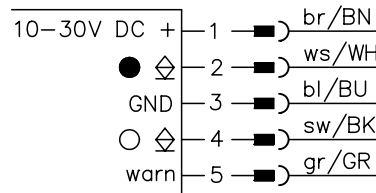
Dimensioned drawing



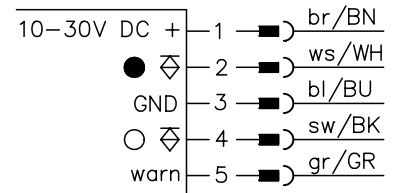
- A Switching indicator yellow
- B Operation indicator green
- C Optical axis

Electrical connection

IPRK 95/22 L.2



IPRK 95/44 L.2
IPRK 95/44 L.3

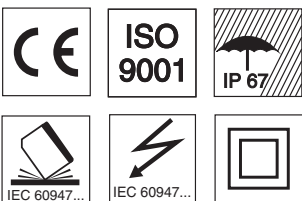


Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 95_b04e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light beam characteristic
 Light source
 Wavelength

IPRK 95/... L.2

0 ... 6m (TK(S) 100x100)
 see table
 divergent
 LED (modulated light)
 660nm (visible red light, polarised)

IPRK 95/44 L.3

0 ... 0.3m (tape 2)
 see table
 focussed at 100mm

Timing

Switching frequency
 Response time
 Delay before start-up

1000Hz
 0.5ms
 ≤ 100ms

Electrical data

Operating voltage U_B
 Residual ripple
 Bias current
 Switching output
 Function characteristics
 Signal voltage high/low
 Output current

10 ... 30VDC (incl. residual ripple)
 ≤ 15% of U_B
 ≤ 35mA
 2 PNP or 2 NPN transistor outputs, complementary
 light/dark switching
 $\geq (U_B - 2V) / \leq 2V$
 max. 100mA

Indicators

LED green
 LED yellow
 LED yellow flashing

ready
 light path free
 light path free, no performance reserve

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

diecast zinc
 glass
 90g
 M 12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage) ³⁾
 Protective circuit ⁴⁾
 VDE safety class ⁵⁾
 Protection class
 Standards applied

-25°C (-30°C) ... +55°C/-40°C ... +55°C
 2,3
 II, all-insulated
 IP 67
 IEC 60947-5-2

Options

Warning output autoControl warn
 Signal voltage high/low
 Output current

PNP or NPN transistor, counting principle
 $\geq (U_B - 2V) / \leq 2V$
 max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

	Designation	Part No.
with PNP switching output 0 ... 6.0m	IPRK 95/44 L.2	500 22680
with PNP switching output 0 ... 0.3m	IPRK 95/44 L.3	500 22681
with NPN switching output 0 ... 6.0m	IPRK 95/22 L.2	500 29050

Tables

IPRK 95/... L.2

Reflectors	Operating range
1 TK(S) 100x100	0 ... 4.2m
2 MTK(S) 50x50	0 ... 3.2m
3 TK(S) 30x50	0 ... 1.8m
4 TK(S) 20x40	0 ... 1.7m
5 Tape 2 100x100	0 ... 1.2m

1	0	4.2	6
2	0	3.2	5.4
3	0	1.8	3.0
4	0	1.7	2.9
5	0	1.2	1.7

Operating range [m]
 Typ. operating range limit [m]

IPRK 95/44 L.3

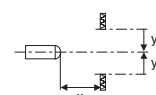
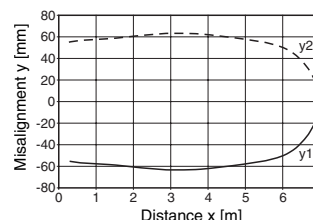
Reflectors	Operating range
Tape 2 10x10	0 ... 0.3m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

IPRK 95/... L.2

Typ. response behaviour (TK 100x100)

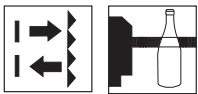


Remarks

- The retro-reflective photoelectric sensor with 3m operating range is also available with an integrated AS-i chip for direct connection to the AS-i system.



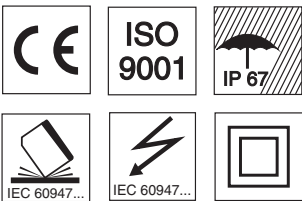
IPRK 95 Retro-reflective photoel. sensors with polarisation filter/remote calibr.



0 ... 1.8m



- Retro-reflective photoelectric sensor for safe detection of transparent media (e.g. clear glass, PE, foil)
- Remote calibration for contamination compensation (retentive), prolongs maintenance intervals and secures availability
- High switching frequency for detection of fast events
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)

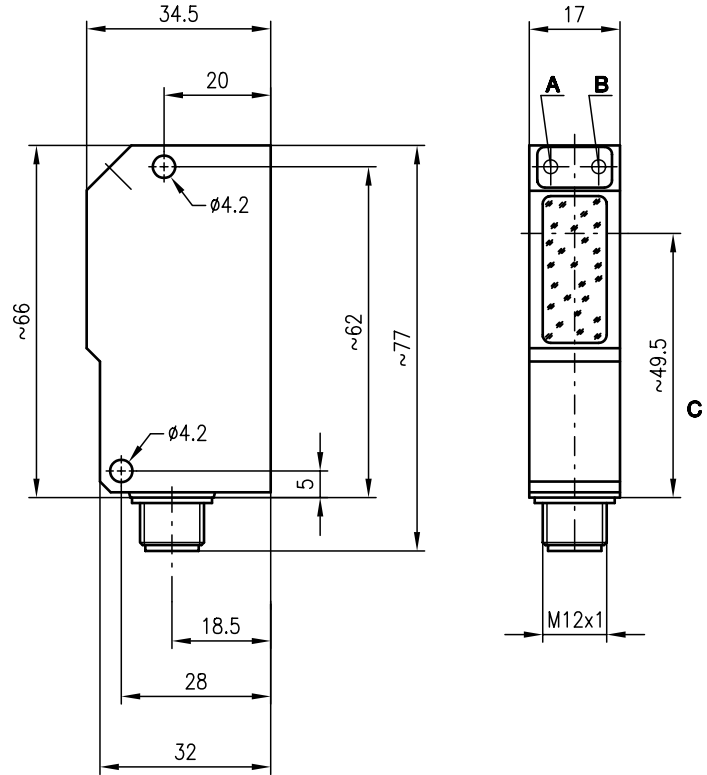


Accessories:

(available separately • see page 258)

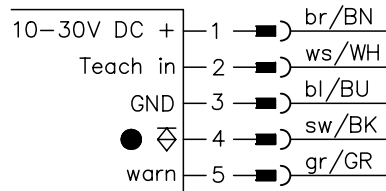
- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Switching indicator yellow
- B Operation indicator green
- C Optical axis

Electrical connection



We reserve the right to make changes • 95_b05e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 1.8m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)
Gap detection	≤ 5mm in the range between 0 ... 300mm (see remarks)

Timing

Switching frequency	500Hz
Response time	1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	1 PNP transistor output
Function characteristics	dark switching
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Sensitivity	selectable via PLC protocol (see diagram)

Indicators

LED green, slowly flashing	operating point 1 - PE bottle
LED green, quickly flashing	operating point 2 - glass bottle
LED green continuous light	operating point 3 - standard object
LED yellow, continuous light	light path free
LED yellow flashing	double warning function (see remarks and tables)

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C (-30°C) ... +55°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

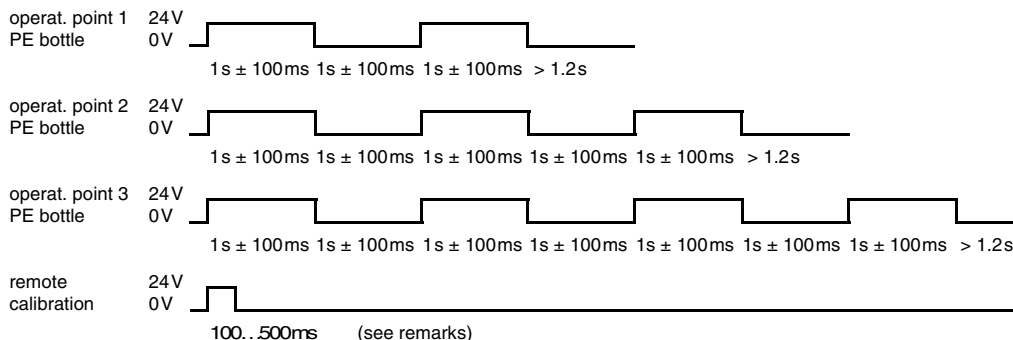
Options

Warning output autoControl warn	PNP transistor, counting principle (see remarks)
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Sensitivity selection via remote calibration PIN 2:

Sensitivity selection



Order guide

Designation	Part No.
IPRK 95/4 DL.41	500 80859

Tables

Reflectors	Operating range
TK(S) 100x100	0.5 ... 1.5m
TK(S) 50x100	0.5 ... 1.0m
TK 82	0.5 ... 1.5m
TK 45	0.0 ... 0.9m
TK 35	0.0 ... 0.7m
Tape 2 100x100	0.0 ... 0.5m

TK ...	= adhesive
TKS ...	= screw type
Tape 2	= adhesive

warning function	LED yellow	LED green
operation with performance reserve	on or off	on or flashing
operation with-out performance reserve	on or off	on or flashing
no function	flashing	on or flashing
calibration	flashing	off

Remarks

- Commutation of the operating point is possible anytime.
- Warning message is erased at new remote calibration.
- Clean system and perform new remote calibration during static warning message.
- Double warning function displays soiling or wrong calibration.
- Smallest gap is attainable in operating point 3.
- autoControl in all operating points.
- LED yellow displays status of warning output.
- Delay before start-up max. 2s after remote calibration.



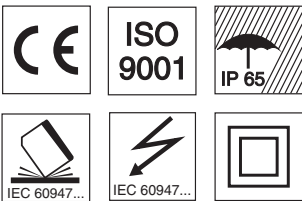
(V)PRK 95 Retro-reflective photoelectric sensors with polarisation filter



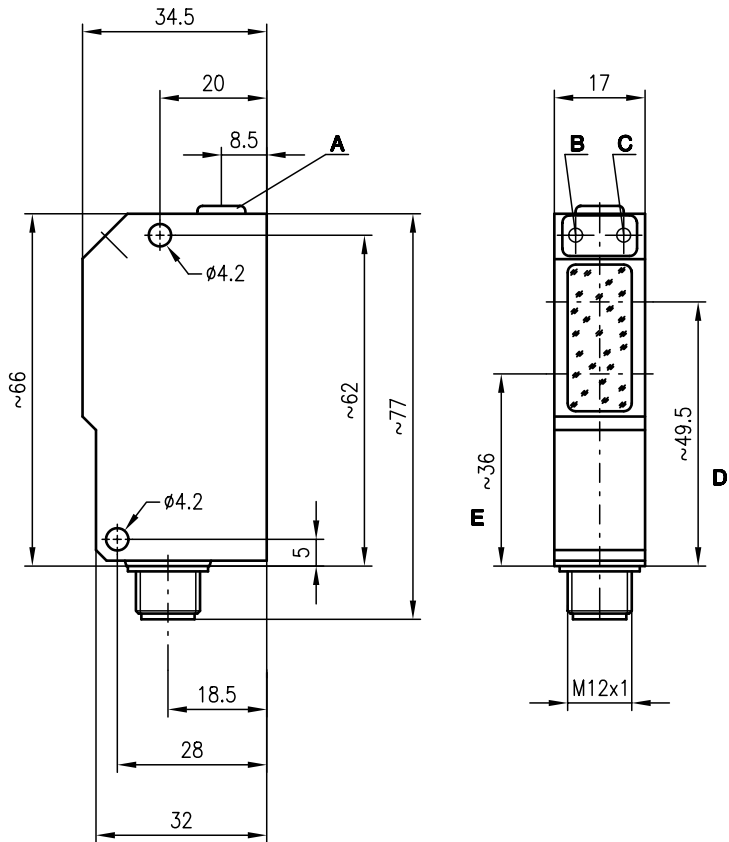
0.15 ... 9m
1.0 ... 12m



- Polarised retro-reflective photoelectric sensor using visible red light
- High switching frequency for detection of fast events
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Polarisation filter blocks unwanted reflections
- Complementary outputs for light/dark switching or as a control function



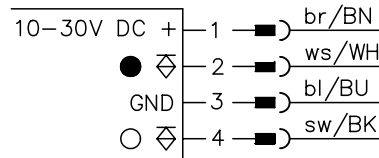
Dimensioned drawing



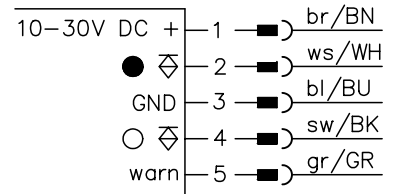
- A sensitivity adjustment (for IPRK 95/44 L.5)
- B Switching indicator yellow
- C Operation indicator green
- D Optical axis receiver
- E Optical axis transmitter

Electrical connection

PRK 95/44 L
VPRK 95/44 L



IPRK 95/44 L.5



We reserve the right to make changes • 95_b07e.fm

Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	(I)PRK 95...	VPRK 95...
Operating range ²⁾	0.15 ... 9m	1.0 ... 12m
Light beam characteristic	see table	see table
Light source	divergent	
Wavelength	LED (modulated light)	
	660nm (visible red light, polarised)	

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable with multitrans potentiometer

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M12 connector, stainless steel

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +55°C/-40°C ... +55°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

- 1) Operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

	Designation	Part No.
with polarisation filter	PRK 95/44 L	500 34511
with polarisation filter and long range	VPRK 95/44 L	500 34608
with polarisation filter, sensitivity adjustment and warning output	IPRK 95/44 L.5	500 34512

Tables

(I)PRK 95...

Reflectors	Operating range
1 TK(S) 100x100	0.2 ... 6.0m
2 MTK(S) 50x50	0.2 ... 4.2m
3 TK(S) 30x50	0.2 ... 2.5m
4 TK(S) 20x40	0.2 ... 1.9m
5 Tape 2 100x100	0.2 ... 2.4m

1	0.2	6	9
2	0.2	4.2	7.1
3	0.2	2.5	4.1
4	0.2	1.9	3.2
5	0.2	2.4	4.0

- Operating range [m]
- Typ. operating range limit [m]

VPRK 95...

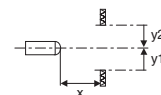
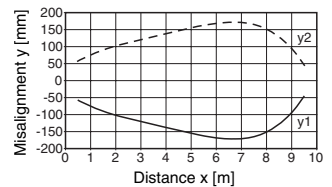
Reflectors	Operating range
TK(S) 100x100	1.0 ... 10.0m
TK(S) 50x50	1.0 ... 6.0m
TK(S) 20x40	1.0 ... 4.0m
Tape 2 100x100	1.0 ... 4.0m

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

(I)PRK 95...

Typ. response behaviour (TK 100x100)

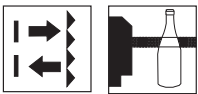


Remarks



IPRK 95

Retro-reflective photoelectric sensors with polarisation filter



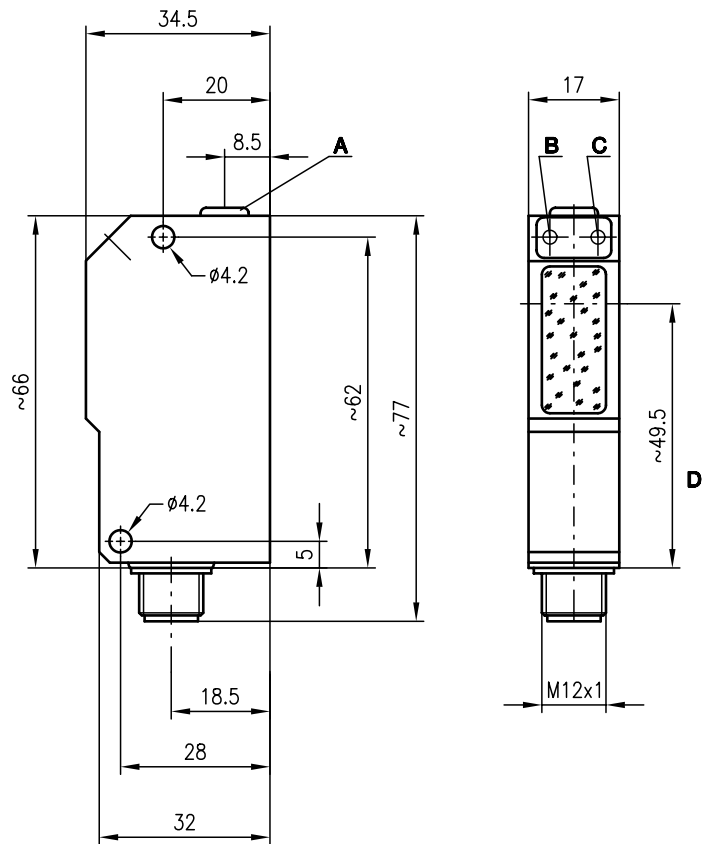
0 ... 3m
0 ... 6m



- Polarised retro-reflective photoelectric sensors with integrated AS-i slave
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- The retro-reflective photoelectric sensor PRK 95/A L.4 is used for the detection of transparent media (e.g. clear glass, PE, foil) within the operating range of 1.5m
- Adjustable sensitivity with high resolution allows detection of transparent objects.

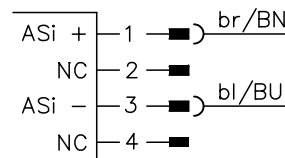


Dimensioned drawing



- A Sensitivity adjustment
- B Switching indicator yellow
- C Operation indicator green
- D Optical axis

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 95_b06e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾
 Operating range ²⁾
 Light beam characteristic
 Light source
 Wavelength

IPRK 95/A L.2

0 ... 6m
 see table
 divergent
 LED (modulated light)
 660nm (visible red light, polarised)

PRK 95/A L.4

0 ... 3m
 see table

Timing

Sensor switching frequency 1000Hz
 Sensor response time 0.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 26.5 ... 31.6 V (according to AS-interface specifications)
 Bias current ≤ 35mA
 Sensitivity adjustable with 10-turn potentiometer

Indicators ³⁾

LED green ready
 LED yellow, slowly flashing operating point 1 **clear glass**
 transition from quickly flashing to slowly flashing / light path free
 LED yellow, quickly flashing operating point 2 **coloured glass**
 transition from continuous light to quickly flashing / light path free
 LED yellow, continuous light operating point 3 **non transparent media**
 continuous light/light path free

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M 12 connector, stainless steel

Environmental data

Ambient temp. (operation/storage) ⁴⁾ -25°C (-30°C) ... +55°C/-40°C ... +55°C
 Protective circuit ⁵⁾ 1, 4
 VDE safety class ⁶⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

AS-i data

I/O code 1
 ID code 1
 Address programmed by the user in the range of 1 to 31 (default=0)
 Cycle time acc. to AS-i specification 5ms
 AS-i standard according to profile S-1.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) for IPRK 95/A L.2: LED yellow - light path free/LED yellow flashing - light path free, no performance reserve
- 4) -30°C with operating voltage continuously applied
- 5) 1=transient protection, 4=interference blanking
- 6) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection	system input			1	
D ₁	warning output autoControl ¹⁾	∅ active	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1 not active	system input			1 light switching	
D ₂	ready output	∅ sensor not ready	system input	*P ₂	NC	∅	system parameter
		1 sensor ready	system input			1	
*D ₃	activation input	∅ transmitter on	system output	*P ₃	NC	∅	system parameter
		1 transmitter off	system output			1	

* default = 1

1) applies only for IPRK 95/A L.2

Order guide

Designation	Part No.
IPRK 95/A L.2	500 27094
PRK 95/A L.4	500 27095

Tables

IPRK 95/A L.2

Reflectors	Operating range
1 TK(S) 100x100	0 ... 4.2m
2 MTK(S) 50x50	0 ... 3.2m
3 TK(S) 30x50	0 ... 1.8m
4 TK(S) 20x40	0 ... 1.7m
5 Tape 2 100x100	0 ... 1.2m

1	0	4.2	6
2	0	3.2	5.4
3	0	1.8	3.0
4	0	1.7	2.9
5	0	1.2	1.7

PRK 95/A L.4

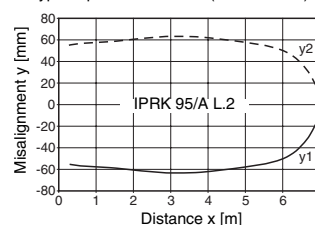
Reflectors	Operating range
1 TK(S) 100x100	0 ... 1.8m
2 MTK(S) 50x50	0 ... 1.8m
3 TK(S) 30x50	0 ... 1.1m
4 TK(S) 20x40	0 ... 1.0m
5 Tape 2 100x100	0 ... 0.4m

1	0	1.8	3
2	0	1.8	3
3	0	1.1	1.8
4	0	1.0	1.7
5	0	0.4	0.7

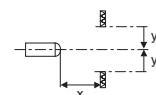
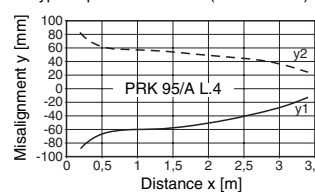
□ Operating range [m]
 ▒ Typ. operating range limit [m]

Diagrams

Typ. response behaviour (TK 100x100)



Typ. response behaviour (TK 100x100)



Remarks

Objects	Adjustment (indicator LED yellow)
Clear glass, PE, foil	operating point 1
Coloured glass	operating point 2
Opaque objects	operating point 3



IRK 95

Energetic diffuse reflection light scanner

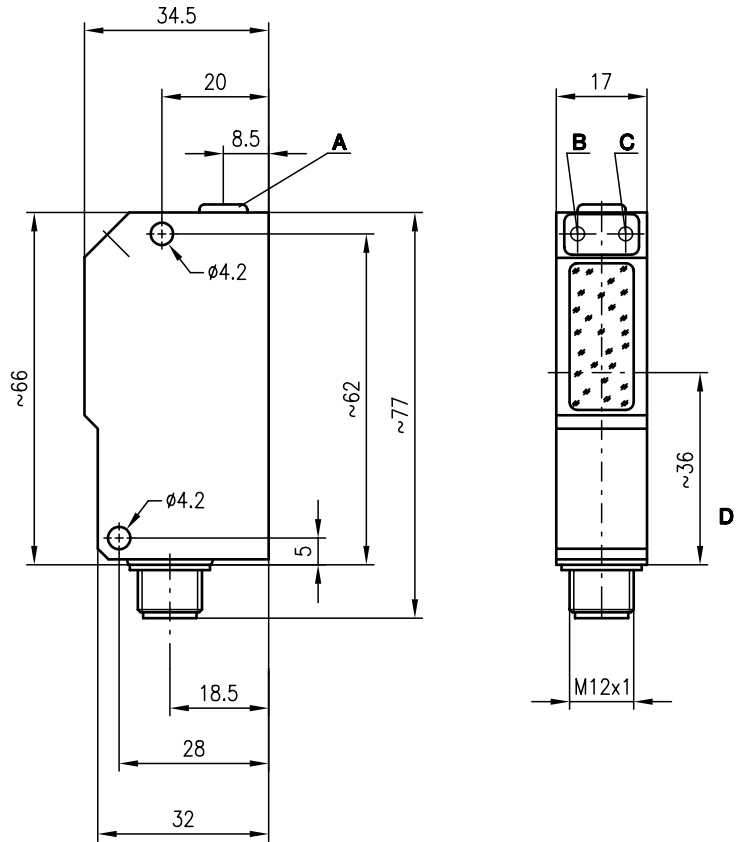


10 ... 400mm



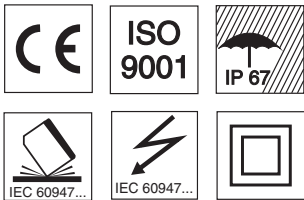
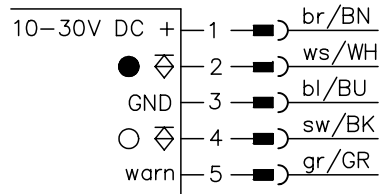
- Energetic scanner with sensitivity adjustment in visible red light or infrared light
- High switching frequency for detection of fast events
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary switching outputs for light/dark switching or as a control function

Dimensioned drawing



- A Scanning range adjustment
- B Switching indicator yellow
- C Operation indicator green
- D Optical axis

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

IRK 95/44-250 L

Infrared light
 10 ... 400mm
 see table
 70 ... 400mm
 LED (modulated light)
 880nm

IRKR 95/44-250 L

Red light
 10 ... 400mm
 see table
 70 ... 400mm
 LED (modulated light)
 660nm

Timing

Switching frequency
 Response time
 Delay before start-up

1000Hz
 0.5ms
 ≤ 100ms

Electrical data

Operating voltage U_B
 Residual ripple
 Bias current
 Switching output
 Function characteristics
 Signal voltage high/low
 Output current

10 ... 30VDC (incl. residual ripple)
 ≤ 15% of U_B
 ≤ 35mA
 2 PNP transistor outputs, complementary
 light/dark switching
 $\geq (U_B - 2V) \leq 2V$
 max. 100mA

Indicators

LED green
 LED yellow
 LED yellow flashing

ready
 reflection
 reflection, no performance reserve

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

diecast zinc
 glass
 90g
 M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage) ³⁾
 Protective circuit ⁴⁾
 VDE safety class ⁵⁾
 Protection class
 Standards applied

-25°C (-30°C) ... +60°C/-40°C ... +70°C
 2, 3
 II, all-insulated
 IP 67
 IEC 60947-5-2

Options

Warning output autoControl warn
 Signal voltage high/low
 Output current

PNP transistor, counting principle
 $\geq (U_B - 2V) \leq 2V$
 max. 100mA

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

Infrared light
 Red light

Designation

IRK 95/44-250 L
 IRKR 95/44-250 L

Part No.

500 25611
 500 25612

Tables

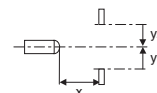
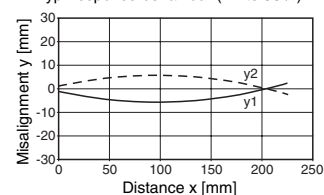
1	10	250	400
2	15	190	250
3	20	160	180

1	white 90%
2	grey 18%
3	black 6%

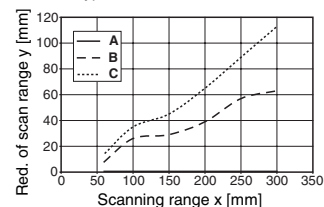
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

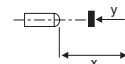
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
B grey 18%
C black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



RKR 95

Energetic diffuse reflection light scanner

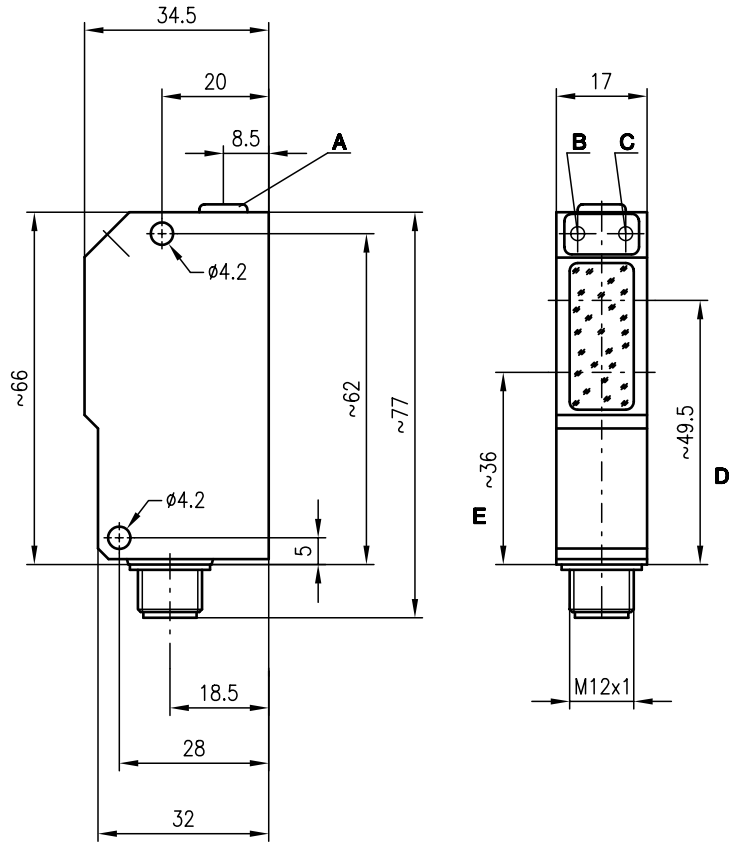


20 ... 900mm



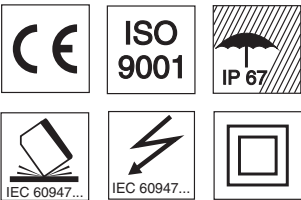
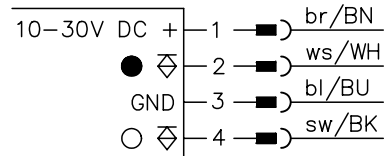
- Energetic scanner with sensitivity adjustment using visible red light for fast and easy alignment
- High switching frequency for detection of fast events
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

Dimensioned drawing



- A Scanning range adjustment
- B Switching indicator yellow
- C Operation indicator green
- D Optical axis receiver
- E Optical axis transmitter

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_c02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	20 ... 900mm
Scanning range ²⁾	see table
Adjustment range	100 ... 900mm
Light source	LED (modulated light)
Wavelength	660nm (red light)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED green	ready
LED yellow	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M 12 connector, stainless steel, 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +60°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250 VAC

Order guide

	Designation	Part No.
Red light	RKR 95/44-600 L	500 34513

Tables

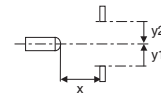
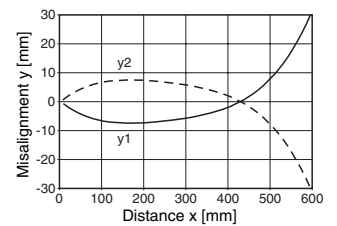
1	20	600	900
2	30	330	420
3	40	220	300

1	white 90%
2	grey 18%
3	black 6%

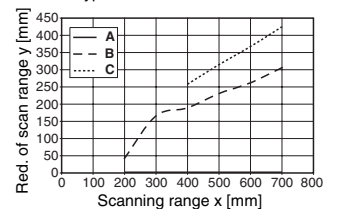
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

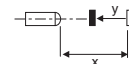
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A** white 90%
- B** grey 18%
- C** black 6%



Remarks

- With the set scanning range, the upper and lower scanning range limits may change depending on the reflection properties of the material surface.

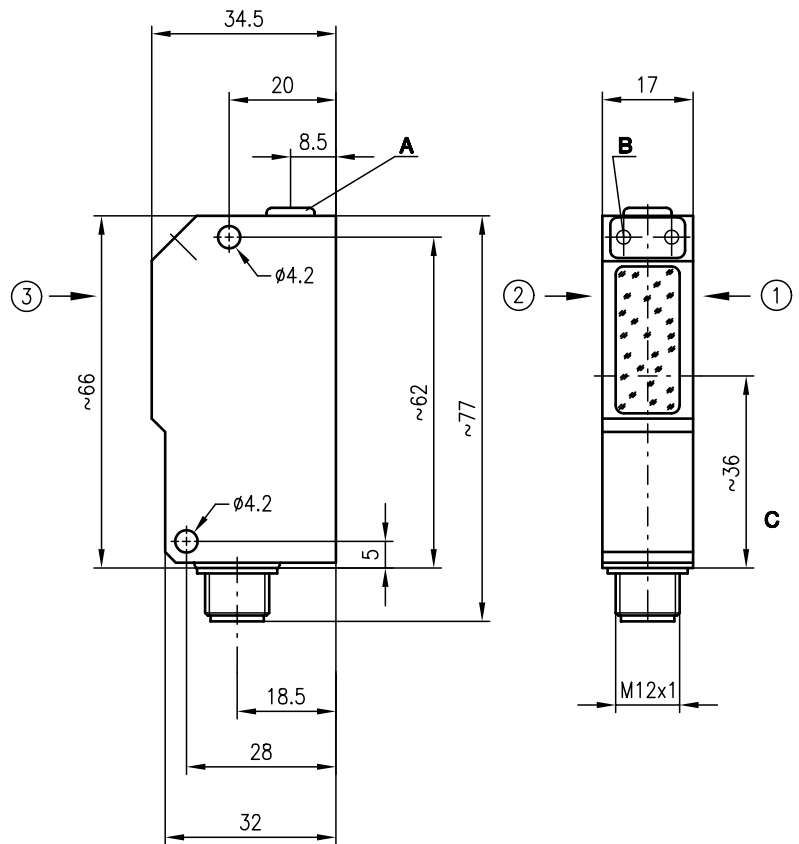


FRKR 95

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Scanning range adjustment
 - B Switching indicator yellow
 - C Optical axis
- Preferred entry direction for objects ① + ② + ③

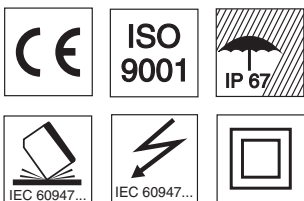
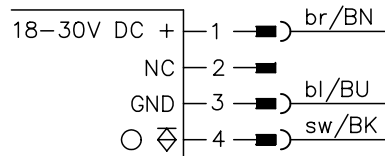


20 ... 200 mm



- Scanner with adjustable background suppression using visible red light for fast and easy alignment
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Mounting holes and M12 connector for fast installation

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_d01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light beam characteristic
 Light source
 Wavelength

FRKR 95/4-130 L

20 ... 200mm
 see table
 50 ... 200mm
 convergent
 LED (modulated light)
 660nm (visible red light)

Timing

Switching frequency 200Hz
 Response time 2.5 ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 18 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output 1 PNP transistor output
 Function characteristics light switching
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

Indicators

LED yellow reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M12 connector, stainless steel, 4-pin

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -30°C ... +70°C
 Protective circuit ³⁾ 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

Designation	Part No.
FRKR 95/4-130 L	500 27994

Tables

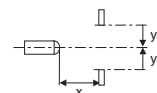
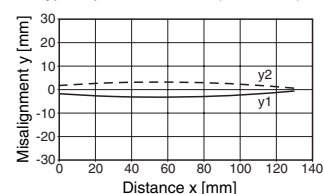
1	15	130	200
2	18	125	187
3	20	113	150

1	white 90%
2	grey 18%
3	black 6%

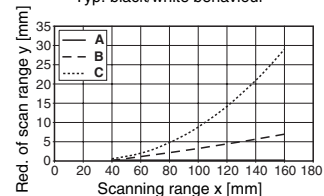
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

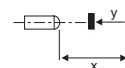
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

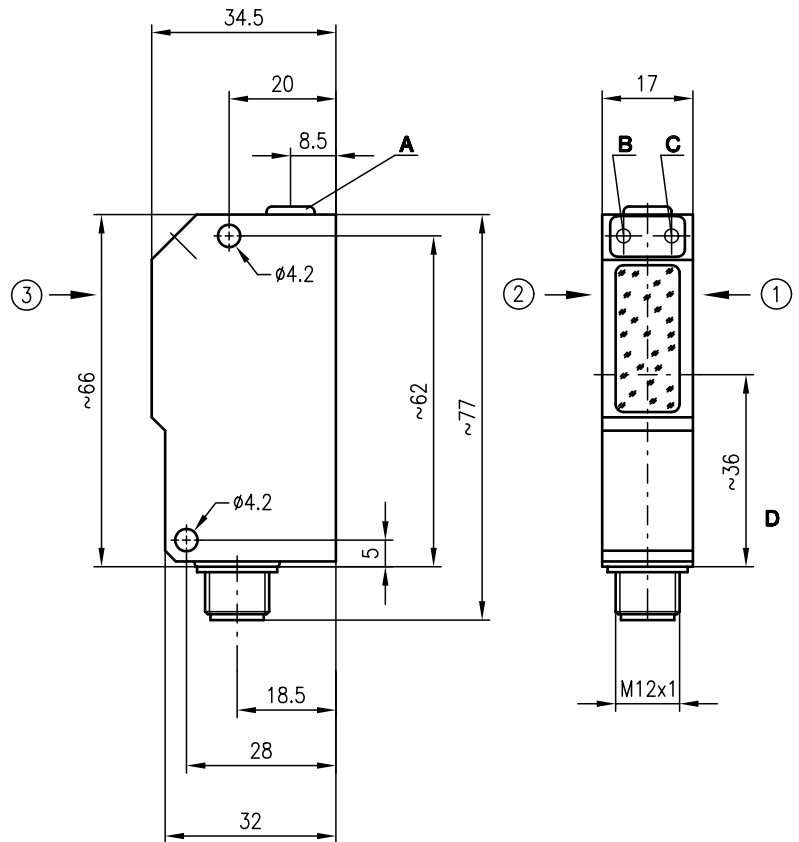


FRK 95

Diffuse reflection light scanner with background suppression



Dimensioned drawing



20 ... 230 mm
20 ... 190 mm

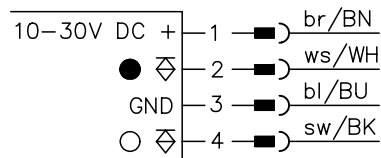


- Scanner with adjustable background suppression in visible red light or infrared light
- Very good black/white performance, exact adjustment via multiturn potentiometer
- High switching frequency for detection of fast events
- Complementary outputs for light/dark switching or as a control function

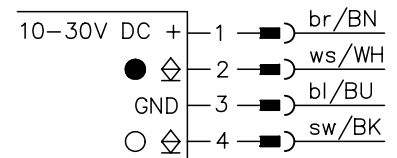
- A** Scanning range adjustment
 - B** Switching indicator yellow
 - C** Operation indicator green
- Preferred entry direction for objects ① + ② + ③

Electrical connection

FRK 95/44-150 L
FRKR 95/44-150 L



FRK 95/22-150 L



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_d02e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light beam characteristic
 Light source
 Wavelength

FRK 95/...-150 L

Infrared light
 20 ... 230mm
 see table
 40 ... 230mm
 divergent
 LED (modulated light)
 880nm

FRKR 95/44-150 L

Red light
 20 ... 190mm
 see table
 40 ... 190mm
 focussed at 110mm
 LED (modulated light)
 660nm

Timing

Switching frequency 1000Hz
 Response time 0.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 35mA
 Switching output
 .../44-...
 .../22-...
 Function characteristics
 Signal voltage high/low
 Output current
 2 PNP transistor outputs, complementary
 2 NPN transistor outputs, complementary
 light/dark switching
 $\geq (U_B - 2V) \leq 2V$
 max. 100mA

Indicators

LED green ready
 LED yellow reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M12 connector, stainless steel, 4-pin

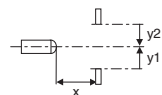
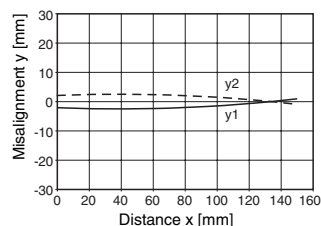
Environmental data

Ambient temp. (operation/storage) ³⁾ -25°C (-30°C) ... +60°C/-40°C ... +70°C
 Protective circuit ⁴⁾ 2, 3
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

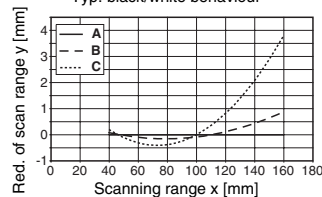
- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Diagrams (FRKR 95...)

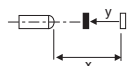
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Order guide

	Designation	Part No.
with PNP switching outputs, infrared light	FRK 95/44-150 L	500 19925
with PNP switching outputs, red light	FRKR 95/44-150 L	500 25610
with NPN switching outputs, infrared light	FRK 95/22-150 L	500 22794

Tables

FRK 95

1	12	150	230
2	15	143	200
3	20	136	170

FRKR 95

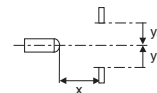
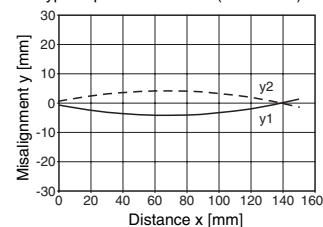
1	12	150	190
2	15	149	185
3	20	146	175

1	white 90%
2	grey 18%
3	black 6%

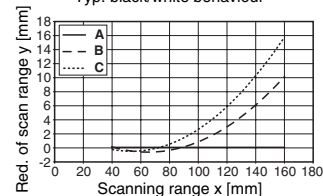
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams (FRKR 95...)

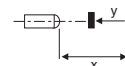
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.
- The diffuse reflection light scanner using visible red light is also available with integrated AS-i chip for direct connection to the AS-i system.



FRK(R) 95

Diffuse reflection light scanner with background suppression

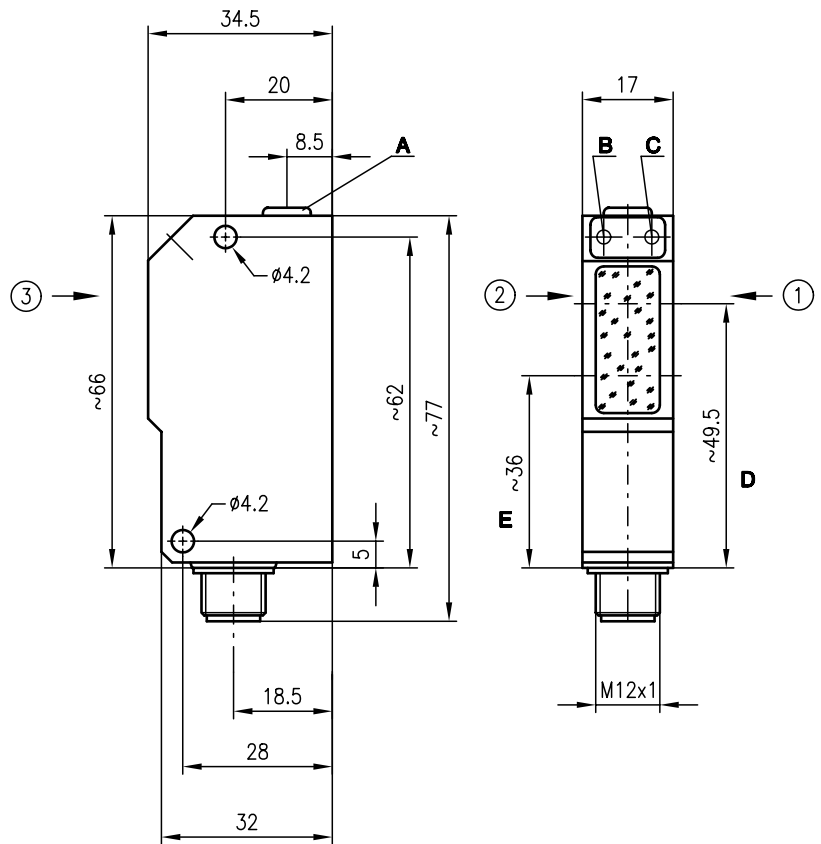


20 ... 500mm



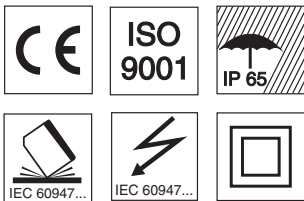
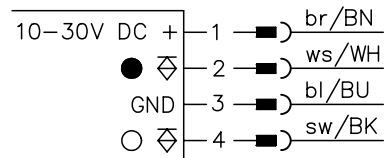
- Scanner with adjustable background suppression using visible red light for fast and easy alignment
- Scanner with adjustable background suppression using infrared light for inclined and/or shiny surfaces
- Very good black/white performance, exact adjustment via multiturn potentiometer
- High switching frequency for detection of fast events

Dimensioned drawing



- A Scanning range adjustment
 - B Switching indicator yellow
 - C Operation indicator green
 - D Optical axis receiver
 - E Optical axis transmitter
- Preferred entry direction for objects ① + ② + ③

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_d05e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light beam characteristic
 Light source
 Wavelength

FRKR 95/44-350 L

20 ... 500mm
 see table
 60 ... 500mm
 focussed
 LED (modulated light)
 660nm (red light)

FRK 95/44-350 L

880nm (infrared light)

Timing

Switching frequency 1000Hz
 Response time 0.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 35mA
 Switching output 2 PNP transistor outputs, complementary
 Function characteristics light/dark switching
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current max. 100mA

Indicators

LED green ready
 LED yellow reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M 12 connector, stainless steel, 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾ 25°C (-30°C) ... +60°C/-40°C ... +70°C
 Protective circuit ⁴⁾ 2, 3
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250 VAC

Order guide

	Designation	Part No.
Red light	FRKR 95/44-350 L	500 34514
Infrared light	FRK 95/44-350 L	500 34515

Tables

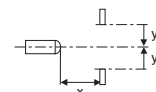
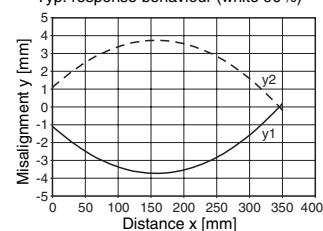
1	5	350	500
2	20	328	440
3	25	300	350

1	white 90%
2	grey 18%
3	black 6%

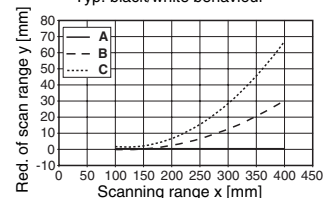
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

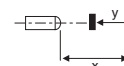
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
B grey 18%
C black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

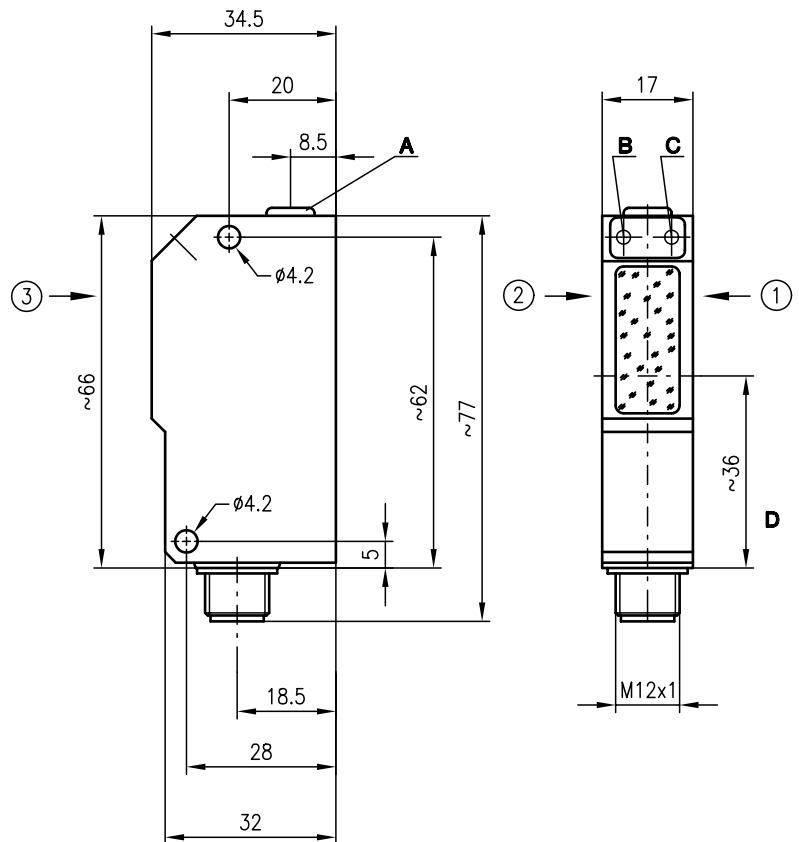


FRKR 95

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Scanning range adjustment
 - B Switching indicator yellow
 - C Operation indicator green
 - D Optical axis
- Preferred entry direction for objects ① + ② + ③

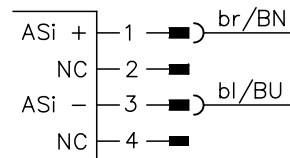


20 ... 190mm



- Scanner with adjustable background suppression and integrated AS-i slave
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Visible red light for fast and easy alignment
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 95_d03e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light beam characteristic
 Light source
 Wavelength

FRKR 95/A-150 L

20 ... 190mm
 see table
 40 ... 190mm
 focussed at 110mm
 LED (modulated light)
 660nm (visible red light)

Timing

Sensor switching frequency 1000Hz
 Sensor response time 0.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 26.5 V ... 31.6 V (according to AS-i specification)
 Bias current ≤ 35mA

Indicators

LED green ready
 LED yellow reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 90g
 Connection type M12 connector, stainless steel

Environmental data

Ambient temp. (operation/storage) ³⁾ -25°C (-30°C) ... +60°C/-40°C ... +70°C
 Protective circuit ⁴⁾ 1, 4
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

AS-i data

I/O code 1
 ID code 1
 Address programmed by the user in the range of 1 to 31 (default=0)
 Cycle time acc. to AS-i specification 5ms
 AS-i standard according to profile S-1.1

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection	input			1	parameter
D ₁	NC	∅	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1	input			1 light switching	parameter
D ₂	ready output	∅ sensor not ready	system input	*P ₂	NC	∅	system parameter
		1 sensor ready	input			1	parameter
*D ₃	activation input	∅ transmitter on	system output	*P ₃	NC	∅	system parameter
		1 transmitter off	output			1	parameter

* default = 1

Order guide

Designation	Part No.
FRKR 95/A-150 L	500 27096

Tables

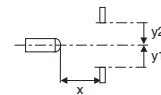
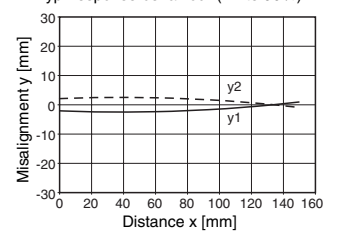
1	12	150	190
2	15	149	185
3	20	146	175

1	white 90%
2	grey 18%
3	black 6%

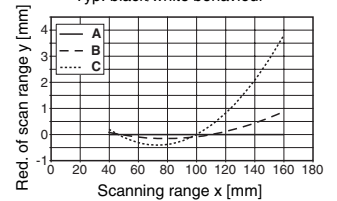
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

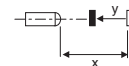
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
B grey 18%
C black 6%



Remarks

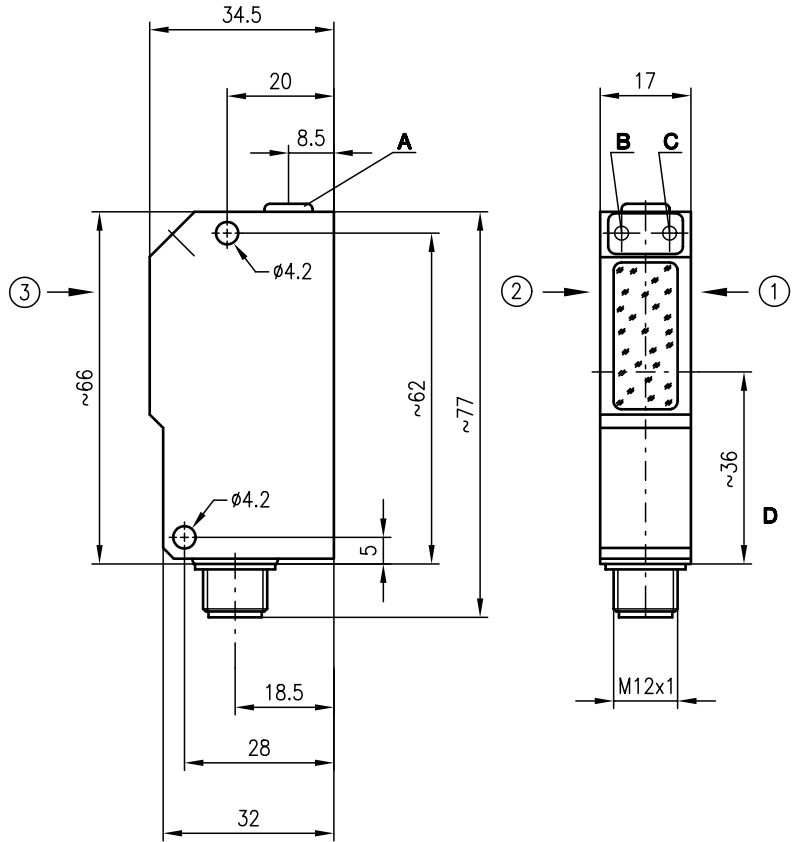


VRKR 95

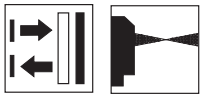
Diffuse reflection light scanner with foreground suppression



Dimensioned drawing



- A Scanning range adjustment
 - B Switching indicator yellow
 - C Operation indicator green
 - D Optical axis
- Preferred entry direction for objects ① + ② + ③



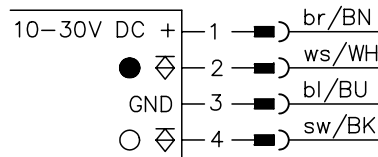
0 ... 150m

10 - 30 V
DC

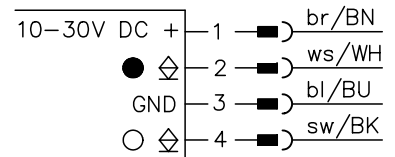
- Scanner with adjustable foreground suppression using visible red light for fast and easy alignment
- Very good black/white performance, exact adjustment via multiturn potentiometer
- High switching frequency for detection of fast events
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Mounting holes and M12 connector for fast installation

Electrical connection

VRKR 95/44-150 L



VRKR 95/22-150 L

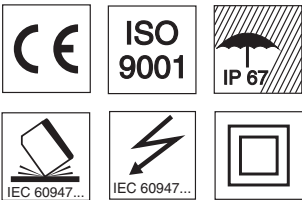


Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 95_d04e.fm





Specifications

Optical data

Typ. scanning range limit (white 90%)	0 ... 150mm
Adjustment range	40 ... 150mm
Light beam characteristic	focussed at 110mm
Light source	LED (modulated light)
Wavelength	660nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 100mA

Indicators

LED green	ready
LED yellow	reflection

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M 12 connector, stainless steel, 4-pin

Environmental data

Ambient temp. (operation/storage) ¹⁾	-25°C (-30°C) ... +60°C/-40°C ... +70°C
Protective circuit ²⁾	2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) -30°C with operating voltage continuously applied

2) 2=polarity reversal protection, 3=short-circuit protection for all outputs

3) Rating voltage 250VAC

Order guide

Designation	Part No.
VRKR 95/22-150 L	500 33201
VRKR 95/44-150 L	500 25613

Tables

Remarks

Scanning range calibration on existing background

- The scanner is adjusted to the background using the light spot. The prescribed distance of 150mm may not be exceeded.
- The adjustment screw (10-turn potentiometer) is completely turned out. The yellow LED must be off.
- The adjustment screw is turned back until the yellow LED illuminates.
- As a check, the object to be scanned is placed in the beam. The yellow LED may not illuminate over the entire range from 0mm to the reference surface.

Attention!

When operating the scanner with the minimum scanning range setting (10-turn potentiometer), operation within the given specifications cannot be guaranteed.



VRKR 95 Diffuse reflection light scanner with foreground suppression

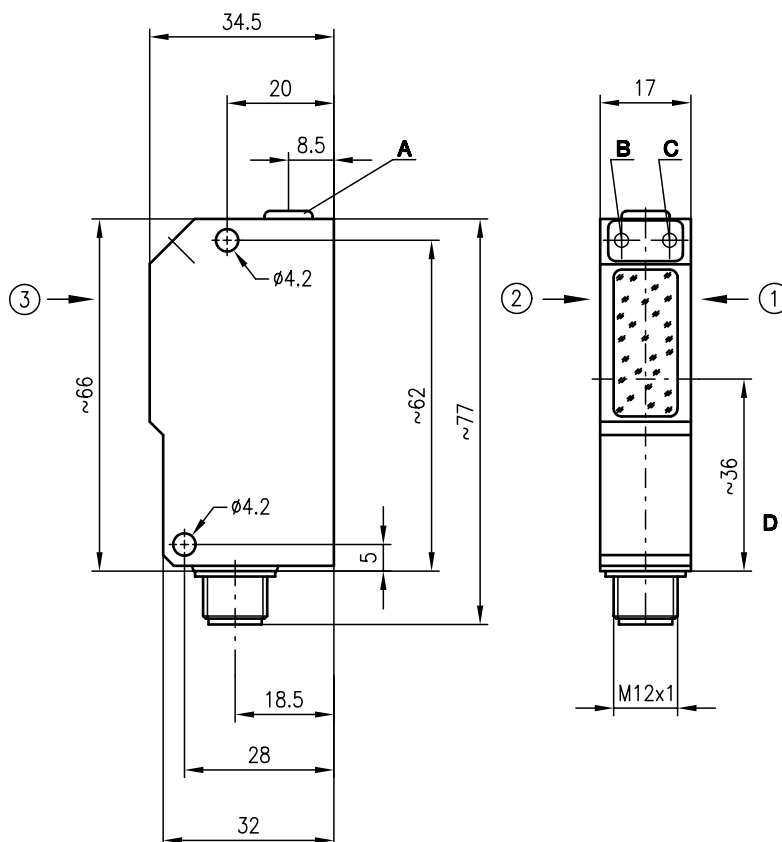


0 ... 150mm



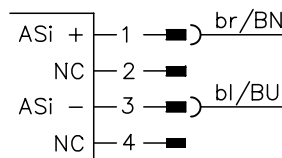
- Scanner with adjustable foreground suppression and integrated AS-i slave
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Visible red light for fast and easy alignment

Dimensioned drawing



- A** Scanning range adjustment
 - B** Switching indicator yellow
 - C** Operation indicator green
 - D** Optical axis
- Preferred entry direction for objects ① + ② + ③

Electrical connection



Accessories:

(available separately • see page 258)

- Mounting systems (BT 95, UMS 1)
- M 12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 95_d07e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%)	0 ... 150mm
Adjustment range	40 ... 150mm
Light beam characteristic	focussed at 110mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 35mA

Indicators

LED green	ready
LED yellow	reflection

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	90g
Connection type	M 12 connector, stainless steel

Environmental data

Ambient temp. (operation/storage) ¹⁾	25°C (-30°C) ... +60°C/-40°C ... +70°C
Protective circuit ²⁾	1, 4
VDE safety class ³⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

1) -30°C with operating voltage continuously applied

2) 1=transient protection, 4=interference blanking

3) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection	input			1	parameter
D ₁	NC	∅	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1	input			1 light switching	parameter
D ₂	ready output	∅ sensor not ready	system input	*P ₂	NC	∅	system parameter
		1 sensor ready	input			1	parameter
*D ₃	activation input	∅ transmitter on	system output	*P ₃	NC	∅	system parameter
		1 transmitter off	output			1	parameter

* default = 1

Order guide

Designation	Part No.
VRKR 95/A-150 L	500 33687

Tables

Remarks

Scanning range calibration on existing background

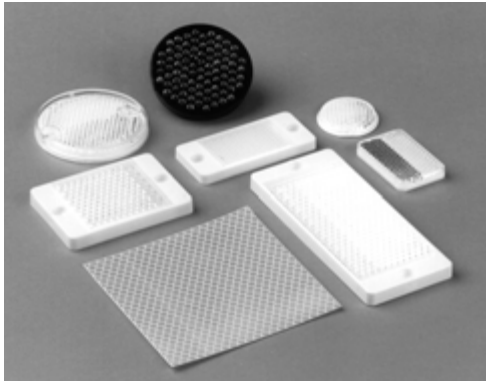
- The scanner is adjusted to the background using the light spot. The prescribed distance of 150mm may not be exceeded.
- The adjustment screw (10-turn potentiometer) is completely turned out. The yellow LED must be off.
- The adjustment screw is turned back until the yellow LED illuminates.
- As a check, the object to be scanned is placed in the beam. The yellow LED may not illuminate over the entire range from 0mm to the reference surface.

Attention!

When operating the scanner with the minimum scanning range setting (10-turn potentiometer), operation within the given specifications cannot be guaranteed.



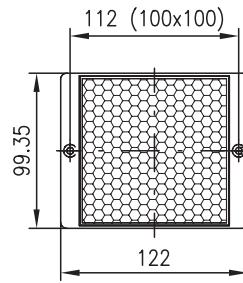
Reflectors



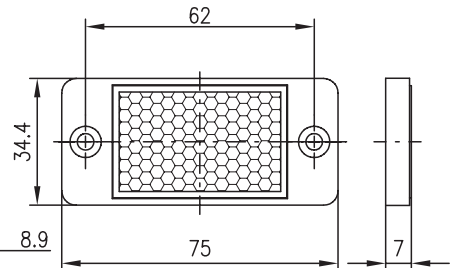
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

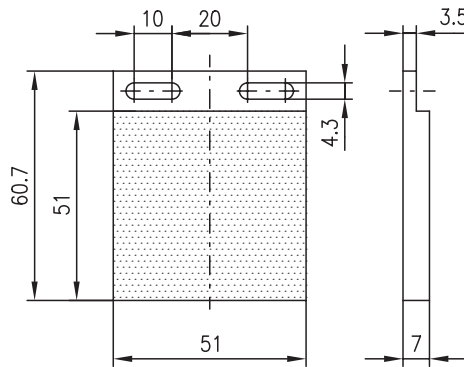
TKS 100 x 100



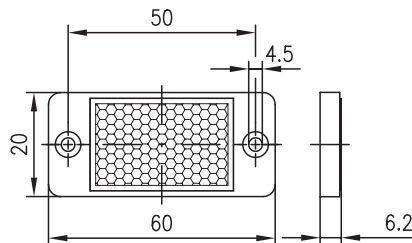
TKS 30 x 50



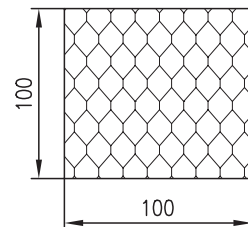
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

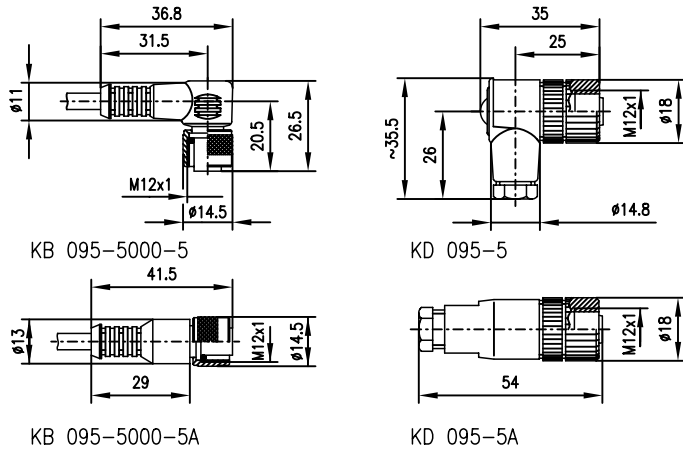


Additional information in section "Accessories" from page 925 onwards!

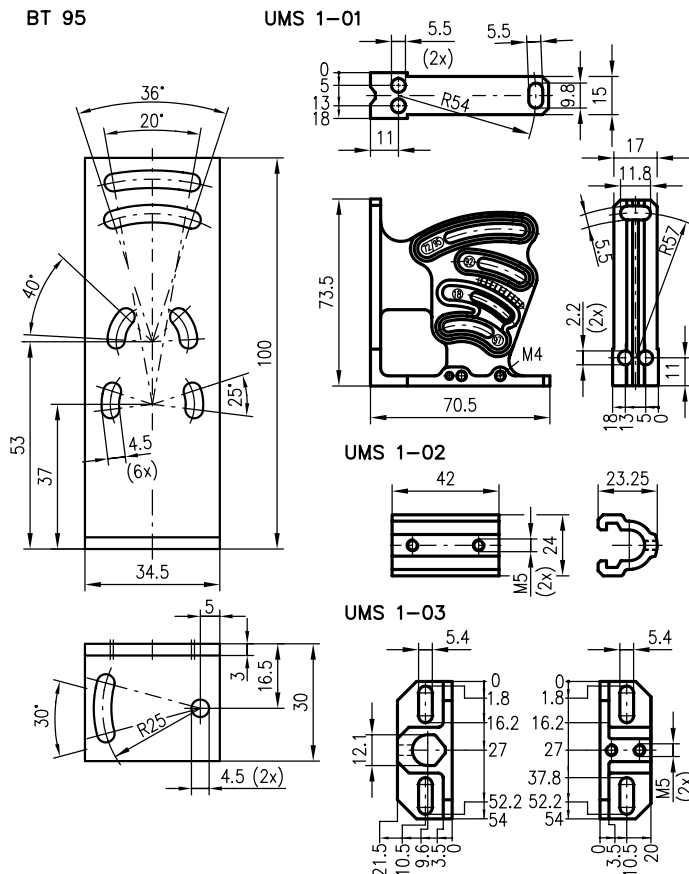
We reserve the right to make changes • 95_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 418-5000-3	500 23545
KB 418-5000-3A	500 23544
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 95	500 20833
UMS 1-01	500 22281
UMS 1-02	500 22282
UMS 1-03	500 22283
UMS 96-95	500 80334

Dimensioned drawings

Selection table

M12 connectors			
with cable (5m cable length)		without cable	
KB 095-5000-3	KB 095-5000-3A	KD 095-5	KD 095-5A
KB 095-5000-5	KB 095-5000-5A		

Dimensioned drawings

Connectors, plugs, cables


Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices.

Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: 4 connectors with ready-made 5m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

Mounting systems

BT 95



UMS 1-01, UMS 1-02, UMS 1-03



UMS 96-95





97 Series

Overview and advantages



Small sensor series in robust metal housing with glass cover



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression



10 ... 30VDC voltage with PNP- (NPN) transistor output



Connection via M12 connector, standard plug or cable








Options:

- Activation input for function testing or interlinking a number of sensors





Operating principle	Designation		Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage		Output		
				Diecast zinc		Red light	Infrared	10 ... 30VDC	AS-i system	PNP transistor	NPN transistor	AS-interface
	LSR 97/2 L	•	0 ... 9m	•		•		•			•	
	LSR 97/4 L	•	0 ... 9m	•		•		•		•		
	LS 97/4 L.2	•	0 ... 6m	•			•	•		•		
	LS 97/4 S.1	•	0 ... 9m	•			•	•		•		
	LS 97/4.8.1		0 ... 9m	•			•	•		•		
	RK 97/4 DS	•	0.1 ... 6.0m	•			•	•		•		
	RK 97/4 S	•	0.1 ... 6.0m	•			•	•		•		
	PRK 97/4 S	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/4 DS.1	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/2 L	•	0.1 ... 6.0m	•		•		•			•	
	PRK 97/4 L	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/4.8 L	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/4		0.1 ... 6.0m	•		•		•		•		
	PRK 97/4 L.1	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/4 DL	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/44 L	•	0.1 ... 6.0m	•		•		•		•		
	PRK 97/4 DS	•	0.1 ... 6.0m	•		•		•		•		
		RK 97/2-80 S	•	2 ... 100mm	•			•	•			•
RK 97/4-80 S		•	2 ... 100mm	•			•	•		•		
RK 97/4.8-80			2 ... 100mm	•			•	•		•		
RKR 97/4-150 L		•	2 ... 200mm	•		•		•		•		
	FRKR 97/2-100 L	•	2 ... 150mm	•		•		•			•	
	FRKR 97/4-100 L	•	2 ... 150mm	•		•		•		•		



Switching frequency	Switching		Connection			Options					Page
	Light	Dark	M12 connector	Plug	Cable 2m	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Focussed light beam	
200Hz	•		•								265
200Hz	•		•								265
200Hz	•		•						•		265
200Hz	•			•							265
200Hz	•				•			•			265
200Hz		•		•							267
200Hz	•			•							267
200Hz	•			•		•					269
200Hz		•		•		•					269
200Hz	•		•			•					269
200Hz	•		•			•					269
200Hz	•		•			•		•			269
200Hz	•			•	•	•					269
200Hz		•	•			•					269
200Hz	•	•	•			•					269
200Hz		•		•		•					269
200Hz	•			•							271
200Hz	•			•							271
200Hz	•				•			•			271
200Hz	•		•						•	•	271
200Hz	•		•				•		•	•	273
200Hz	•		•				•		•	•	273



LS 97

Throughbeam photoelectric sensors

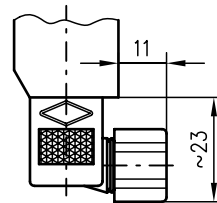
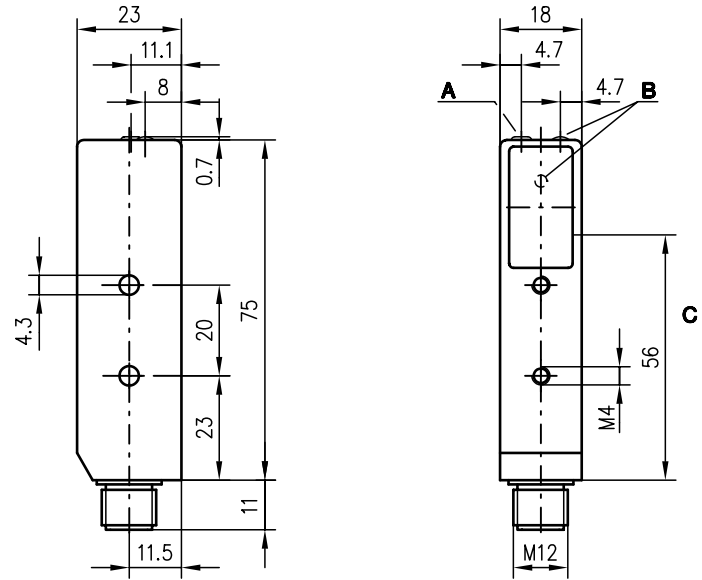


9m

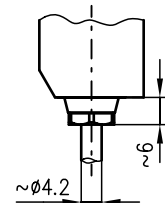
10 - 30 V
DC

- Throughbeam photoelectric sensor with infrared light or visible red light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Connection via M12 connector, plug or cable
- Activation input for testing and interlinking
- Additional indicator diode on the front part (for exact alignment)

Dimensioned drawing



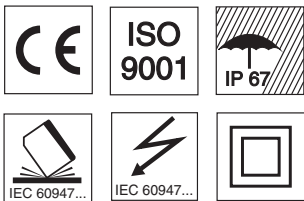
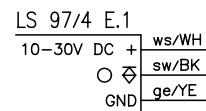
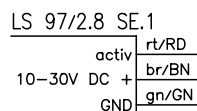
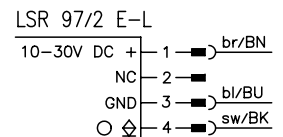
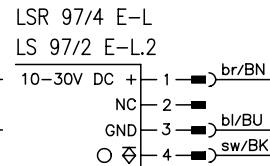
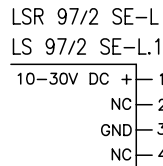
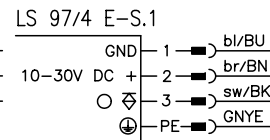
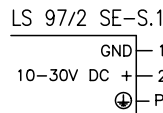
LS 97/2 SE-S.1
LS 97/4 E-S.1



LS 97/2.8 SE.1
LS 97/4 E.1

- A Sensitivity adjustment (only for LS 97/4 E-L.2)
- B Indicator diode
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 274)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- Diaphragm (BL 97.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 97_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

LS 97...

0 ... 9m
 0 ... 5m
 LED (modulated light)
 880nm (infrared)/660nm (visible red light)

LS 97/4 L.2

0 ... 6m
 0 ... 3.5m

Timing

Switching frequency
 Response time
 Delay before start-up

200Hz
 2.5ms
 ≤ 100ms

Electrical data

Operating voltage U_B
 Residual ripple
 Bias current
 Switching output
 Function characteristics
 Signal voltage high/low
 Output current
 Sensitivity

10 ... 30VDC (incl. residual ripple)
 ≤ 15% of U_B
 ≤ 40mA
 PNP or NPN transistor output
 light switching
 ≥ ($U_B - 2V$) / ≤ 2V
 max. 100mA

adjustable with
 12-turn potentiometer

Indicators

LED yellow
 LED yellow flashing

light path free
 light path free, no performance reserve

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

diecast zinc
 glass
 85g
 M12 connector 4-pin, stainless steel,
 connector 4-pin or cable 2m (cross section 3x0.25mm²)

Environmental data

Ambient temp. (operation/storage)
 Protective circuit ³⁾
 VDE safety class ⁴⁾

-20°C ... +60°C / -30°C ... +70°C
 2, 3
 I (for S types)
 II, all-insulated (for all L and cable types)
 IP 67/IP 65 (for all S types)
 IEC 60947-5-2

Protection class
 Standards applied

Options

Activation input active
 Transmitter active/not active

≥ 8V / ≤ 2V or not connected

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Tables

LS 97...

0	5	9
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Operating range [m]
 Typ. operating range limit [m]

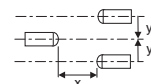
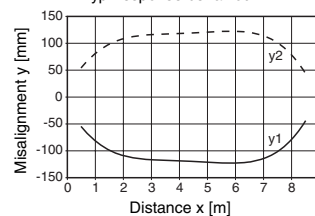
LS 97/4 L.2

0	3.5	6
---	-----	---

Operating range [m]
 Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Order guide

Selection table		Order code →						
Equipment ↓		LSR 97/2 L Part No. 500 29648 (Tr) Part No. 500 29647 (Re)	LS 97/4 S.1 Part No. 500 29651 (Tr) Part No. 500 29655 (Re)	LSR 97/4 L Part No. 500 29648 (Tr) Part No. 500 29649 (Re)	LS 97/4 L.2 Part No. 500 29650 (Tr) Part No. 500 29654 (Re)	LS 97/4.8.1 Part No. 500 29652 (Tr) Part No. 500 29653 (Re)		
Switching output	PNP transistor		●	●	●	●		
	NPN transistor	●						
Light source	red light	●		●				
	infrared light		●		●	●		
Connection	M12 connector	●		●	●			
	cable					●		
	plug		●					
Features	sensitivity adjustment				●			
	activation input					●		

Remarks

- The S types are shipped with connectors.



RK 97

Retro-reflective photoelectric sensors

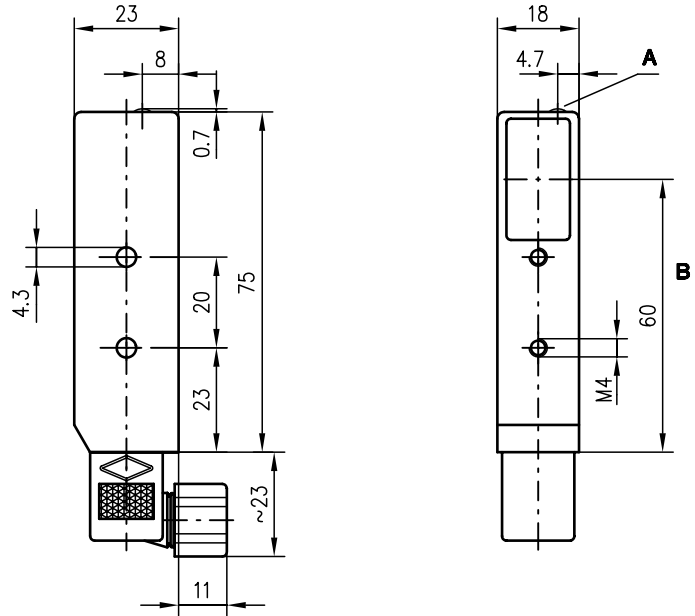


0.1 ... 6m



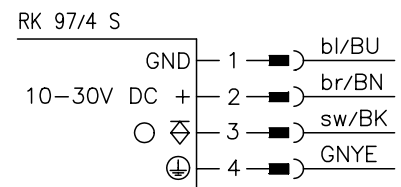
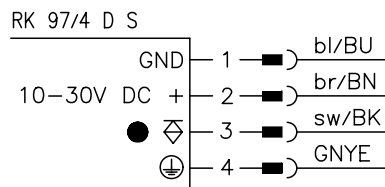
- Retro-reflective photoelectric sensors with infrared light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Connection via plug

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection



Accessories:

(available separately • see page 274)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- Diaphragm (BL 97.1)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 97_b01e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 6m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	85g
Connection type	connector 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class	I
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.1 ... 4m
2	MTK(S) 50x50	0.1 ... 3m
3	TK(S) 30x50	0.1 ... 1.7m
4	TK(S) 20x40	0.1 ... 1.5m
5	Tape 2 100x100	0.15 ... 1.4m

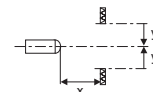
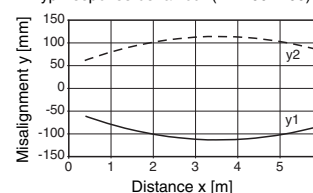
1	0.1		4	6
2	0.1		3	4.5
3	0.1	1.7	2.6	
4	0.1	1.5	2.4	
5	0.15	1.4	2.4	

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

	Designation	Part No.
light switching	RK 97/4 S	500 00556
dark switching	RK 97/4 DS	500 00557

Remarks

- The devices are shipped with connectors.



PRK 97

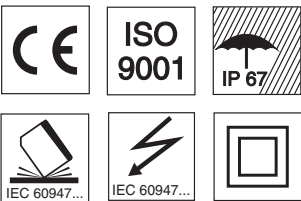
Retro-reflective photoelectric sensors with polarisation filter



0.1 ... 6m



- Polarised retro-reflective photoelectric sensors with visible red light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Adjustable sensitivity with high resolution allows detection of transparent objects
- Connection via M12 connector, plug or cable
- Activation input for testing and interlinking

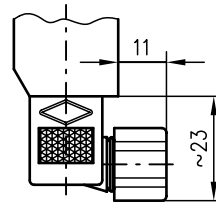
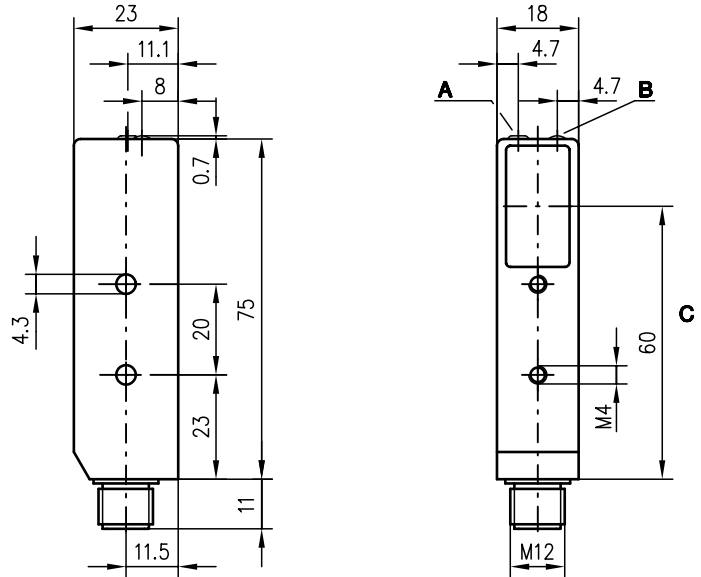


Accessories:

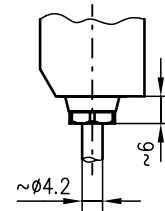
(available separately • see page 274)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- Diaphragm (BL 97.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Dimensioned drawing



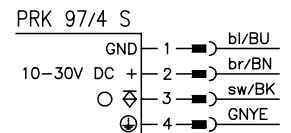
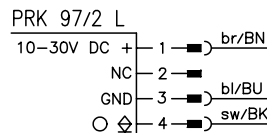
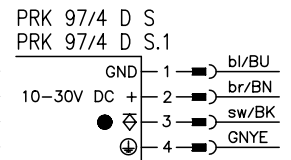
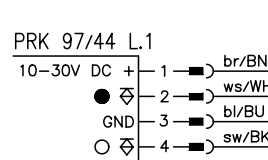
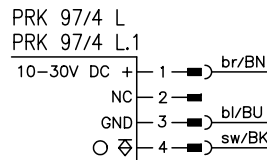
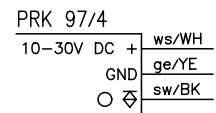
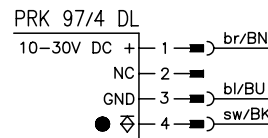
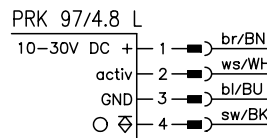
PRK 97/4 D S.1
PRK 97/4 S



PRK 97/4

- A** Sensitivity adjustment (only PRK 97/4 L.1)
- B** Indicator diode
- C** Optical axis

Electrical connection



We reserve the right to make changes • 97_b02e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 6m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 30mA
Switching output	PNP or NPN transistor output
Function characteristics	light/dark switching (PRK 97/44 L with complementary outputs)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 12-turn potentiometer for PRK 97/4 L.1

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	85g
Connection type	M 12 connector 4-pin, stainless steel, connector 4-pin or cable 2m (cross section 3x0.25mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	I (for S types) II, all-insulated (for all L and cable types)
Protection class	IP 67/IP 65 (for all S types)
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	≥ 8V/≤ 2V or not connected

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 VAC

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.1 ... 4m
2	MTK(S) 50x50	0.1 ... 3m
3	TK(S) 30x50	0.1 ... 1.7m
4	TK(S) 20x40	0.1 ... 1.4m
5	Tape 2 100x100	0.15 ... 1.4m

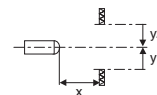
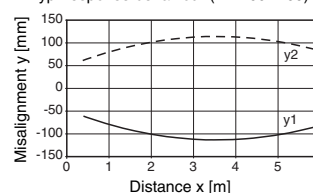
1	0.1	4	6
2	0.1	3	4.5
3	0.1	1.7	2.6
4	0.1	1.4	2.1
5	0.15	1.4	2.4

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

Selection table		Order code →									
Equipment ↓		PRK 97/4.8 L Part No. 500 80474	PRK 97/4 L Part No. 500 19663	PRK 97/4 S Part No. 500 17092	PRK 97/4 DS.1 Part No. 500 25686	PRK 97/4 DL Part No. 500 29642	PRK 97/4 Part No. 500 80994	PRK 97/4 L.1 Part No. 500 25324	PRK 97/2 L Part No. 500 29641	PRK 97/44 L Part No. 500 35301	PRK 97/4 DS Part No. 500 81305
Switching output	PNP transistor	●	●	●	●	●	●	●		●	●
	NPN transistor								●		
Switching	light switching	●	●	●		●	●	●			
	dark switching				●	●					●
	compl. switch. outputs									●	
Connection	M 12 connector	●	●			●		●	●	●	
	cable			●	●						●
	plug						●				
Features	activation input	●									
	sensitivity							●			

Remarks

- PRK 97/4 S and PRK 97/4 DS are shipped with cable connector.



RK(R) 97

Energetic diffuse reflection light scanner

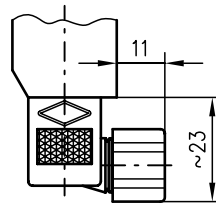
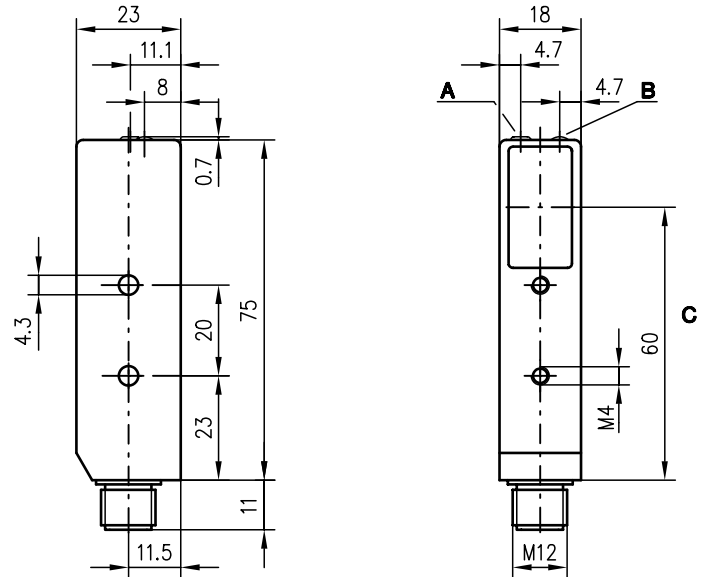


2 ... 100mm
2 ... 200mm

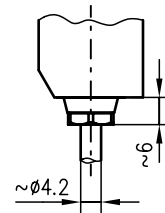


- Energetic scanner with sensitivity adjustment in visible red light or fixed scanning range with infrared light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Adjustable sensitivity with high resolution allows optimal adaptation to applications
- Connection via M12 connector, plug or cable
- Activation input for testing and interlinking

Dimensioned drawing



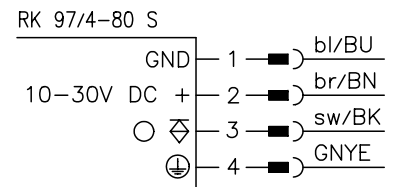
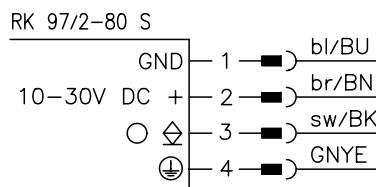
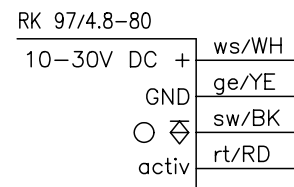
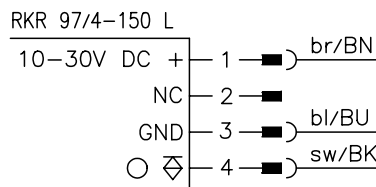
RK 97/4-80 S
RK 97/2-80 S



RK 97/4.8-80

- A** Sensitivity adjustment (only PRK 97/4 150 L)
- B** Indicator diode
- C** Optical axis

Electrical connection



Accessories:

(available separately • see page 274)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 97_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

RK 97/...

2 ... 100mm
 2 ... 80mm
 LED (modulated light)
 880nm

RKR 97/...

2 ... 200mm
 2 ... 150mm
 60 ... 200mm
 LED (modulated light)
 660nm (visible red light)

Timing

Switching frequency
 Response time
 Delay before start-up

200Hz
 2.5ms
 ≤ 100ms

Electrical data

Operating voltage U_B
 Residual ripple
 Bias current
 Switching output
 Function characteristics
 Signal voltage high/low
 Output current
 Sensitivity

10 ... 30VDC (incl. residual ripple)
 ≤ 15% of U_B
 ≤ 30mA
 PNP or NPN transistor output
 light switching
 $\geq (U_B - 2V) / \leq 2V$
 max. 100mA

adjustable via
 12-turn potentiometer

Indicators

LED yellow

light path free

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

diecast zinc
 glass
 85g
 M12 connector 4-pin, stainless steel,
 connector 4-pin or cable 2m (cross section 4x0.38mm²)

Environmental data

Ambient temp. (operation/storage)
 Protective circuit ³⁾
 VDE safety class ⁴⁾

-20°C ... +60°C / -30°C ... +70°C
 2, 3
 I (for S types)
 II, all-insulated (for all L and cable types)
 IP 67/IP 65 (for all S types)
 IEC 60947-5-2

Protection class
 Standards applied

Options

Activation input active
 Transmitter active/not active $\geq 8V / \leq 2V$ or not connected

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Tables

RK 97...

1	2	80	100
2	8	60	80
3	12	50	70

1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

RKR 97...

1	2	150	200
2	20	110	140
3	30	90	100

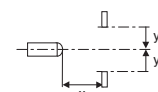
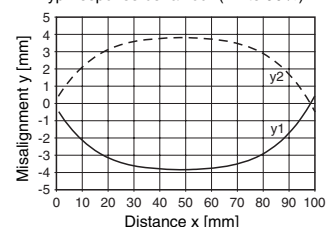
1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

RK 97...

Typ. response behaviour (white 90%)



Order guide

Selection table		Order code →	RKR 97/4-150 L Part No. 500 29644	RK 97/4-80 S Part No. 500 00558	RK 97/4-8-80 Part No. 500 06884	RK 97/2-80 S Part No. 500 06572							
Equipment ↓	Switching output	PNP transistor	●	●	●								
		NPN transistor				●							
Light source	red light		●										
	infrared light			●	●	●							
Connection	M12 connector		●										
	cable				●	●							
	plug			●									
Features	sensitivity adjustment		●										
	activation input				●								

Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.
- The S types are shipped with connectors.



FRKR 97

Diffuse reflection light scanner with background suppression

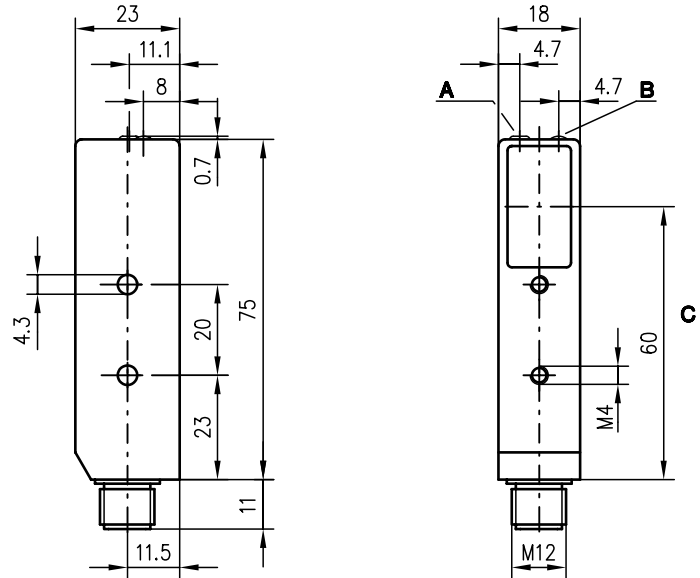


2 ... 150mm



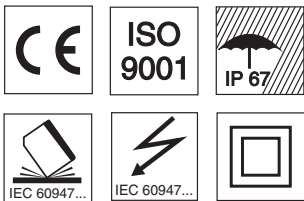
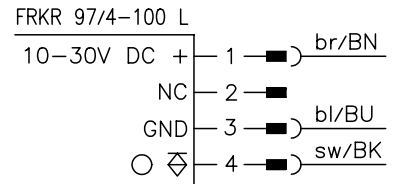
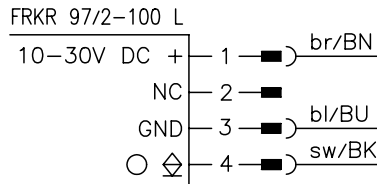
- Scanner with adjustable background suppression
- Visible red light for fast and easy alignment
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Small construction with glass cover and robust metal housing for protection against environmental influences

Dimensioned drawing



- A Scanning range adjustment
- B Indicator diode
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 274)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 97_d01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	2 ... 150mm
Scanning range ²⁾	2 ... 100mm
Adjustment range	30 ... 150mm
Light beam characteristic	focussed at 80mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP or NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	85g
Connection type	M12 connector, 4-pin, stainless steel

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Tables

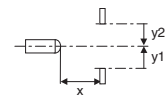
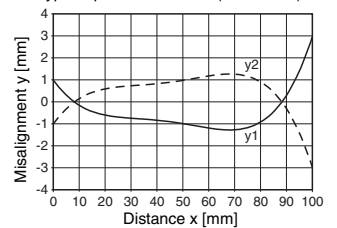
1	2	100	150
2	4	98	135
3	9	93	120

1	white 90%
2	grey 18%
3	black 6%

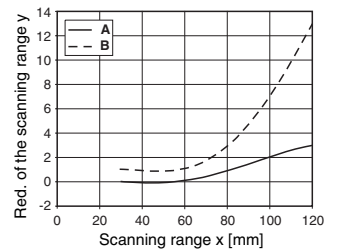
- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams

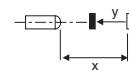
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A** grey 18%
- B** black 6%

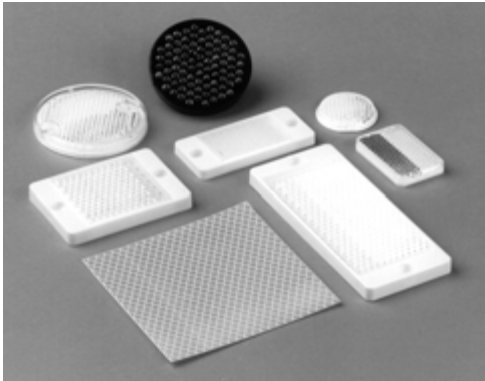


Order guide

	Designation	Part No.
PNP transistor output	FRKR 97/4-100 L	500 29646
NPN transistor output	FRKR 97/2-100 L	500 29645

Remarks

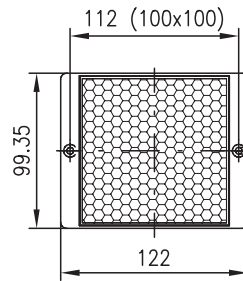
- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Reflectors


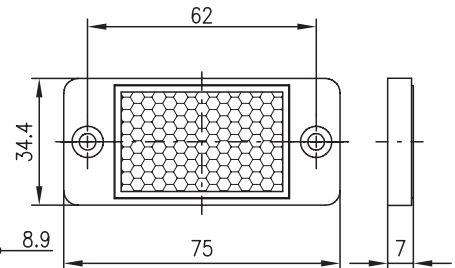
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

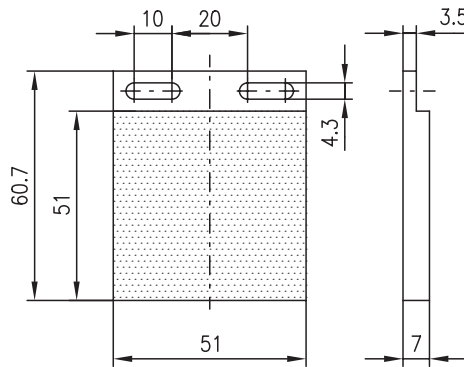
TKS 100 x 100



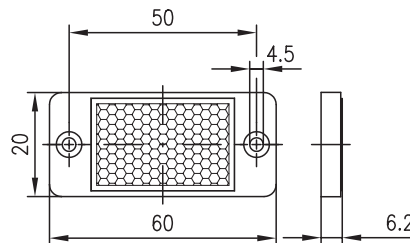
TKS 30 x 50



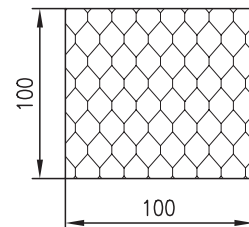
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

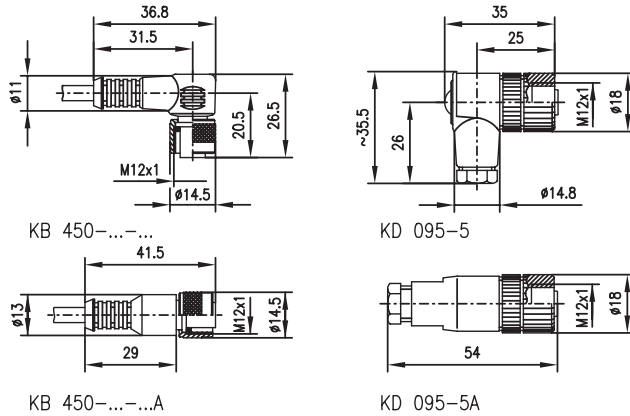


Additional information in section "Accessories" from page 925 onwards!

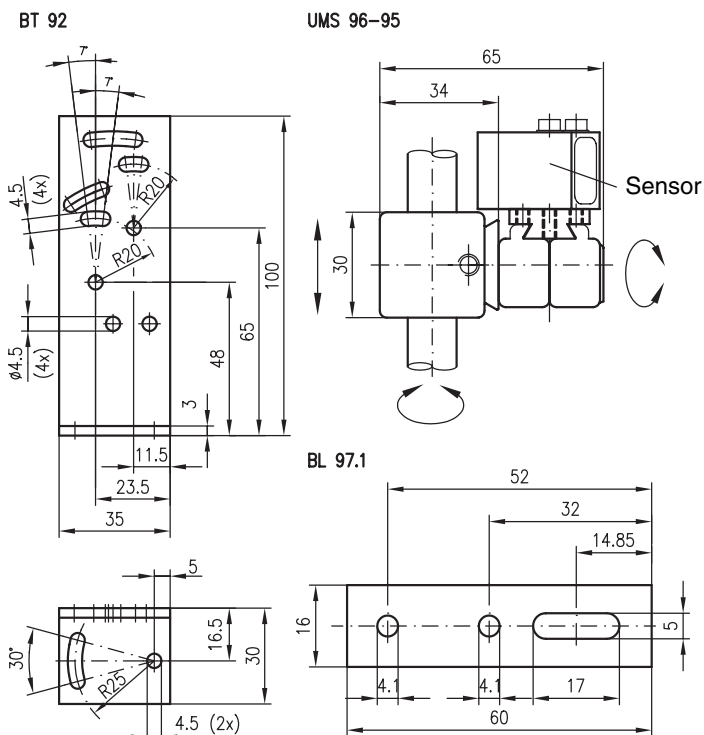
We reserve the right to make changes • 97_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
BT 92	500 18415
UMS 96-95	500 80334

Dimensioned drawings

Selection table

Ready-made cables		
KB 097-2000-4 (2m)	KB 097-6000-4 (6m)	KB 097-12000-4 (12m)
M12 connectors		
 with 4-wire cable		 without cable
2m cable length		KD 095-5 KD 095-5A
KB 450-2000-4	KB 450-2000-4A	
5m cable length		
KB 450-5000-4	KB 450-5000-4A	
Cable length 10m		
KB 450-10000-4	KB 450-10000-4A	

Dimensioned drawings

Connectors, plugs, cables


Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices.

Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: connectors with ready made cables and 2 conductor sockets with screw connection.

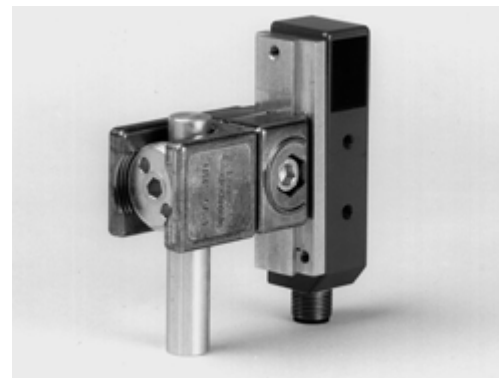
When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

Mounting systems

BT 92



UMS 96-95





46 Series

Overview and advantages



Compact sensor series in solid plastic housing



Operating principles:

- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Diffuse reflection light scanners with background suppression
- Energetic diffuse reflection light scanners



- 10 ... 30VDC voltage with PNP transistor output
- Alternatively: AS-interface bus connection



Complementary outputs for light/dark switching or as a control function



Connection via M12 connector or cable



- Innovative mounting system for rod mounting or
- Mounting holes for screw connection



Options:

- Warning output
- Activation input





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage		Output		Switching frequency
			Plastic		Red light	Infrared	10 ... 30VDC	AS-i system	PNP transistor	AS-interface	
	LS 46/44-S12	0 ... 50m	•			•			•		200Hz
	LS 46/44.8-S12	0 ... 50m	•			•			•		200Hz
	LS 46/44, 2000	0 ... 50m	•			•			•		200Hz
	LS 46/44.8, 2000	0 ... 50m	•			•			•		200Hz
	LS 46/44, 300-S12	0 ... 50m	•			•			•		200Hz
	LS 46/44.8, 300-S12	0 ... 50m	•			•			•		200Hz
	SLS 46/44.8-S12	0 ... 36m	•			•			•		200Hz
	SLS 46/44.8, 2000	0 ... 36m	•			•			•		200Hz
	SLS 46/44.8, 300-S12	0 ... 36m	•			•			•		200Hz
	LS 46/A-S12	0 ... 50m	•			•		•		•	200Hz
	PRK 46/44-S12	0.3 ... 16m	•	•		•			•		200Hz
	IPRK 46/4-S.12	0.3 ... 16m	•	•		•			•		200Hz
	PRK 46/4.8-S12	0.3 ... 16m	•	•		•			•		200Hz
	PRK 46/44, 2000	0.3 ... 16m	•	•		•			•		200Hz
	IPRK 46/4, 2000	0.3 ... 16m	•	•		•			•		200Hz
	PRK 46/4.8, 2000	0.3 ... 16m	•	•		•			•		200Hz
	PRK 46/44, 300-S12	0.3 ... 16m	•	•		•			•		200Hz
	IPRK 46/4, 300-S12	0.3 ... 16m	•	•		•			•		200Hz
	PRK 46/4.8, 300-S12	0.3 ... 16m	•	•		•			•		200Hz
	PRK 46/44.1-S12	0 ... 7m	•	•		•			•		200Hz
	IPRK 46/4.1-S12	0 ... 7m	•	•		•			•		200Hz
	PRK 46/44.11-S12	0 ... 7m	•	•		•			•		200Hz
	IPRK 46/4.11-S.12	0 ... 7m	•	•		•			•		200Hz
	IPRK 46/4.11, 300-S12	0 ... 7m	•	•		•			•		200Hz
	PRK 46/A-S12	0.3 ... 16m	•	•		•		•		•	200Hz
	PRK 46/A.1-S12	0 ... 7m	•	•		•		•		•	200Hz
		RT 46/44.9-100-S12	5 ... 140mm	•			•			•	
RT 46/A.9-100-S12		5 ... 140mm	•			•		•		•	200Hz
RT 46/44.9-400-S12		5 ... 250mm	•			•			•		200Hz
	HRT 46/44-800-S12	10 ... 1000mm	•			•			•		200Hz
	IHRT 46/4D-800-S12	10 ... 1000mm	•			•			•		200Hz
	HRT 46/44-800, 2000	10 ... 1000mm	•			•			•		200Hz
	IHRT 46/4-800, 2000	10 ... 1000mm	•			•			•		200Hz
	HRT 46/44-800, 300-S12	10 ... 1000mm	•			•			•		200Hz
	IHRT 46/4D-800, 300-S12	10 ... 1000mm	•			•			•		200Hz
	IHRT 46/4-800, 300-S12	10 ... 1000mm	•			•			•		200Hz
	HRTR 46/44-500-S12	50 ... 600mm	•	•		•			•		200Hz
	HRTR 46/44-500, 300-S12	50 ... 600mm	•	•		•			•		200Hz
	HRT 46/A-800-S12	10 ... 1000mm	•			•		•		•	200Hz



Switching			Connection			Options						Page
Light/dark	Light	Dark	M12 connector	Cable with M12 connector	Cable	Warning output	Polarisation filter	Background suppression	Sensitivity adjustment	Activation input	AOPD Type 2	
•			•									281
•			•							•		281
•					•							281
•					•					•		281
•				•								283
•				•						•		283
•			•							•	•	285
•					•					•	•	285
•				•						•	•	287
	•	•	•			•				•		289
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	•			•		•		•				295
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•			•						•			301
	•	•	•			•			•	•		301
•			•						•			305
•			•					•				307
		•	•			•		•				307
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•				•				•				309
		•		•		•		•				309
	•			•		•		•				309
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•				•				•				311
	•	•	•					•		•		313



LS 46

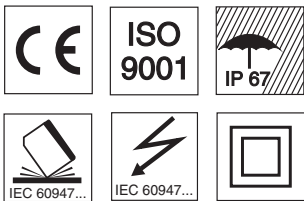
Throughbeam photoelectric sensors



50m

10 - 30 V
DC

- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Solid plastic housing, protection class IP 67 for industrial application
- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- Activation input for testing and interlinking

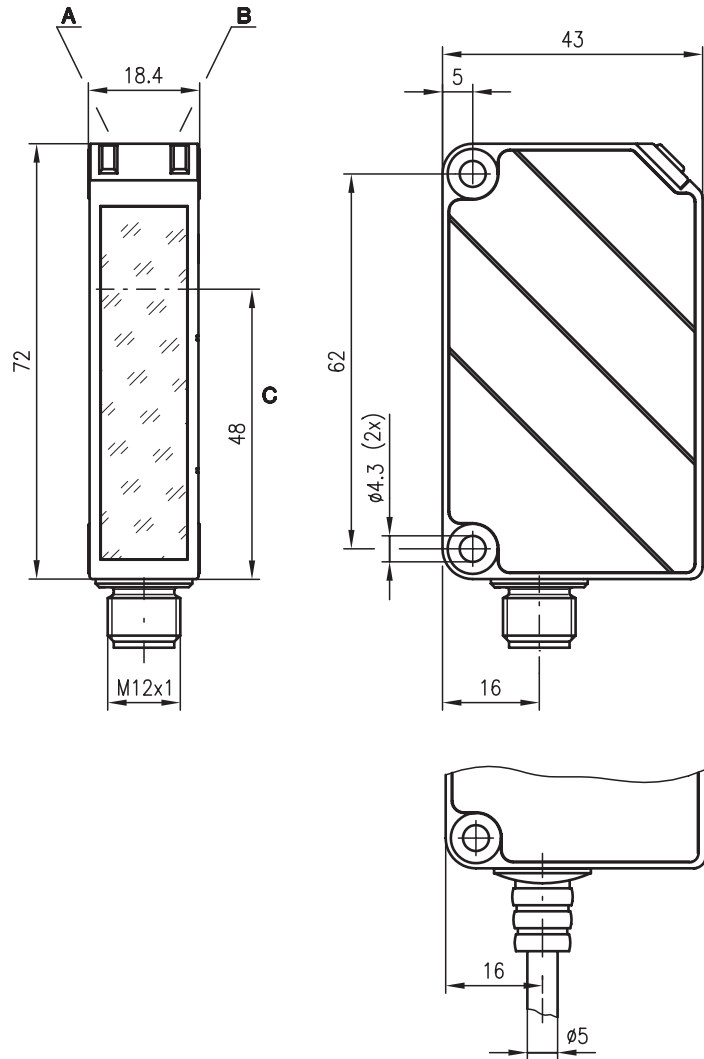


Accessories:

(available separately • see page 314)

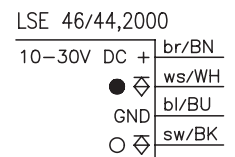
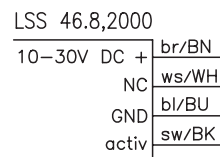
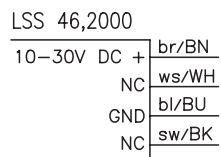
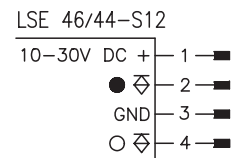
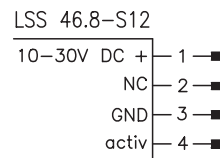
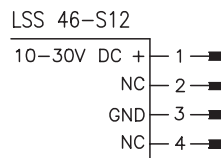
- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis

Electrical connection



We reserve the right to make changes • 46_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 50m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter LSS 46.8-S12 (2000)

LED yellow	transmitter active
------------	--------------------

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M12 connector, or cable, cable length: 2000mm, PVC

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... + 70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	>
Transmitter active/not active	≥ 8V / ≤ 2V
Activation/disable delay	≤ 1ms / ≤ 2ms
Input resistance	10KΩ ± 10%

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	LS 46/44-S12	
Transmitter without activation input	LSS 46-S12	500 81246
Receiver	LSE 46/44-S12	500 81248
with 2m cable		
Transmitter and receiver	LS 46/44, 2000	
Transmitter without activation input	LSS 46, 2000	500 81929
Receiver	LSE 46/44, 2000	500 81932
with 2m cable		
Transmitter and receiver	LS 46/44.8, 2000	
Transmitter with activation input	LSS 46.8, 2000	500 81928
Receiver	LSE 46/44, 2000	500 81932

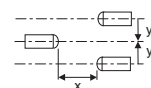
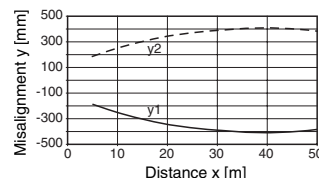
Tables

0	30	50
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<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks



LS 46

Throughbeam photoelectric sensors

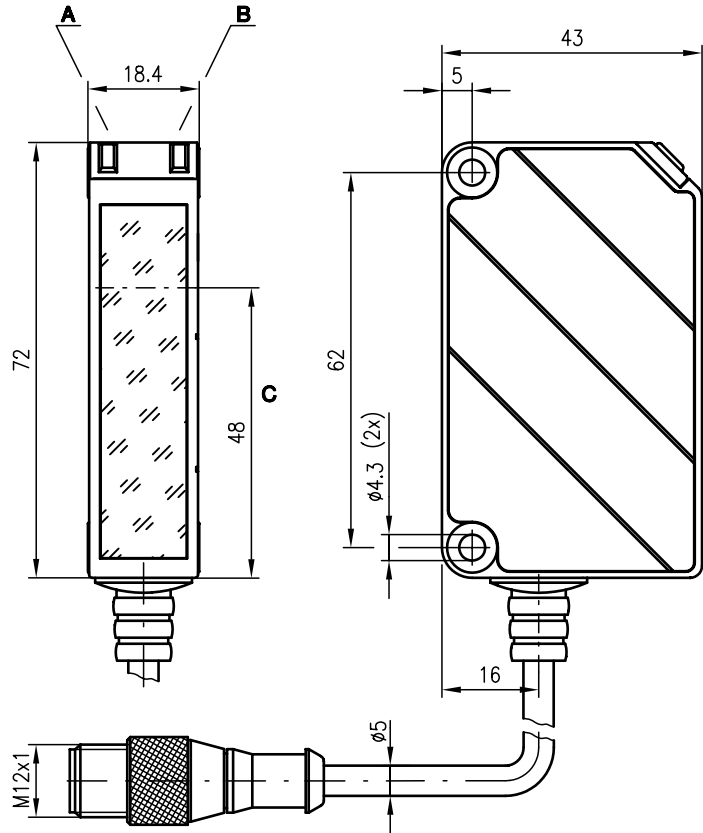


50m



- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Solid plastic housing, protection class IP 67 for industrial application
- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- Activation input for testing and interlinking

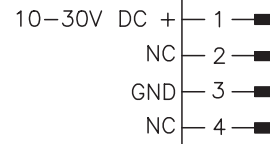
Dimensioned drawing



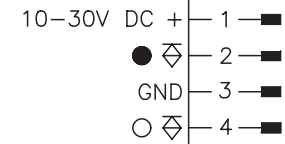
- A Indicator diode green
- B Indicator diode yellow
- C Optical axis

Electrical connection

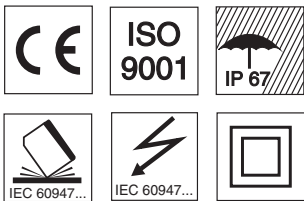
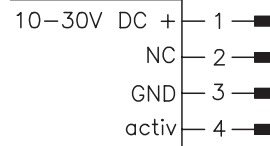
LSS 46, 300-S12



LSE 46/44, 300-S12



LSS 46.8, 300-S12



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 46_a02e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 50m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter LSS 46.8...

LED green	ready
LED yellow	transmitter active

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	cable with M12 connector, cable length: 300mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	≥ 8V / ≤ 2V
Transmitter active/not active	≤ 1ms / ≤ 2ms
Activation/disable delay	≤ 1ms / ≤ 2ms
Input resistance	10KΩ ± 10%

- 1) Operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
Transmitter and receiver	LS 46/44, 300-S12	
Transmitter without activation input	LSS 46, 300-S12	500 81320
Receiver	LSE 46/44, 300-S12	500 81321
Transmitter and receiver	LS 46/44.8, 300-S12	
Transmitter with activation input	LSS 46.8, 300-S12	500 60927
Receiver	LSE 46/44, 300-S12	500 81321

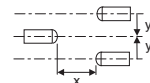
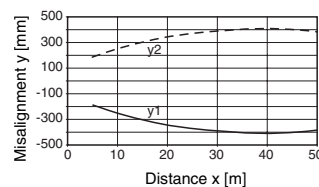
Tables

0	30	50
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	Operating range [m]
	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

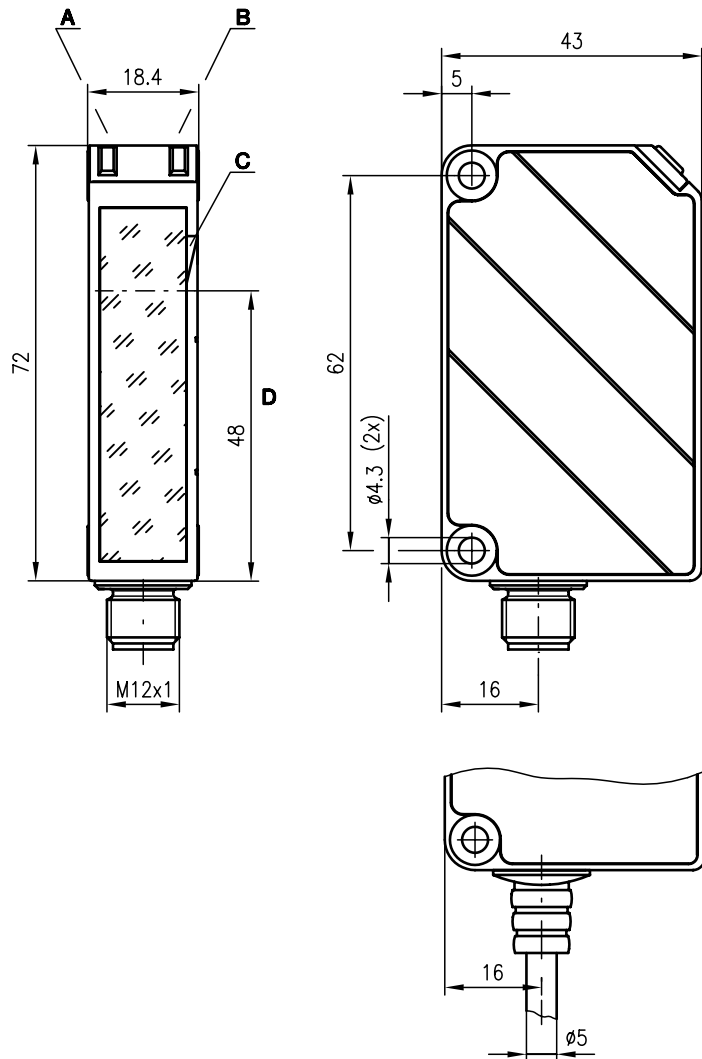


SLS 46

Protective throughbeam photoelectric sensors



Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Marker
- D Optical axis

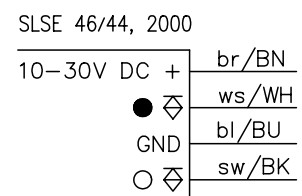
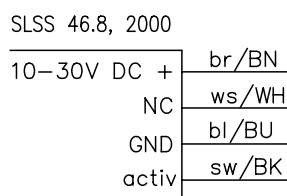
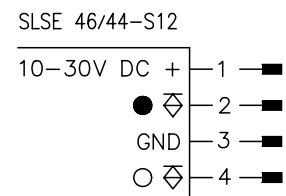
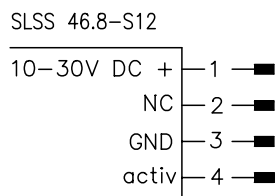


36m



- Protective throughbeam photoelectric sensors with high performance reserve in infrared light
- Solid plastic housing, protection class IP 67 for industrial application
- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- Activation input for testing and interlinking

Electrical connection



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 46_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 36m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED green	ready
LED yellow	transmitter active

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M 12 connector, or cable, cable length: 2000mm, PVC

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active

Transmitter active/not active	≥ 8V / ≤ 2V
Activation/disable delay	≤ 1ms / ≤ 2ms
Input resistance	10KΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	SLS 46/44.8-S12	
Transmitter with activation input	SLSS 46.8-S12	500 60935
Receiver	SLSE 46/44-S12	500 60936
with 2m cable		
Transmitter and receiver	SLS 46/44.8, 2000	
Transmitter with activation input	SLSS 46.8, 2000	500 60939
Receiver	SLSE 46/44, 2000	500 60940

Tables

Diagrams

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
Minimum blackening object: Ø22mm.
- At the device, the tip of the marker indicates the location of the optical axis.

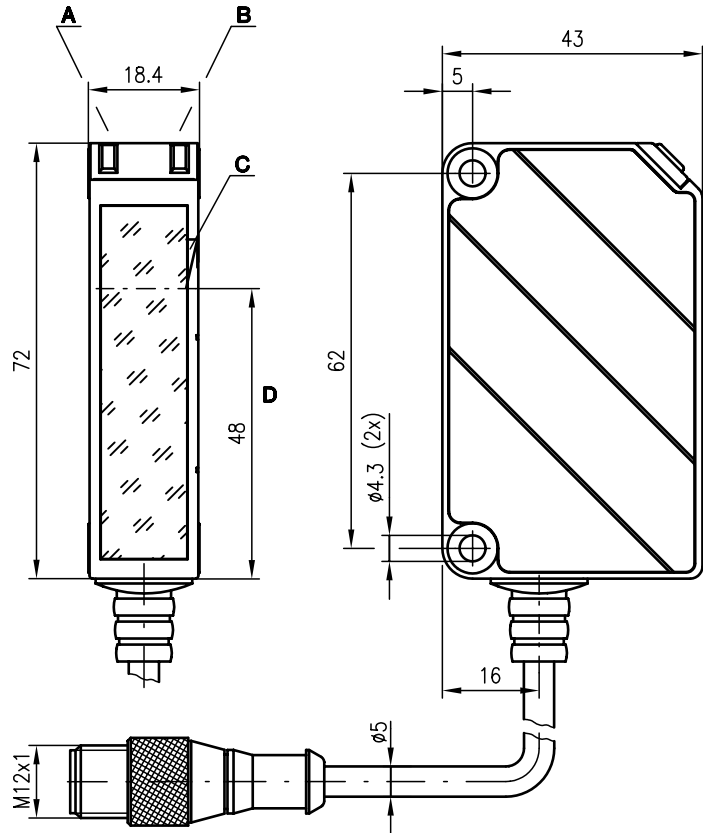


SLS 46

Protective throughbeam photoelectric sensors



Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Marker
- D Optical axis



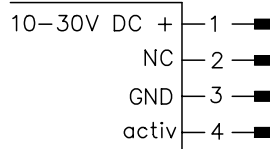
36m



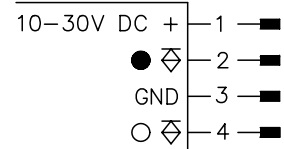
- Protective throughbeam photoelectric sensors with high performance reserve in infrared light
- Solid plastic housing, protection class IP 67 for industrial application
- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- Activation input for testing and interlinking

Electrical connection

SLSS 46.8, 300-S12



SLSE 46/44, 300-S12



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 46_a04e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 36m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED green	ready
LED yellow	transmitter active

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	cable with M12 connector, cable length: 300mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active

Transmitter active/not active	≥ 8V/≤ 2V
Activation/disable delay	≤ 1ms/≤ 2ms
Input resistance	10KΩ ± 10%

1) Operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	SLS 46/44.8, 300-S12	
Transmitter with activation input	SLSS 46.8,300-S12	500 60937
Receiver	SLSE 46/44,300-S12	500 60938

Tables

Diagrams

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
Minimum blackening object: Ø22mm.
- At the device, the tip of the marker indicates the location of the optical axis.



LS 46

Throughbeam photoelectric sensors

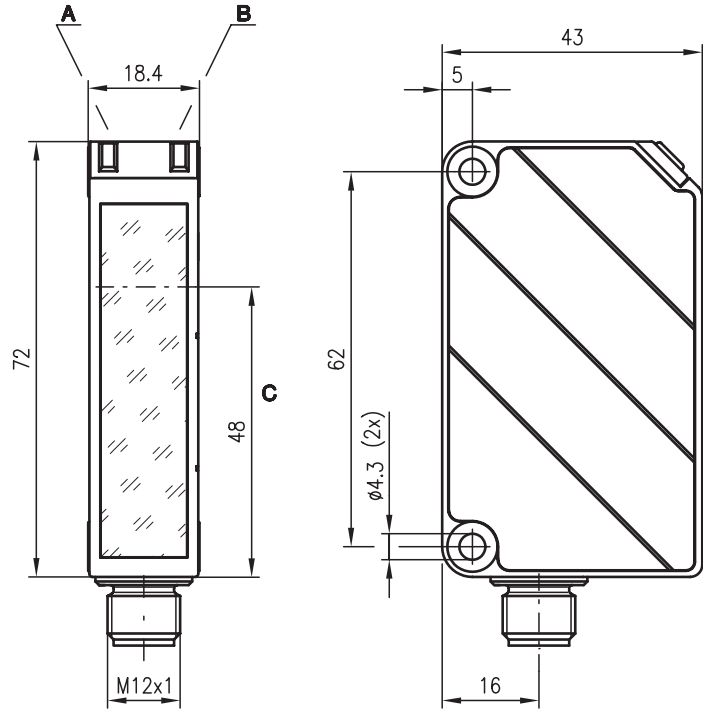


50m



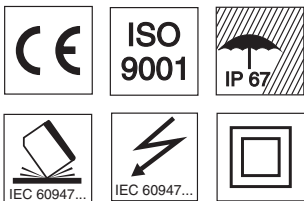
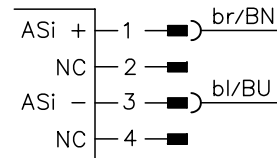
- Throughbeam photoelectric sensor with high performance reserve in the infrared
- Solid plastic housing, protection class IP 67 for industrial application
- Common conductor for both power and data reduces installation work
- Access to all sensor functions via an AS-interface without additional wiring
- Transmitter and receiver with integrated AS-i slave technology

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 46_a06e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 50 m
Operating range ²⁾	0 ... 30 m
Light source	LED (modulated light)
Wavelength	880 nm

Timing

Switching frequency	200 Hz
Response time	2.5 ms
Delay before start-up	≤ 100 ms

Electrical data

Operating voltage U _B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 30 mA

Indicators

LED green	ready
Receiver	
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve
Transmitter	
LED yellow	transmitter active

Mechanical data

Housing and optics cover	plastic
Weight	100 g
Connection type	M 12 connector

Environmental data

Ambient temp. (operation/storage)	-20 °C ... +60 °C / -40 °C ... +70 °C
Protective circuit ³⁾	2
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for transmitter

I/O code/ID code	D/1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5 ms
AS-i standard according to profile	S-D.1

Assignment data bits Programming (host level) (parameter bits are not used)			
D ₀	activation input	0 transmitter off	system output
		1 transmitter on	

AS-i data for receiver

I/O code/ID code	1/1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5 ms
AS-i standard according to profile	S-1.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection
- 4) Rating voltage 250 VAC

Assignment: data bits Programming (host level)				Assignment: parameter bits Programming (host level)			
D ₀	switching output	0 no signal	system input	P ₀	NC	0	system parameter
		1 signal detected				1	
D ₁	warning output autoControl	0 not active	system input	P ₁	light/dark switching	0 dark switching	system parameter
		1 active				1 light switching	
D ₂	ready output	0 sensor not ready	system input	P ₂	NC	0	system parameter
		1 sensor ready				1	
D ₃	NC	0		P ₃	NC	0	system parameter
		1				1	

Order guide

	Designation	Part No.
Transmitter and receiver	LS 46/A-S12	
Transmitter	LSS 46/A-S12	500 82127
Receiver	LSE 46/A-S12	500 82128

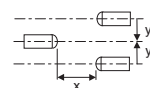
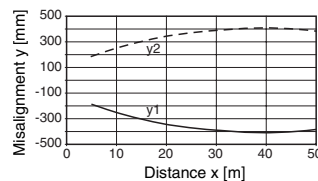
Tables

0	30	50
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- Operating range [m]
- Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks



PRK 46

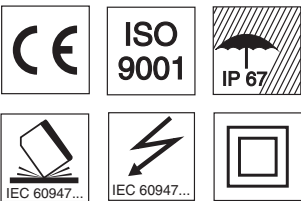
Retro-reflective photoelectric sensors with polarisation filter



0.3 ... 16m



- Wide voltage range 10 ... 30V with PNP switching output
- Polarisation filter blocks unwanted reflections
- Complementary switching outputs for optimal adaptation to the application
- Warning output - for increased availability
- Activation input for testing and interlinking

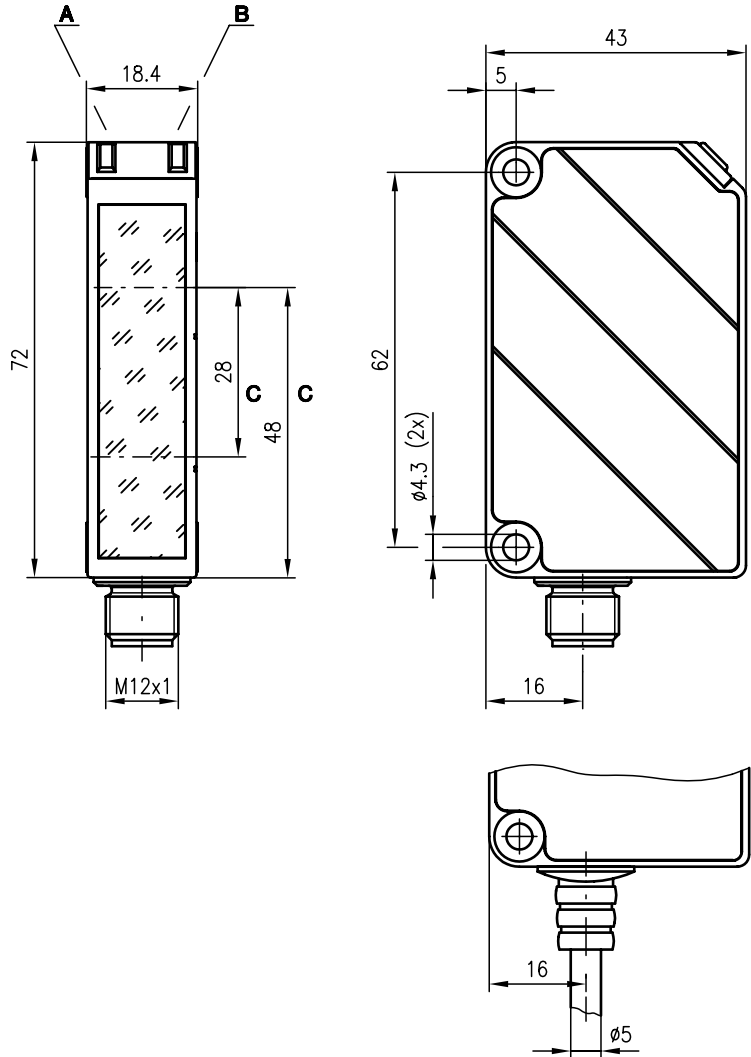


Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

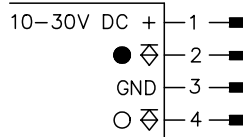
Dimensioned drawing



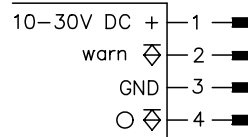
- A Indicator diode green
- B Indicator diode yellow
- C Optical axis

Electrical connection

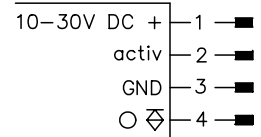
PRK 46/44-S12



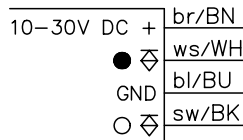
IPRK 46/4-S12



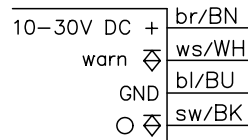
PRK 46/4.8-S12



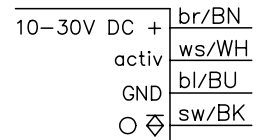
PRK 46/44,2000



IPRK 46/4,2000



PRK 46/4.8,2000



We reserve the right to make changes • 46_b01e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.3 ... 16m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	PRK 46/44(-12; 2000) light/dark switching (complementary) IPRK 46..., PRK... .8... light switching
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M12 connector, or cable, cable length: 2000mm, PVC

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Warning output autoControl	PNP transistor, counting principle
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V
Output current	max. 100mA
Activation input active	
Transmitter active/not active	≥ 8V/≤ 2V
Activation/disable delay	≤ 1 ms/≤ 2 ms
Input resistance	10KΩ ± 10%

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with M12 connector		
complementary switching output	PRK 46/44-S12	500 81294
warning output	IPRK 46/4-S.12	500 80981
activation input	PRK 46/4.8-S12	500 60920
with 2m cable		
complementary switching output	PRK 46/44, 2000	500 60922
warning output	IPRK 46/4, 2000	500 60923
activation input	PRK 46/4.8, 2000	500 34080

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 12m
2 MTK(S) 50x50	0.3 ... 6m
3 TK(S) 30x50	0.3 ... 4m
4 TK(S) 20x40	0.3 ... 3m
5 Tape 2 100x100	0.3 ... 5m

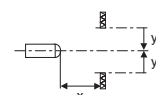
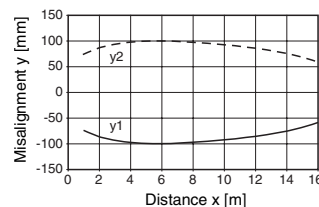
1	0.3			12	16
2	0.3		6	8	
3	0.3	4		5.8	
4	0.3	3	4		
5	0.3		5	6	

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



PRK 46

Retro-reflective photoelectric sensors with polarisation filter

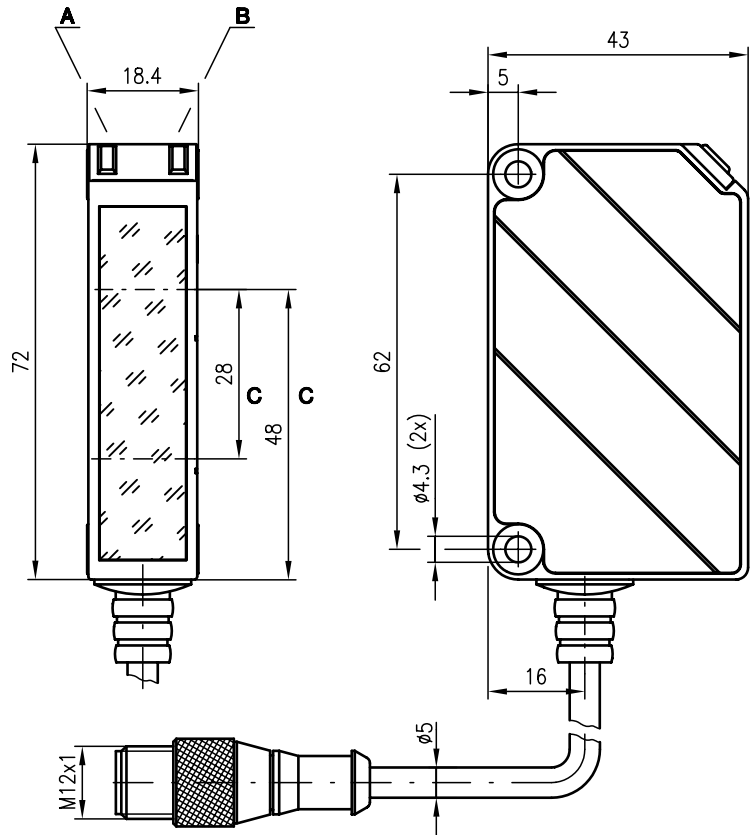


0.3 ... 16m



- Wide voltage range 10 ... 30V with PNP switching output
- Polarisation filter blocks unwanted reflections
- Complementary switching outputs for optimal adaptation to the application
- Warning output - for increased availability
- Activation input for testing and interlinking

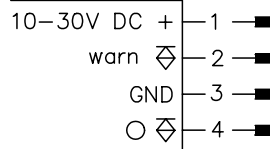
Dimensioned drawing



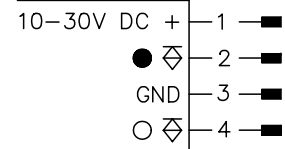
- A Indicator diode green
- B Indicator diode yellow
- C Optical axis

Electrical connection

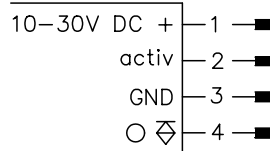
I PRK 46/4, 300-S12



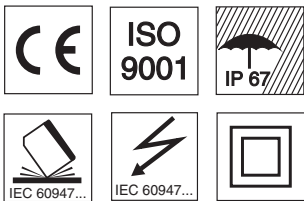
PRK 46/44, 300-S12



PRK 46/4.8, 300-S12



We reserve the right to make changes • 46_b03e.fm



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.3 ... 16m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

PRK 46
IPRK 46, PRK... .8...

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	cable with M12 connector, cable length: 300mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -40°C ... +55°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Warning output autoControl	PNP transistor, counting principle
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Activation input active	
Transmitter active/not active	≥ 8V / ≤ 2V
Activation/disable delay	≤ 1ms / ≤ 2ms
Input resistance	10KΩ ± 10%

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
complementary switching output	PRK 46/44, 300-S12	500 81319
warning output	IPRK 46/4, 300-S12	500 80980
activation input	PRK 46/4.8, 300-S12	500 60921

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 12m
2 MTK(S) 50x50	0.3 ... 6m
3 TK(S) 30x50	0.3 ... 4m
4 TK(S) 20x40	0.3 ... 3m
5 Tape 2 100x100	0.3 ... 5m

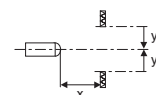
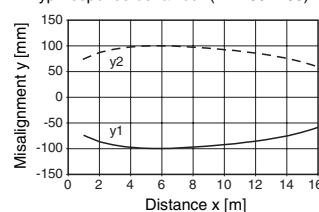
1	0.3			12	16
2	0.3		6	8	
3	0.3	4	5.8		
4	0.3	3	4		
5	0.3		5	6	

- Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



PRK 46

Retro-reflective photoelectric sensors with polarisation filter

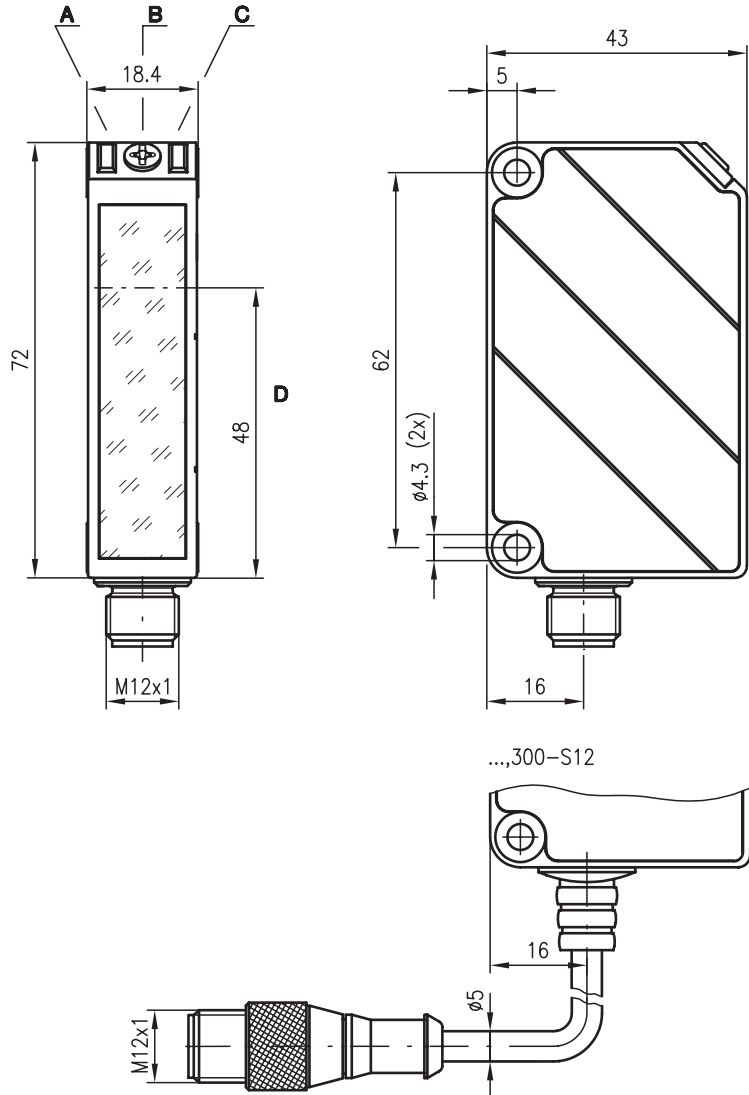


0 ... 7m



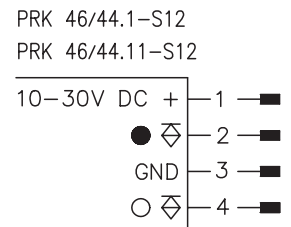
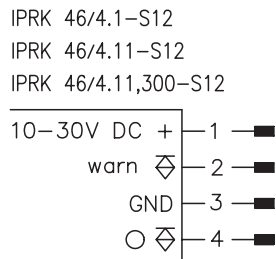
- Wide voltage range 10 ... 30V with PNP switching output
- Polarisation filter blocks unwanted reflections
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Warning output - for increased availability
- Sensitivity adjustment optional

Dimensioned drawing



- A** Operation indicator green
- B** Sensitivity adjustment optional
- C** Switching indicator yellow
- D** Optical axis

Electrical connection



We reserve the right to make changes • 46_b04e.fm

Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 7m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	PRK 46 IPRK 46 light/dark switching (complementary) light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable (optional)

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M12 connector, or cable with M12 connector, cable length: 300mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -40°C ... +55°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Warning output autoControl	PNP transistor, counting principle
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with M12 connector		
complementary switching output	PRK 46/44.11-S12	500 34452
warning output	IPRK 46/4.11-S.12	500 34453
with M12 connector and sensitivity adjustment		
complementary switching output	PRK 46/44.1-S12	500 60924
warning output	IPRK 46/4.1-S12	500 60925
cable with M12 connector, cable length: 300mm		
warning output	IPRK 46/4.11, 300-S12	500 35185

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 4m
2 MTK(S) 50x50	0 ... 3.5m
3 TK(S) 30x50	0 ... 2m
4 TK(S) 20x40	0 ... 1.8m
5 Tape 2 100x100	0 ... 0.8m

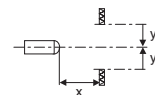
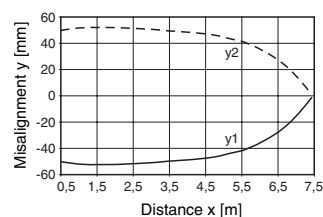
1	0	4	7
2	0	3.5	5.8
3	0	2	3
4	0	1.8	2.7
5	0	0.8	1.3

- Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



PRK 46

Retro-reflective photoelectric sensors with polarisation filter



0.3 ... 16m



- Common conductor for both power and data reduces installation work
- Polarisation filter blocks unwanted reflections
- Access to all sensor functions via an ASi-interface without additional wiring



Accessories:

(available separately • see page 314)

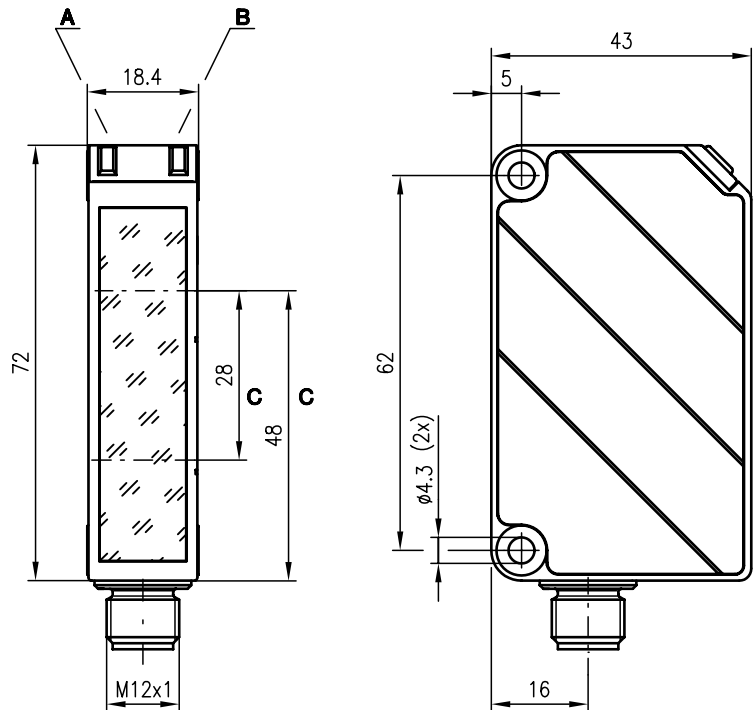
- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

AS-i Accessories:

(available separately)

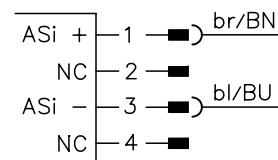
- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

Dimensioned drawing



- A Operation indicator green
- B Switching indicator yellow
- C Optical axis

Electrical connection



We reserve the right to make changes • 46_b05e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.3 ... 16m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Sensor switching frequency	200Hz
Sensor response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 35mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M 12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ³⁾	2
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for receiver

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection
- 4) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection 1 reflection	system input	*P ₀	NC	∅ 1	system parameter
D ₁	warning output autoControl	∅ active 1 not active	system input	*P ₁	light/dark switching	∅ dark switching 1 light switching	system parameter
D ₂	ready output	∅ sensor not ready 1 sensor ready	system input	*P ₂	NC	∅ 1	system parameter
D ₃	Activation input	∅ transmitter on 1 transmitter off	system output	*P ₃	NC	∅ 1	system parameter

* default = 1

Order guide

Designation	Part No.
PRK 46/A-S12	500 82126

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 12m
2 MTK(S) 50x50	0.3 ... 6m
3 TK(S) 30x50	0.3 ... 4m
4 TK(S) 20x40	0.3 ... 3m
5 Tape 2 100x100	0.3 ... 5m

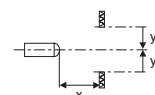
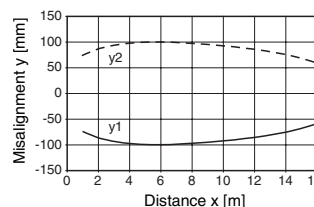
1	0.3	12	16
2	0.3	6	8
3	0.3	4	5.8
4	0.3	3	4
5	0.3	5	6

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



PRK 46

Retro-reflective photoelectric sensors with polarisation filter



0 ... 7m



- Common conductor for both power and data reduces installation work
- Polarisation filter blocks unwanted reflections
- Access to all sensor functions via an AS-interface without additional wiring
- Sensitivity adjustment



Accessories:

(available separately • see page 314)

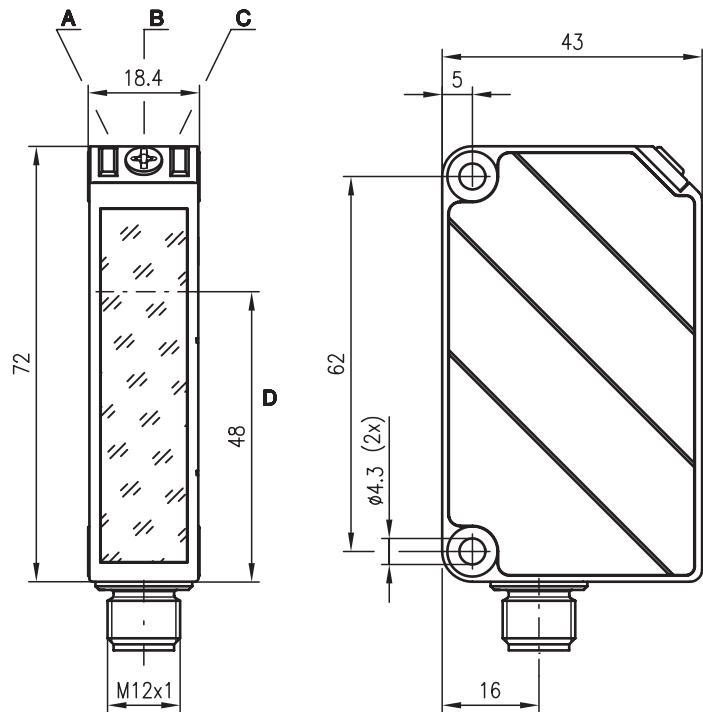
- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

AS-i Accessories:

(available separately)

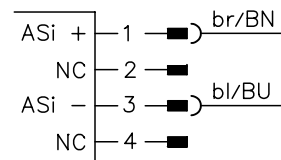
- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

Dimensioned drawing



- A Indicator diode green
- B Sensitivity adjustment
- C Indicator diode yellow
- D Optical axis

Electrical connection



We reserve the right to make changes • 46_b06e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 7m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Sensor switching frequency	200Hz
Sensor response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 35mA
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... + 55°C
Protective circuit ³⁾	2
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for receiver

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection
- 4) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	0 no reflection	system input	*P ₀	NC	0	system parameter
		1 reflection	system input			1	system parameter
D ₁	warning output autoControl	0 active	system input	*P ₁	light/dark switching	0 dark switching	system parameter
		1 not active	system input			1 light switching	system parameter
D ₂	ready output	0 sensor not ready	system input	*P ₂	NC	0	system parameter
		1 sensor ready	system input			1	system parameter
D ₃	activation input	0 transmitter on	system output	*P ₃	NC	0	system parameter
		1 transmitter off	system output			1	system parameter

* default = 1

Order guide

Designation	Part No.
PRK 46/A.1-S12	500 60926

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 4m
2 MTK(S) 50x50	0 ... 3.5m
3 TK(S) 30x50	0 ... 2m
4 TK(S) 20x40	0 ... 1.8m
5 Tape 2 100x100	0 ... 0.8m

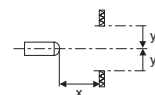
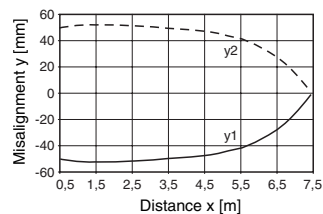
1	0	4	7
2	0	3.5	5.8
3	0	2	3
4	0	1.8	2.7
5	0	0.8	1.3

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks

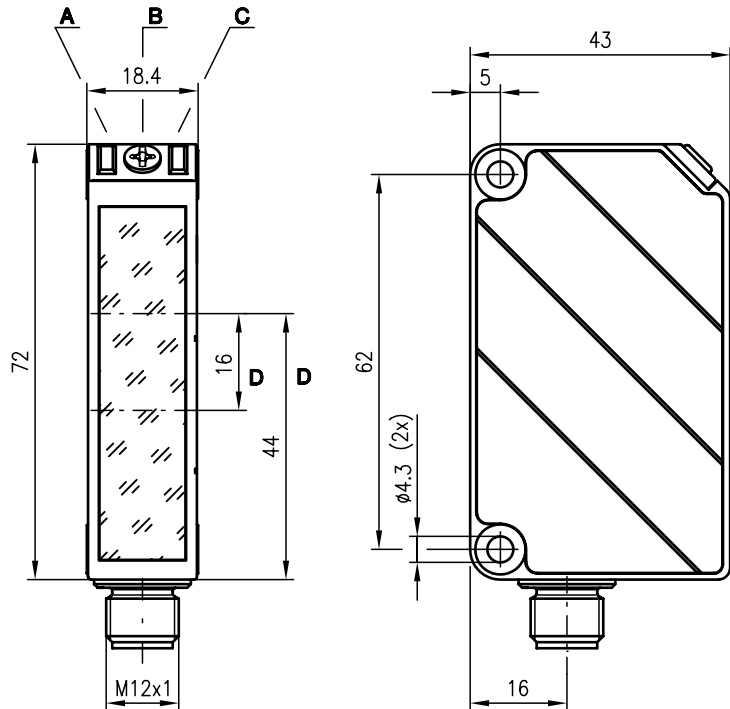


RT 46

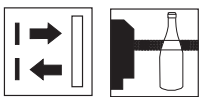
Energetic diffuse reflection light scanner



Dimensioned drawing



- A Indicator diode green
- B Sensitivity adjustment
- C Indicator diode yellow
- D Optical axis

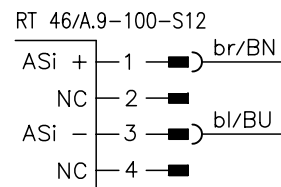
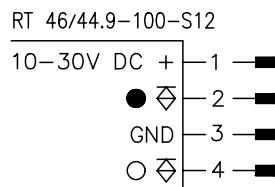


5 ... 140mm



- Scanner for detection of PE and glass bottles in single lane conveyors
- Large scanning range with optimised beam for secure object detection
- Wide voltage range 10 ... 30V with PNP switching output
- Sensitivity adjustment
- AS-interface for optimal adaptation to the application
- Common conductor for both power and data reduces installation work
- Access to all sensor functions via an AS-interface without additional wiring

Electrical connection



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cables, intermediate cables
- Address programming device, coupling modules

We reserve the right to make changes • 46_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

RT 46/44.9-100-S12
 5 ... 140mm
 see table
 0 ... 100%
 LED (modulated light)
 880nm

RT 46/A.9-100-S12

Timing

Switching frequency
 Response time
 Delay before start-up

200Hz
 2.5ms
 ≤ 100ms

Electrical data

Operating voltage U_B

10 ... 30VDC
 (incl. residual ripple)

26.5V ... 31.6V
 (according to AS-i
 specification)

Residual ripple
 Bias current
 Switching output
 Function characteristics

≤ 15% of U_B
 ≤ 30mA
 PNP transistor
 light/dark switching
 (complementary)
 $\geq (U_B - 2V) / \leq 2V$
 max. 100mA

AS-interface
 light/dark switching

Signal voltage high/low
 Output current

Indicators

LED green
 LED yellow
 LED yellow flashing

ready
 reflection
 reflection, no performance reserve

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

plastic
 plastic
 100g
 M 12 connector

Environmental data

Ambient temp. (operation/storage)
 Protective circuit ³⁾
 VDE safety class ⁴⁾
 Protection class
 Standards applied

-20°C ... +60°C/-40°C ... +70°C
 2, 3
 II, all-insulated
 IP 67
 IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	0 no reflection	system input	*P ₀	NC	0	system parameter
		1 reflection	input			1	parameter
D ₁	warning output autoControl	0 active	system input	*P ₁	light/dark switching	0 dark switching	system parameter
		1 not active	input			1 light switching	parameter
D ₂	ready output	0 sensor not ready	system input	*P ₂	NC	0	system parameter
		1 sensor ready	input			1	parameter
*D ₃	activation input	0 transmitter on	system output	*P ₃	NC	0	system parameter
		1 transmitter off	output			1	parameter

* default = 1

Order guide

	Designation	Part No.
with complementary switching outputs	RT 46/44.9-100-S12	500 34082
with AS-interface	RT 46/A.9-100-S12	500 34083

Tables

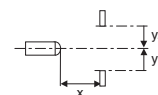
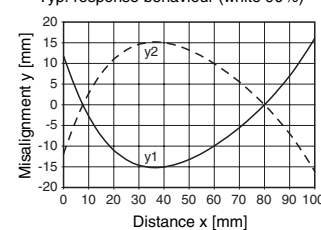
1	0	100	140
2	2	70	85
3	5	40	50

1	white 90%
2	grey 18%
3	black 6%

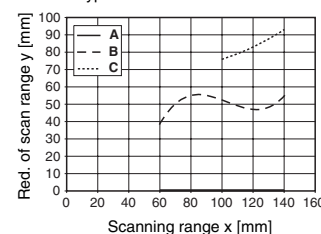
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

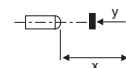
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
 B grey 18%
 C black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

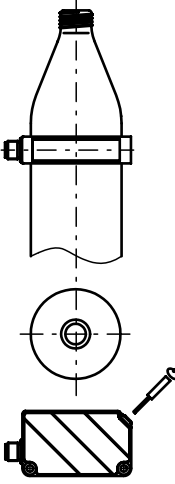
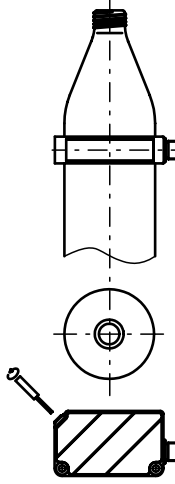
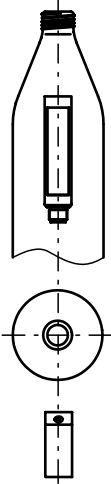
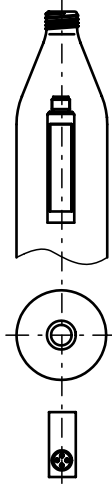


RT 46

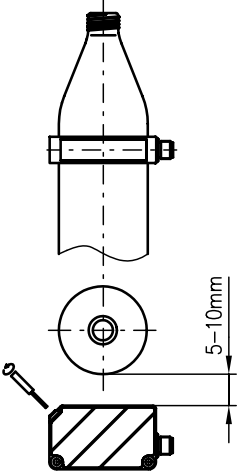
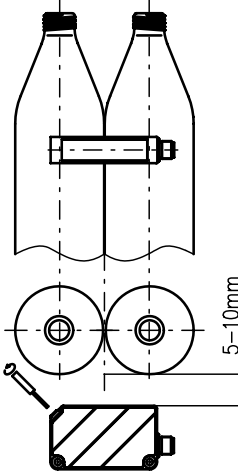
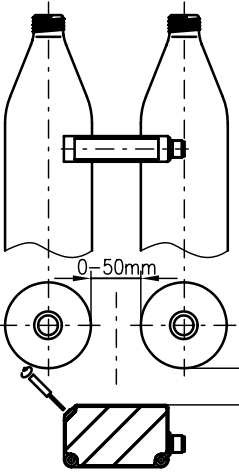
Mounting and adjustment notes for bottle scanners

RT 46/A.9-100-S12 (AS-i type) and RT 46/44.9-100-S12 (PNP type)

Mounting possibilities (as desired, horizontal or vertical)

Horizontal Adjustment right	Horizontal Adjustment left
	
Vertical Adjustment top	Vertical Adjustment bottom
	

Gap width adjustment

Step 1: Base setting	Step 2: Congestion message check	Step 3: Gap width adjustment
 <p>Figure 1</p>	 <p>Figure 2</p>	 <p>Figure 3</p>
<ol style="list-style-type: none"> 1. Mount sensor acc. to figure 1. 2. Keep distance to bottle in the range 5 ... 10mm. 3. Position a single bottle in front of the sensor according to figure 1. 4. Turn adjustment screw left until indicator LED extinguishes. 5. Turn adjustment screw right until indicator LED is continuously illuminated. 	<ol style="list-style-type: none"> 1. Move several sensors past the bottle without gap. Make sure that no other objects (e.g. hand) are located in the scanning area of the sensor or behind the bottles. 2. Indicator LED must not switch off. 3. The gap width can be changed between 0 ... 50mm using the adjustment screw. <ul style="list-style-type: none"> - to enlarge the gap → turn screw clockwise - to reduce the gap → turn screw counter-clockwise 	<ol style="list-style-type: none"> 1. Position two bottles in front of the sensor according to figure 3. 2. Create a gap symmetrical to the sensor's centre. Make sure that no other objects (e.g. hand) are located in the scanning area of the sensor or behind the bottles. 3. The gap width can be changed between 0 ... 50mm using the adjustment screw. <ul style="list-style-type: none"> - to enlarge the gap → turn screw clockwise - to reduce the gap → turn screw counter-clockwise



RT 46

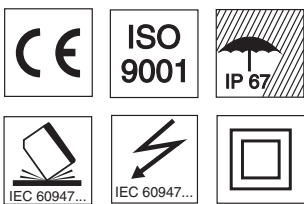
Energetic diffuse reflection light scanner



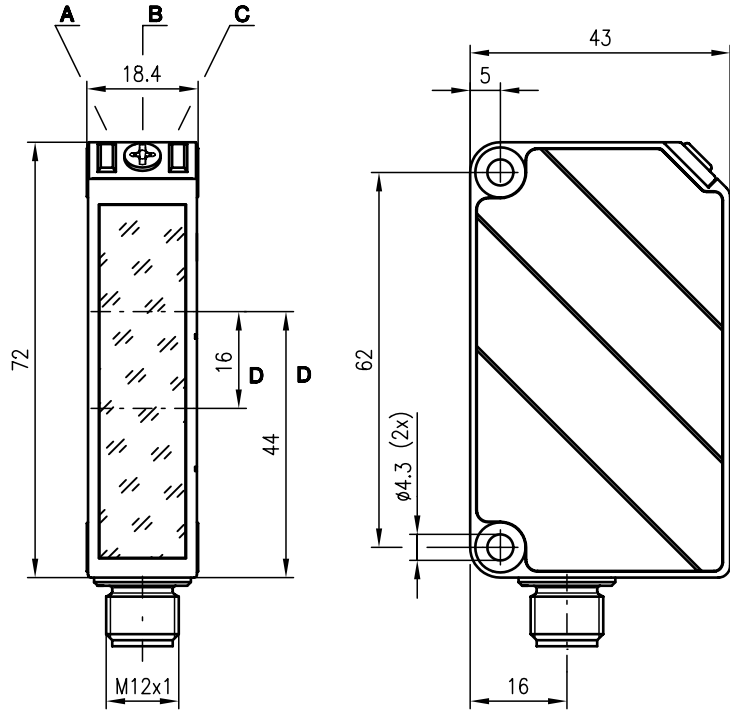
5 ... 250mm



- Scanner for detection of broken packing drums for use in the conveyor technology
- Large scanning range with optimised beam for secure object detection
- Wide voltage range 10 ... 30V with PNP switching output
- Sensitivity adjustment



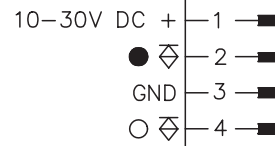
Dimensioned drawing



- A Indicator diode green
- B Sensitivity adjustment
- C Indicator diode yellow
- D Optical axis

Electrical connection

RT 46/44.9-400-S12



We reserve the right to make changes • 46_c02e.fm

Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 250mm
Scanning range ²⁾	see table
Adjustment range	0 ... 100%
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

LED green	ready
LED yellow	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M 12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 VAC

Tables

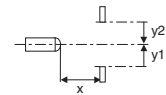
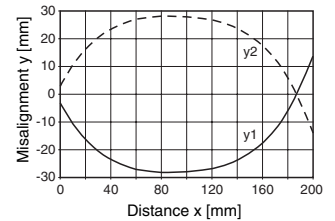
1	0	200	250
2	1	150	170
3	2	90	120

1	white 90%
2	grey 18%
3	black 6%

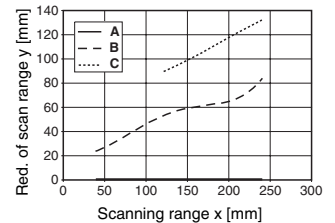
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

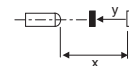
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
 B grey 18%
 C black 6%



Order guide

	Designation	Part No.
with complementary switching outputs	RT 46/44.9-400-S12	500 34451

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRT 46

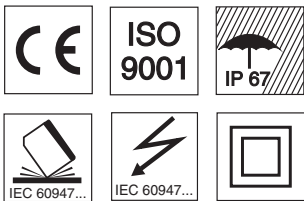
Diffuse reflection light scanner with background suppression



10 ... 1000mm

10 - 30 V
DC

- Adjustable scanner with background suppression
- Safe detection of light and dark, as well as inclined or sloped surfaces
- Exact scanning range adjustment through multiturn potentiometer
- Complementary switching outputs for optimal adaptation to the application
- Warning output - for increased availability

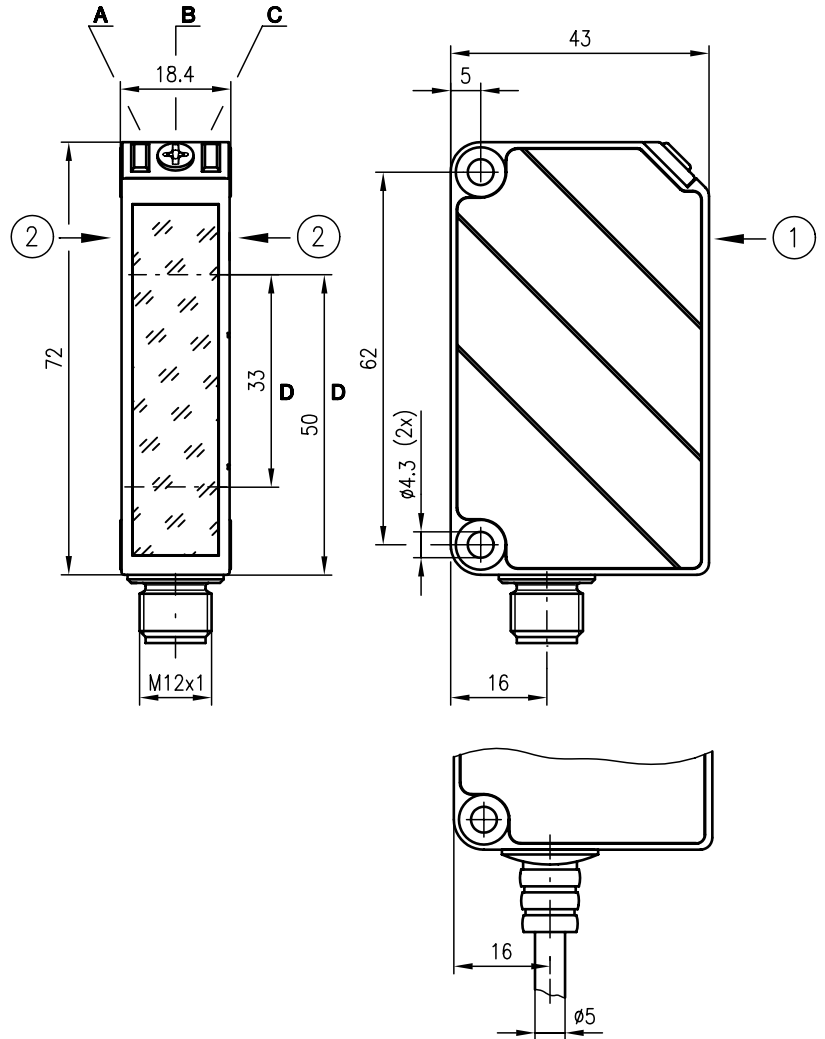


Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

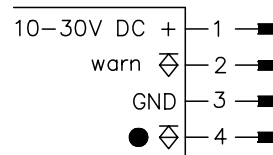
Dimensioned drawing



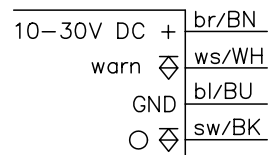
- A Indicator diode green
 - B Scanning range adjustment
 - C Indicator diode yellow
 - D Optical axis
- Preferred direction for movement of the test object ①+②

Electrical connection

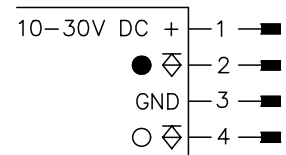
IHRT 46/4D-800-S12



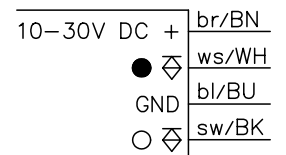
IHRT 46/4-800,2000



HRT 46/44-800-S12



HRT 46/44-800,2000



We reserve the right to make changes • 46_d01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared light

10 ... 1000mm
 see table
 300 ... 800mm
 LED (modulated light)
 880nm

Timing

Switching frequency 200Hz
 Response time 2.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output PNP transistor
 Function characteristics HRT46... light/dark switching (complementary)
 IHRT46... dark switching
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current max. 100mA

Indicators

LED green ready
 LED yellow reflection
 LED yellow flashing reflection, no performance reserve

Mechanical data

Housing plastic
 Optics cover plastic
 Weight 100g
 Connection type M12 connector, or cable, cable length: 2000mm, PVC

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Warning output autoControl warn
 Signal voltage high/low PNP transistor, counting principle
 Output current ≥ ($U_B - 2V$) / ≤ 2V
 max. 100mA

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Tables

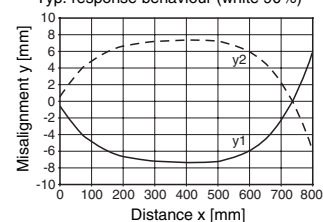
1	0	800	1000
2	1	780	900
3	2	750	880

1	white 90%
2	grey 18%
3	black 6%

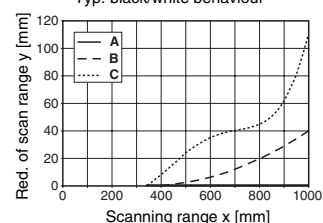
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

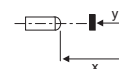
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Order guide

	Designation	Part No.
with M12 connector	complementary switching output	HRT 46/44-800-S12 500 80979
	dark switching with warning output	IHRT 46/4D-800-S12 500 80978
with 2m cable	complementary switching output	HRT 46/44-800, 2000 500 60941
	dark switching with warning output	IHRT 46/4-800, 2000 500 34081

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRT 46

Diffuse reflection light scanner with background suppression

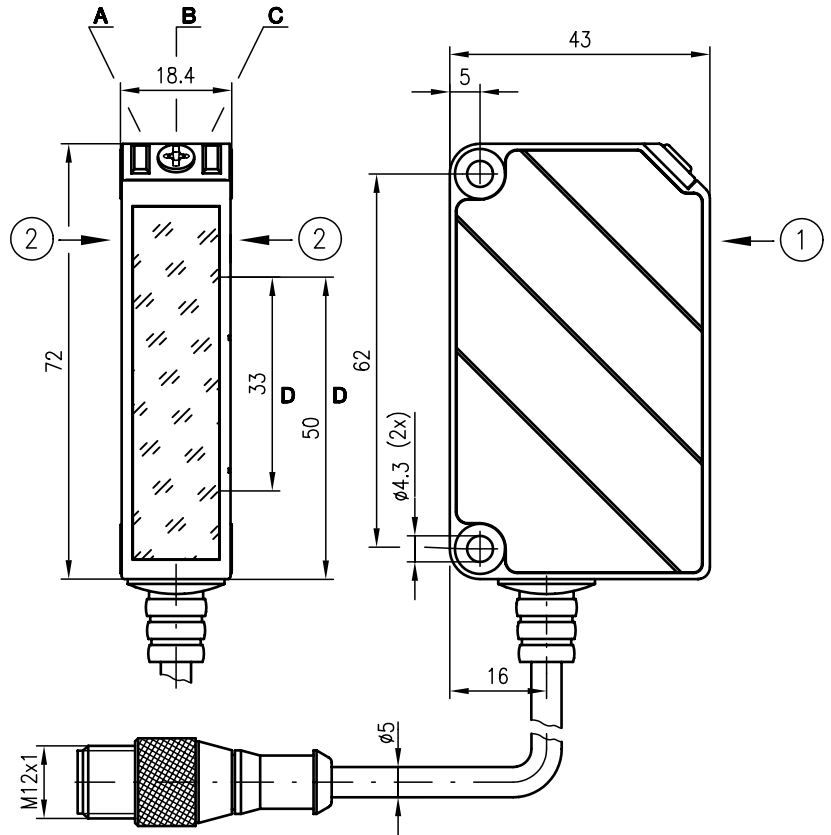


10 ... 1000mm



- Adjustable scanner with background suppression
- Safe detection of light and dark, as well as inclined or sloped surfaces
- Exact scanning range adjustment through multiturn potentiometer
- Complementary switching outputs for optimal adaptation to the application
- Warning output - for increased availability

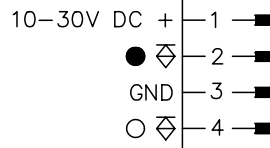
Dimensioned drawing



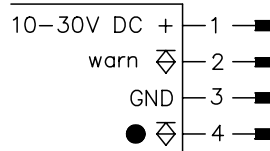
- A Indicator diode green
 - B Scanning range adjustment
 - C Indicator diode yellow
 - D Optical axis
- Preferred direction for movement of the test object ① + ②

Electrical connection

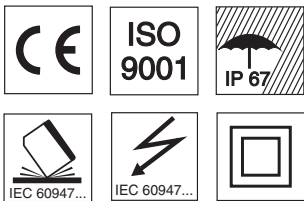
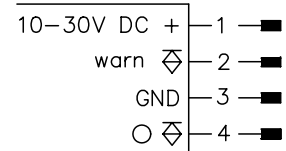
HRT 46/44-800, 300-S12



IHRT 46/4D-800, 300-S12



IHRT 46/4-800, 300-S12



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 46_d02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared light

10 ... 1000mm
 see table
 300 ... 800mm
 LED (modulated light)
 880nm

Timing

Switching frequency 200Hz
 Response time 2.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output PNP transistor
 Function characteristics HRT46/44-... light/dark switching (complementary)
 IHRT46/4D-... dark switching
 IHRT46/4-... light switching
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

Indicators

LED green ready
 LED yellow reflection
 LED yellow flashing reflection, no performance reserve

Mechanical data

Housing plastic
 Optics cover plastic
 Weight 100g
 Connection type Cable with M12 connector, cable length: 300mm

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Warning output autoControl warn PNP transistor, counting principle
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
complementary switching output	HRT 46/44-800, 300-S12	500 81318
dark switching with warning output	IHRT 46/4D-800, 300-S12	500 80977
light switching with warning output	IHRT 46/4-800, 300-S12	500 81440

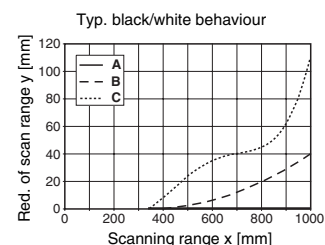
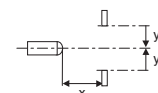
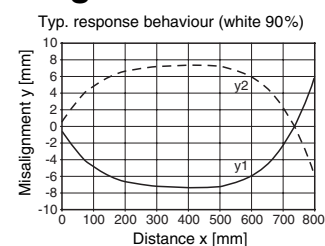
Tables

1	0	800	1000
2	1	780	900
3	2	750	880

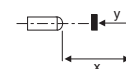
1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams



A white 90%
B grey 18%
C black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRTR 46

Diffuse reflection light scanner with background suppression

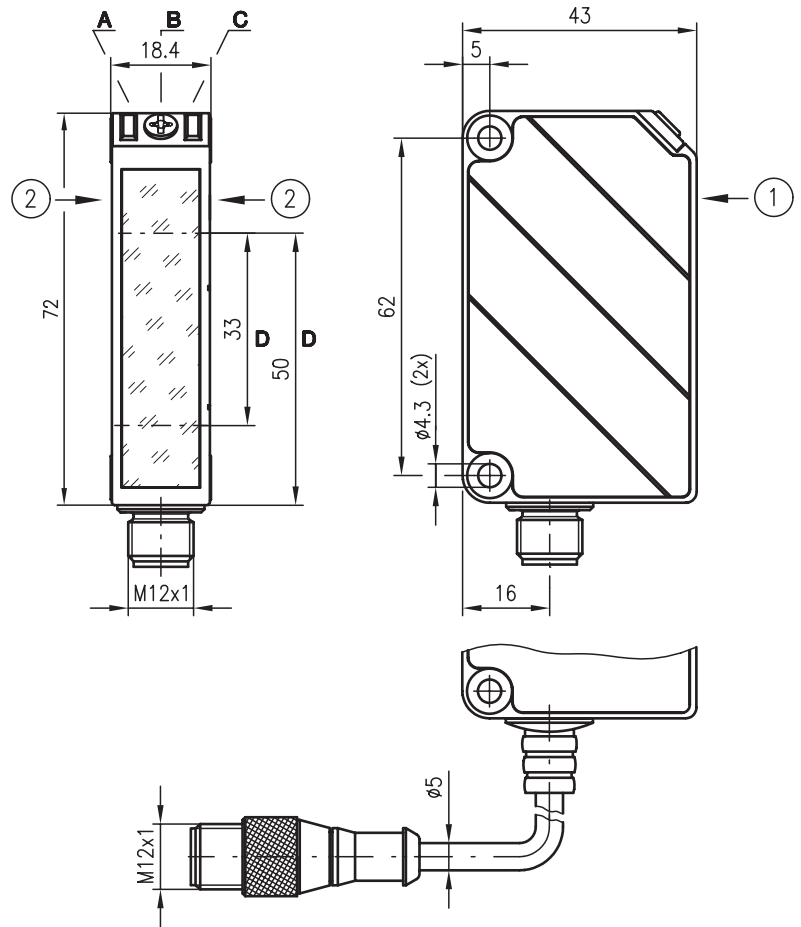


50 ... 600 mm



- Adjustable scanner with background suppression
- Safe detection of light and dark, as well as inclined or sloped surfaces
- Exact scanning range adjustment through multiturn potentiometer
- Complementary switching outputs for optimal adaptation to the application
- Visible red light for easy and quick alignment

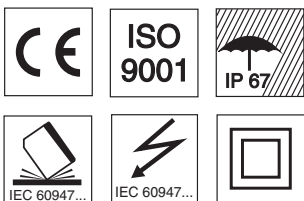
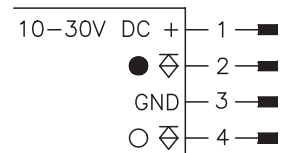
Dimensioned drawing



- A Indicator diode green
 - B Scanning range adjustment
 - C Indicator diode yellow
 - D Optical axis
- Preferred direction for movement of the test object ① + ②

Electrical connection

HRTR 46/44-500-S12
HRTR 46/44-500, 300-S12



Accessories:

(available separately • see page 314)

- Mounting systems (T 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 46_d03e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light beam characteristic
 Light source
 Wavelength

Red light

50 ... 600mm
 see table
 10 ... 500mm
 focussed
 LED (modulated light)
 660nm

Timing

Switching frequency 200Hz
 Response time 2.5ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output PNP transistor
 Function characteristics light/dark switching (complementary)
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current max. 100mA

Indicators

LED green ready
 LED yellow reflection
 LED yellow flashing reflection, no performance reserve

Mechanical data

Housing plastic
 Optics cover plastic
 Weight 100g
 Connection type M12 connector, or cable with M12 connector, cable length: 300mm

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Warning output autoControl warn PNP transistor, counting principle
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current max. 100mA

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

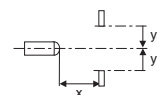
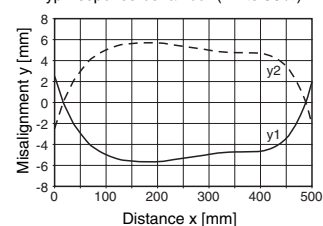
1	0	500	600
2	1	490	585
3	2	480	560

1	white 90%
2	grey 18%
3	black 6%

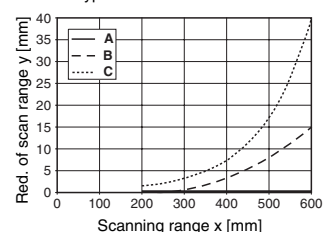
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

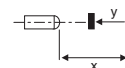
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
B grey 18%
C black 6%



Order guide

	Designation	Part No.
with M12 connector	HRTR 46/44-500-S12	500 60942
cable with M12 connector cable length: 300mm	HRTR 46/44-500, 300-S12	500 34450

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

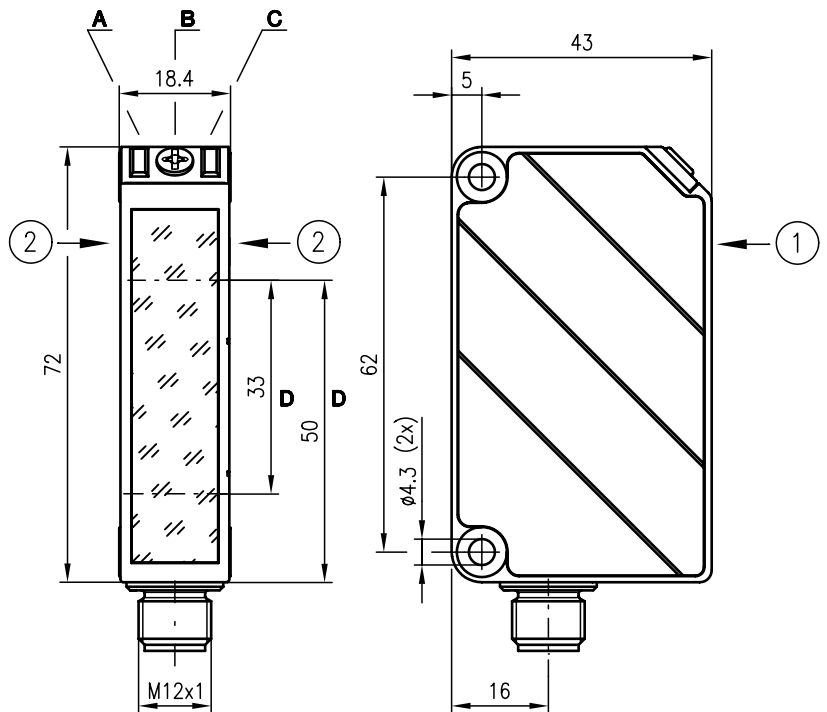


HRT 46

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Indicator diode green
 - B Scanning range adjustment
 - C Indicator diode yellow
 - D Optical axis
- Preferred direction for movement of the test object ① + ②

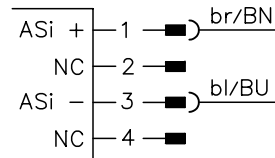


10 ... 1000mm

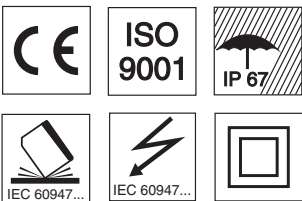


- Adjustable scanner with background suppression
- Common conductor for both power and data reduces installation work
- Safe detection of light and dark, as well as inclined or sloped surfaces
- Exact scanning range adjustment through multiturn potentiometer
- Access to all sensor functions via an AS-interface without additional wiring

Electrical connection



We reserve the right to make changes • 46_d04e.fm



Accessories:

(available separately • see page 314)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	10 ... 1000mm
Scanning range ²⁾	see table
Adjustment range	300 ... 800mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	200Hz
Sensor response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 35mA

Indicators

LED green	ready
LED yellow	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	2
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for receiver

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection
- 4) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	0 no reflection	system input	*P ₀	NC	0	system parameter
		1 reflection	input			1	parameter
D ₁	warning output autoControl	0 active	system input	*P ₁	light/dark switching	0 dark switching	system parameter
		1 not active	input			1 light switching	parameter
D ₂	ready output	0 sensor not ready	system input	*P ₂	NC	0	system parameter
		1 sensor ready	input			1	parameter
*D ₃	activation input	0 transmitter on	system output	*P ₃	NC	0	system parameter
		1 transmitter off	output			1	parameter

* default = 1

Order guide

Designation	Part No.
HRT 46/A-800-S12	500 82125

Tables

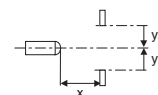
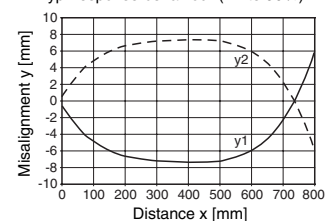
1	0	800	1000
2	1	780	900
3	2	750	880

1	white 90%
2	grey 18%
3	black 6%

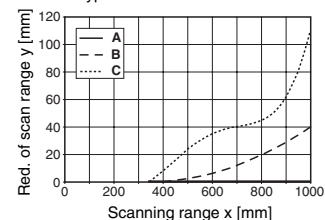
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

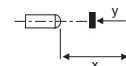
Typ. response behaviour (white 90%)



Typ. black/white behaviour

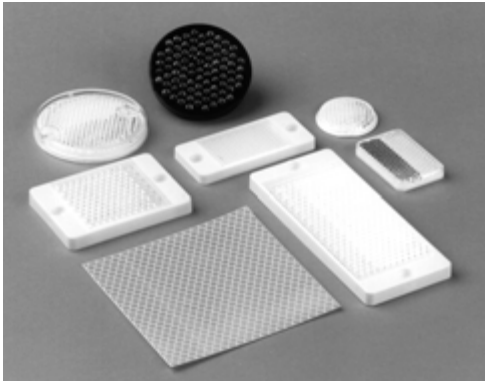


- A white 90%
- B grey 18%
- C black 6%



Remarks

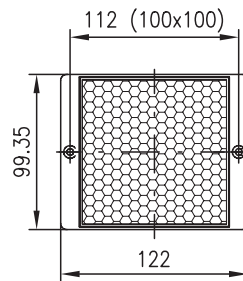
- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Reflectors


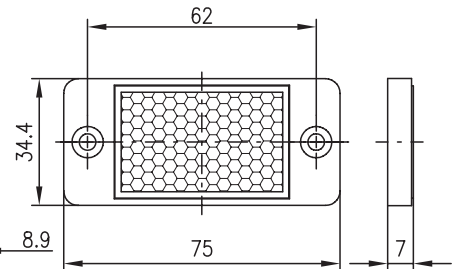
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

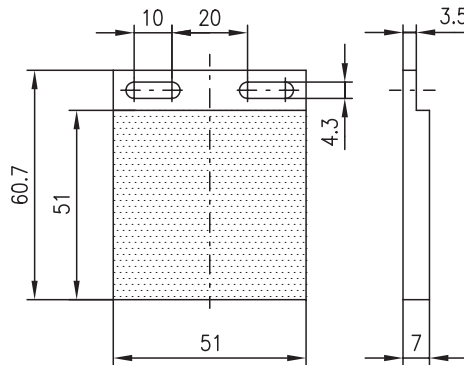
TKS 100 x 100



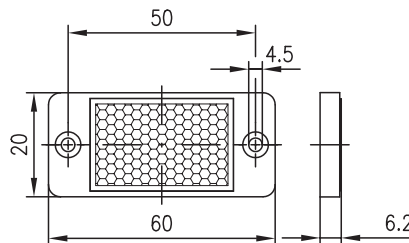
TKS 30 x 50



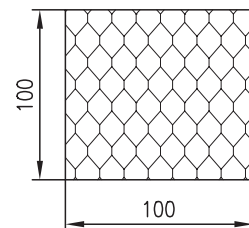
MTKS 50 x 50



TKS 20 x 40



Tape No. 2



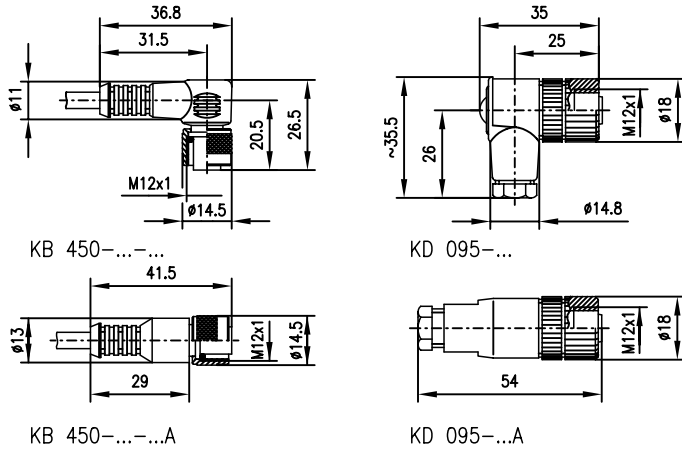
Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 46_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KB 450-2000-4	500 80833
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80834
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
KD 095-4	500 31324
KD 095-4A	500 31323
BT 46.1	500 30556
BT 46.1.5	500 82106
BT 46.2	500 33785

Dimensioned drawings



Selection table

M12 connectors				
with cable		length	without cable	
		5m		
		2m		
		5m		
		10m		

Dimensioned drawings

See next page

Connectors, plugs, cables



Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices.

Select the appropriate cable for the device with the desired cable length from the following tables.

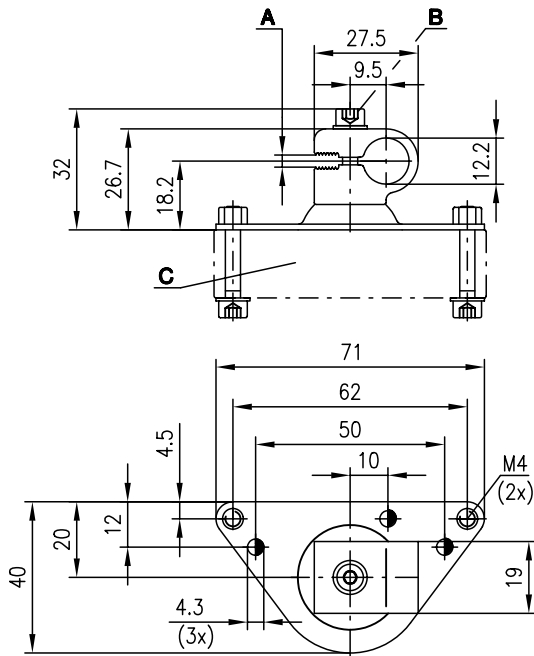
For devices with M12 connectors, there are available: connectors with ready-made 2m, 5m and 10m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

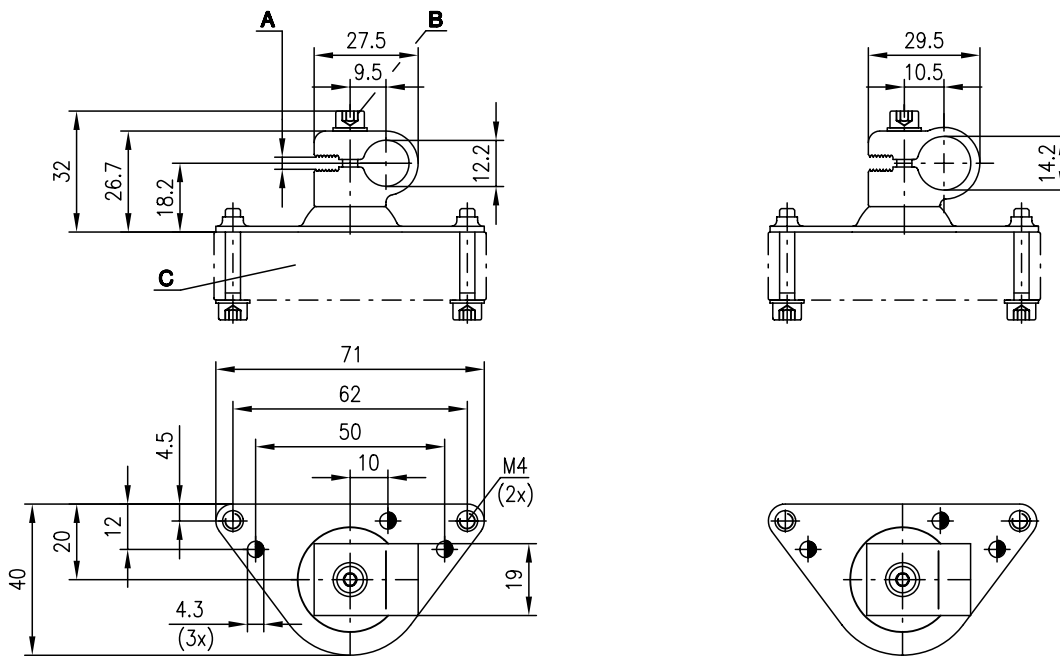
Mounting systems

BT 46.1, BT 46.1.5 (12mm rod)
B 46.2 (14mm rod)



46 Series
Dimensioned drawings
BT 46.1 (steel, aluminium)
BT 46.1.5 (stainless steel)


- A** Slit for clamping sheet metal; sheet metal thickness 1.5 to 3mm
- B** Screw DIN 912-M4
- C** Sensor

BT 46.2 (steel, aluminium)


- A** Slit for clamping sheet metal; sheet metal thickness 1.5 to 3mm
- B** Screw DIN 912-M4
- C** Sensor

92 Series

Overview and advantages

Medium-size series with many different models with robust metal housing and glass cover or stainless steel models

Operating principles:

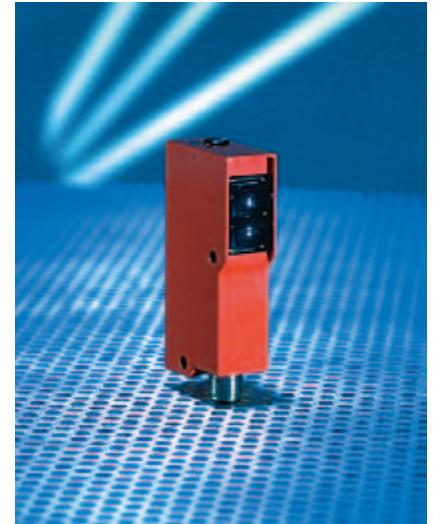
- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression

10 ... 30VDC voltage with PNP transistor output, AS-interface bus connection as an option

Connection via M12 connector, standard plug or cable

Options:

- For detection of transparent media
- Protective throughbeam photoelectric sensor type 2
- Warning output
- Activation input





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage		Output		
			Metal	Stainless steel/VA	Red light	Infrared	10 ... 30VDC	AS-i system	PNP transistor	NPN transistor	AS-interface
	ILS 92/4.8 S	0 ... 26m	•			•	•		•		
	LS 92/4.8-S	0 ... 16m	•			•	•		•		
	LS 92/4.8 L	0 ... 16m	•			•	•		•		
	LS 92/4.8-S.1	0 ... 16m	•			•	•		•		
	IRK 92/44.4, 10000	0 ... 2m	•		•		•		•		
	IPRK 92/4 S	0.2 ... 12.5m	•		•		•		•		
	IPRK 92/4 S.1	0.2 ... 12.5m	•		•		•		•		
	IPRK 92/4.8 S	0.2 ... 12.5m	•		•		•		•		
	IPRK 92/4 L	0.2 ... 12.5m	•		•		•		•		
	IPRK 92/4, 6000	0.2 ... 12.5m	•		•		•		•		
	IPRK 92/A L	0.2 ... 12.5m	•		•			•			•
	IRK 92/4-400 S	0 ... 900mm	•			•	•		•		
	IRK 92/4-400 L	0 ... 900mm	•			•	•		•		
	FRK 92/4-300 S	5 ... 440mm	•			•	•		•		
	FRK 92/4-300 L	5 ... 440mm	•			•	•		•		
	FRKR 92/4-300 S	0 ... 400mm	•		•		•		•		
	FRKR 92/4-300 L	0 ... 400mm	•		•		•		•		
	FRK 92/4-300 L.5	20 ... 300mm		•		•	•		•		
	FRK 92/4-500 L	25 ... 1600mm	•			•	•		•		
	FRK 92/A-300 L	5 ... 440mm	•			•		•			•



Switching frequency	Switching	Connection			Options							Page
		Light/dark	Standard plug 6-pin	M 12 connector	Cable	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Transparent media	
200Hz	•	•			•			•				321
200Hz	•	•						•				323
200Hz	•		•					•				323
200Hz	•	•						•				323
100Hz	•			•	•			•	•	•		325
500Hz	•	•			•	•						327
500Hz	•	•			•	•						327
500Hz	•	•			•	•		•				327
500Hz	•		•		•	•						327
500Hz	•			•	•	•						327
500Hz/AS-i	•		•		•	•						329
500Hz	•	•			•				•			331
500Hz	•		•		•				•			331
500Hz	•	•					•		•			333
500Hz	•		•				•		•			333
500Hz	•	•					•		•			335
500Hz	•		•				•		•			335
200Hz	•		•				•		•			337
200Hz	•		•				•				•	339
500Hz/AS-i	•		•				•		•			341



ILS 92

Throughbeam photoelectric sensors



26m



- Warning output autoControl for increased availability
- Activation input for testing and interlinking
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Light or dark switching by reversing the polarity of the operating voltage
- Electrical connection with 6-pin standard plug



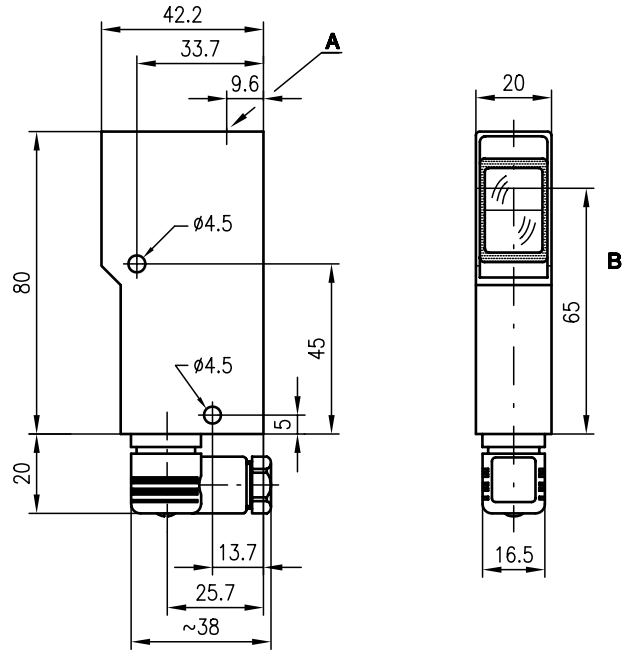
We reserve the right to make changes • 92_a01e.fm

Accessories:

(available separately • see page 342)

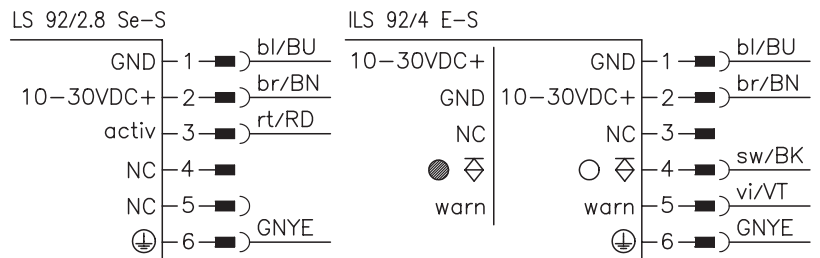
- Mounting systems (BT 92, UMS 1)
- Ready-made cables (KB ...)

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 26 m
Operating range ²⁾	0 ... 18 m
Light source	LED (modulated light)
Wavelength	880 nm

Timing

Switching frequency	200 Hz
Response time	2.5 ms
Delay before start-up	≤ 100 ms

Electrical data

Operating voltage U_B	10 ... 30 VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35 mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100 mA

Indicators

Receiver	
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve
Transmitter	
LED yellow	transmitter ON

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140 g
Connection type	standard plug 6-pin

Environmental data

Ambient temp. (operation/storage)	-20 °C ... +60 °C / -30 °C ... +70 °C
VDE safety class	I for S types
Protective circuit ³⁾	2, 3
Protection class	IP 65 for all S types IP 67 (with M12 types, optional)
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	$\geq 8V / \leq 2V$ or not connected
Activation/disable delay	≤ 1 ms
Input resistance	$4.7K\Omega \pm 10\%$
Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100 mA

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with 6-pin standard plug	ILS 92/4.8 S	
Transmitter	LS 92/2.8 Se-S	500 11218
Receiver with warning output	ILS 92/4 E-S	500 18061

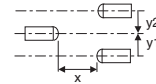
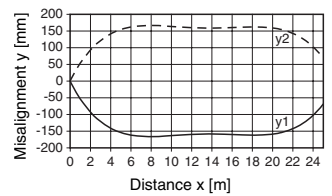
Tables

0	18	26
---	----	----

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

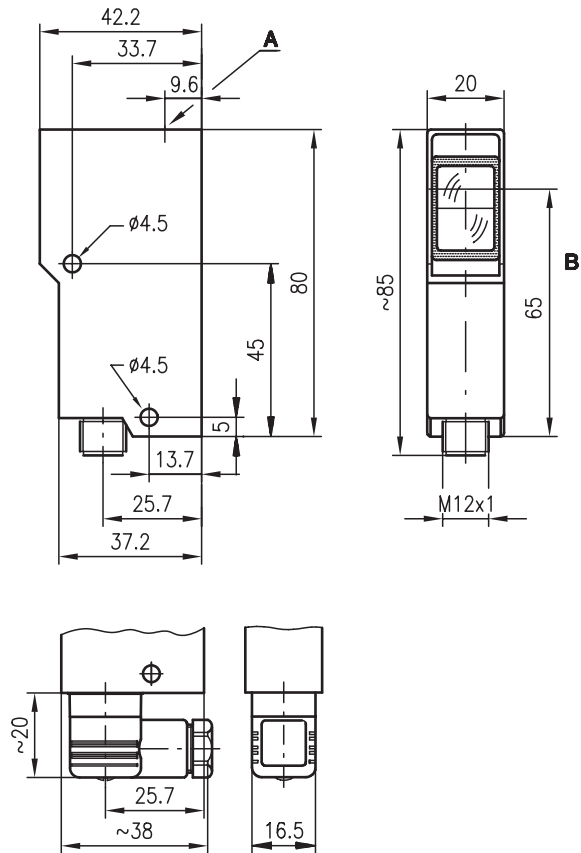


LS 92

Protective throughbeam photoelectric sensors



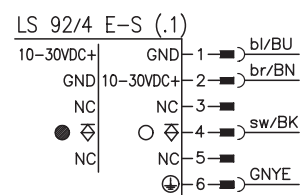
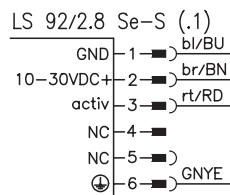
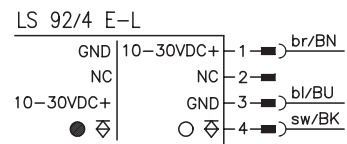
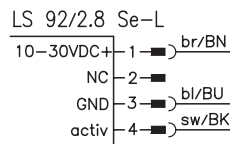
Dimensioned drawing



LS 92/2.8 Se-S
LS 92/4 E-S
LS 92/4 E-S.1
LS 92/2.8 Se-S.1

A Indicator diode
B Optical axis

Electrical connection



16m

10 - 30 V
DC

BWS
Typ 2



- Activation input for testing and interlinking
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Light or dark switching by reversing the polarity of the operating voltage
- Electrical connection with M 12 connector or 6-pin standard plug



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 92_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 16m
Operating range ²⁾	0 ... 12m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver	
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve
Transmitter	
LED yellow	transmitter ON

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector or 6-pin standard plug

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
VDE safety class	I for S types
VDE safety class ³⁾	II for L types (M12 connector)
Protective circuit ⁴⁾	2, 3
Protection class	IP 67, IP 65 for all S types
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7KΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) Rating voltage 250VAC

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with 6-pin standard plug		
Transmitter and receiver	LS 92/4.8-S	
Transmitter	LS 92/2.8 Se-S	500 11218
Receiver	LS 92/4 E-S	500 11217
with M12 connector		
Transmitter and receiver	LS 92/4.8 L	
Transmitter	LS 92/2.8 Se-L	500 22703
Receiver	LS 92/4 E-L	500 22704
with 6-pin standard plug without cable connector		
Transmitter and receiver	LS 92/4.8-S.1	
Transmitter	LS 92/2.8 Se-S.1	500 20360
Receiver	LS 92/4 E-S.1	500 20573

Tables

Diagrams

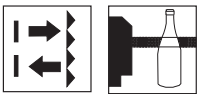
Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø13mm.



IRK 92

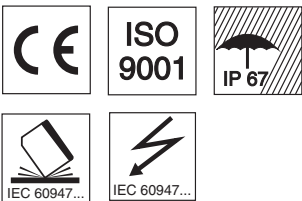
Retro-reflective photoelectric sensors



0 ... 2m

10 - 30 V
DC

- Retro-reflective photoelectric sensor using visible red light for safe detection of transparent objects (e.g. glass, PE, foil)
- Adjustable sensitivity with high resolution allows detection of transparent objects
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- Compact construction with glass optics and robust aluminium diecast housing, protection class IP 67 for industrial application
- Warning output autoControl for increased availability

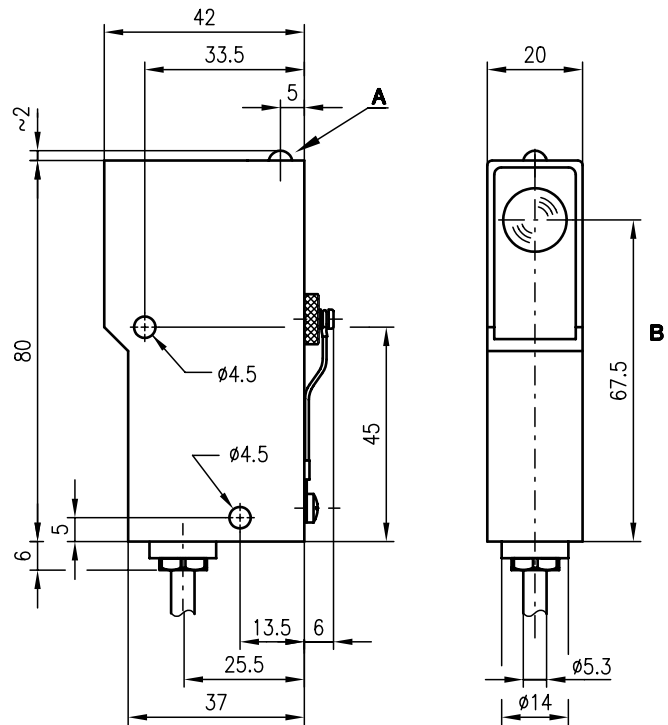


Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection

10-30V DC +	br/BN
GND	bl/BU
○	sw/BK
●	rt/RD
warn	vi/VT
⊕	gnge/GNYE

We reserve the right to make changes • 92_b01e.fm



Specifications

Optical data

Operating range (TK(S) 100x100) ¹⁾
 Light source
 Wavelength

0 ... 2m
 LED (modulated light)
 660nm (visible red light)

Timing

Switching frequency
 Response time

100Hz
 5ms

Electrical data

Operating voltage U_B
 Residual ripple
 Bias current
 Switching output
 Function characteristics
 Signal voltage high/low
 Output current

10 ... 30VDC (incl. residual ripple)
 $\leq 15\%$ of U_B
 ≤ 30 mA
 2 PNP transistor outputs, complementary
 light or dark switching (by reversing the polarity of U_B)
 $\geq (U_B - 2V) / \leq 2V$
 max. 100mA

Indicators

LED yellow
 LED red

light path free
 light path free, no performance reserve

Mechanical data

Housing
 Optics
 Weight
 Connection type

diecast aluminium
 glass
 90g
 cable: length 10m, 6x0.25mm²

Environmental data

Ambient temp. (operation/storage)
 Protective circuit ²⁾
 VDE safety class
 Protection class
 Standards applied

-20°C ... +60°C / -30°C ... +70°C
 2, 3
 I
 IP 67
 IEC 60947-5-2

Options

Warning output autoControl warn
 Signal voltage high/low
 Output current

PNP transistor, counting principle
 $\geq (U_B - 2V) / \leq 2V$
 max. 100mA

- 1) Operating range: recommended range with performance reserve
 2) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Reflectors		Operating range
TK(S)	100x100	0 ... 2.0 m
TK(S)	50x100	0 ... 1.8 m
TK(S)	50x50	0 ... 1.0 m
TK(S)	30x50	0 ... 0.8 m
TK	82	0 ... 2.0 m
TK	60	0 ... 0.8 m
TK	35	0 ... 0.8 m

TK ... = adhesive
 TKS ... = screw type

Diagrams

Order guide

Designation	Part No.
IRK 92/44.4, 10000	500 23851

Remarks

- Sensitivity adjustment is carried out by placing an object between the transmitter and the reflector.
- Turn the potentiometer until the LED illuminates red or yellow.
Then turn back to the point where the LED turns off.
- Remove the object and check the setting by moving the object through the light path (correct setting if necessary).



IPRK 92

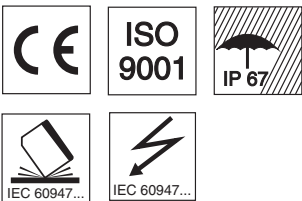
Retro-reflective photoelectric sensors with polarisation filter



0.2 ... 12.5 m



- Compact construction with glass optics and robust zinc diecast housing, protection class IP 67 for industrial application
- Warning output autoControl for increased availability
- Electrical connection with M12 connector, cable or 6-pin standard plug

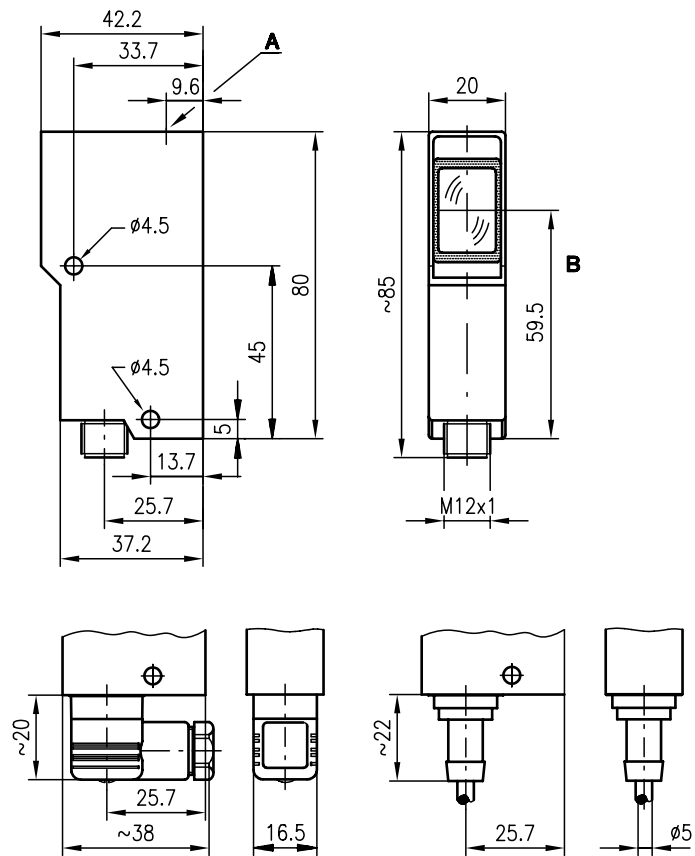


Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

Dimensioned drawing

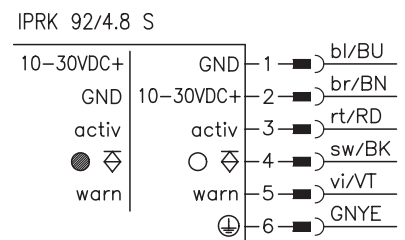
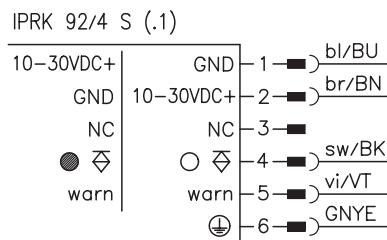
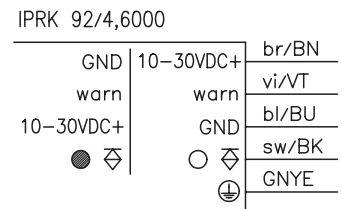
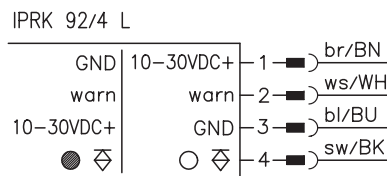


IPRK 92/4 S
IPRK 92/4.8 S

IPRK 92/4,6000

- A Indicator diode
- B Optical axis

Electrical connection



We reserve the right to make changes • 92_b02e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.2 ... 12.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	500Hz
Response time	1 ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector, 6-pin standard plug or cable: length 6m, 3x0.25mm ² +1x0.5mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
VDE safety class	I for S types and cable version
VDE safety class ³⁾	II for L types (M12 connector)
Protective circuit ⁴⁾	2, 3
Protection class	IP 67, IP 65 for IPRK 92/4...S
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	1 ms
Input resistance	4.7KΩ ± 10%
Warning output autoControl warn	
Signal voltage high/low	PNP transistor, counting principle
Output current	≥ ($U_B - 2V$) / ≤ 2V max. 100mA

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) Rating voltage 250 VAC
 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with 6-pin standard plug		
without transmitter activation	IPRK 92/4 S	500 13059
with activation input	IPRK 92/4.8 S	500 14199
with M12 connector	IPRK 92/4 L	500 18778
with cable connection 6m	IPRK 92/4, 6000	500 23962
with 6-pin standard plug	IPRK 92/4 S.1	500 20358
without cable connector		

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.2 ... 8.5m
2 TK(S) 47x47	0.2 ... 7.0m
3 TK(S) 30x50	0.2 ... 3.5m
4 TK(S) 20x40	0.2 ... 3.0m
5 Tape 2 100x100	0.3 ... 3.0m

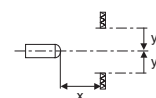
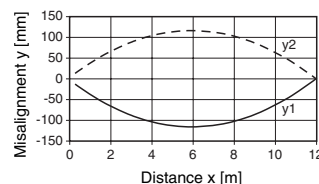
1	0.2	8.5	12.5
2	0.2	7.0	10
3	0.2	3.5	5.5
4	0.2	3.0	4.5
5	0.2	3.0	4.5

- Operating range [m]
 ▒ Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks

- The retro-reflective photoelectric sensor is also available with integrated AS-i chip for direct connection to the AS-i system.



IPRK 92

Retro-reflective photoelectric sensors

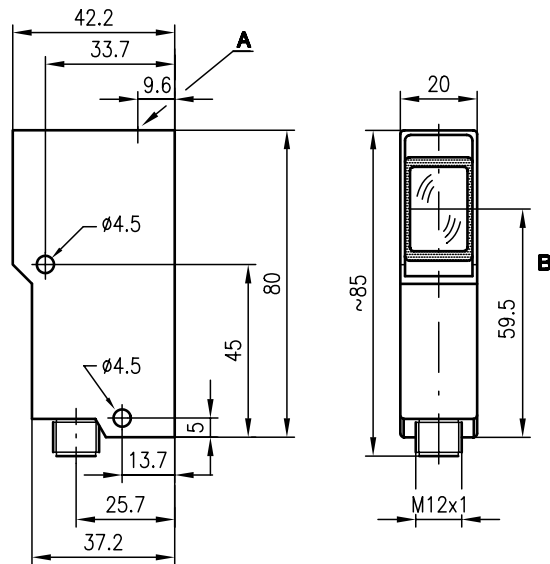


0.2 ... 12.5 m



- Polarised retro-reflective photoelectric sensor with integrated AS-i slave
- Access to all sensor functions via an AS-i slave without additional wiring
- Common conductor for both power and data reduces installation work
- Warning output autoControl for increased availability
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Mounting holes and M12 connector for fast installation

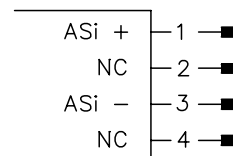
Dimensioned drawing



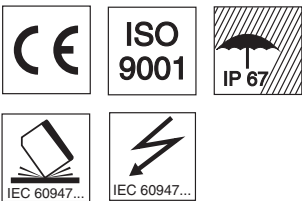
- A Indicator diode
- B Optical axis

Electrical connection

IPRK 92/A L



We reserve the right to make changes • 92_b04e.fm



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals, AS-i ribbon cable, address programming device, coupling modules, intermediate cables, etc.

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.2 ... 12.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Sensor switching frequency	500Hz
Sensor response time	1 ms

Electrical data

Operating voltage U_B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 30mA

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector, stainless steel 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
VDE safety class ³⁾	II
Protection class	IP 67
Electromagnetic compatibility	acc. to AS-i specification

AS-i data

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	0 no reflection	system input	*P ₀	NC	0	system parameter
		1 reflection	input			1	parameter
D ₁	warning output autoControl	0 active	system input	*P ₁	light/dark switching	0 dark switching	system parameter
		1 not active	input			1 light switching	parameter
D ₂	ready output	0 sensor not ready	system input	*P ₂	NC	0	system parameter
		1 sensor ready	input			1	parameter
*D ₃	activation input	0 transmitter on	system output	*P ₃	NC	0	system parameter
		1 transmitter off	output			1	parameter

* default = 1

Order guide

Designation	Part No.
IPRK 92/A L	500 24298

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.2 ... 8.5m
2 TK(S) 47x47	0.2 ... 7.0m
3 TK(S) 30x50	0.2 ... 3.5m
4 TK(S) 20x40	0.2 ... 3.0m
5 Tape 2 100x100	0.3 ... 3.0m

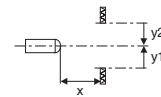
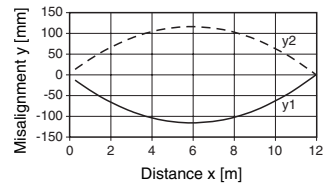
1	0.2	8.5	12.5
2	0.2	7.0	10
3	0.2	3.5	5.5
4	0.2	3.0	4.5
5	0.2	3.0	4.5

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Remarks



IRK 92

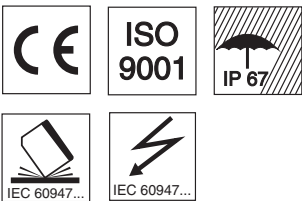
Energetic diffuse reflection light scanner



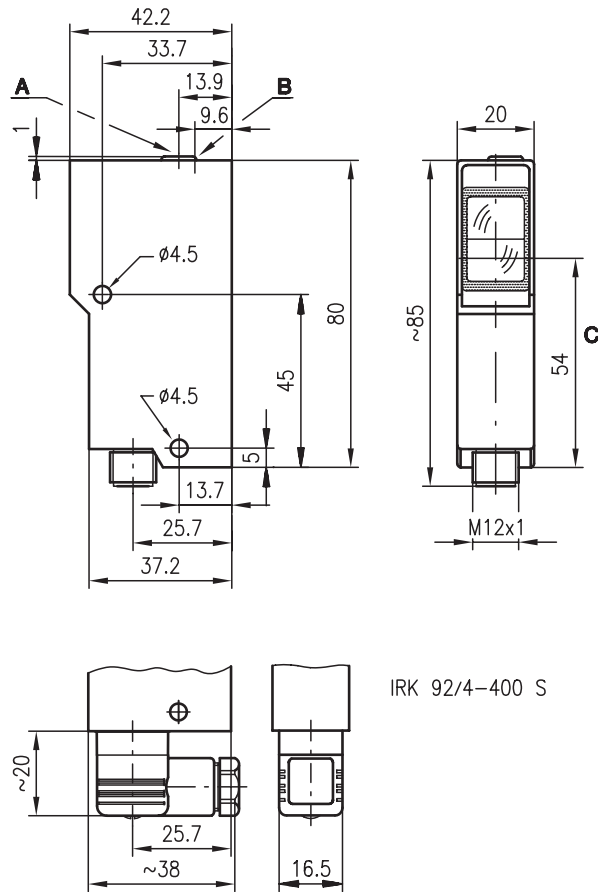
0 ... 900 mm



- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Warning output autoControl for increased availability
- Light or dark switching by reversing the polarity of the operating voltage
- Electrical connection with M12 connector or 6-pin standard plug

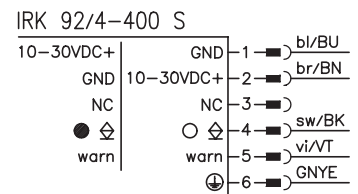
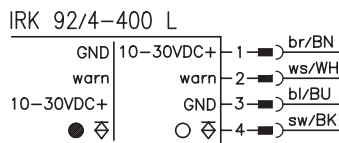


Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection



We reserve the right to make changes • 92_c01e.fm

Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 900mm
Scanning range ²⁾	see table
Adjustment range	80 ... 400mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	500Hz
Response time	1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector or 6-pin standard plug

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
VDE safety class	I for S types
VDE safety class ³⁾	II for L types (M12 connector)
Protective circuit ⁴⁾	2, 3
Protection class	IP 67, IP 65 for IRK 92/4-400 S
Standards applied	IEC 60947-5-2

Options

Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Rating voltage 250 VAC
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector	IRK 92/4-400 L	500 19281
with 6-pin standard plug	IRK 92/4-400 S	500 13058

Tables

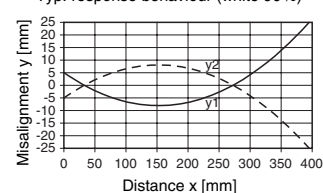
1	0	400	900
2	10	280	470
3	15	230	350

1	white 90%
2	grey 18%
3	black 6%

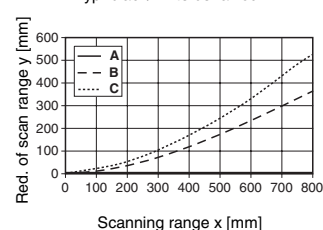
<input type="checkbox"/>	Scanning range [mm]
<input type="checkbox"/>	Typ. scanning range limit [mm]

Diagrams

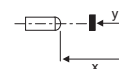
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.

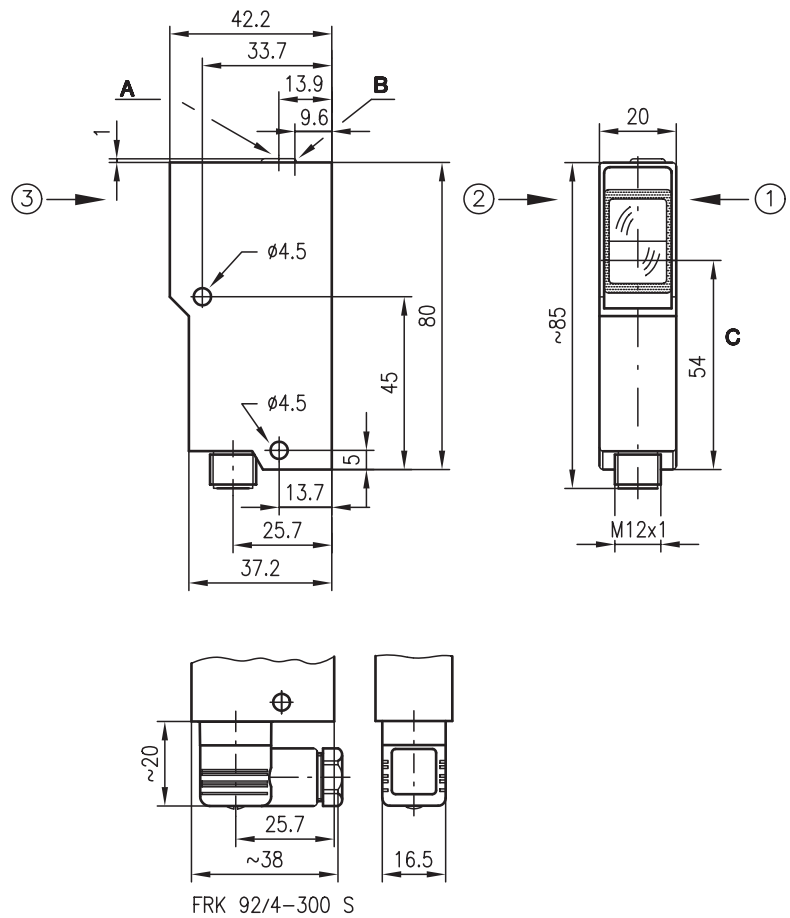


FRK 92

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Scanning range adjustment
 - B Indicator diode
 - C Optical axis
- Preferred entry direction for objects ① + ② + ③

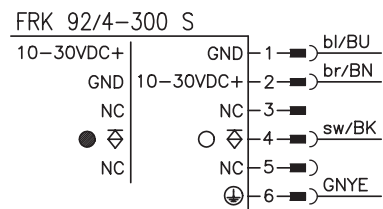
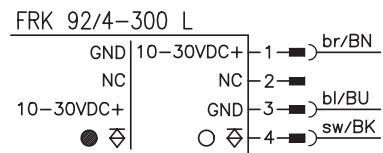
5 ... 440mm



10 - 30 V
DC

- Very good black/white performance, exact adjustment via multiturn potentiometer
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Electrical connection with M 12 connector or 6-pin standard plug

Electrical connection



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 92_d01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 440mm
Scanning range ²⁾	see table
Adjustment range	50 ... 300mm
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	500Hz
Response time	1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector or 6-pin standard plug

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
VDE safety class	I for S types
VDE safety class ³⁾	II for L types (M12 connector)
Protective circuit ⁴⁾	2, 3
Protection class	IP 67, IP 65 for FRK 92/4-300 S
Standards applied	IEC 60947-5-2

1) Typ. scanning range limit: max. attainable range without performance reserve

2) Scanning range: recommended range with performance reserve

3) Rating voltage 250VAC

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector	FRK 92/4-300 L	500 19283
with 6-pin standard plug	FRK 92/4-300 S	500 11213

Tables

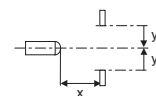
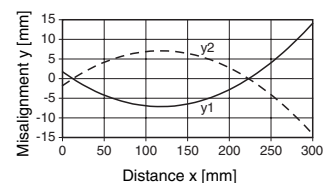
1	5	300	440
2	15	280	390
3	20	260	360

1	white 90%
2	grey 18%
3	black 6%

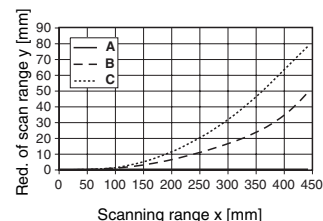
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

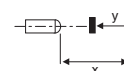
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.
- The diffuse reflection light scanner is also available with integrated AS-i chip for direct connection to the AS-i system.



FRKR 92

Diffuse reflection light scanner with background suppression

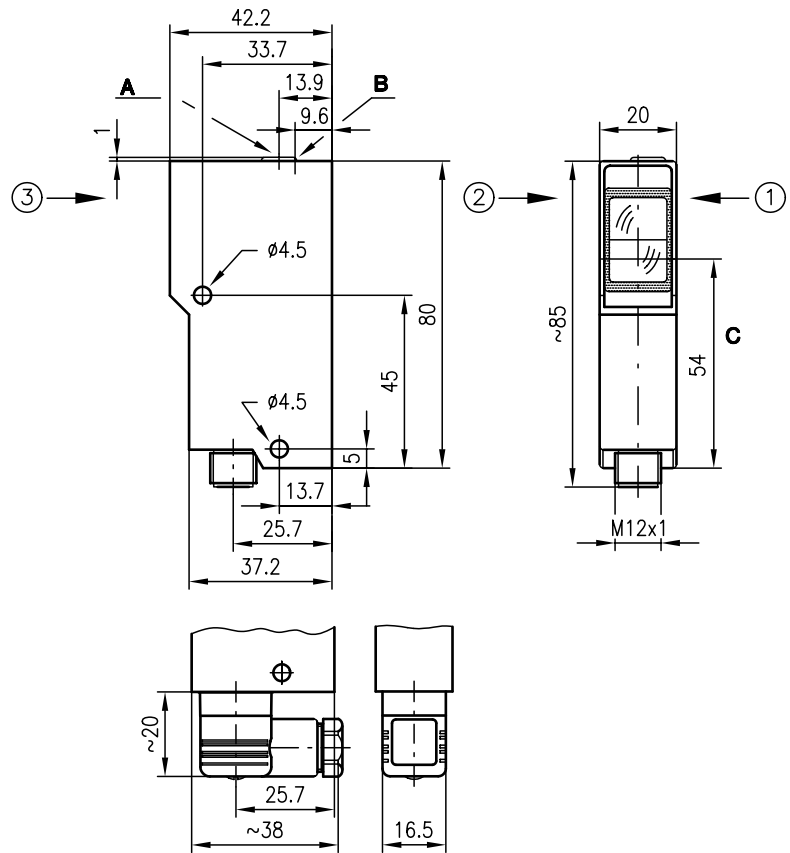


0 ... 400mm

10 - 30 V
DC

- Very good black/white performance, exact adjustment via multiturn potentiometer
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Electrical connection with M 12 connector or 6-pin standard plug
- Visible red light for easy and quick alignment

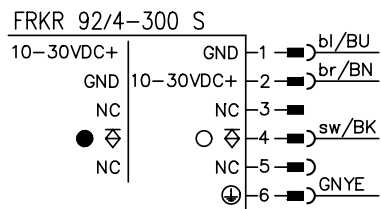
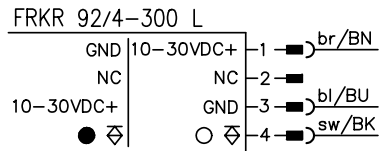
Dimensioned drawing



FRKR 92/4-300 S

- A Scanning range adjustment
 - B Indicator diode
 - C Optical axis
- Preferred entry direction for objects ① + ② + ③

Electrical connection



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 92_d05e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 400mm
Scanning range ²⁾	see table
Adjustment range	50 ... 300mm
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm

Timing

Switching frequency	500Hz
Response time	1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector or 6-pin standard plug

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
VDE safety class	I for S types
VDE safety class ³⁾	II for L types (M12 connector)
Protective circuit ⁴⁾	2, 3
Protection class	IP 67, IP 65 for FRKR 92/4-300 S
Standards applied	IEC 60947-5-2

1) Typ. scanning range limit: max. attainable range without performance reserve

2) Scanning range: recommended range with performance reserve

3) Rating voltage 250VAC

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector	FRKR 92/4-300 L	500 80328
with 6-pin standard plug	FRKR 92/4-300 S	500 21764

Tables

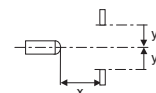
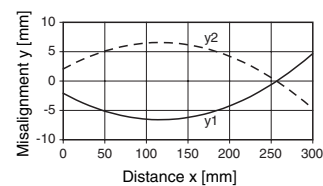
1	0	300	400
2	3	285	360
3	5	270	330

1	white 90%
2	grey 18%
3	black 6%

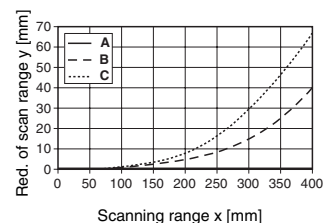
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

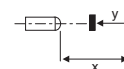
Typ. response behaviour (white 90%)



Typ. black/white behaviour



A white 90%
B grey 18%
C black 6%



Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.

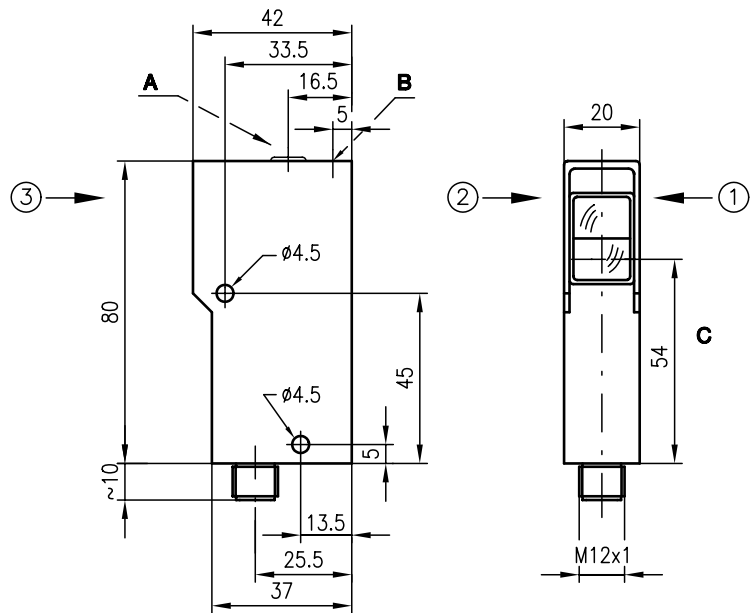


FRK 92

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Scanning range adjustment
 - B Indicator diode
 - C Optical axis
- Preferred entry direction for objects ① + ② + ③

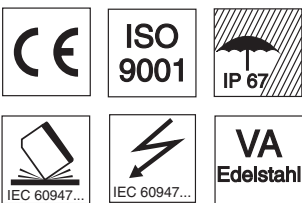
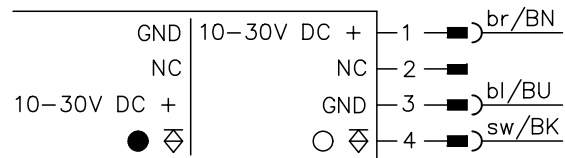


20 ... 300 mm



- Compact construction with robust stainless steel housing and glass optics, protection class IP 67 for industrial application
- Very good black/white performance, exact adjustment via multiturn potentiometer

Electrical connection



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 92_d02e.fm



Specifications

Optical data

Scanning range (white 90%)	20 ... 300mm
Adjustment range	50 ... 300mm
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5 ms

Electrical data

Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Bias current	≤ 35 mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

LED red	reflection
---------	------------

Mechanical data

Housing	stainless steel G - X 6 Cr Ni 18 9 (1.4308)
Optics	glass
Weight	220g
Connection type	M 12 connector, stainless steel 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -30°C ... +70°C
Protective circuit ²⁾	2, 3
Protection class	IP 67

1) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)

2) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Designation	Part No.
FRK 92/4-300 L.5	500 22686

Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.



FRK 92

Diffuse reflection light scanner with background suppression

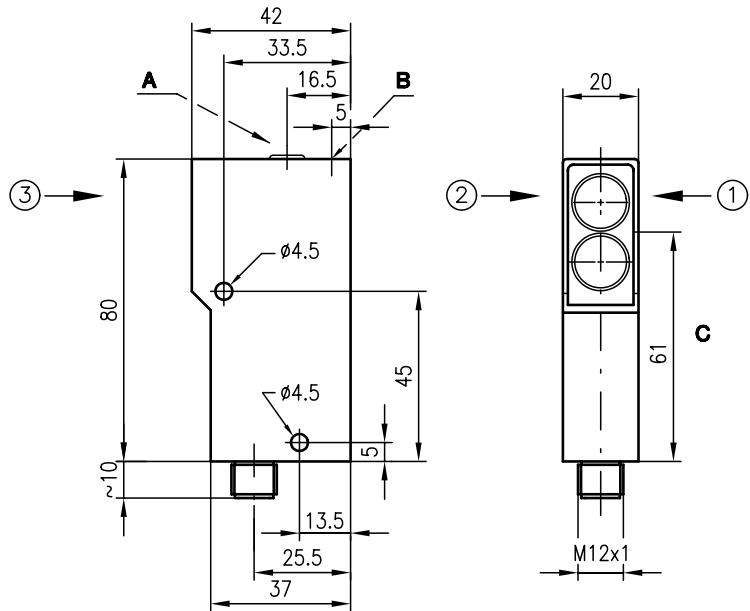


25 ... 1600 mm

10 - 30 V
DC

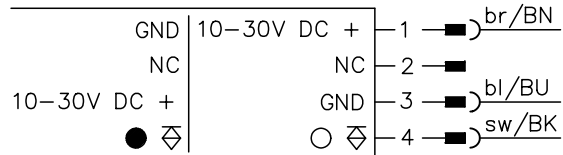
- Compact construction with robust aluminium diecast housing and glass optics, protection class IP 67 for industrial application
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Indicator diode used as alignment aid for simple mounting
- Cross-talk control - for preventing mutual interference

Dimensioned drawing



- A Scanning range adjustment
 - B Indicator diode
 - C Optical axis
- Preferred entry direction for objects ① + ② + ③

Electrical connection



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)

We reserve the right to make changes • 92_d03e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	25 ... 1600mm
Scanning range ²⁾	see table
Adjustment range	100 ... 500mm adjustable using multiturn potentiometer
Light beam characteristic	focussed
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	min 2.5ms

Electrical data

Operating voltage U_B ³⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Bias current	≤ 35 mA
Switching output ⁴⁾	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U_B)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	diecast aluminium
Optics	glass
Weight	90g
Connection type	M12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
VDE safety class	
Protective circuit ⁵⁾	2, 3
Protection class	IP 67
Standards applied	IEC 60947-5-2
Cross-talk-Control	no mutual interference

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
The voltage supply must provide at least a basic insulation (according to VDE 0160) for separation of the primary and secondary circuits.
- 4) Light switching: transistor activated with reflection
Dark switching: transistor activated with no reflection
- 5) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

Designation	Part No.
FRK 92/4-500 L	500 22196

Tables

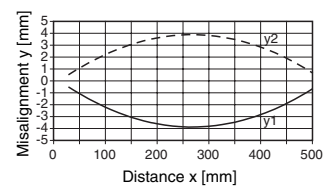
1	25	500	1600
2	30	490	1000
3	30	470	800

1	white 90%
2	grey 18%
3	black 6%

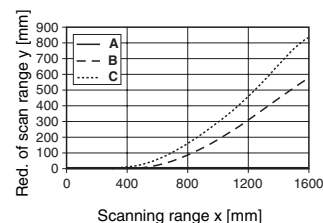
<input type="checkbox"/>	Scanning range [mm]
<input type="checkbox"/>	Typ. scanning range limit [mm]

Diagrams

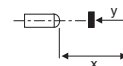
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A** white 90%
- B** grey 18%
- C** black 6%



Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



FRK 92

Diffuse reflection light scanner with background suppression



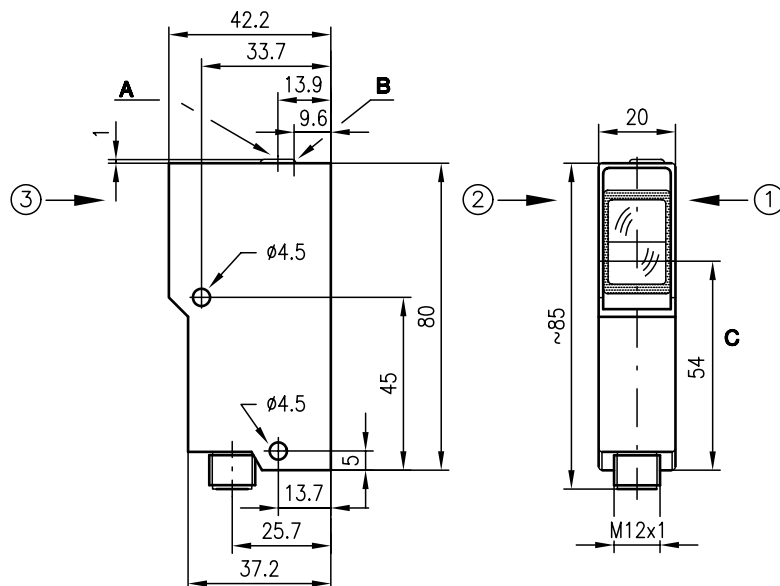
Dimensioned drawing



5 ... 440 mm



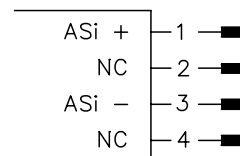
- Scanner with adjustable background suppression and integrated AS-i slave
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Common conductor for both power and data reduces installation work
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences



- A** Scanning range adjustment
 - B** Indicator diode
 - C** Optical axis
- Preferred entry direction for objects ① + ② + ③

Electrical connection

FRK 92/A-300



Accessories:

(available separately • see page 342)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals, AS-i ribbon cable, address programming device, coupling modules, intermediate cables, etc.

We reserve the right to make changes • 92_d04e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 440mm
Scanning range ²⁾	see table
Adjustment range	50 ... 300mm
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	500Hz
Sensor response time	1ms

Electrical data

Operating voltage U_B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 30mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector, stainless steel 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
VDE safety class ³⁾	II
Protection class	IP 67
Electromagnetic compatibility	acc. to AS-i specification

AS-i data

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Rating voltage 250VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection	input			1	parameter
D ₁	NC	∅ active	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1 not active	input			1 light switching	parameter
D ₂	ready output	∅ sensor not ready	system input	*P ₂	NC	∅	system parameter
		1 sensor ready	input			1	parameter
*D ₃	activation input	∅ transmitter on	system output	*P ₃	NC	∅	system parameter
		1 transmitter off	output			1	parameter

* default = 1

Order guide

Designation	Part No.
FRK 92/A-300 L	500 24299

Tables

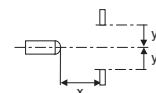
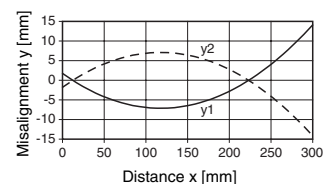
1	5	300	440
2	15	280	390
3	20	260	360

1	white 90%
2	grey 18%
3	black 6%

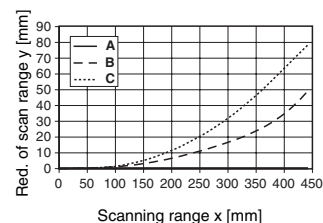
	Scanning range [mm]
	Typ. scanning range limit [mm]

Diagrams

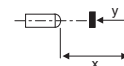
Typ. response behaviour (white 90%)



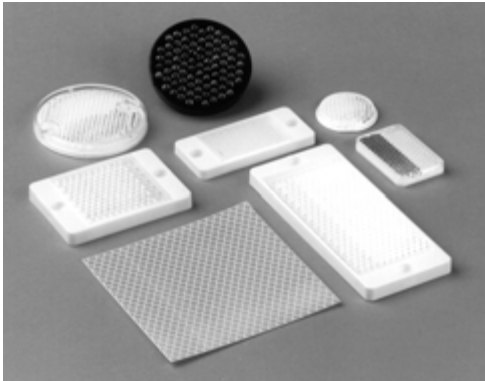
Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



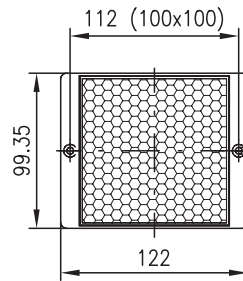
Remarks

Reflectors


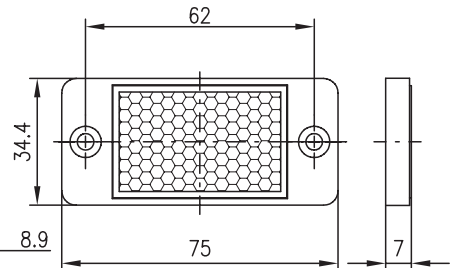
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tapes No 2 and No 3 may be used.

Dimensioned drawings

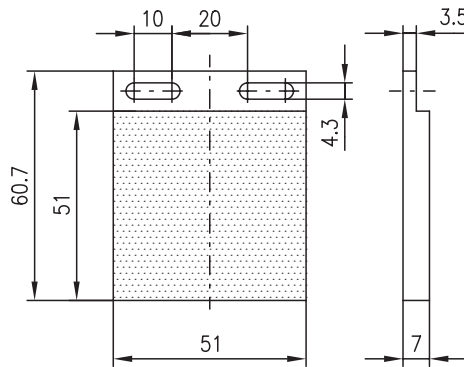
TKS 100 x 100



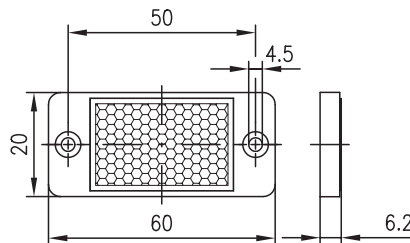
TKS 30 x 50



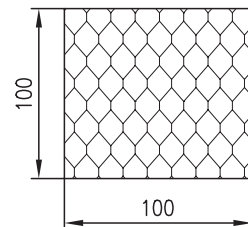
MTKS 50 x 50



TKS 20 x 40



Tape No. 2



Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 92_zu_e.fm

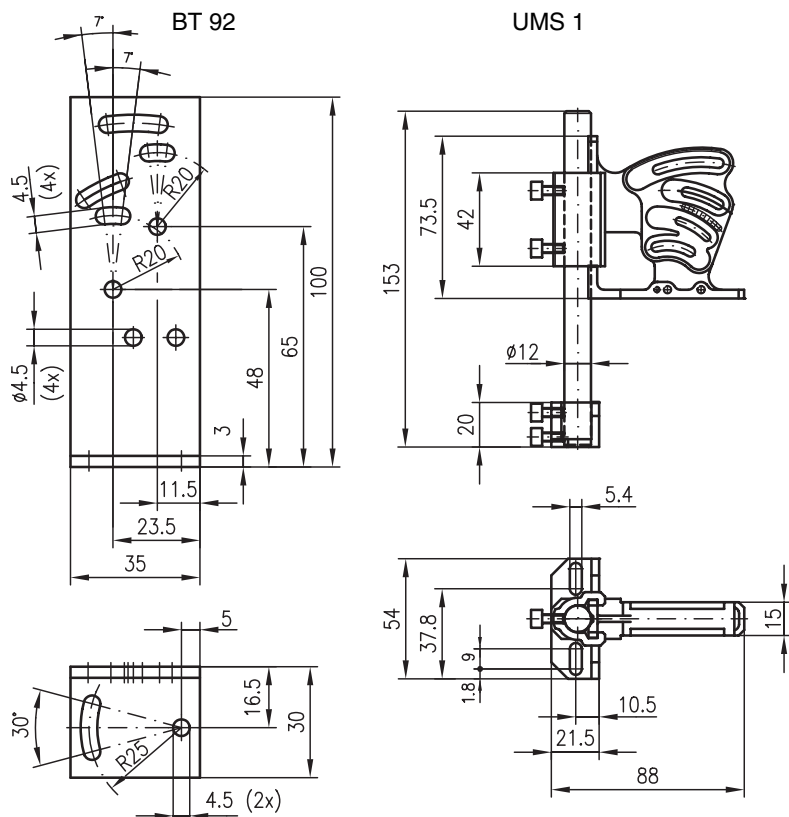
Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 92	500 18415
UMS 1	500 22281
Socket	500 10889

Selection table

Ready-made cables with 6-pin standard plug			
	Cable length		
	2m	6m	M 12
Sensor designation	Cable designation (Part No.)		
LS 92/4 E-S(.1)	KB 092-2000-4 (Part No. 500 11257)	KB 092-6000-4 (Part No. 500 11258)	KB 092-12000-4 (Part No. 500 11946)
FRK 92/4-300 S			
FRKR 92/4-300 S			
LS 92/2.8 Se-S.1	KB 092-2000-4 Se (Part No. 500 11950)	KB 092-6000-4 Se (Part No. 500 11951)	KB 092-12000-4 Se (Part No. 500 11952)
ILS 92/4 E-S	KB 092-2000-5 (Part No. 500 13169)	KB 092-6000-5 (Part No. 500 13192)	
IPRK 92/4 S(.1)			
IRK 92/4-400 S			
IPRK 92/4.8 S	KB 092-2000-6 (Part No. 500 11947)	KB 092-6000-6 (Part No. 500 11948)	KB 092-12000-6 (Part No. 500 11949)

M12 connectors			
with cable (5m cable length)		without cable	
KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A

Dimensioned drawings

Connectors, plugs, cables


Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices. Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: 2 connectors with ready made 5m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

Mounting systems

BT 92



UMS 1





93 Series

Overview and advantages

Special sensor series with many different models in robust metal housing with glass lens

Operating principles:

- Energetic diffuse reflection light scanners
- Diffuse reflection light scanner with foreground and background suppression
- Diffuse reflection light scanners with background suppression

- Foreground and background suppression through fixed optical system
- Ignores the short and distant range

- 10 ... 30VDC voltage with PNP- (NPN) transistor output
- alternatively AS-interface bus connection

Connection via M12 connector or cable

Options:

- Warning output
- Wire break monitoring





Operating principle	Designation	Typ. scanning range limit	Housing	Light source		Operating voltage		Output		
				Red light	Infrared	10 ... 30VDC	18 ... 35VDC	PNP transistor	NPN transistor	AS-interface
	RK 93/4-20 L	0 ... 23mm	•		•			•		
	RK 93/4-20 S	0 ... 23mm	•		•			•		
	RK 93/2-20 S	0 ... 23mm	•		•				•	
	RK 93/4-20	0 ... 23mm	•		•			•		
	RK 93/4-60 L	0 ... 65mm	•		•			•		
	RK 93/4-60 S	0 ... 65mm	•		•			•		
	RK 93/2-60 S	0 ... 65mm	•		•				•	
	RK 93/2-60	0 ... 65mm	•		•				•	
	RK 93/4-60	0 ... 65mm	•		•			•		
	RK 93/4-60.1	0 ... 65mm	•		•			•		
	RK 93/4-150 L	5 ... 170mm	•		•			•		
	RK 93/4-150 S	5 ... 170mm	•		•			•		
	RK 93/2-150 S	5 ... 170mm	•		•				•	
	RK 93/4-150	5 ... 170mm	•		•			•		
	RK 93/4-200 L	2 ... 210mm	•		•			•		
	RK 93/A-60 L	0 ... 65mm	•		•					•
		FRK 93/44-60	15 ... 75mm	•		•			•	
IFRK 93/4-100 L.2		30 ... 100mm	•		•		•	•		



Switching frequency	Switching		Connection			Options				Page
	Light	Dark	M12 connector	Standard plug 4-pin	Cable 2 m	Background suppression	Background suppression	Warning output	Wire break monitoring	
250 Hz	•		•			•				349
250 Hz	•			•		•				349
250 Hz	•			•		•				349
250 Hz	•				•	•				349
250 Hz	•		•			•				351
250 Hz	•			•		•				351
250 Hz	•			•		•				351
250 Hz	•			•		•				351
250 Hz	•				•	•				351
250 Hz	•				•	•				351
250 Hz	•		•			•				353
250 Hz	•			•		•				353
250 Hz	•			•		•				353
250 Hz	•				•	•				353
250 Hz	•		•			•				353
250 Hz	•	•	•			•		•		355
200 Hz	•	•			•		•			357
150 Hz	•		•				•	•	•	359



RK 93

Energetic diffuse reflection light scanner



0 ... 23mm



- Background suppression via V-shaped optical system
- Infrared light
- Mounting holes for fast installation
- Connection via M12 connector, standard plug or cable (2m)

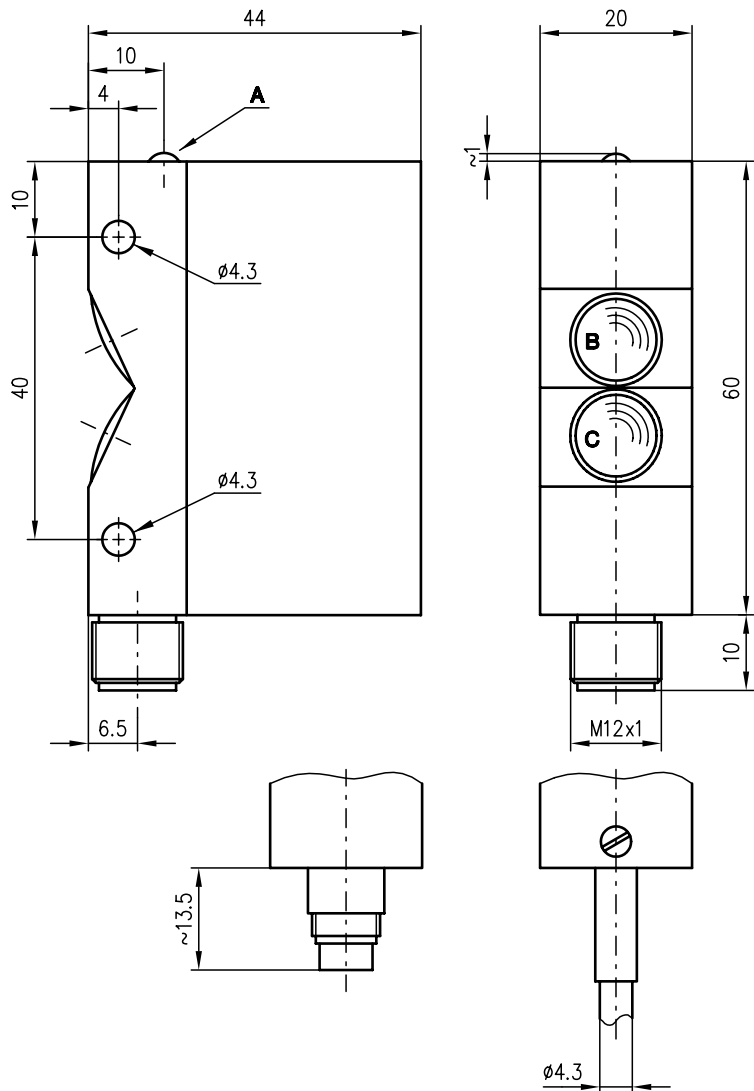


Accessories:

(available separately • see page 360)

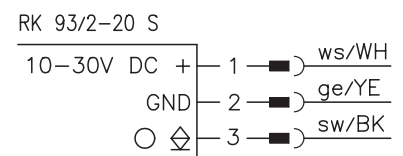
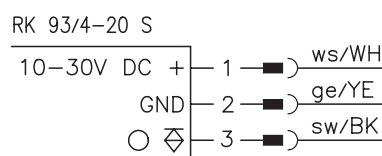
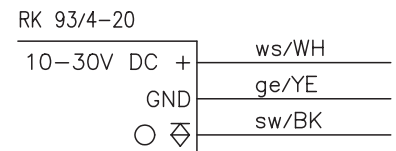
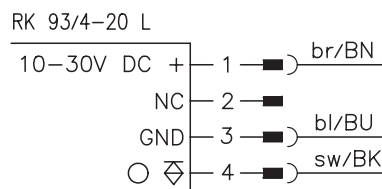
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Standard plug

Dimensioned drawing



- A Indicator diode
- B Receiver
- C Transmitter

Electrical connection



We reserve the right to make changes • 93_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 23mm
Scanning range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	250Hz
Response time	2ms

Electrical data

Operating voltage U_B ³⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Power consumption	max. 0.6 W
Switching output	PNP or NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 3V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow on	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight	170g
Connection type ⁴⁾	M 12 connector 4-pin, standard plug 4-pin, or cable 2000mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ⁵⁾	2, 3
Protection class	IP 65

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) Cable cross-section 4x0.25mm²
- 5) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

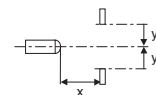
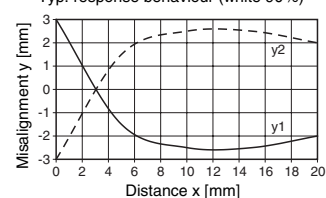
1	0	20	23
2	2	18	20
3	4	15	17

1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams

Typ. response behaviour (white 90%)



Order guide

	Designation	Part No.
with M12 connector		
PNP transistor output	RK 93/4-20 L	500 23930
with standard plug		
NPN transistor output	RK 93/2-20 S	500 00544
PNP transistor output	RK 93/4-20 S	500 00551
with cable connection 2m		
PNP transistor output	RK 93/4-20	500 00550

Remarks



RK 93

Energetic diffuse reflection light scanner



0 ... 65 mm

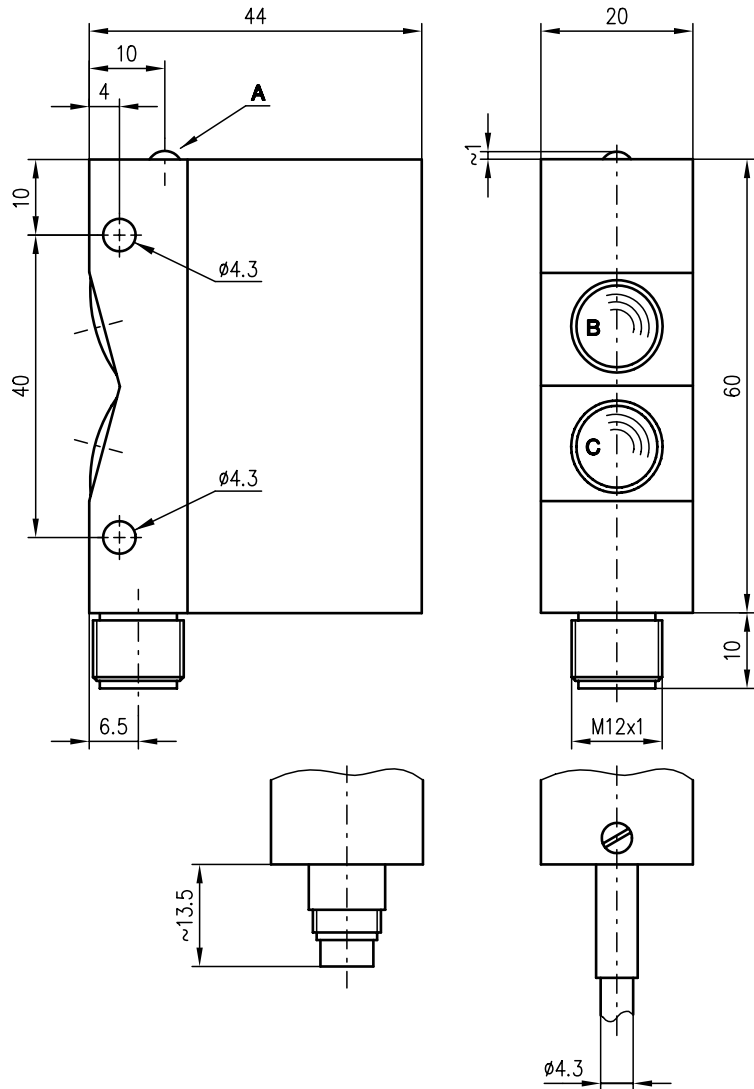


10 - 30 V
DC

- Background suppression via V-shaped optical system
- Infrared light
- Small light profile for slot scanning (RK 93/4-60.1)
- Mounting holes for fast installation
- Connection via M12 connector, standard plug or cable (2m)

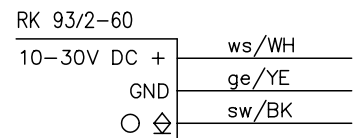
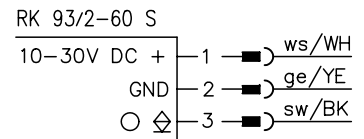
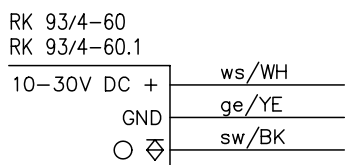
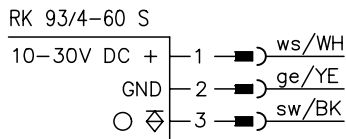
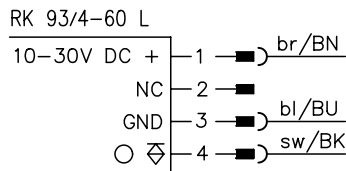


Dimensioned drawing



- A Indicator diode
- B Receiver
- C Transmitter

Electrical connection



We reserve the right to make changes • 93_c02e.fm

Accessories:

(available separately • see page 360)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Standard plug

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 65mm
Scanning range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	250Hz
Response time	2ms

Electrical data

Operating voltage U_B ³⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Power consumption	max. 0.6W
Switching output	PNP or NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 3V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow on	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight	170g
Connection type ⁴⁾	M 12 connector 4-pin, standard plug 4-pin, or cable 2000mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ⁵⁾	2, 3
Protection class	IP 65

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) Cable cross-section 4x0.25 mm²
- 5) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector		
PNP transistor output	RK 93/4-60 L	500 22192
with standard plug		
NPN transistor output	RK 93/2-60 S	500 00546
PNP transistor output	RK 93/4-60 S	500 00553
with cable connection 2m		
NPN transistor output	RK 93/2-60	500 00545
PNP transistor output	RK 93/4-60	500 00552
PNP transistor output	RK 93/4-60.1	500 82014

Tables

RK 93...60[L][S]

1	0	60	65
2	5	40	45
3	8	37	40

RK 93/4-60.1

1	0	60	65
2	15	50	55
3	20	45	50

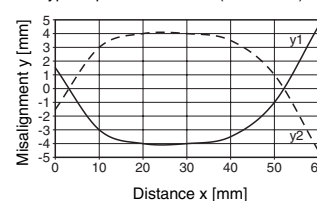
1	white 90%
2	grey 18%
3	black 6%

<input type="checkbox"/>	Scanning range [mm]
<input type="checkbox"/>	Typ. scanning range limit [mm]

Diagrams

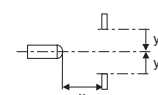
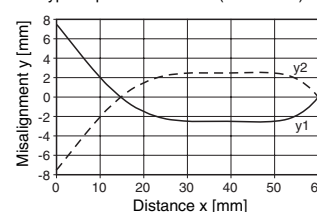
RK 93...60[L][S]

Typ. response behaviour (white 90%)



RK 93/4-60.1

Typ. response behaviour (white 90%)



Remarks

- Small light spot for slot scanning (RK 93/4-60.1)



RK 93

Energetic diffuse reflection light scanner



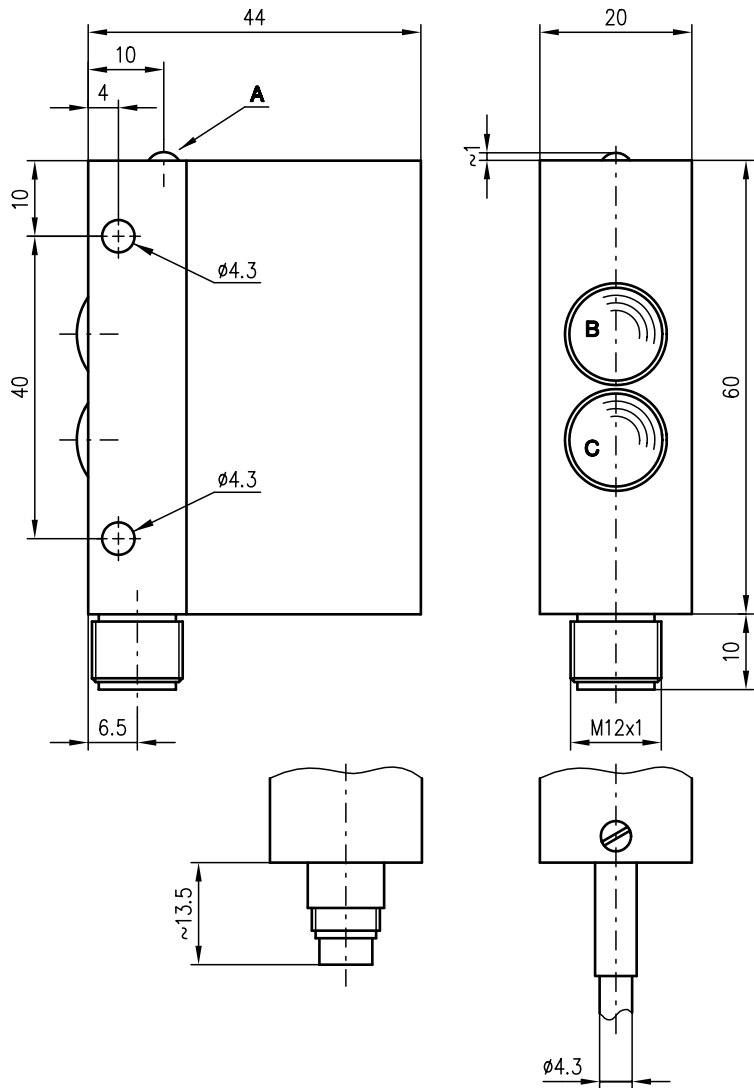
Dimensioned drawing



5 ... 170mm
2 ... 210mm



- Infrared light
- The geometry of the optics provides for background suppression
- Mounting holes for fast installation
- Connection via M12 connector, standard plug or cable (2m)

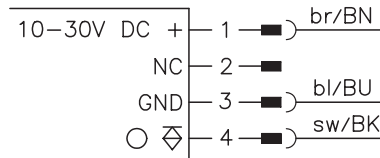


- A Indicator diode
- B Receiver
- C Transmitter

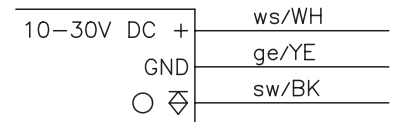
Electrical connection



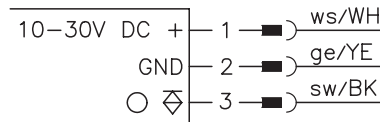
RK 93/4-150 L
RK 93/4-200 L



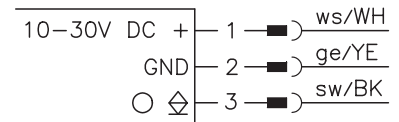
RK 93/4-150



RK 93/4-150 S



RK 93/2-150 S



We reserve the right to make changes • 93_c03e.fm

Accessories:

(available separately • see page 360)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Standard plug

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Light source
 Wavelength

RK 93/4-150...

5 ... 170mm
 see table
 LED (modulated light)
 880nm (infrared)

RK 93/4-200...

2 ... 210mm
 see table

Timing

Switching frequency 250Hz
 Response time 2ms

Electrical data

Operating voltage U_B ³⁾ 10 ... 30VDC (incl. residual ripple)
 Residual ripple $\leq 15\%$ of U_B
 Power consumption max. 0.6W
 Switching output PNP or NPN transistor output
 Function characteristics light switching
 Signal voltage high/low $\geq (U_B - 3V) / \leq 2V$
 Output current max. 100mA

Indicators

LED yellow on reflection reflection, output transistor activated
 LED yellow flashing reflection, no performance reserve

Mechanical data

Housing metal
 Optics cover glass
 Weight 170g
 Connection type ⁴⁾ M12 connector 4-pin, standard plug 4-pin, or cable 2000mm

Environmental data

Ambient temp. (operation/storage) $-20^\circ\text{C} \dots +60^\circ\text{C} / -30^\circ\text{C} \dots +70^\circ\text{C}$
 Protective circuit ⁵⁾ 2, 3
 Protection class IP 65

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) Cable cross-section $4 \times 0.25 \text{ mm}^2$
- 5) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector	PNP transistor output	RK 93/4-150 L 500 25513
	PNP transistor output	RK 93/4-200 L 500 24851
with standard plug	NPN transistor output	RK 93/2-150 S 500 00549
	PNP transistor output	RK 93/4-150 S 500 00555
with cable connection 2m	PNP transistor output	RK 93/4-150 500 00554

Tables

1	5	150	170
2	20	100	110
3	25	70	80

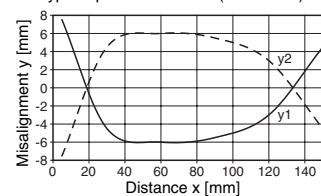
1	2	200	210
2	7	135	140
3	15	105	110

1	white 90%
2	grey 18%
3	black 6%

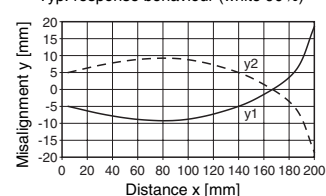
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

RK 93/4-150
 Typ. response behaviour (white 90%)



RK 93/4-200
 Typ. response behaviour (white 90%)



Remarks



RK 93

Energetic diffuse reflection light scanner

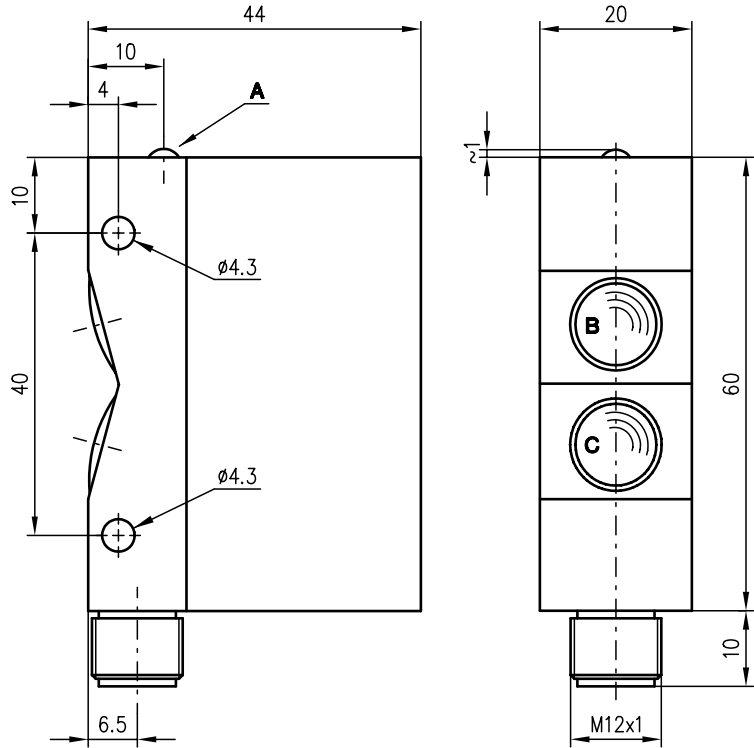


0 ... 65mm



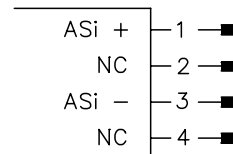
- Background suppression via V-shaped optical system
- Integrated AS-i slave
- Infrared light
- Mounting holes for fast installation

Dimensioned drawing



- A Indicator diode
- B Receiver
- C Transmitter

Electrical connection



Accessories:

(available separately • see page 360)

- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 93_c05e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%)	0 ... 65 mm
Scanning range	see table
Light source	LED (modulated light)
Wavelength	880 nm (infrared)
Timing	
Switching frequency (sensor)	according to AS-interface specifications max. 5 ms (250 Hz)
Response time (sensor)	2.5 ms

Electrical data

Operating voltage U_B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 35 mA
Indicators	
LED yellow on	reflection
LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	metal
Optics cover	glass
Weight	170 g
Connection type	M 12 connector, 4-pin, stainless steel

Environmental data

Ambient temp. (operation/storage)	-20 °C ... +60 °C / -30 °C ... +70 °C
Protection class	IP 65
Standards applied	IEC 60947-5-2
Electromagnetic compatibility	acc. to AS-i specification

AS-i data

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31
Cycle time acc. to AS-i specification	5 ms
AS-i standard according to profile	S-1.1

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection				1	
D ₁	NC	∅	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1				1 light switching	
D ₂	NC	∅	system input	*P ₂	NC	∅	system parameter
		1				1	
D ₃	NC	∅	system output	*P ₃	NC	∅	system parameter
		1				1	

* default = 1

Tables

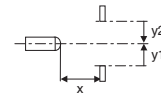
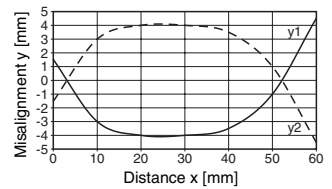
1	0	60	65
2	5	40	45
3	8	37	40

1	white 90%
2	grey 18%
3	black 6%

<input type="checkbox"/>	Scanning range [mm]
<input type="checkbox"/>	Typ. scanning range limit [mm]

Diagrams

Typ. response behaviour (white 90%)



Order guide

Designation	Part No.
RK 93/A-60 L	500 81080

Remarks



FRK 93

Diffuse reflection light scanner with background suppression



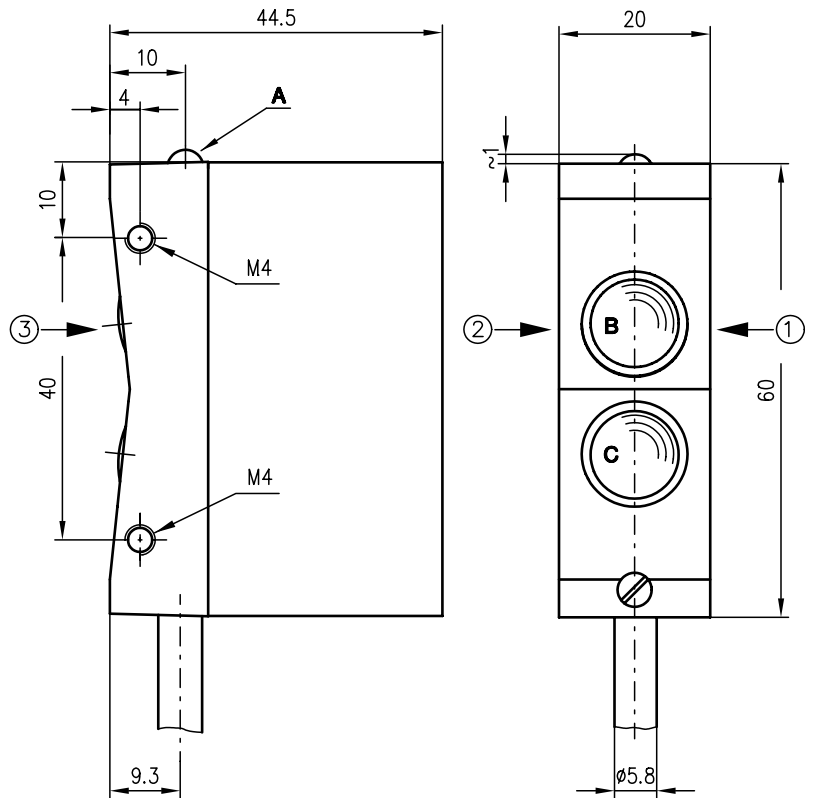
15 ... 75mm



10 - 30 V
DC

- Scanner with foreground and background suppression due to V-shaped optics
- Infrared light
- Very good detection of dark objects
- Mounting holes for fast installation
- Connection via cable

Dimensioned drawing



- A Indicator diode
 - B Receiver
 - C Transmitter
- Preferred entry direction for objects ① + ② + ③

Electrical connection

10-30V DC +	br/BN
●	ws/WH
○	sw/BK
GND	bl/BU
⊕	gnge/GNYE



Accessories:

(available separately • see page 360)

- Ready-made cables (KB ...)

We reserve the right to make changes • 93_d01e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾ 15 ... 75 mm
 Scanning range ²⁾ see table
 Light source LED (modulated light)
 Wavelength 880nm (infrared)

Timing

Switching frequency 200Hz
 Response time 3.3ms

Electrical data

Operating voltage U_B ³⁾ 10 ... 35VDC (incl. residual ripple)
 Residual ripple $\leq 15\%$ of U_B
 Power consumption max. 2W
 Switching output PNP transistor output
 Function characteristics light/dark switching complementary
 Signal voltage high/low $\geq (U_B - 3V) / \leq 2V$
 Output current max. 100mA

Indicators

LED yellow on reflection, output transistor activated
 LED yellow flashing reflection, no performance reserve

Mechanical data

Housing metal
 Optics glass
 Weight approx. 170g
 Connection type cable 2000mm

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -30°C ... +70°C
 Protective circuit ⁴⁾ 2, 3
 Protection class IP 65

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

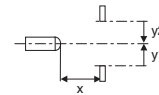
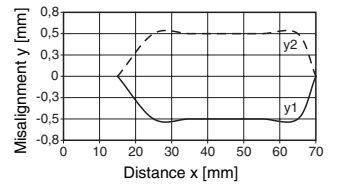
1	15	60	75
2	22	60	65
3	25	60	60

1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

Typ. response behaviour (white 90%)



Order guide

Designation	Part No.
FRK 93/44-60	500 21132

Remarks



IFRK 93

Diffuse reflection light scanner with background suppression

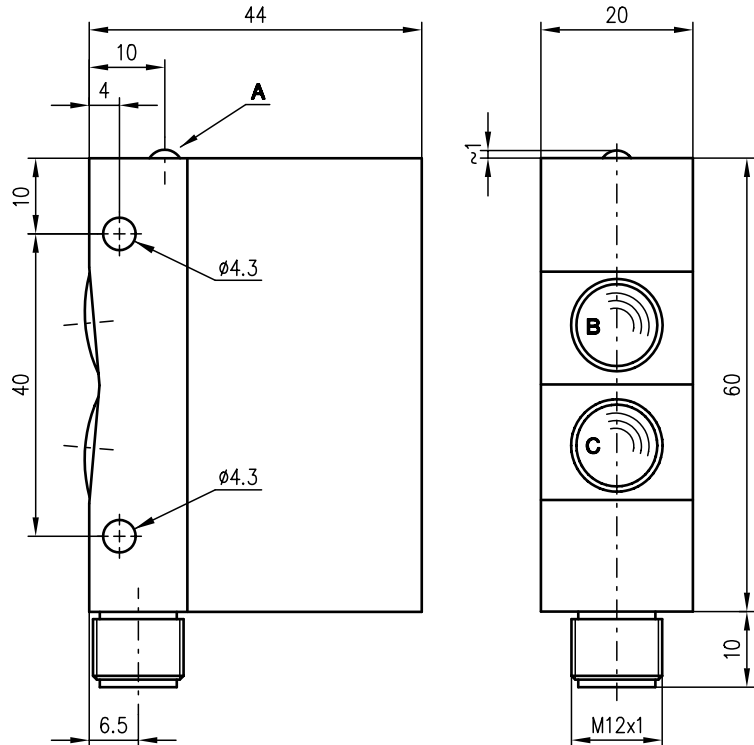


30 ... 100 mm



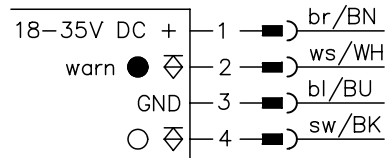
- Scanner with foreground and background suppression due to V-shaped optics
- Infrared light
- Mounting holes for fast installation
- Connection via M12 connector

Dimensioned drawing



- A Indicator diode
- B Receiver
- C Transmitter

Electrical connection



Accessories:

(available separately • see page 360)

- M12 connectors (KD ...)

We reserve the right to make changes • 93_d02e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	30 ... 100mm
Scanning range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	150Hz
Response time	3.3ms

Electrical data

Operating voltage U_B ³⁾	18 ... 35VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Power consumption	max. 2W
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 3V) / \leq 2V$
Output current	max. 100mA

Indicators

LED yellow off	no reflection, warning output activated (wire break monitoring)
LED yellow on	reflection, switching output activated
LED yellow flashing	warning output activated
	reflection, no performance reserve
	warning output not activated

Mechanical data

Housing	metal
Optics	glass
Weight	170g
Connection type	M12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ⁴⁾	2, 3
Protection class	IP 65

Options

warning output	PNP transistor output
Function characteristics	
Switching output = Q	at reflection: Q 0 high/QW 0 high
Warning output = QW	at reflection, performance reserve insufficient: Q=high, QW=low
	no reflection: Q=low/QW=high

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

Designation	Part No.
IFRK 93/4-100 L.2	500 27863

Tables

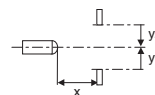
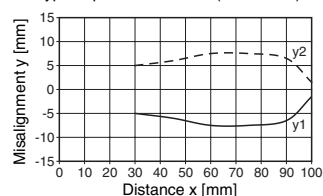
1	30	100	100
2	30	100	100
3	30	90	95

1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams

Typ. response behaviour (white 90%)



Remarks

- Warning output with double-function



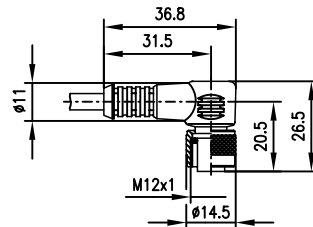
M12 connectors



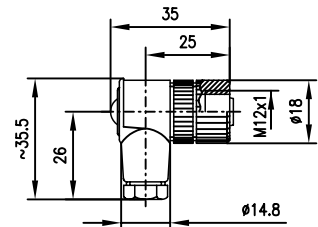
For devices with M12 connectors, there are available: 4 connectors with ready made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

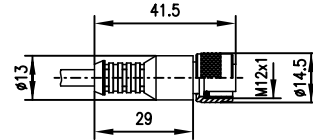
Dimensioned drawings



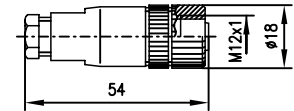
KB 095-5000-5



KD 095-5



KB 095-5000-5A



KD 095-5A

Selection table

M12 connectors			
with cable (5m cable length)		without cable	
KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A
Part No. 500 20500	Part No. 500 20499	Part No. 500 20502	Part No. 500 20501

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 93_zu_e.fm

450 Series Overview and advantages



Compact sensor series in solid plastic housing



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanner with background suppression



- General sensitivity adjustment for optimal adaptation to the application
- Complementary outputs for light/dark switching or as a control function







Connection via M18 respectively M12 connector for fast mounting



- Various mounting possibilities
- Mounting holes for screw connection





Operating principle	Designation	Typ. operating range limit/scanning range	Housing	Light source		Operating voltage		Output			
				Plastic	Red light	Infrared	10 ... 30VDC	24 ... 230VAC/DC	PNP transistor	Complementary Q and Q negative	NPN transistor
	LS 450K/P-S12	0 ... 25m	•		•	•		•	•		
	LS 450K/R-UC-S18	0 ... 25m	•		•		•				•
	PRK 450K/P-S12	0 ... 8m	•	•		•		•	•		
	PRK 450K/R-UC-S18	0 ... 8m	•	•			•				•
	RT 450K/P-500-S12	10 ... 500mm	•		•	•		•	•		
	RT 450K/R-500-UC-S18	10 ... 500mm	•		•		•				•
	HRT 450K/P-500-S12	50 ... 500mm	•		•	•		•	•		



Switching frequency	Switching	Connection		Options							Page
	Light/dark	M12 connector	M18 connector	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment/ scanning range	Transparent media	Focussed light beam	
200Hz	•	•						•			365
20Hz	•		•					•			367
200Hz	•	•			•			•			369
20Hz	•		•		•			•			371
200Hz	•	•						•			373
20Hz	•		•					•			375
200Hz	•	•				•		•			377



LS 450

Throughbeam photoelectric sensors

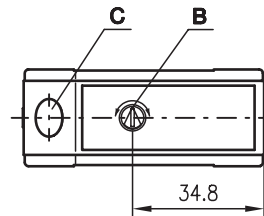
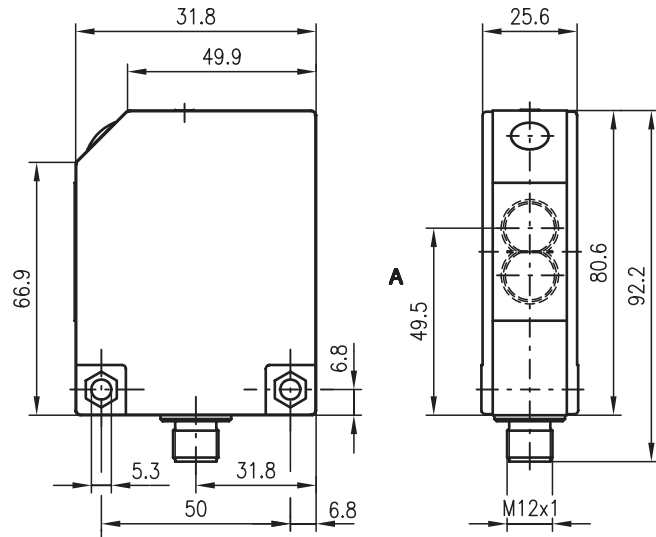


25m



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- DC versions with wide voltage range 10 ... 30V and complementary PNP switching outputs for PLC applications
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

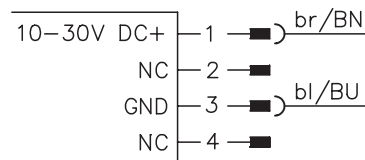
Dimensioned drawing



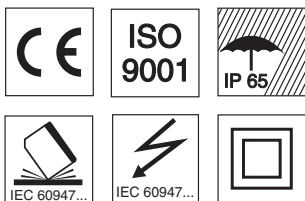
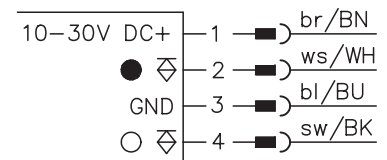
- A** Optical axis
- B** Sensitivity adjustment
- C** Indicator diode

Electrical connection

LSS 450K-S12



LSE 450K/P-S12



Accessories:

(available separately • see page 378)

- Mounting system (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 450_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 25 m
Operating range ²⁾	0 ... 20 m
Light source	LED (modulated light)
Wavelength	880 nm

Timing

Switching frequency	200 Hz
Response time	2.5 ms
Delay before start-up	≤ 200 ms

Electrical data

Operating voltage U_B	10 ... 30 VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40 mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100 mA
Sensitivity	adjustable

Indicators

LED green (transmitter)	ready
LED yellow (receiver)	light path free

Mechanical data

Housing	glass fiber reinforced plastic housing
Optics cover	plastic
Weight	100 g
Connection type	M 12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25 °C ... +60 °C / -30 °C ... +65 °C
Protective circuit ³⁾	2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs, 4=overvoltage protection
 4) Rating voltage 250 VAC

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 450K/P-S12	
Transmitter	LSS 450K-S12	500 23735
Receiver	LSE 450K/P-S12	500 23736

Remarks

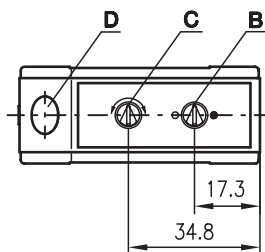
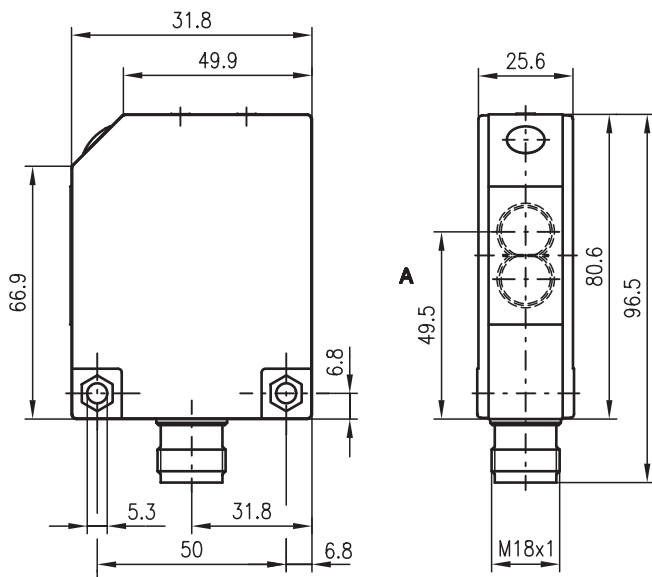


LS 450

Throughbeam photoelectric sensors



Dimensioned drawing



- A Optical axis
- B Light/dark switching
- C Sensitivity adjustment
- D Indicator diode

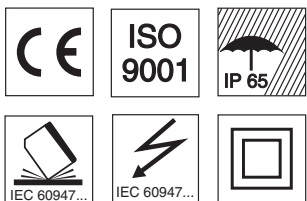


25m



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- All-mains design 24 ... 230VAC/DC with relay output
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

Electrical connection

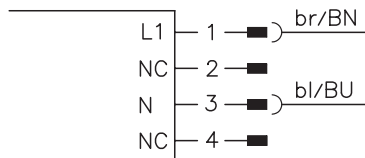


Accessories:

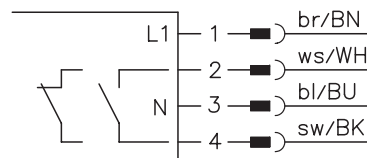
(available separately • see page 378)

- Mounting systems (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M18 connectors (KD ...)

LSS 450K-UC-S18



LSE 450K/R-UC-S18



We reserve the right to make changes • 450_a02e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 25m
Operating range ²⁾	0 ... 20m
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	25Hz
Response time	20ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	24 ... 230VAC 50/60Hz 24 ... 230VDC ± 10%
Power consumption	≤ 1.5VA
Switching output ³⁾	relay 1 make-contact or 1 break-contact, reversible at the sensor
Function characteristics	light/dark switching (reversible)
Switching voltage, relay	240 VAC/DC
Switching current, relay	240 VAC, 3A/30VDC, 3A
Min. relay switching power	0.02A/24VDC
Sensitivity	adjustable

Indicators

LED green (transmitter)	ready
LED yellow (receiver)	light path free

Mechanical data

Housing	glass fiber reinforced plastic housing
Optics cover	plastic
Weight	150g
Connection type	M18 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-30°C ... +65°C
Protective circuit ⁴⁾	1
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection
- 5) Rating voltage 250VAC

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 450K/R-UC-S18	
Transmitter	LSS 450K-UC-S18	500 27871
Receiver	LSE 450K/R-UC-S18	500 27872

Remarks



PRK 450

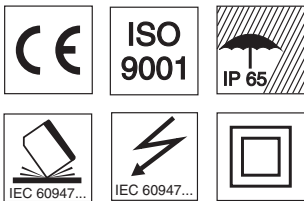
Retro-reflective photoelectric sensors with polarisation filter



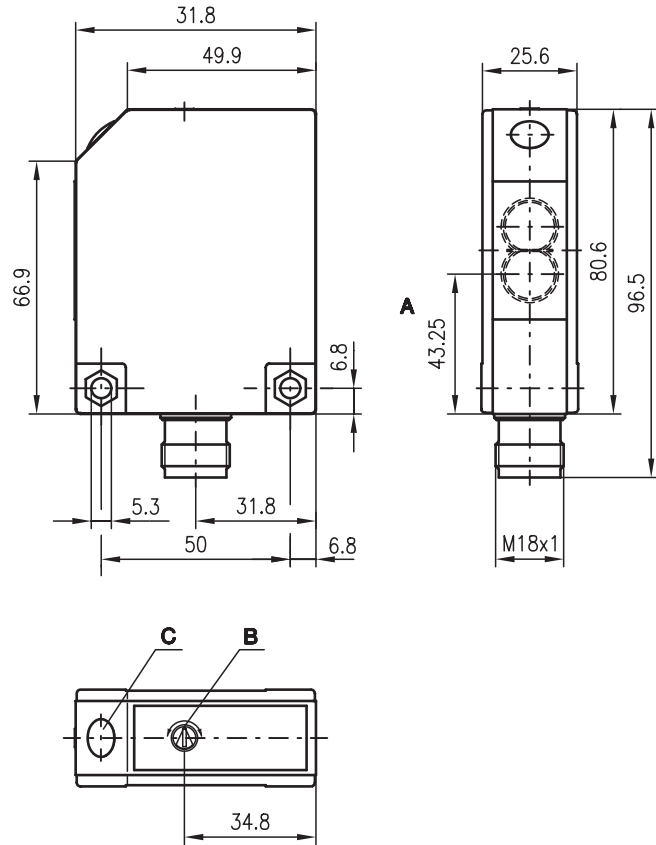
8m



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- DC versions with wide voltage range 10 ... 30V and complementary PNP switching outputs for PLC applications
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

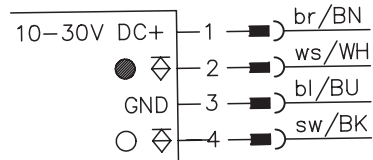


Dimensioned drawing



- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection



We reserve the right to make changes • 450_b01e.fm

Accessories:

(available separately • see page 378)

- Mounting systems (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 8m
Operating range ²⁾	see table
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 40mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	glass fiber reinforced plastic housing
Optics cover	glass
Weight	100g
Connection type	M12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C/-30°C ... +65°C
Protective circuit ³⁾	2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs, 4=overvoltage protection
- 4) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 6.0m
TK(S)	50x100	0.1 ... 4.0m
TK(S)	50x50	0.1 ... 3.0m
TK(S)	30x50	0.1 ... 2.5m
TK	82	0.1 ... 5.0m
TK	60	0.1 ... 3.0m
Tape 2	50x50	0.1 ... 2.5m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

Designation	Part No.
PRK 450K/P-S12	500 23737

Remarks



PRK 450

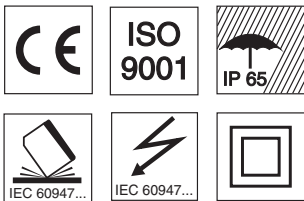
Retro-reflective photoelectric sensors with polarisation filter



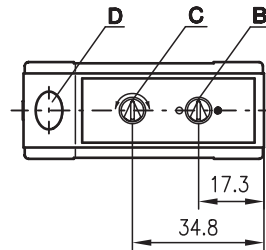
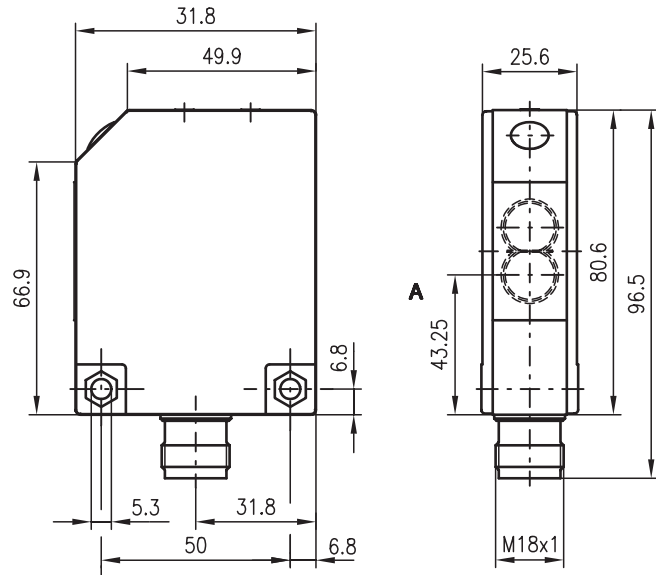
8m



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- All-mains design 24 ... 230VAC/DC with relay output
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

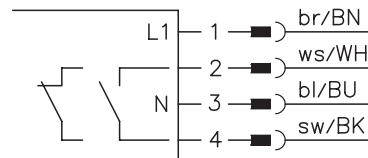


Dimensioned drawing



- A Optical axis
- B Light/dark switching
- C Sensitivity adjustment
- D Indicator diode

Electrical connection



We reserve the right to make changes • 450_b02e.fm

Accessories:

(available separately • see page 378)

- Mounting systems (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M18 connectors (KD ...)
- Reflectors
- Reflective tapes



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 0.1 ... 8m
 Operating range ²⁾ see table
 Light beam characteristic divergent
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 25Hz
 Response time 20ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 24 ... 230VAC 50/60Hz
 24 ... 230VDC ± 10%
 Power consumption 1VA
 Switching output ³⁾ relay,
 1 make-contact or 1 break-contact, reversible at the sensor
 Function characteristics light/dark switching (reversible)
 Switching voltage, relay 240 VAC/DC
 Switching current, relay 240 VAC, 3A / 30VDC, 3A
 Min. relay switching power 0.02A / 24 VDC
 Sensitivity adjustable

Indicators

LED yellow light path free

Mechanical data

Housing glass fiber reinforced plastic housing
 Optics cover glass
 Weight 150g
 Connection type M18 connector, 4-pin

Environmental data

Ambient temp. (operation/storage) -25°C ... +55°C/-30°C ... +65°C
 Protective circuit ⁴⁾ 1
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 65
 Standards applied IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection
- 5) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 6.0m
TK(S)	50x100	0.1 ... 4.0m
TKS	50x50	0.1 ... 3.0m
TKS	30x50	0.1 ... 2.5m
TK	82	0.1 ... 5.0m
TK	60	0.1 ... 3.0m
Tape 2	50x50	0.1 ... 2.5m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

Designation	Part No.
PRK 450K/R-UC-S18	500 27873

Remarks



RT 450

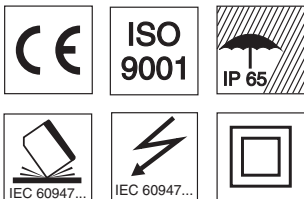
Energetic diffuse reflection light scanner



10 ... 500mm



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- DC versions with wide voltage range 10 ... 30V and complementary PNP switching outputs for PLC applications
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

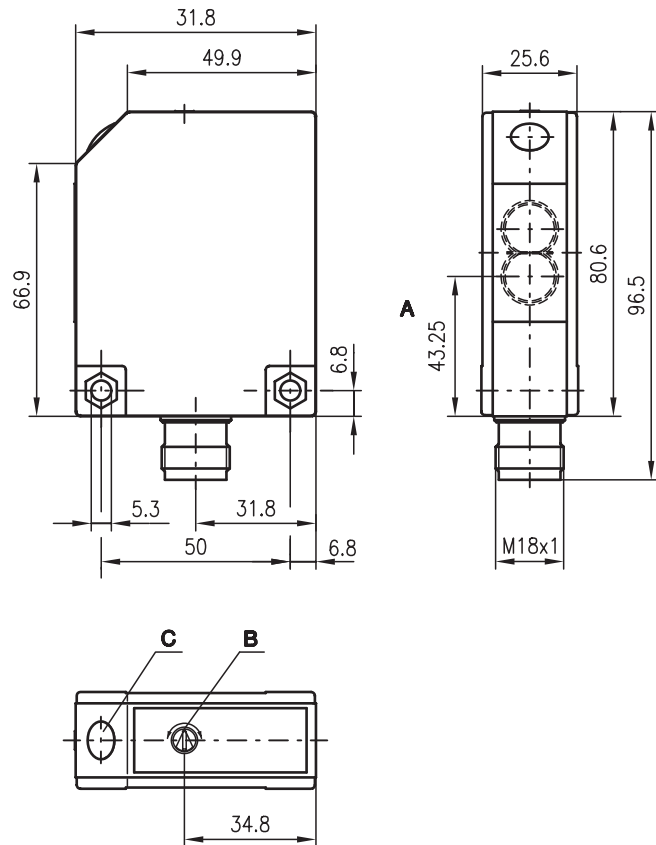


Accessories:

(available separately • see page 378)

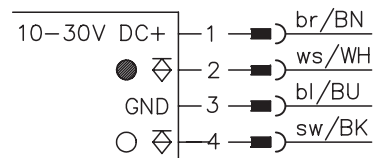
- Mounting systems (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A** Optical axis
- B** Sensitivity adjustment
- C** Indicator diode

Electrical connection



We reserve the right to make changes • 450_c01e.fm



Specifications

Optical data

Scanning range (white 90%)	10 ... 500mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	glass fiber reinforced plastic housing
Optics cover	plastic
Weight	100g
Connection type	M 12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25 °C ... +60 °C / -30 °C ... +65 °C
Protective circuit ¹⁾	2, 3, 4
VDE safety class ²⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) 2=polarity reversal protection, 3=short-circuit protection for all outputs, 4=overvoltage protection
2) Rating voltage 250 VAC

Tables

Diagrams

Order guide

Designation	Part No.
RT 450K/P-500-S12	500 23738

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



RT 450

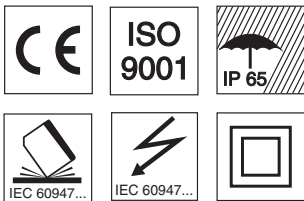
Energetic diffuse reflection light scanner



10 ... 500mm



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- All-mains design 24 ... 230VAC/DC with relay output
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

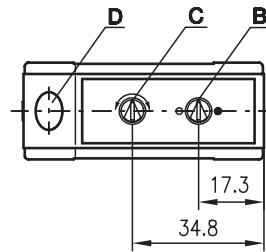
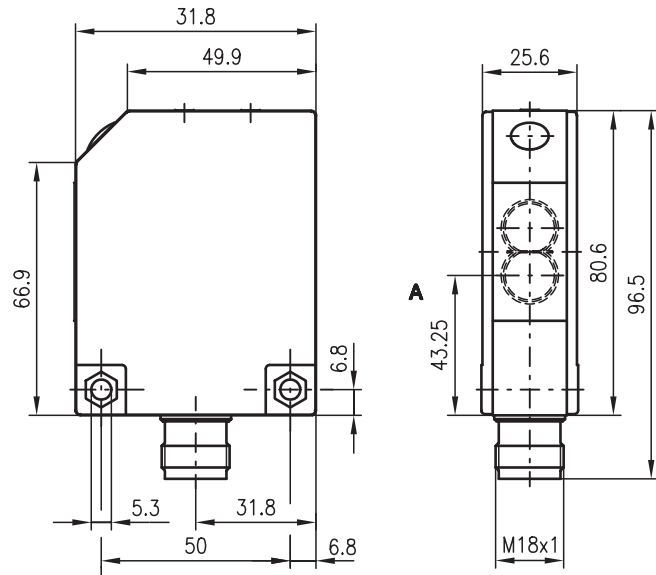


Accessories:

(available separately • see page 378)

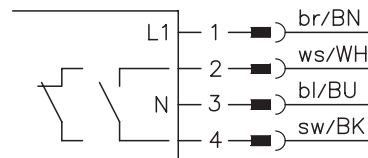
- Mounting systems (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M18 connectors (KD ...)

Dimensioned drawing



- A Optical axis
- B Light/dark switching
- C Sensitivity adjustment
- D Indicator diode

Electrical connection



We reserve the right to make changes • 450_c02e.fm



Specifications

Optical data

Scanning range (white 90%)	10 ... 500mm
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	25Hz
Response time	20ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	24 ... 230VAC 50/60Hz
Power consumption	24 ... 230VDC ± 10%
Switching output ¹⁾	≤ 1.5VA relay, 1 make-contact or 1 break-contact, reversible at the sensor light/dark switching (reversible)
Function characteristics	240VAC/DC
Switching voltage, relay	240VAC, 3A/30VDC, 3A
Switching current, relay	0.02A/24VDC
Min. relay switching power	adjustable
Sensitivity	

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	glass fiber reinforced plastic housing
Optics cover	plastic
Weight	150g
Connection type	M18 connector, 4-pin,

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-30°C ... +65°C
Protective circuit ²⁾	1
VDE safety class ³⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) Suitable spark extinction must be provided with inductive or capacitive loads

2) 1=transient protection

3) Rating voltage 250VAC

Tables

Diagrams

Order guide

Designation	Part No.
RT 450K/R-500-UC-S18	500 27874

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.



HRT 450

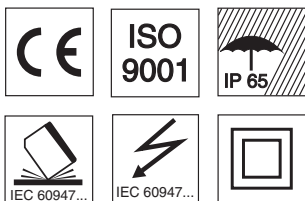
Diffuse reflection light scanner with background suppression



50 ... 500 mm



- Compact plastic housing with flat outer surface, protection class IP 65 for industrial application
- DC versions with wide voltage range 10 ... 30V and complementary PNP switching outputs for PLC applications
- General light/dark switching, scanning range adjustment and delay before start-up provide for optimal adaptation to the application
- Mounting holes and plug connection for fast mounting and service functions

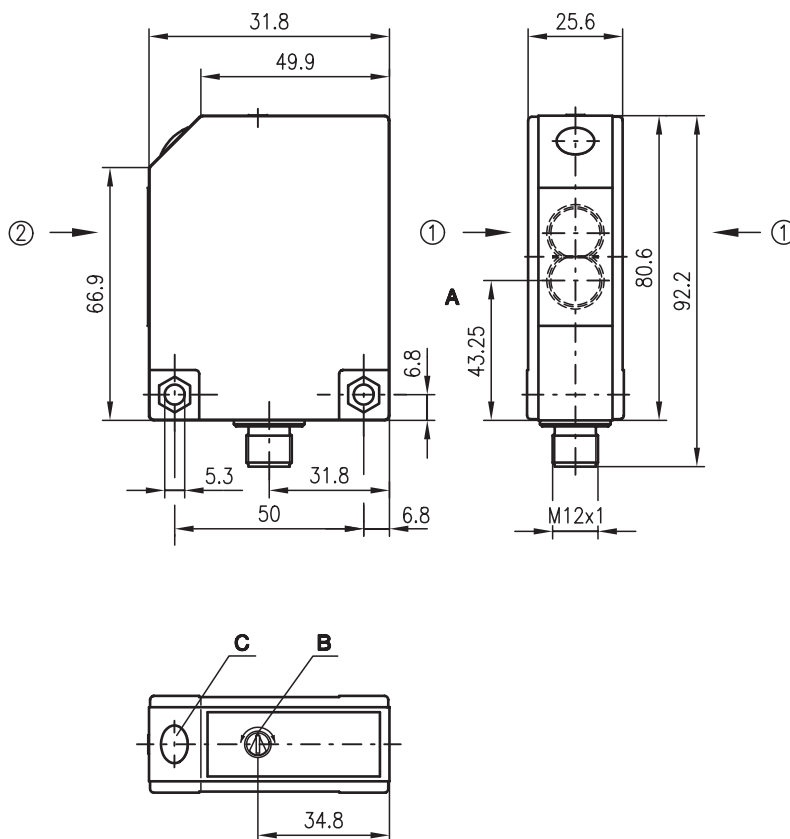


Accessories:

(available separately • see page 378)

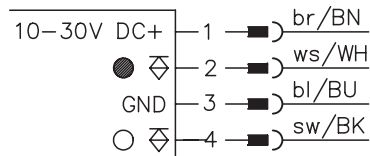
- Mounting systems (BT 450, BT 450.1/450.2, UMS 1-02.1, UMS 96-450)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing



- A** Optical axis
 - B** Scanning range adjustment
 - C** Indicator diode
- Preferred direction for movement of the test object ① + ②

Electrical connection



We reserve the right to make changes • 450_d01e.fm



Specifications

Optical data

Scanning range (white 90%)	50 ... 500mm
Adjustment range	80 ... 500mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	glass fiber reinforced plastic housing
Optics cover	glass
Weight	100g
Connection type	M 12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25 °C ... +60 °C / -30 °C ... +65 °C
Protective circuit ¹⁾	2, 3, 4
VDE safety class ²⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs, 4=overvoltage protection

2) Rating voltage 250 VAC

Tables

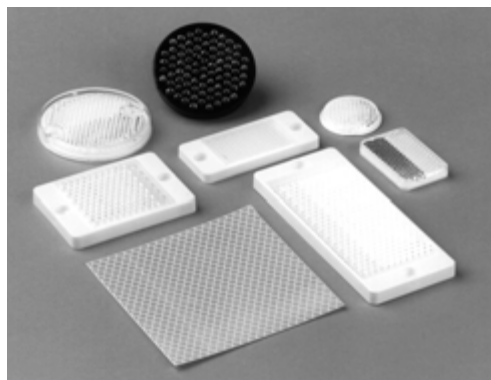
Diagrams

Order guide

Designation	Part No.
HRT 450K/P-500-S12	500 80279

Remarks

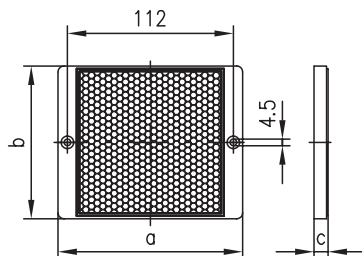
- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Reflectors


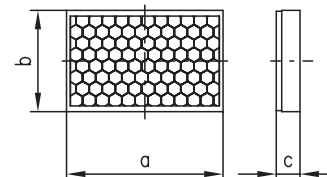
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

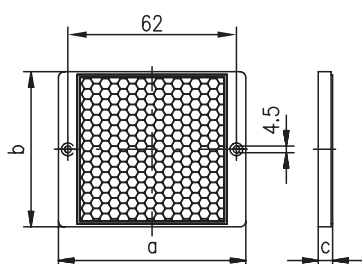
TKS 100 x 100



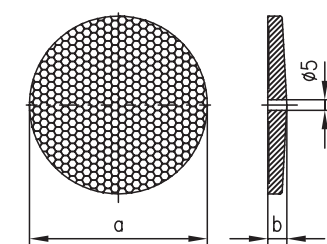
TK 30 x 50



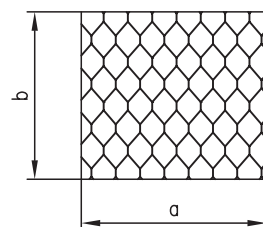
TKS 50 x 50



TK 82



Tape No. 2


Order codes:

Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 50x50	500 22814
TKS 30x50	500 23525
TK 30x50	500 03189
TK 82	500 03187
TK 60	500 03186
Tape 2	500 11523
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
KD 450-4	500 27875
KD 450-4A	500 27876

Selection table

Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 ²⁾	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 ²⁾	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 ²⁾	-20°C/+60°C	48	32	6.8	○	●
TK 82 ¹⁾	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
Tape 2	-20°C/+60°C	100	100			●

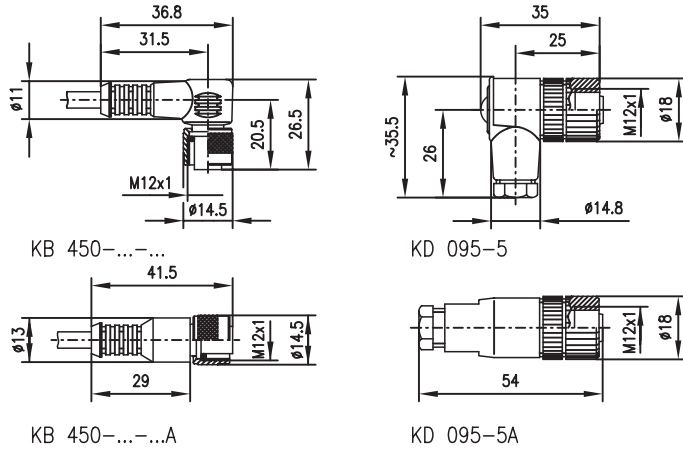
1) heating capability (HTK 82)

2) for screw mounting use mounting bracket

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 450_zu_e.fm

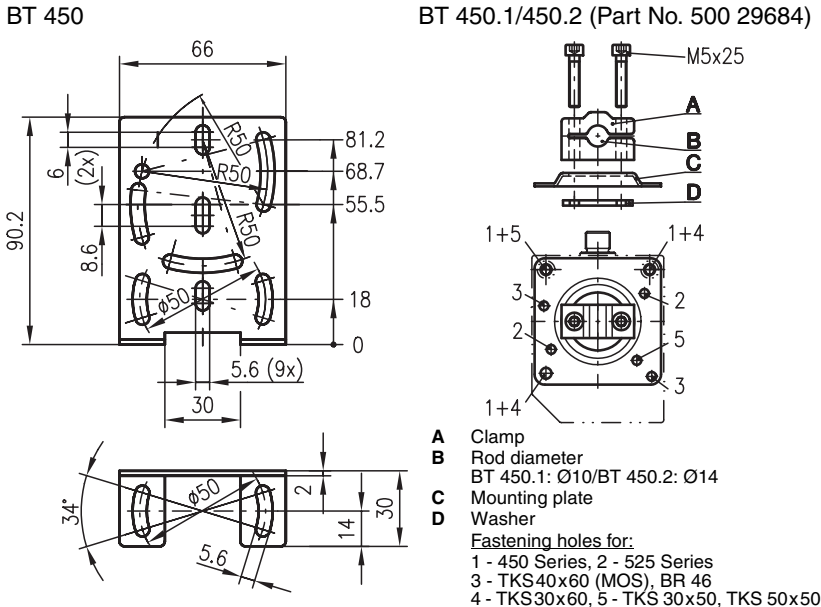
Dimensioned drawings



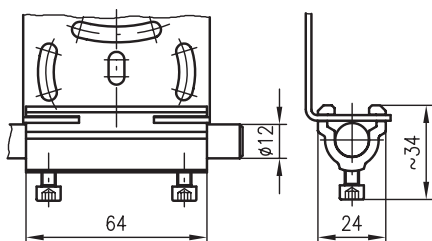
Selection table

M12/M18 connectors				
with cable		without cable		
M12	KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A
M12	KB 450-2000-4	KB 450-2000-4A		
M12	KB 450-5000-4	KB 450-5000-4A		
M12	KB 450-10000-4	KB 450-10000-4A		
M18			KD 450-4	KD 450-4A

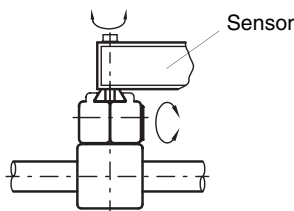
Dimensioned drawings



UMS 1-02.1



UMS 96-450 (Part No. 500 29070)



Connectors, plugs, cables



There are 2 connectors available for devices with M12 connectors: angled or straight, with and without cable.

For devices with M18 connectors, 2 connectors (angular/not angular) are available.

Protection class (DIN 40050) plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 450 (Part No. 500 25573)



UMS 1-02.1 (Part No. 500 25923) (clamp piece for rod mounting)




BT 450.1 (Part No. 500 29632)







72 Series


Overview and advantages

 Slim series in robust metal housing with glass optics

-  Operating principles:
- Throughbeam photoelectric sensors
 - Retro-reflective photoelectric sensors
 - Retro-reflective photoelectric sensors with polarisation filter
 - Diffuse reflection light scanners

 24VDC voltage with PNP/NPN transistor output

 Connection via M12 connector, standard plug or cable

-  Options:
- Light/dark switching by reversing the polarity
 - Scanner for label detection on bottles





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing	Light source		Operating voltage			Output	
				Red light	Infrared	24 V ± 10%	10 ... 30VDC	12 ... 30VDC	PNP transistor	NPN transistor
	LS 72/2,6000	0 ... 12m	•		•	•				•
	LS 72/4,6000	0 ... 12m	•		•	•			•	
	LS 72/4 L	0 ... 12m	•		•	•			•	
	LS 72/4 S	0 ... 12m	•		•	•			•	
	TLS 72/4,6000	0 ... 12m	•		•	•			•	
	TLS 72/4 S	0 ... 12m	•		•	•			•	
	RK 72/2	0.1 ... 6m	•		•			•		•
	RK 72/2,5000	0.1 ... 6m	•		•			•		•
	RK 72/4	0.1 ... 6m	•		•			•	•	
	RK 72/4,5000	0.1 ... 6m	•		•			•	•	
	RK 72/4 L	0.1 ... 6m	•		•		•		•	
	RK 72/4 S	0.1 ... 6m	•		•		•		•	
	PRK 72/2	0.1 ... 6m	•	•			•			•
	PRK 72/4	0.1 ... 6m	•	•			•		•	
	PRK 72/4,5000	0.1 ... 6m	•	•			•		•	
	PRK 72/4 L	0.1 ... 6m	•	•			•		•	
	PRK 72/4 S	0.1 ... 6m	•	•			•		•	
		RK 72/2-200	10 ... 340mm	•		•			•	
RK 72/2-200,5000		10 ... 340mm	•		•			•		•
RK 72/4-200		10 ... 340mm	•		•			•	•	
RK 72/4-200,5000		10 ... 340mm	•		•			•	•	
RK 72/4-200 L.1		10 ... 340mm	•		•			•	•	



Switching frequency	Switching		Connection			Options					Page
	Light	Dark	Cable	M12 connector	Standard plug 4-pin	Polarisation filter	Sensitivity adjustment	Label detection on glass	Light/dark by reversing the polarity	Test input (low active)	
100Hz	•		•								385
100Hz	•		•								385
100Hz	•			•							385
100Hz	•				•						385
100Hz	•		•							•	387
100Hz	•				•					•	387
100Hz	•	•	•						•		389
100Hz	•	•	•						•		389
100Hz	•	•	•						•		389
100Hz	•	•	•	•					•		389
100Hz	•	•		•	•				•		389
200Hz	•	•	•			•			•		391
200Hz	•	•	•			•			•		391
200Hz	•	•	•			•			•		391
200Hz	•	•		•		•			•		391
200Hz	•	•			•	•			•		391
100Hz	•	•	•				•		•		393
100Hz	•	•	•				•		•		393
100Hz	•	•	•				•		•		393
100Hz	•	•	•				•		•		393
150Hz	•	•		•			•	•	•		393



LS 72

Throughbeam photoelectric sensors



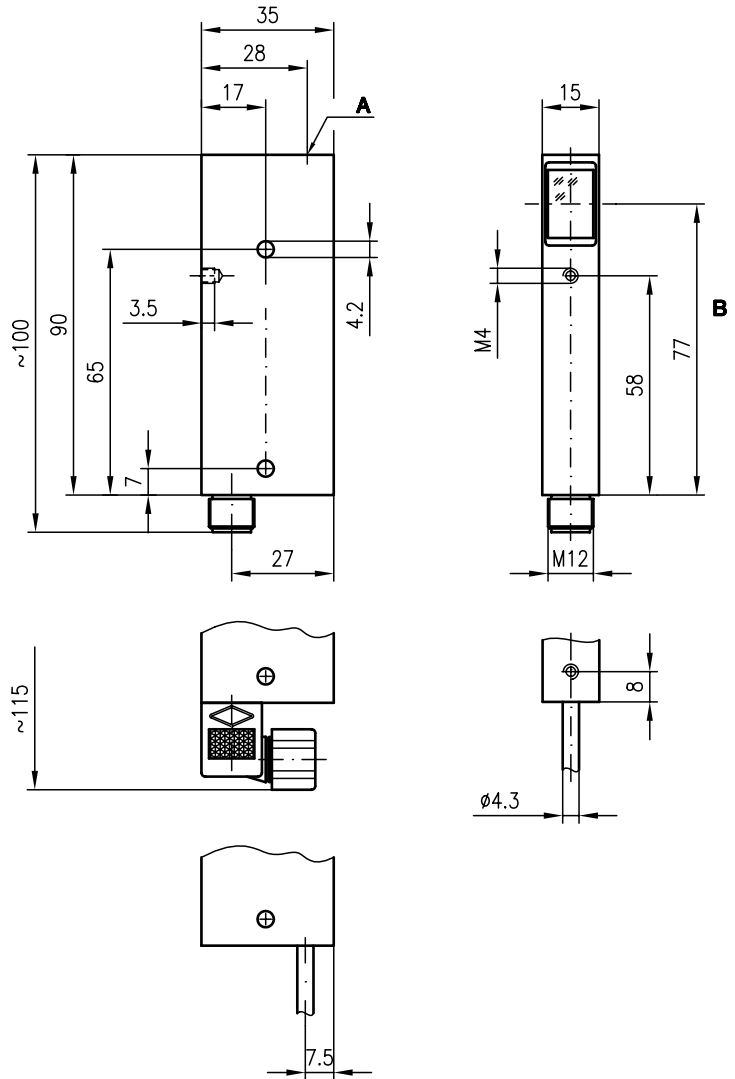
12m



- Slim construction with glass lens and robust metal housing for protection against environmental influences
- LEDs as switching state indicators
- Output is short-circuit proof and polarity reversal protected, thus guaranteeing riskless commissioning
- Mounting holes and M4 threads for fast front side mounting
- Connection via M12 connector, plug or cable

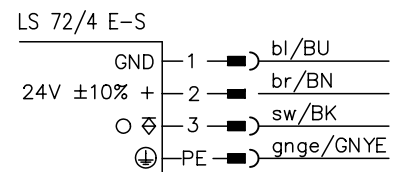
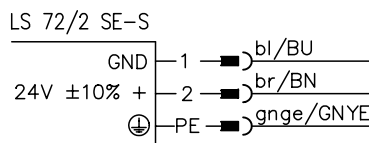
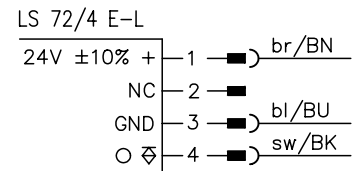
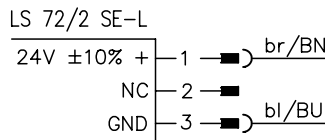
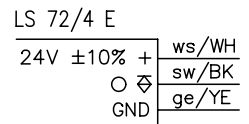
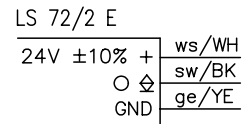
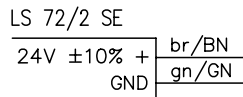


Dimensioned drawing



- A Indicator diode (only at receiver)
- B Optical axis

Electrical connection



We reserve the right to make changes • 72_a01e.fm

Accessories:

(available separately • see page 394)

- Mounting systems (BT 92)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- UMS 1

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 12m
Operating range ²⁾	0 ... 8m
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	100Hz
Response time	5ms

Electrical data

Operating voltage U_B	24VDC \pm 10% (incl. residual ripple)
Residual ripple	\leq 15% of U_B
Bias current	\leq 50mA
Switching output	PNP or NPN transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 3V) / \leq 2V$
Output current	max. 100mA

Indicators

LED green/red	green: light path free red: light path interrupted
---------------	---

Mechanical data

Housing	diecast
Weight	170g, cable device 480g
Optics	glass lens
Connection type	M12 connector 4-pin, plug 4-pin or cable (cross section 3x0.25mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

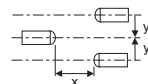
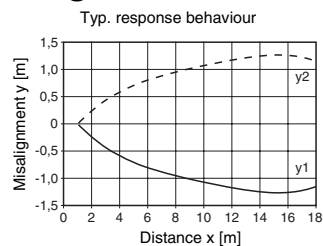
3) 2=polarity reversal protection, 3=short circuit protection

Tables

0	8	12
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<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams



Order guide

Selection table		Order code →					
Equipment ↓		LS 72/2, 6000 Part No. 500 00219 (Tr) Part No. 500 00220 (Re)	LS 72/4, 6000 Part No. 500 00219 (Tr) Part No. 500 00223 (Re)	LS 72/4 L Part No. 500 18611 (Tr) Part No. 500 18612 (Re)	LS 72/4 S Part No. 500 06514 (Tr) Part No. 500 06515 (Re)		
Light source	infrared	●	●	●	●		
Connection	cable 6m	●	●				
	M12			●			
	standard plug 4-pin				●		
Indicator LED	top of housing	●	●	●	●		
Switching output	PNP		●	●	●		
	NPN	●					

Remarks



TLS 72

Throughbeam photoelectric sensor with testing



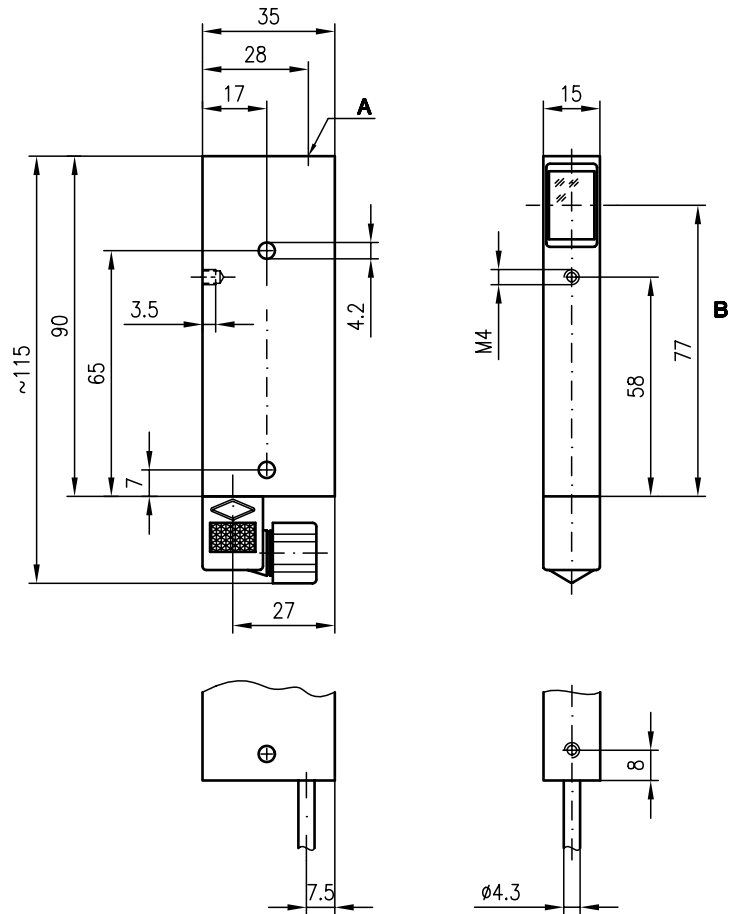
12m



- Slim construction with glass lens and robust metal housing for protection against environmental influences
- LEDs as switching state indicators
- Output is short-circuit proof and polarity reversal protected, thus guaranteeing riskless commissioning
- Mounting holes and M4 threads for fast front side mounting
- Connection via M12 connector, plug or cable
- test input (low active)

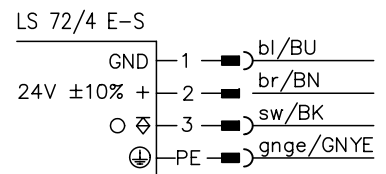
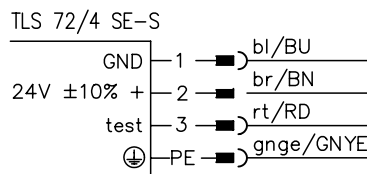
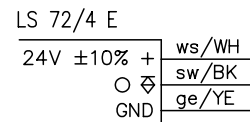
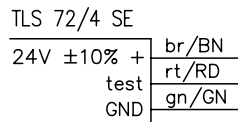


Dimensioned drawing



A Indicator diode (only at receiver)
 B Optical axis

Electrical connection



Accessories:

(available separately • see page 394)

- Mounting systems (BT 92)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 72_a02e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 12m
Operating range ²⁾	0 ... 8m
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	100Hz
Response time	5ms

Electrical data

Operating voltage U_B	24VDC \pm 10% (incl. residual ripple)
Residual ripple	\leq 15% of U_B
Bias current	\leq 70mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 3V) / \leq 2V$
Output current	max. 100mA

Indicators

LED green/red	green: light path free red: light path interrupted
---------------	---

Mechanical data

Housing	diecast
Weight	170g, cable device 480g
Optics	glass lens
Connection type	M12 connector 4-pin, plug 4-pin or cable (cross section 3x0.25mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67

Options

Test input (low active)	
Transmitter active/not active	$\geq (U_B - 3V) / \leq 2V$

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short circuit protection

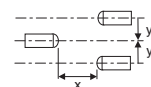
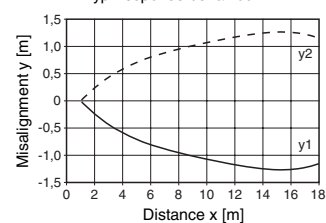
Tables

0	8	12
---	---	----

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Order guide

Selection table		Order code →					
Equipment ↓		TLS 72/4, 6000 Part No. 500 03364 (Tr) Part No. 500 00223 (Re)	TLS 72/4 S Part No. 500 06516 (Tr) Part No. 500 06515 (Re)				
Light source	infrared	●	●				
Connection	cable 6m	●					
	M12						
	standard plug 4-pin		●				
Indicator LED	top of housing	●	●				
Features	test input (low active)	●	●				

Remarks



RK 72

Retro-reflective photoelectric sensors



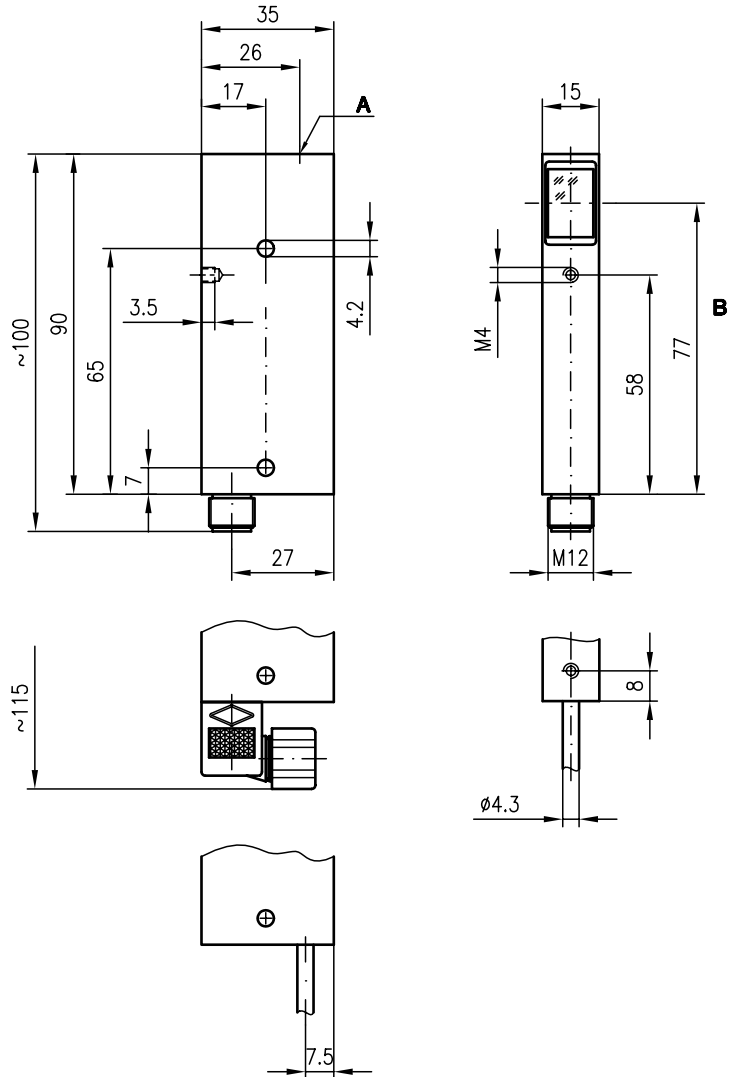
0 ... 6m



- Slim construction with glass lens and robust metal housing for protection against environmental influences
- LEDs as switching state indicators
- Output is short-circuit proof and polarity reversal protected, thus guaranteeing riskless commissioning
- Mounting holes and M4 threads for fast front side mounting
- Connection via M12 connector, plug or cable



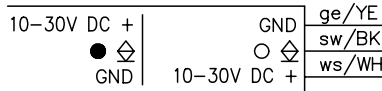
Dimensioned drawing



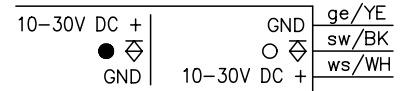
A Indicator diode
 B Optical axis

Electrical connection

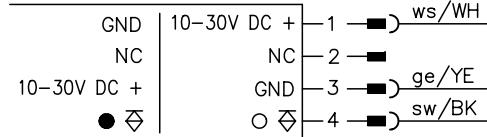
RK 72/2



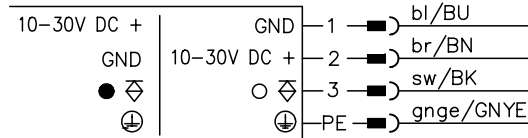
RK 72/4



RK 72/4 L



RK 72/4 S



We reserve the right to make changes • 72_b01e.fm

Accessories:

(available separately • see page 394)

- Mounting systems (BT 92)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 6m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm (infrared)

Timing

Switching frequency	100Hz
Response time	5ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Bias current	≤ 50 mA
Switching output	PNP or NPN transistor output
Function characteristics	light/dark switching by reversing the polarity
Signal voltage high/low	$\geq (U_B - 3V) / \leq 2V$
Output current	max. 100mA

Indicators

LED red	light path free
LED red flashing	no performance reserve

Mechanical data

Housing	diecast
Weight	150g
Optics	glass lens
Connection type	M12 connector 4-pin, plug 4-pin or cable (cross section 4x0.25mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short circuit protection

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.1 ... 4m
2	MTK(S) 50x50	0.1 ... 3.5m
3	TK(S) 30x50	0.1 ... 2.5m
4	TK(S) 20x40	0.1 ... 2m
5	Tape 2 100x100	0.1 ... 3m

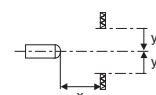
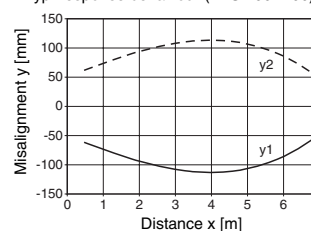
1	0.1	4	6
2	0.1	3.5	5
3	0.1	2.5	3
4	0.1	2	2.5
5	0.1	3	3.5

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Order guide

Selection table		Order code →					
Equipment ↓		RK 72/2 Part No. 500 00396	RK 72/2,5000 Part No. 500 00397	RK 72/4 Part No. 500 00413	RK 72/4,5000 Part No. 500 00415	RK 72/4 L Part No. 500 17372	RK 72/4 S Part No. 500 00419
Light source	infrared	●	●	●	●	●	●
Connection	cable 2m	●		●			
	cable 5m		●		●		
	cable 6m						
	M12					●	
	standard plug 4-pin		●				●
Indicator LED	top of housing	●	●	●	●	●	●
Features	light/dark by reversing the	●	●	●	●	●	●

Remarks



PRK 72

Retro-reflective photoelectric sensors with polarisation filter



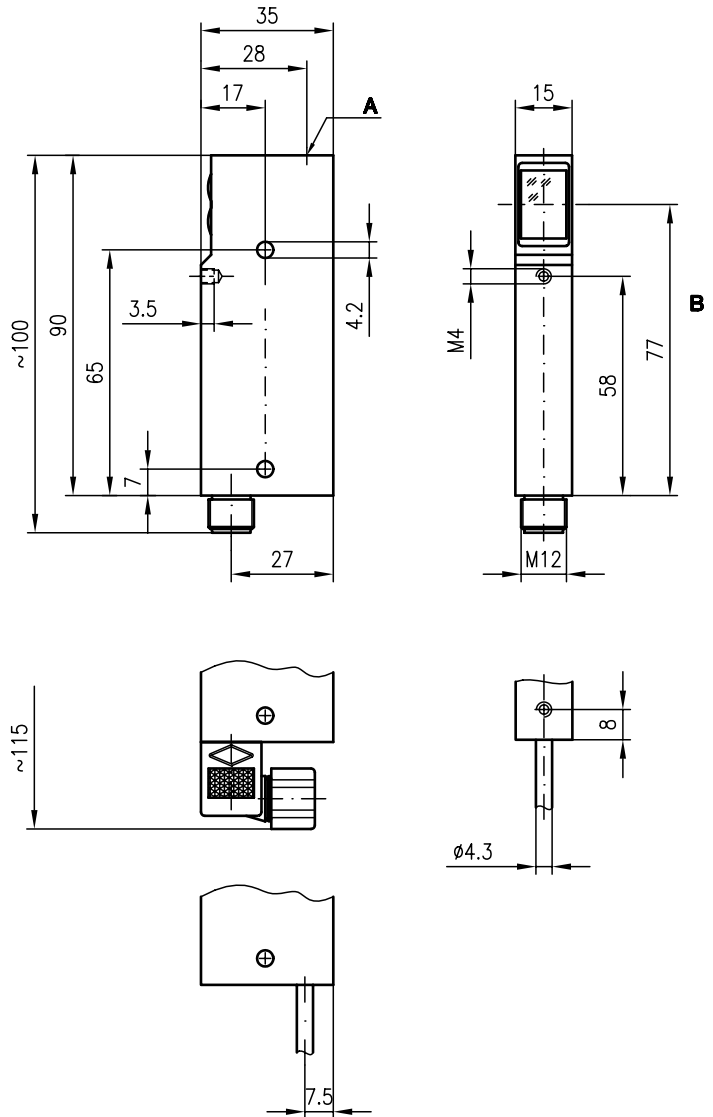
0.1 ... 6m

10 - 30 V
DC

- Slim construction with glass lens and robust metal housing for protection against environmental influences
- LEDs as switching state indicators
- Output is short-circuit proof and polarity reversal protected, thus guaranteeing riskless commissioning
- Mounting holes for fast installation and M4 thread for front mounting
- Connection via M12 connector, plug or cable

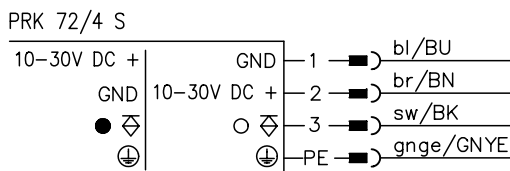
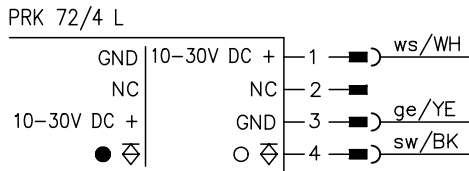
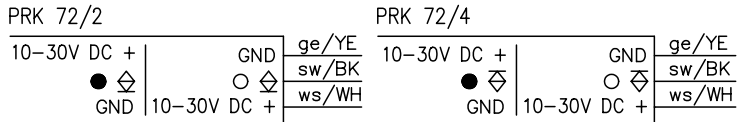


Dimensioned drawing



- A** Indicator diode (only at receiver)
- B** Optical axis

Electrical connection



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Accessories:

(available separately • see page 394)

- Mounting systems (BT 92)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 6m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (red light)

Timing

Switching frequency	200Hz
Response time	2.5ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Bias current	≤ 100 mA
Switching output	PNP or NPN transistor output
Function characteristics	light/dark switching by reversing the polarity
Signal voltage high/low	$\geq (U_B - 3V) / \leq 2V$
Output current	max. 100mA

Indicators

LED red	light path free
LED red flashing	no performance reserve

Mechanical data

Housing	diecast
Weight	130g
Optics	glass lens
Connection type	M12 connector 4-pin, plug 4-pin or cable (cross section 4x0.25mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ³⁾	2, 3
Protection class	IP 67

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short circuit protection

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.1 ... 4m
2	MTK(S) 50x50	0.1 ... 3.5m
3	TK(S) 30x50	0.1 ... 2.5m
4	TK(S) 20x40	0.1 ... 2m
5	Tape 2 100x100	0.1 ... 2.2m

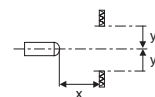
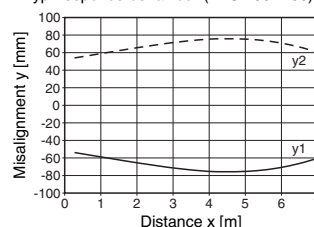
1	0.1	4	6
2	0.1	3.5	4.5
3	0.1	2.5	3
4	0.1	2	2.5
5	0.1	2.2	2.5

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Order guide

Selection table		Order code →				
Equipment ↓		PRK 72/2 Part No. 500 00596	PRK 72/4 Part No. 500 00597	PRK 72/4,5000 Part No. 500 06537	PRK 72/4 L Part No. 500 17527	PRK 72/4 S Part No. 500 06538
Light source	red light	●	●	●	●	●
Connection	cable 2m	●	●			
	cable 5m			●		
	cable 6m					
	M12				●	
	standard plug 4-pin					●
Indicator LED	top of housing	●	●	●	●	●
Features	light/dark by reversing the	●	●	●	●	●
	Polarisation	●	●	●	●	●

Remarks



RK 72

Energetic diffuse reflection light scanner



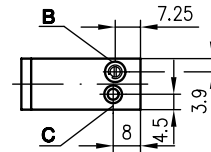
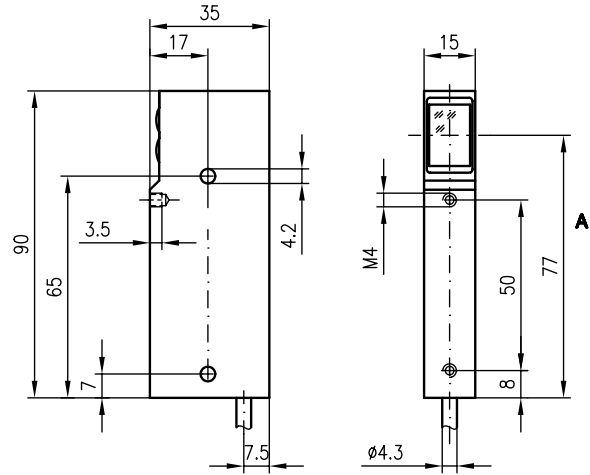
Dimensioned drawing



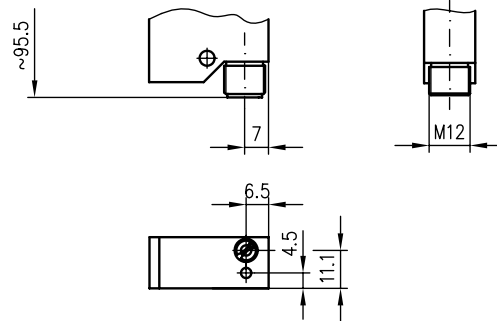
10 ... 200mm



- Slim construction with glass lens and robust metal housing for protection against environmental influences
- LEDs as switching state indicators
- Output is short-circuit proof and polarity reversal protected, thus guaranteeing riskless commissioning
- Mounting holes and M4 threads for fast front side mounting
- Connection via M12 connector, plug or cable



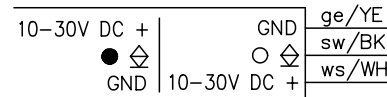
RK 72/4-200 L.1



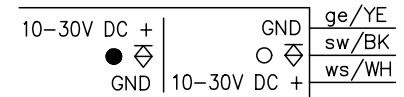
- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection

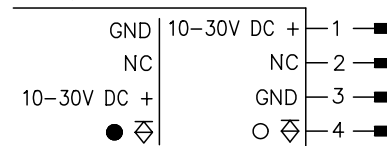
RK 72/2-200



RK 72/4-200



RK 72/4-200 L.1



Accessories:

(available separately • see page 394)

- Mounting systems (BT 92)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)



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Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Light source
 Wavelength

RK 72 ...
 0 ... 340mm
 0 ... 200mm
 LED (modulated light)
 880nm (infrared)

RK 72 ... L.1

Timing

Switching frequency
 Response time

100Hz
 5ms

150Hz
 3.3ms

Electrical data

Operating voltage U_B
 Residual ripple
 Bias current
 Switching output
 Function characteristics
 Signal voltage high/low
 Output current
 Sensitivity

12 ... 30VDC (incl. residual ripple)
 $\leq 15\%$ of U_B
 ≤ 50 mA
 PNP or NPN transistor output
 light/dark switching by reversing the polarity
 $\geq (U_B - 3V) \leq 2V$
 max. 100mA
 adjustable with 270° potentiometer

Indicators

LED red

reflection

Mechanical data

Housing
 Weight
 Optics
 Connection type

diecast
 150g
 glass lens
 M12 connector 4-pin, plug 4-pin or cable (cross section
 4x0.25mm²)

Environmental data

Ambient temp. (operation/storage)
 Protective circuit ³⁾
 Protection class

-20°C ... +60°C / -30°C ... +70°C
 2, 3
 IP 67

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short circuit protection

Order guide

Selection table		Order code →				
Equipment ↓		RK 72/2-200 Part No. 500 00408	RK 72/2-200.5000 Part No. 500 00409	RK 72/4-200 Part No. 500 00420	RK 72/4-200.5000 Part No. 500 06626	RK 72/4-200 L.1 Part No. 500 27360
Light source	infrared	●	●	●	●	●
Connection	cable 2m	●		●		
	cable 5m		●		●	
	cable 6m					
	M12					●
	standard plug 4-pin					
Indicator LED	top of housing	●	●	●	●	●
Features	label detection on glass					●
	sensitivity adjustment 270°	●	●	●	●	●
	light/dark by reversing the	●	●	●	●	●

Tables

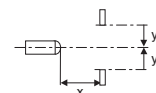
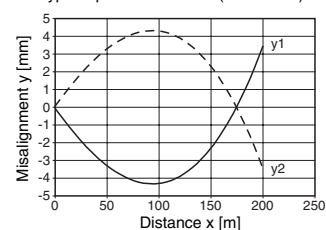
1	0	200	340
2	8	140	250
3	10	110	200

1	white 90%
2	grey 18%
3	black 6%

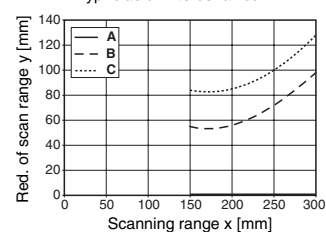
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

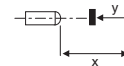
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
 B grey 18%
 C black 6%

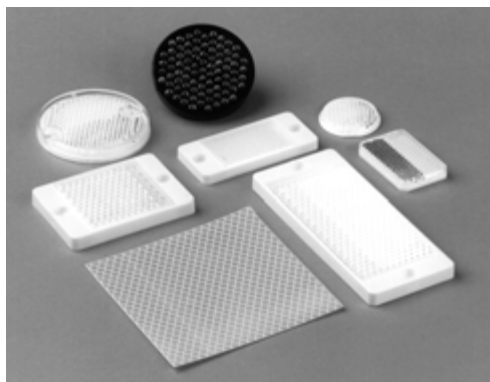


Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.



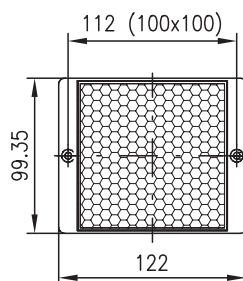
Reflectors



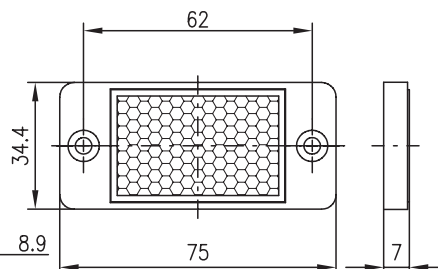
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

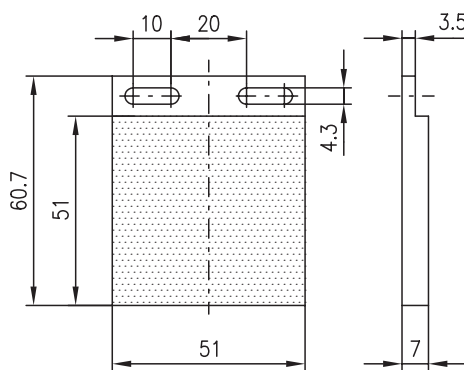
TKS 100 x 100



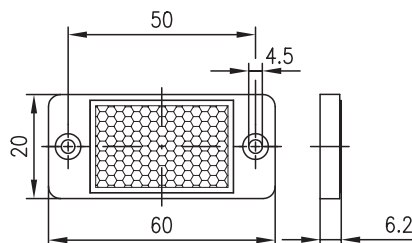
TKS 30 x 50



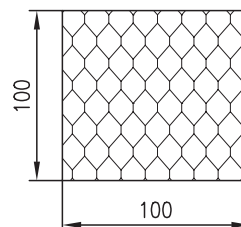
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

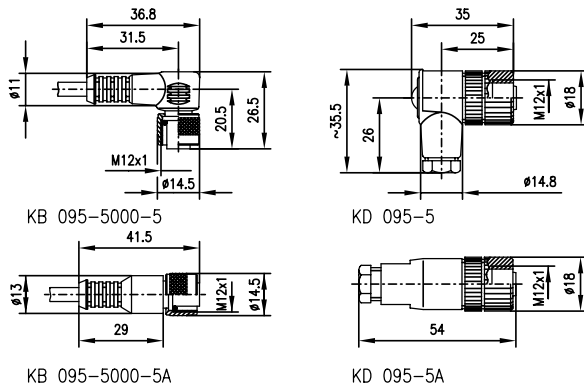


Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes * 72_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 097-2000-4	500 11655
KB 097-6000-4	500 11656
KB 097-12000-4	500 11657
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 92	500 18415
UMS 1	500 22281

Dimensioned drawings

Selection table

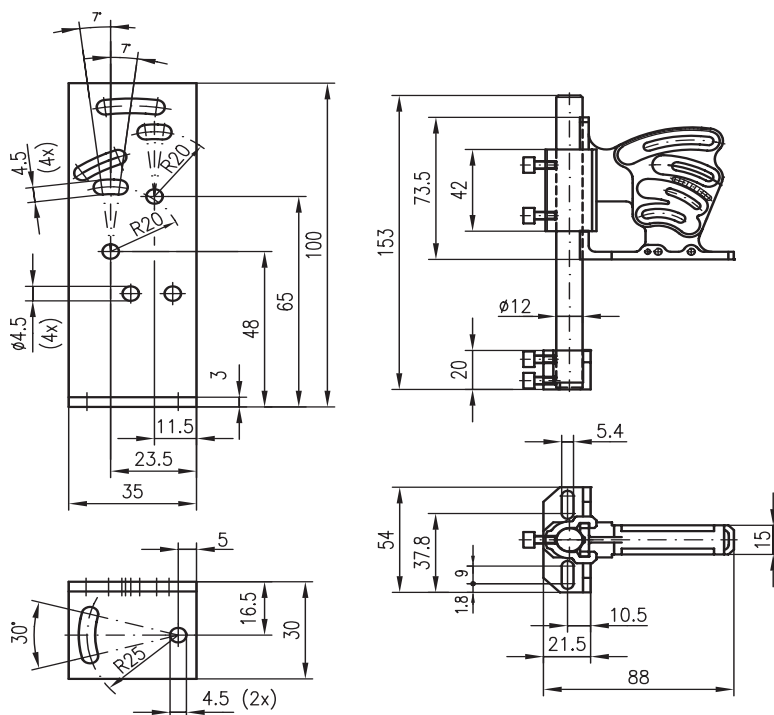
Connection cable with 4-pin standard plug		
2m	6m	M12
KB 097-2000-4	KB 097-6000-4	KB 097-12000-4

M12 connectors			
with cable (5m), 5-pin		without cable, 5-pin	
KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A

Dimensioned drawings

BT 92

UMS 1


Connectors, plugs, cables


Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices. Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: 2 connectors with ready-made 5m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver

Mounting systems

BT 92



UMS 1





64 Series

Overview and advantages

Slim sensor series with integrated aids for alignment and optimised adjustment in robust metal housing with glass lens.

Operating principles:

- Throughbeam photoelectric sensors with infrared light
- Throughbeam photoelectric laser sensors with visible red light
- Throughbeam photoelectric sensors with dynamic evaluation principle

Integrated LEDs guarantee fast and optimal mounting and commissioning

10 ... 30VDC voltage with PNP transistor output


Connection via M12 connector or plug

Options:

- Activation input
- Series connection without additional effort
- Pulse stretching for connection to a control system
- Mounting device with integrated wobble plate





Operating principle	Designation	Typ. oper. range limit	Housing	Light source		Indicators					Operating voltage
				Diecast aluminium	Infrared	Red light laser	Receiver			Transmitter	
						Light path free (LED red)	Alignment aid (4 LEDs red)	Pulse stretching (LED yellow)	Voltage connected (LED green)	Activation (LED yellow)	
	LS 64/4.8 L	0 ... 60m	•	•		•	•				•
	LS 64/4.8 L.1	0 ... 120m	•	•		•	•				•
	LS 64/4 L.5	0 ... 30m	•	•		•		•			•
	LSRL 64/4.8 L	0 ... 150m	•		•	•	•		•	•	•

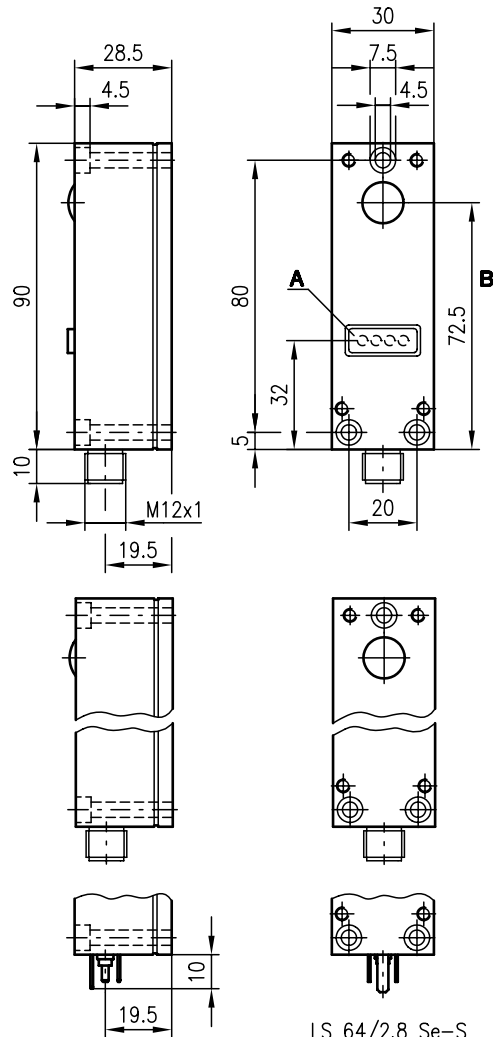


LS 64

Throughbeam photoelectric sensors



Dimensioned drawing

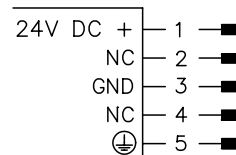


LS 64/2.8 Se-S
LS 64/2.8 Se-S.1
LS 64/4 E-S

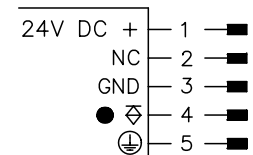
A Indicator diodes
B Optical axis

Electrical connection

LS 64/2.8 Se-L
LS 64/2.8 Se-L.1



LS 64/4 E-L



0 ... 60m
0 ... 120m



- Throughbeam photoelectric sensor with infrared light
- 4-way LED indicator for fast status display and exact alignment
- Activation input for function testing and linking several optical axes
- Connection via M12 connector and plug



Accessories:

(available separately • see page 406)

- Mounting systems (BT 64)
- Diaphragm (BL 64)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 64_a01e.fm



Specifications

	LS 64/4.8 L	LS 64/4.8 L.1
Optical data		
Typ. operating range limit ¹⁾	0 ... 60m	0 ... 120m
Operating range ²⁾	0 ... 50m	0 ... 100m
Light source	LED (modulated light)	
Wavelength	880nm	
Timing		
Switching frequency	100Hz	
Response time	≤ 5ms	
Delay before start-up	≤ 100ms	
Electrical data		
Operating voltage U _B	24VDC ± 20%	
Residual ripple	≤ 10% of U _B	
Bias current		
Transmitter	≤ 65mA	
Receiver	≤ 35mA	
Switching output	PNP transistor	
Function characteristics	light switching	
Output current	max. 100mA	
Indicators		
Receiver		
4-fold LED red	switching state and alignment aid	
Function	off: no Signal - output=low	
	LED on: number of illuminating LEDs as indicator	
	for receiving level - output=high	
Mechanical data		
Housing	diecast aluminium	
Optics	glass	
Weight	430g	
Connection type	M12 connector, stainless steel, 5-pin	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60 °C/-40 °C ... +70°C	
Protective circuit ³⁾	1, 2, 3	
Protection class	IP 65	
Standards applied	IEC 60947-5-2	
Options		
Activation input active		
Transmitter active/not active	≥ 8V/≤ 2V or not connected	
Activation/disable delay	0.5ms	

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	LS 64/4.8 L	
Transmitter	LS 64/2.8 Se-L	500 29414
Receiver	LS 64/4 E-L	500 29415
Transmitter and receiver	LS 64/4.8 L.1	
Transmitter	LS 64/2.8 Se-L.1	500 29416
Receiver	LS 64/4 E-L	500 29415

Tables

Diagrams

Remarks

- Optimal performance reserve is achieved when all four LEDs illuminate.
- The first red LED indicates the state of the switching output.
- The diameter of the darkening object must be ≥ 12mm.
- Operating range with diaphragm

LS 64/4.8 L	0 ... 2m
LS 64/4.8 L.1	0 ... 4m



LS 64

Dynamic throughbeam photoelectric sensors



0 ... 30m



24 V
DC

- Dynamic throughbeam photoelectric sensor for detection of the smallest parts (partial darkening) of the light beam
- Automatic contamination compensation
- 200ms pulse stretching for problem-free connection to control devices
- Sensitivity adjustment with high resolution
- Connection via M12 connector



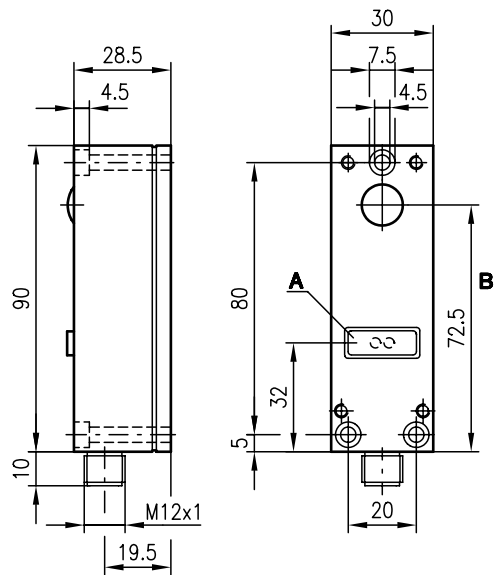
Accessories:

(available separately • see page 406)

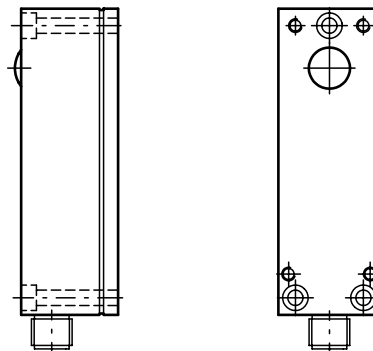
- Mounting system (BT 64)
- M12 connectors (KD ...)

Dimensioned drawing

Receiver



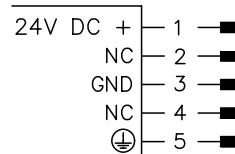
Transmitter



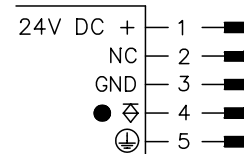
- A Indicator diodes
- B Optical axis

Electrical connection

Transmitter



Receiver



We reserve the right to make changes • 64_a02e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 30m
Operating range ²⁾	0 ... 25m
Light beam propagation	divergent
Light source	LED (modulated light)
Wavelength	880nm

Timing

Output pulse	200ms constant
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	24VDC ± 20%
Residual ripple	≤ 15% of U_B
Bias current	
Transmitter	≤ 35mA
Receiver	≤ 40mA
Switching output	PNP transistor
Function characteristics	dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver	
LED red	alignment aid
Function	off: no voltage
	on: alignment o.k.
	flashing: alignment incorrect
	Switching output
LED yellow	

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	430g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
Transmitter and receiver	LS 64/4 L.5	
Transmitter	LS 64/2 Se-L.2	500 29072
Receiver	LS 64/4 E-L.5	500 29073

Tables

Diagrams

Remarks

- Flashing red LED displays permanent interruption of the light path.
- The sensitivity is to be adapted to the distance between transmitter and receiver.
- Wobble plate for easy alignment.
- Response behaviour depends on object size and dwelling time.

Potentiometer position

- right: small objects in fast movement.
 left: big objects in slow movement.



LSRL 64

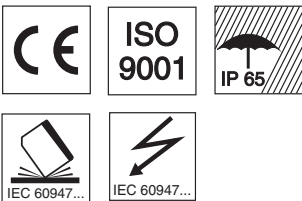
Throughbeam photoelectric laser sensors



0 ... 150m



- Throughbeam photoelectric laser sensor with high performance reserve in red light
- 4-way LED indicator for fast status display and exact alignment
- Activation input for function testing and linking several optical axes
- Connection via M12 connector



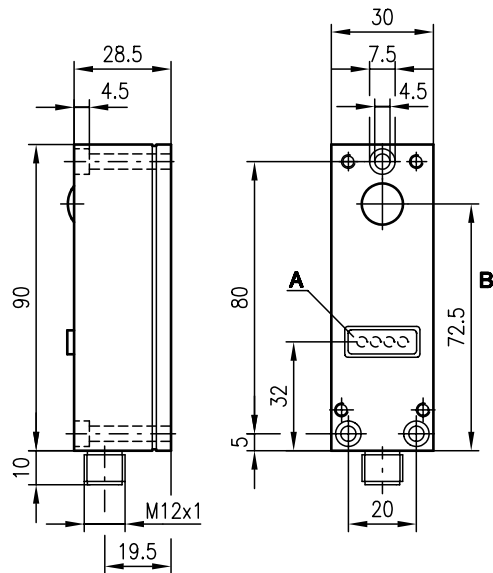
Accessories:

(available separately • see page 406)

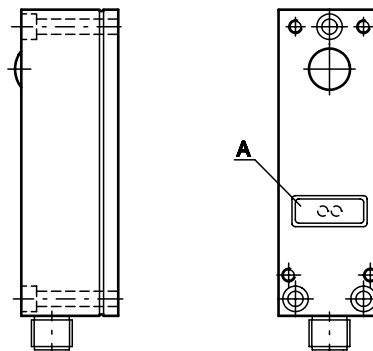
- Mounting system (BT 6 4)
- M12 connectors (KD ...)

Dimensioned drawing

Receiver



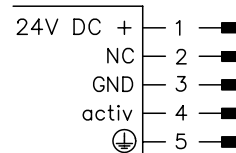
Transmitter



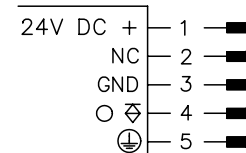
- A Indicator diodes
- B Optical axis

Electrical connection

Transmitter



Receiver



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Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 150m
Operating range ²⁾	0 ... 120m
Light beam propagation	divergent (typical 0.11°)
Light source	laser (modulated light)
Wavelength	670nm (visible red light)
Laser warning notice	see remarks

Timing

Switching frequency	100Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	24VDC ± 20%
Residual ripple	≤ 15% of U_B
Bias current	
Transmitter	≤ 35mA
Receiver	≤ 40mA
Switching output	PNP transistor
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

Transmitter	
LED green	ready
LED yellow	transmitter active
Receiver	
4-fold LED red	switching state and alignment aid
Function	off: no signal - output=low LEDs on: number of illuminating LEDs as indicator for receiving level - output=high

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	430g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +40°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class	I
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	$\geq 8V / \leq 2V$ or not connected
Activation/disable delay	≤ 0.5ms

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
Transmitter and receiver	LSRL 64/4.8 L	
Transmitter	LSRL 64/2.8 Se-L	500 80151
Receiver	LSRL 64/4 E-L	500 80150

Tables

Diagrams

Remarks

- Optimal performance reserve is achieved when all four LEDs illuminate.
- The first red LED indicates the state of the switching output.

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

64 Series
 Pulse duration 4µs
 Quiescent period 4µs
 $P_{max} \leq 1mW + 10\%$
 $\lambda = 670nm$



Accessories

64 Series

M12 connectors



For devices with M12 connectors, there are available: 4 connectors with ready made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050) plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 64 (Part No. 500 80152)



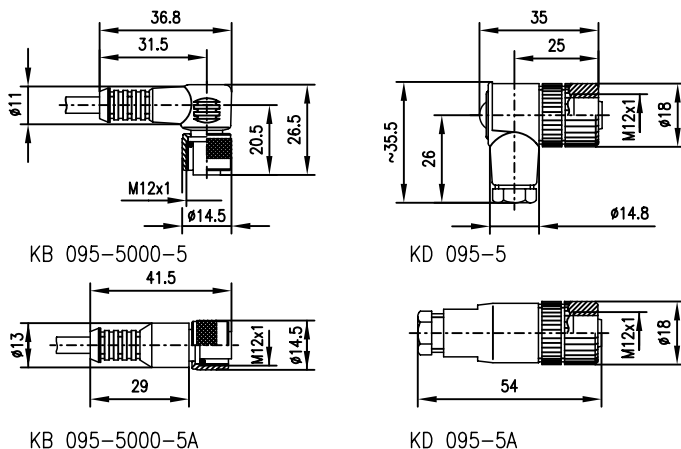
BT 64 mounted



BL 64 (Part No. 500 13958)



Dimensioned drawings

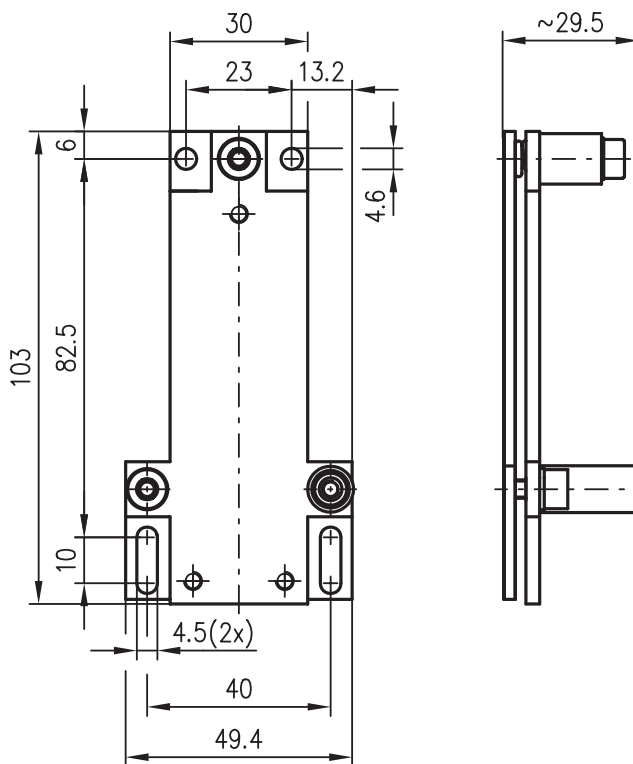


Selection table

M12 connectors			
with 5-pin cable (5m)		without cable	
KB 095-5000-5 Part No. 500 20500	KB 095-5000-5A Part No. 500 20499	KD 095-5 Part No. 500 20502	KD 095-5A Part No. 500 20501

Dimensioned drawings

BT 64



Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 64_zu_e.fm

96 Series

Overview and advantages

Extensive sensor series:

- In robust metal housing with glass optics
- In solid plastic housing
- In protection class IP 67

Operating principles:

- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression
- Retro-reflective photoelectric sensor for safe detection of transparent media

- Visible red light for easy alignment
- Infrared light for high performance reserve and to prevent interference from extraneous light

- 10 ... 30VDC voltage with PNP/NPN transistor output
- Alternatively AS-interface bus connection or 20 ... 230V all mains voltage with relay output

M12 connector or comfortable terminal compartment for individual electrical connection



Innovative mounting systems for rod mounting or through holes for universal screw mounting

Extensive options:

- Warning output
- Activation input
- Switching delay
- Low temperature and optics heating down to -35°C
- Wide angle







Operating principle	Designation		Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage			Output			
				Metal	Plastic	Red light	Infrared	10 ... 30VDC	AS-i system	20 ... 230VAC/DC	PNP transistor	NPN transistor	Relay	AS-interface
	LS 96M/P-1020-2	•	65m	•			•	•			•			
	LS 96M/P-1040-2	•	65m	•			•	•			•			
	LS 96M/P-1040-4	•	65m	•			•	•			•			
	LS 96M/P-1130-2	•	65m	•			•	•			•			
	LS 96M/P-1170-2	•	39m	•			•	•			•			
	LS 96M/P-1170-4	•	39m	•			•	•			•			
	LS 96M/N-1010-2	•	65m	•			•	•			•	•		
	LS 96K/P-1010-2	•	65m		•		•	•			•			
	LS 96K/P-1010-4	•	65m		•		•	•			•			
	LS 96K/P-1030-2	•	65m		•		•	•			•			
	LS 96K/P-1030-4	•	65m		•		•	•			•			
	LS 96K/P-1140-2 ³⁾	•	39m		•		•	•			•			
	LS 96M/P-3010-4	•	150m	•			•	•			•			
	LS 96M/P-3010-2	•	150m	•			•	•			•			
	LS 96M/P-3012-2	•	150m	•			•	•			•			
	LS 96M/P-181W-4	•	39m	•			•	•			•			
	LS 96M/P-181W-2	•	39m	•			•	•			•			
	LS 96M/P-1816-4	•	39m	•			•	•			•			
	LS 96M/P-1810-4	•	39m	•			•	•			•			
	LS 96M/R-1310-2	•	65m	•			•	•			•		•	
	LS 96K/R-1310-2	•	65m		•		•	•			•		•	
	LS 96K/R-1320-2	•	65m		•		•	•			•		•	
	LS 96K/R-131P-2	•	65m		•		•	•			•		•	
	LS 96M/R-3310-2	•	150m	•			•	•			•		•	
	LS 96M/R-176W-2		39m	•			•	•			•		•	
	SLS 96M/P-1070-T2-2	•	65m	•			•	•			•			
	SLS 96M/P-1070-T2-4	•	65m	•			•	•			•			
	SLS 96M/P-1200-T2-2	•	39m	•			•	•			•			
	SLS 96M/P-1200-T2-4	•	39m	•			•	•			•			
	SLS 96M/P-1071-T2-2	•	65m	•			•	•			•			
	SLS 96M/P-1071-T2-4	•	65m	•			•	•			•			
	SLS 96K/P-1070-T2-2	•	65m		•		•	•			•			
	SLS 96K/P-1070-T2-4	•	65m		•		•	•			•			
	SLS 96K/P-1200-T2-2	•	39m		•		•	•			•			
	SLS 96K/P-1200-T2-4	•	39m		•		•	•			•			
	SLS 96K/P-1207-T2-2 ²⁾	•	39m		•		•	•			•			
	LS 96 M/A-1270-4	•	65m	•			•	•						•
	LS 96M/A-1820-4 ¹⁾	•	39m	•			•	•		•				•
	LS 96M/A-182W-4 ¹⁾	•	39m	•			•	•		•				•
	LS 96K/P-2010-2	•	65m		•		•	•			•			
	LS 96K/P-2140-2	•	39m		•		•	•			•			

1) Transmitter without integrated AS-i-slave technology
2) Suitable for multi-sensor operation (parallel light axes)
3) Activation input LOW (active low)



Switching frequency	Switching		Connection		Options									Page
	Light	Dark	M12 connector	Terminals	Warning output	Polarisation filter	Background suppression	Activation input	Switching delay	Low temp./optics heating	Safety application	Transparent media	Wide angle	
500Hz	•	•		•	•									415
500Hz	•	•		•	•				•					415
500Hz	•	•	•		•				•					415
500Hz	•	•		•	•				•	•				415
500Hz	•	•	•		•				•					415
500Hz	•	•		•	•									415
500Hz	•	•		•	•									417
500Hz	•	•	•											417
500Hz	•	•		•					•					417
500Hz	•	•	•	•					•					417
500Hz	•	•	•	•					•					417
500Hz	•	•	•											419
500Hz	•	•	•											419
500Hz	•	•	•					•		•				419
500Hz	•	•	•										•	421
500Hz	•	•		•									•	421
500Hz	•	•	•							•				421
500Hz	•	•	•											421
20Hz	•	•		•										423
20Hz	•	•		•										423
20Hz	•	•		•					•					423
20Hz	•	•		•										423
20Hz	•	•		•	•									423
20Hz	•	•		•									•	425
500Hz	•			•										427
500Hz	•		•										•	427
500Hz	•			•				•					•	427
500Hz	•		•					•					•	427
500Hz	•			•				•		•			•	427
500Hz	•		•					•		•			•	427
500Hz	•			•				•					•	429
500Hz	•		•					•					•	429
500Hz	•			•				•					•	429
500Hz	•		•					•					•	429
500Hz	•			•				•					•	429
500Hz	•		•					•					•	429
500Hz/AS-i	•	•	•		•			•						431
500Hz/AS-i	•	•	•		•									433
500Hz/AS-i	•	•	•		•								•	433
200Hz	•	•		•										435
200Hz	•	•		•										435







Operating principle	Designation		Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage			Output			
				Metal	Plastic	Red light	Infrared	10 ... 30VDC	AS-i system	20 ... 230VAC/DC	PNP transistor	NPN transistor	Relay	AS-interface
	RK 96K/P-1440-21	•	18m		•		•				•			
	RK 96M/P-1440-21	•	18m	•			•				•			
	RK 96K/R-1560-25	•	18m		•					•			•	
	RK 96K/R-156P-25	•	18m		•					•			•	
	PRK 96M/P-1360-21	•	10m	•			•				•			
	PRK 96M/P-1370-22	•	10m	•			•				•			
	PRK 96M/P-1370-42	•	10m	•			•				•			
	PRK 96M/P-1390-22	•	10m	•			•				•			
	PRK 96M/P-1390-42	•	10m	•			•				•			
	PRK 96M/P-1400-22	•	10m	•			•				•			
	PRK 96M/N-1360-27	•	10m	•			•					•		
	PRK 96M/P-3380-41	•	18m	•			•				•			
	PRK 96M/P-3360-21	•	18m	•			•				•			
	PRK 96M/P-3360-41	•	18m	•			•				•			
	PRK 96K/P-1360-21	•	10m		•		•				•			
	PRK 96K/P-1360-41	•	10m		•		•				•			
	PRK 96K/P-1380-21	•	10m		•		•				•			
	PRK 96K/P-1380-41	•	10m		•		•				•			
	PRK 96K/N-1360-46		10m		•		•					•		
	PRK 96M/P-1362-47	•	10m	•			•				•			
	PRK 96M/P-1361-47	•	10m	•			•				•			
	PRK 96K/P-1363-29 ¹⁾	•	10m		•		•				•			
	PRK 96K/P-1361-47	•	10m		•		•				•			
	PRK 96K/P-1361-29	•	10m		•		•				•			
	PRK 96M/R-1420-25	•	10m	•			•				•			•
	PRK 96M/R-1430-25	•	10m	•			•				•			•
	PRK 96M/R-3420-25		18m	•			•				•			•
	PRK 96M/R-3430-25		18m	•			•				•			•
	PRK 96K/R-1420-25	•	10m		•		•				•			•
	PRK 96K/R-1430-25	•	10m		•		•				•			•
	PRK 96K/R-3428-25		24m		•		•				•			•
	PRK 96M/P-1830-21 ²⁾	•	1.85m	•			•				•			
	PRK 96M/P-1830-41 ²⁾	•	1.85m	•			•				•			
	PRK 96M/R-1850-25 ²⁾	•	1.85m	•			•				•			•
	PRK 96M/P-1838-21	•	8.5m	•			•				•			
	PRK 96M/P-1838-41	•	8.5m	•			•				•			
	PRK 96M/R-1858-25	•	8.5m	•			•				•			•
	PRK 96M/A-1410-44	•	10m	•			•			•				•
	PRK 96M/A-3410-44	•	18m	•			•			•				•
	PRK 96K/P-2360-28	•	10m		•		•				•			
PRK 96M/P-2838-28	•	8.5m	•			•				•				
PRK 96M/P-2838-48	•	8.5m	•			•				•				

1) Active low, 2) Gap detection



Switching frequency	Switching		Connection		Options									Page
	Light	Dark	M12 connector	Terminals	Warning output	Polarisation filter	Background suppression	Activation input	Switching delay	Low temp./optics heating	Safety application	Transparent media	Single lens	
1000Hz	•	•		•										437
1000Hz	•	•		•										437
20Hz	•	•		•										439
20Hz	•	•		•										439
1000Hz	•	•		•		•								441
1000Hz	•	•		•	•	•								441
1000Hz	•	•	•	•	•	•								441
1000Hz	•	•		•	•	•			•					441
1000Hz	•	•	•	•	•	•			•					441
1000Hz	•	•		•	•	•			•					441
1000Hz	•	•		•	•	•			•					441
1000Hz	•	•	•	•	•	•			•					441
1000Hz	•	•		•		•								443
1000Hz	•	•	•	•		•								443
1000Hz	•	•		•		•			•					443
1000Hz	•	•	•	•		•			•					443
1000Hz	•	•	•	•		•		•		•				445
1000Hz	•	•	•	•		•		•						445
1000Hz	•	•		•		•		•						445
1000Hz	•	•	•	•		•		•						445
1000Hz	•	•		•		•		•						445
20Hz	•	•		•		•								447
20Hz	•	•		•		•			•					447
20Hz	•	•		•		•								447
20Hz	•	•		•		•			•					447
20Hz	•	•		•		•								449
20Hz	•	•		•		•			•					449
20Hz	•	•		•		•								449
1000Hz	•	•		•		•						•	•	451
1000Hz	•	•	•	•		•						•	•	451
20Hz	•	•		•		•			•			•	•	453
1000Hz	•	•		•		•						•	•	455
1000Hz	•	•	•	•		•						•	•	455
20Hz	•	•		•		•						•	•	457
1000Hz/AS-i	•	•	•	•	•	•								459
1000Hz/AS-i	•	•	•	•	•	•								459
500Hz	•	•		•		•								461
500Hz	•	•		•		•						•	•	463
500Hz	•	•	•	•		•						•	•	463



Operating principle	Designation		Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage			Output				
				Metal	Plastic	Red light	Infrared	10 ... 30VDC	AS-i system	20 ... 230VAC/DC	PNP transistor	NPN transistor	Relay	AS-interface	
	RT 96M/P-1370-500-22	•	0.7m	•		•		•			•				
	RT 96M/P-1370-500-42	•	0.7m	•		•		•			•				
	RT 96M/P-1450-800-22	•	1.2m	•			•	•			•				
	RT 96M/P-1450-800-42	•	1.2m	•			•	•			•				
	RT 96M/P-1470-800-42	•	1.2m	•			•	•			•				
	RT 96M/P-1480-800-22	•	1.2m	•			•	•			•				
	RT 96K/P-1440-800-21	•	1.2m		•		•	•			•				
	RT 96K/P-1440-800-41	•	1.2m		•		•	•			•				
	RT 96K/P-1444-800-21	•	0.02 ... 1.2m		•		•	•			•				
	RT 96K/P-1444-800-41	•	0.02 ... 1.2m		•		•	•			•				
	RT 96K/P-1460-800-21	•	1.2m		•		•	•			•				
	RT 96K/N-1440-800-46	•	1.2m		•		•	•				•			
		RT 96M/R-1580-500-25	•	0.7m	•		•				•			•	
		RT 96M/R-1560-800-25	•	1.2m	•			•			•			•	
RT 96K/R-1560-800-25		•	1.2m		•		•			•			•		
RT 96K/R-1570-800-25		•	1.2m		•		•			•			•		
RT 96K/P-2440-800-28		•	1.2m		•		•	•			•				
RT 96K/P-2444-800-28		•	0.02 ... 1.2m		•		•	•			•				
RT 96K/P-2360-500-28		•	0.7m		•		•	•			•				
		HRT 96M/P-1630-800-41	•	1.2m	•		•		•			•			
		HRT 96M/P-1640-800-21	•	1.2m	•		•		•			•			
		HRT 96M/P-1640-800-41	•	1.2m	•		•		•			•			
		HRT 96M/P-1610-1200-21	•	1.8m	•			•	•			•			
		HRT 96M/P-1610-1200-41	•	1.8m	•			•	•			•			
		HRT 96M/P-1620-1200-21	•	1.8m	•			•	•			•			
		HRT 96M/P-1620-1200-41	•	1.8m	•			•	•			•			
	HRT 96M/N-1600-1200-27	•	1.8m	•			•	•				•			
	HRT 96K/P-1600-1200-21	•	1.8m		•		•	•			•				
	HRT 96K/P-1600-1200-41	•	1.8m		•		•	•			•				
	HRT 96K/P-1610-1200-21	•	1.8m		•		•	•			•				
	HRT 96K/P-1630-800-21	•	1.2m		•		•	•			•				
	HRT 96K/P-1630-800-41	•	1.2m		•		•	•			•				
	HRT 96K/P-1631-800-47	•	1.2m		•		•	•			•				
	HRT 96K/P-1640-800-41	•	1.2m		•		•	•			•				
	HRT 96M/R-1680-1200-25	•	1.8m	•				•			•			•	
	HRT 96M/R-1690-1200-25	•	1.8m	•				•			•			•	
	HRT 96K/R-1680-1200-25	•	1.8m		•			•			•			•	
	HRT 96K/R-1690-1200-25	•	1.8m		•			•			•			•	
	HRT 96M/A-1660-1200-44	•	1.8 m	•				•						•	
HRT 96M/A-1670-800-44	•	1.2 m	•			•							•		
HRT 96K/P-2600-1200-28	•	1.8 m		•			•				•				
HRT 96K/P-2630-800-28	•	1.2 m		•		•					•				
HRT 96K/P-2630-800-48		1.2 m		•		•					•				
HRT 96M/P-1600-2000-42 ¹⁾	•	0.10 ... 2.5m	•			•		•			•				
HRT 96M/P-3604-2000-42 ²⁾	•	0.01 ... 2.5m	•			•		•			•				

1) 1 Switching point / switching output
2) 2 Switching points / switching outputs, short range



Switching frequency	Switching		Connection			Options							Page
	Light	Dark	M12 connector	M18 connector	Terminals	Warning output	Polarisation filter	Background suppression	Activation input	Switching delay	Low temp./optics heating	Safety application	
300Hz	•	•			•	•							465
300Hz	•	•	•			•							465
300Hz	•	•			•	•							465
300Hz	•	•	•			•							465
300Hz	•	•			•	•				•			465
300Hz	•	•			•					•	•		467
300Hz	•	•	•										467
300Hz	•	•			•								467
300Hz	•	•	•										467
300Hz	•	•			•					•			467
300Hz	•	•	•										467
20Hz	•	•			•								469
20Hz	•	•			•								469
20Hz	•	•			•								469
20Hz	•	•			•					•			469
500Hz	•	•			•								471
500Hz	•	•			•								471
500Hz	•	•			•								471
300Hz	•	•	•					•					473
300Hz	•	•			•			•		•			473
300Hz	•	•	•					•		•			473
300Hz	•	•			•			•		•			473
300Hz	•	•	•					•		•			473
300Hz	•	•			•			•		•	•		473
300Hz	•	•	•					•		•	•		473
300Hz	•	•			•			•					473
300Hz	•	•			•			•					475
300Hz	•	•	•					•					475
300Hz	•	•			•			•		•			475
300Hz	•	•			•			•					475
300Hz	•	•	•					•					475
300Hz	•	•			•			•		•			475
300Hz	•	•	•					•	•				475
300Hz	•	•	•					•		•			475
20Hz	•	•			•			•					477
20Hz	•	•			•			•		•			477
20Hz	•	•			•			•					477
20Hz	•	•			•			•		•			477
300Hz/AS-i	•	•	•					•	•				479
300Hz/AS-i	•	•	•					•	•				479
300Hz	•	•			•			•					481
300Hz	•	•			•			•					481
300Hz	•	•	•					•					481
300Hz	•	•	•					•		•			483
300Hz	•	•	•					•		•			483



LS 96

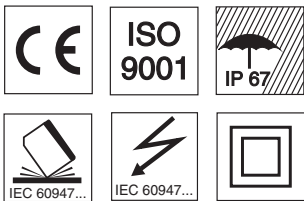
Throughbeam photoelectric sensors



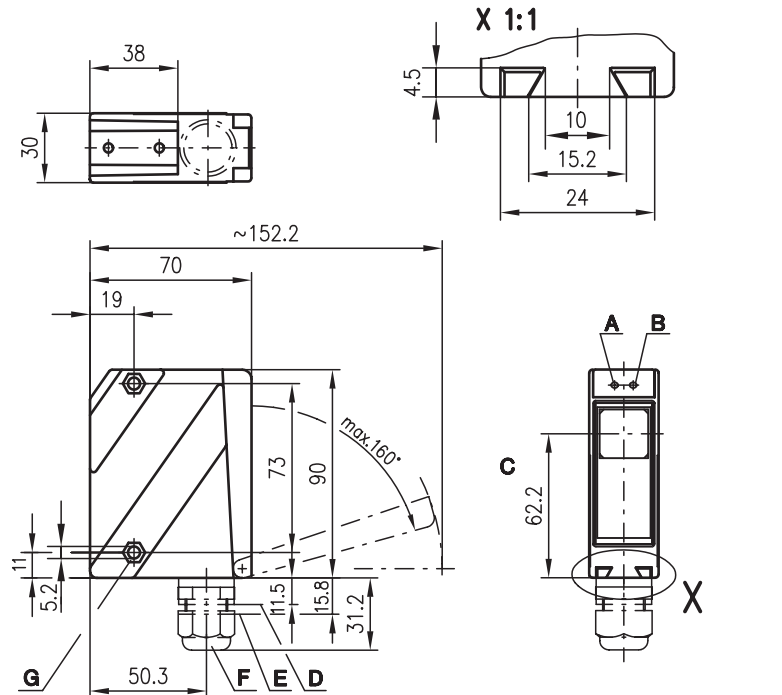
39m
65m

10 - 30 V
DC

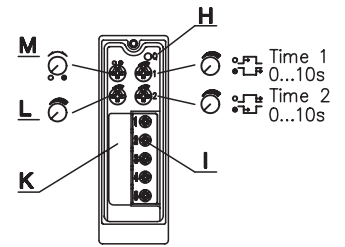
- Throughbeam photoelectric sensors with high performance reserve in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures



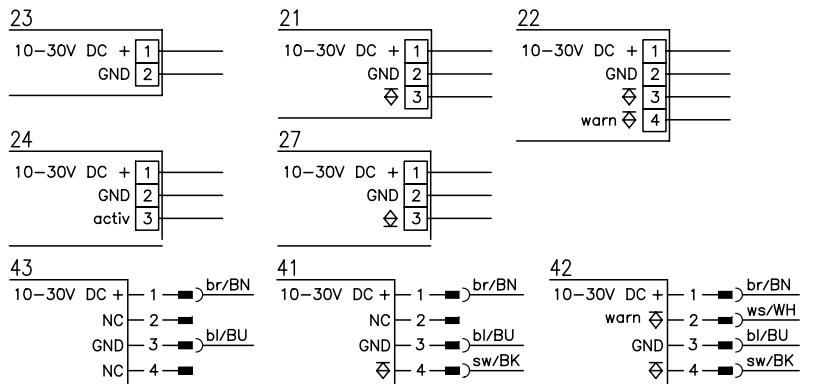
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Device plug M18x1
- F Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G Countersinking for SK nut M5, 4.2 deep
- H Output with switching delay option
- I Connection terminals
- K Cable entry
- L Sensitivity adjustment
- M Light/dark switching



Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96

We reserve the right to make changes • 96_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

Infrared light

0 ... 65m
 0 ... 50m
 LED (modulated light)
 880nm

Red light

0 ... 39m
 0 ... 30m
 LED (modulated light)
 660nm

Timing

Switching frequency 500Hz
 Response time 1ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 50mA, ≤ 130mA with optional optics heating
 Switching output NPN or PNP transistor
 Function characteristics light/dark switching (reversible)
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V (PNP)
 Output current max. 100mA
 Sensitivity adjustable

Indicators

LED green ready
 LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals or M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Activation input active
 Transmitter active/not active ≥ 8V / ≤ 2V (≥ 2V / ≤ 2V) ⁵⁾
 Activation/disable delay ≤ 0.5ms
 Input resistance 47KΩ ± 10%
Warning output autoControl warn PNP transistor, 100mA, counting principle for temperature changes, prevents fogging to -35°C
Optics heating
Low temperature
Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC
- 5) Active low

Order guide

Selection table		LS 96M/P-1020-2 Part No. 500 25225 (Tr) Part No. 500 25207 (Re)	LS 96M/P-1040-2 Part No. 500 25225 (Tr) Part No. 500 25203 (Re)	LS 96M/P-1040-4 Part No. 500 25228 (Tr) Part No. 500 25205 (Re)	LS 96M/P-1130-2 Part No. 500 25223 (Tr) Part No. 500 25201 (Re)	LS 96M/P-1170-2 Part No. 500 25217 (Tr) Part No. 500 25195 (Re)	LS 96M/P-1170-4 Part No. 500 25219 (Tr) Part No. 500 25197 (Re)	LS 96M/N-1010-2 Part No. 500 25225 (Tr) Part No. 500 31294 (Re)
Equipment ↓	Order code →							
	Housing	metal ●	●	●	●	●	●	●
	plastic							
Light source	red light (30m)					●	●	
	infrared light (50m)	●	●	●	●			●
Connection	terminals	●	●		●	●		●
	M 12 connector			●			●	
Features	optics heating/low temp.				●			
	switching delay		●	●	●	●	●	
	warning output	●	●	●	●	●	●	
	activation input				● ⁵⁾			
	NPN switching output							●

Tables

Red light

0	30	39
---	----	----

Infrared light

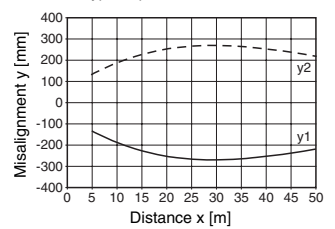
0	50	65
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□ Operating range [m]
 ▒ Typ. operating range limit [m]

Diagrams

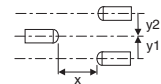
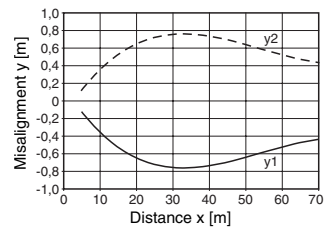
Red light

Typ. response behaviour



Infrared light

Typ. response behaviour



Remarks

- The throughbeam photoelectric sensor is also available with integrated AS-i chip for direct connection to the AS-i system.
- **Output-LED** (with option switching delay) display reacts like switching output - e.g. delayed.



LS 96

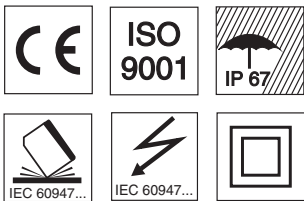
Throughbeam photoelectric sensors



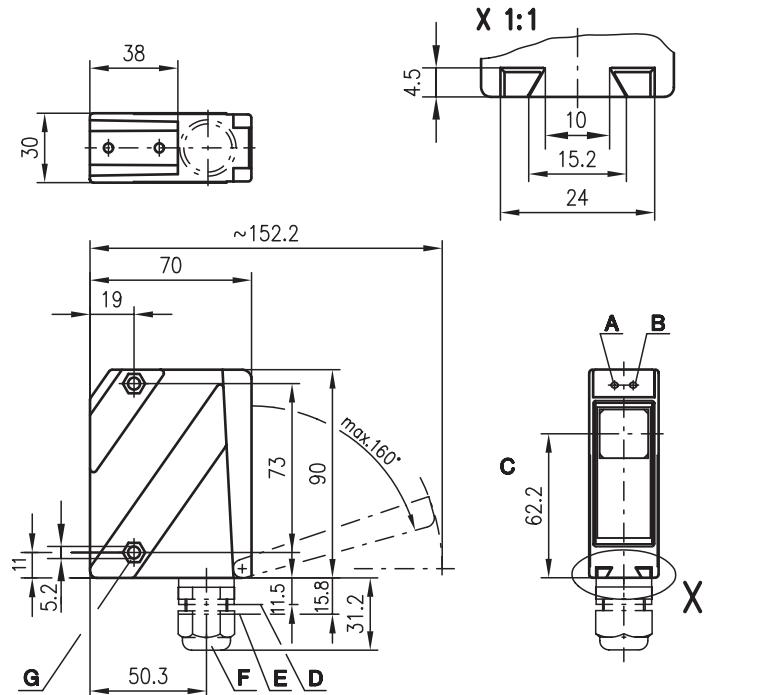
39m
65m

10 - 30 V
DC

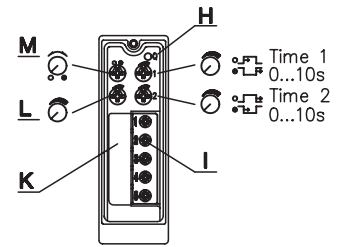
- Throughbeam photoelectric sensors with high performance reserve in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures



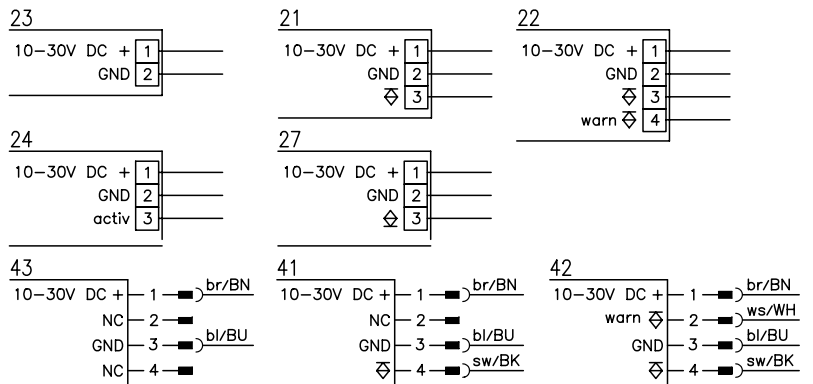
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Device plug M18x1
- F Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G Countersinking for SK nut M5, 4.2 deep
- H Output with switching delay option
- I Connection terminals
- K Cable entry
- L Sensitivity adjustment
- M Light/dark switching



Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96

We reserve the right to make changes • 96_a11e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

Infrared light

0 ... 65m
 0 ... 50m
 LED (modulated light)
 880nm

Red light

0 ... 39m
 0 ... 30m
 LED (modulated light)
 660nm

Timing

Switching frequency 500Hz
 Response time 1ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 50mA, ≤ 130mA with optional optics heating
 Switching output NPN or PNP transistor
 Function characteristics light/dark switching (reversible)
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V (PNP)
 Output current max. 100mA
 Sensitivity adjustable

Indicators

LED green
 LED yellow
 LED yellow flashing

ready
 light path free
 light path free, no performance reserve

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

Plastic housing

polycarbonate
 plastic
 150g
 terminals or M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Activation input active
 Transmitter active/not active
 Activation/disable delay
 Input resistance

≥ 8V / ≤ 2V (≥ 2V / ≤ 2V) ⁵⁾
 ≤ 0,5ms
 47KΩ ± 10%

Warning output autoControl warn

Optics heating

Low temperature

Switching delay (slow oper./release)

PNP transistor, 100mA, counting principle for temperature changes, prevents fogging to -35°C
 0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC
- 5) Active low

Order guide

Selection table		LS 96K/P-1010-2 Part No. 500 25255 (Tr) Part No. 500 25260 (Re)	LS 96K/P-1010-4 Part No. 500 25254 (Tr) Part No. 500 25258 (Re)	LS 96K/P-1030-2 Part No. 500 25255 (Tr) Part No. 500 25259 (Re)	LS 96K/P-1030-4 Part No. 500 25254 (Tr) Part No. 500 80483 (Re)	LS 96K/P-1140-2 Part No. 500 80657 (Tr) Part No. 500 31295 (Re)		
Order code →								
Equipment ↓								
Housing	metal							
	plastic	●	●	●	●	●		
Light source	red light (30m)					●		
	infrared light (50m)	●	●	●	●			
Connection	terminals	●		●		●		
	M 12 connector		●		●			
Features	optics heating/low temp.							
	switching delay			●	●			
	warning output							
	activation input					● ⁵⁾		
	NPN switching output							

Tables

Red light

0	30	39
---	----	----

Infrared light

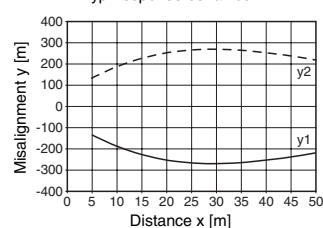
0	50	65
---	----	----

□ Operating range [m]
 ▒ Typ. operating range limit [m]

Diagrams

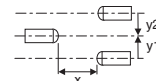
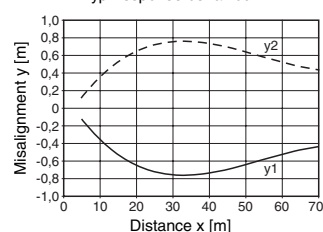
Red light

Typ. response behaviour



Infrared light

Typ. response behaviour



Remarks

- The throughbeam photoelectric sensor is also available with integrated AS-i chip for direct connection to the AS-i system.
- **Output-LED** (with option switching delay) display reacts like switching output - e.g. delayed.



LS 96

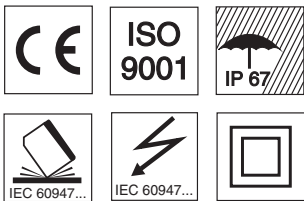
Throughbeam photoelectric sensors



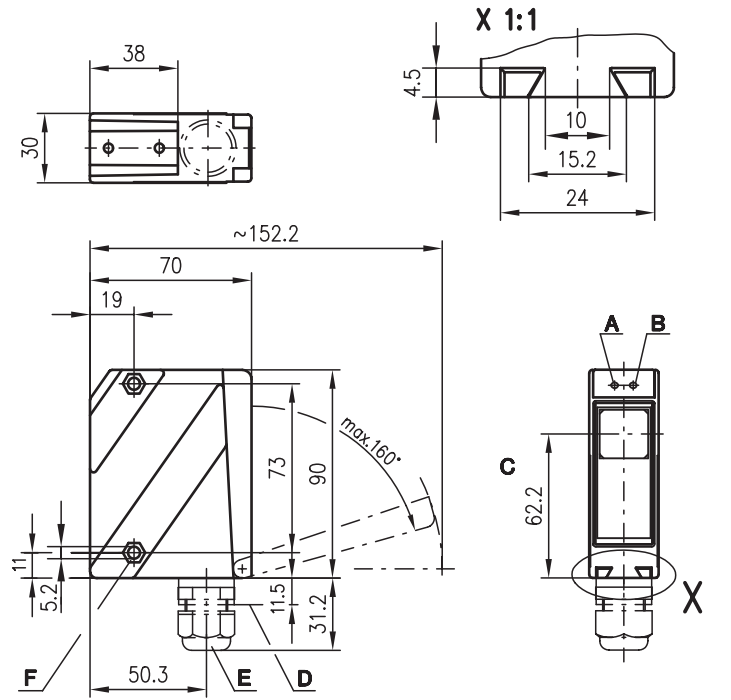
150m



- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures



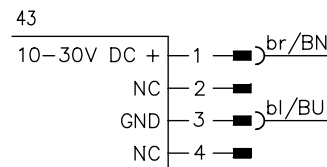
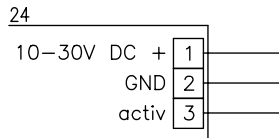
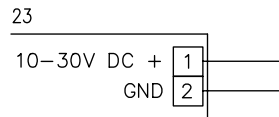
Dimensioned drawing



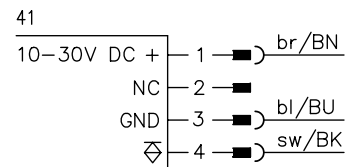
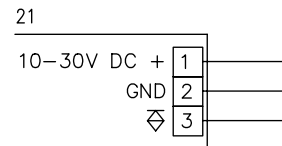
- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- F Countersinking for SK nut M5, 4.2 deep
- G Connection terminals
- H Cable entry
- I Sensitivity adjustment
- K Light/dark switching

Electrical connection

Transmitter



Receiver



We reserve the right to make changes • 96_a02e.fm

Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

Infrared light

0 ... 150m
 0 ... 120m
 LED (modulated light)
 880nm

Timing

Switching frequency 500Hz
 Response time 1ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 50mA, ≤ 130mA with optional optics heating
 Switching output PNP transistor
 Function characteristics light/dark switching (reversible)
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V (PNP)
 Output current max. 100mA
 Sensitivity adjustable

Indicators

LED green ready
 LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals, M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Activation input active
 Transmitter active/not active ≥ 8V / ≤ 2V (≥ 2V / ≤ 2V) ⁵⁾
 Activation/disable delay ≤ 0.5ms
 Input resistance 47KΩ ± 10%
Warning output autoControl warn PNP transistor, 100mA, counting principle for temperature changes, prevents fogging to -35°C
Optics heating
Low temperature
Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC
- 5) Active low

Order guide

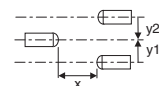
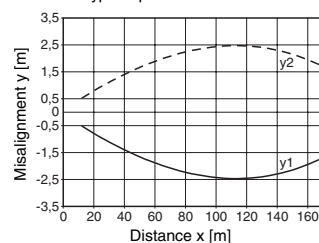
Selection table		Order code →						
Equipment ↓		LS 96M/P-3010-2 Part No. 500 25225 (Tr) Part No. 500 34128 (Re)	LS 96M/P-3010-4 Part No. 500 25228 (Tr) Part No. 500 34128 (Re)	LS 96M/P-3012-2 Part No. 500 25223 (Tr) Part No. 500 33328 (Re)				
Housing	metal	●	●	●				
Light source	infrared light (120m)	●	●	●				
Connection	terminals	●		●				
	M12 connector		●					
Features	optics heating/low temp.			●				
	activation input			● ⁵⁾				

Tables

0	120	150
<input type="checkbox"/> Operating range [m] <input type="checkbox"/> Typ. operating range limit [m]		

Diagrams

Typ. response behaviour



Remarks

LS = Pair consisting of
 LSS = Transmitter
 LSE = Receiver

LS 96M/P-3010-2

LSS 96M-1070-23
 LSE 96M/P-3010-21

LS 96M/P-3010-4

LSS 96M-1070-43
 LSE 96M/P-3010-41

LS 96M/P-3012-2

LSS 96M-1090-24
 LSE 96M/P-3012-21



LS 96

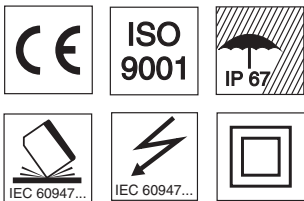
Throughbeam photoelectric sensors



39m



- Powerful throughbeam photoelectric sensors with performance reserve in visible red light
- Wide angle version for easy alignment
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or comfortable terminal compartment up to 1.5mm²

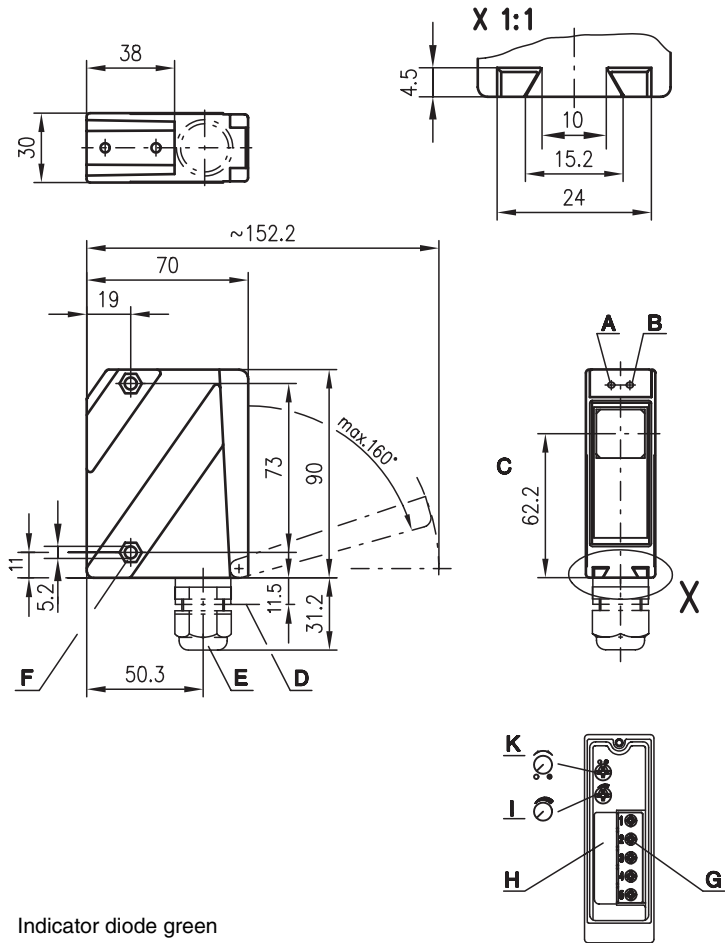


Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Ready-made connection cables
- Alignment aid ARH 96

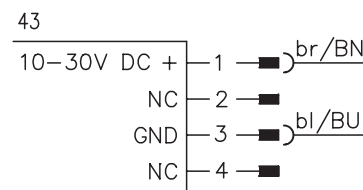
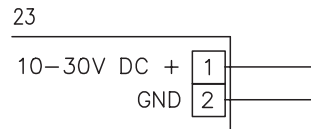
Dimensioned drawing



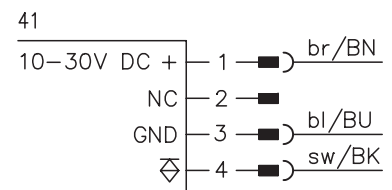
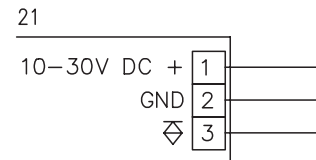
- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- F Countersinking for SK nut M5, 4.2 deep
- G Connection terminals
- H Cable entry
- I Sensitivity adjustment
- K Light/dark switching

Electrical connection

Transmitter



Receiver



We reserve the right to make changes • 96_a03e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

Red light

0 ... 39m
 0 ... 30m
 LED (modulated light)
 660nm

Timing

Switching frequency 500Hz
 Response time 1ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 50mA
 Switching output PNP transistor
 Function characteristics light/dark switching (reversible)
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V (PNP)
 Output current max. 100mA
 Sensitivity adjustable

Indicators

LED green ready
 LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals, M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

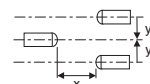
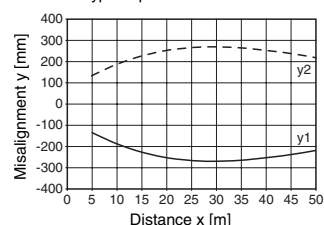
Tables

0	30	39
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Operating range [m]
 Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

- Angle at a distance of 3m:
transmitter:
 angle of radiation typ. 10°
receiver:
 receiving angle typ. 12°

Order guide

Selection table		Order code →					
Equipment ↓		LS 96M/P-181W-4 Part No. 500 31574 (Tr) Part No. 500 31575 (Re)	LS 96M/P-181W-2 Part No. 500 32835 (Tr) Part No. 500 32741 (Re)	LS 96M/P-1816-4 Part No. 500 32129 (Tr) Part No. 500 32128 (Re)	LS 96M/P-1810-4 Part No. 500 25219 (Tr) Part No. 500 80044 (Re)		
Housing	metal	●	●	●	●		
Light source	red light (30m)	●	●	●	●		
Connection	terminals		●				
	M12 connector	●		●	●		
Features	fixed sensitivity setting	●	●	●	●		
	optics heating/low temp.			●			

LS = Pair consisting of
 LSS = Transmitter
 LSE = Receiver

LS 96M/P-181W-4
 LSS 96M-120W-43
 LSE 96M/P-181W-41

LS 96M/P-181W-2
 LSS 96M-120W-23
 LSE 96M/P-181W-21

LS 96M/P-1816-4
 LSS 96M-1206-43
 LSE 96M/P-1816-41

LS 96M/P-1810-4
 LSS 96M-1200-43
 LSE 96M/P-1810-41



LS 96

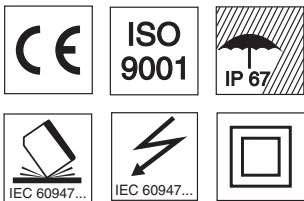
Throughbeam photoelectric sensors



65m
150m



- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- All-mains design 20 ... 230VAC/DC
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5mm²
- Version with additional switching delay

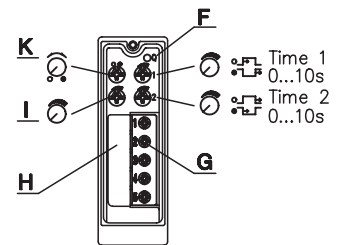
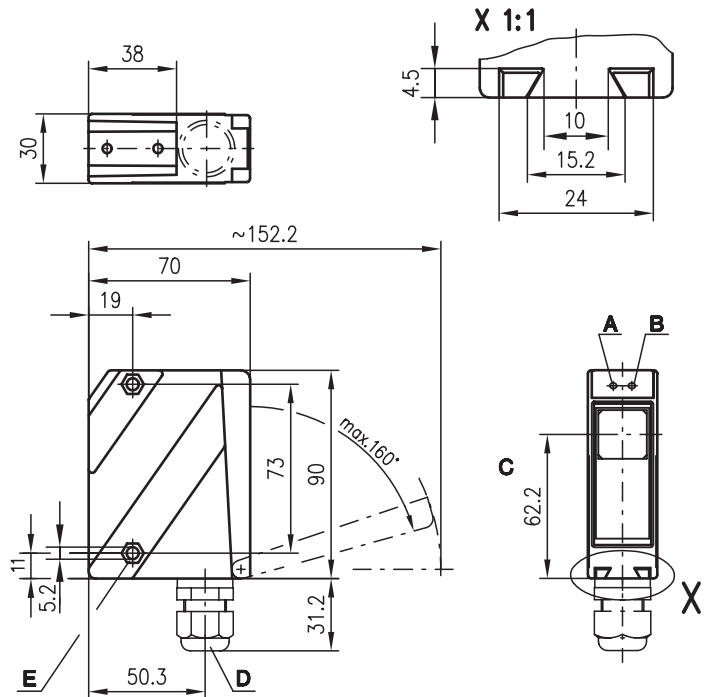


Accessories:

(available separately • see page 484)

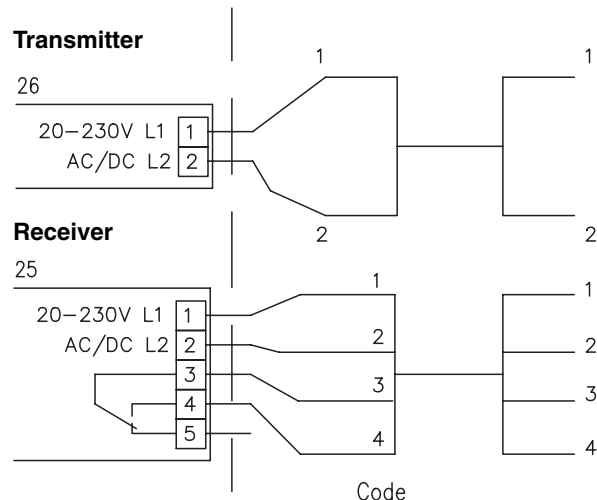
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction
- Alignment aid ARH 96

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- E Countersinking for SK nut M5, 4.2 deep
- F Output with switching delay option
- G Connection terminals
- H Cable entry
- I Sensitivity adjustment
- K Light/dark switching

Electrical connection (example)



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Specifications

Optical data	65m	150m
Typ. operating range limit ¹⁾	0 ... 65m	0 ... 150m
Operating range ²⁾	0 ... 50m	0 ... 120m
Light source	LED (modulated light)	
Wavelength	880nm (infrared)	
Timing		
Switching frequency	20Hz	
Response time	25ms	
Delay before start-up	≤ 200ms	
Electrical data		
Operating voltage U _B	20 ... 230VAC, 50/60Hz 20 ... 230VDC	
Power consumption	≤ 1.5VA	
Switching output ³⁾	relay, 1 change-over contact	
Function characteristics	light/dark switching (reversible)	
Switching voltage, relay	250VAC/DC	
Switching current, relay	250VAC, 3A/30V, 3A	
Bias current	750VA, cosφ=1	
Sensitivity	adjustable	
Indicators		
LED green	ready	
LED yellow	light path free	
LED yellow flashing	light path free, no performance reserve	
Mechanical data	Metal housing	Plastic housing
Housing	diecast zinc	polycarbonate
Optics cover	glass	plastic
Weight	380g	150g
Connection type	terminals	terminals
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C	
Protective circuit ⁴⁾	1, 2, 3	
VDE safety class ⁵⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	
Options		
Switching delay (slow oper./release)	0 ... 10s (separately adjustable)	

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250VAC

Order guide

Selection table		Order code →							
Equipment ↓		LS 96K/R-1310-2 Part No. 500 25253 (Tr) Part No. 500 25257 (Re)	LS 96K/R-1320-2 Part No. 500 25253 (Tr) Part No. 500 25256 (Re)	LS 96M/R-1310-2 Part No. 500 80081 (Tr) Part No. 500 80080 (Re)	LS 96M/R-3310-2 Part No. 500 80081 (Tr) Part No. 500 31651 (Re)	LS 96K/R-131P-2 Part No. 500 30405 (Tr) Part No. 500 30406 (Re)			
Housing	metal			●	●				
	plastic	●	●			●			
Light source	infrared light (50m)	●	●	●		●			
	infrared light (120m)				●				
Connection	terminals	●	●	●	●	●			
Features	switching delay		●						

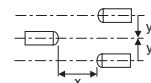
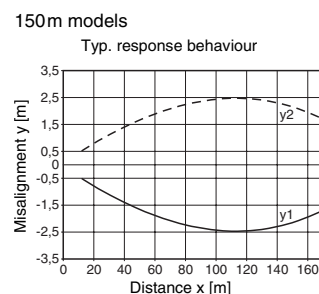
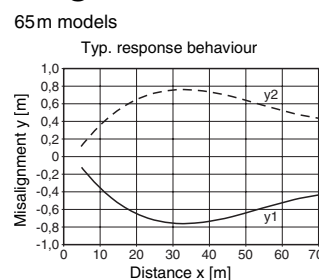
LS 96 K/R... - 06
LS 96 M/R... - 06

Tables

65m models		
0	50	65
150m models		
0	120	150

Operating range [m]
 Typ. operating range limit [m]

Diagrams



Remarks

- LS 96K/R-131P-2
P = Reduction M16
- **Output-LED**
(with option switching delay) display reacts like switching output - e.g. delayed.

LS = Pair consisting of
LSS = Transmitter
LSE = Receiver

LS 96K/R-1310-2
LSS 96K-1350-26
LSE 96K/R-1310-25

LS 96K/R-1320-2
LSS 96K-1350-26
LSE 96K/R-1320-25

LS 96M/R-1310-2
LSS 96M-1350-26
LSE 96M/R-1310-25

LS 96M/R-3310-2
LSS 96M-1350-26
LSE 96M/R-3310-25

LS 96K/R-131P-2
LSS 96K-135P-26
LSE 96K/R-131P-25



LS 96

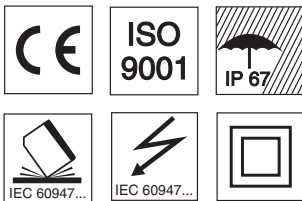
Throughbeam photoelectric sensors



39m



- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Wide angle version for easy alignment
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- All-mains design 20 ... 230VAC/DC with relay output
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5mm²

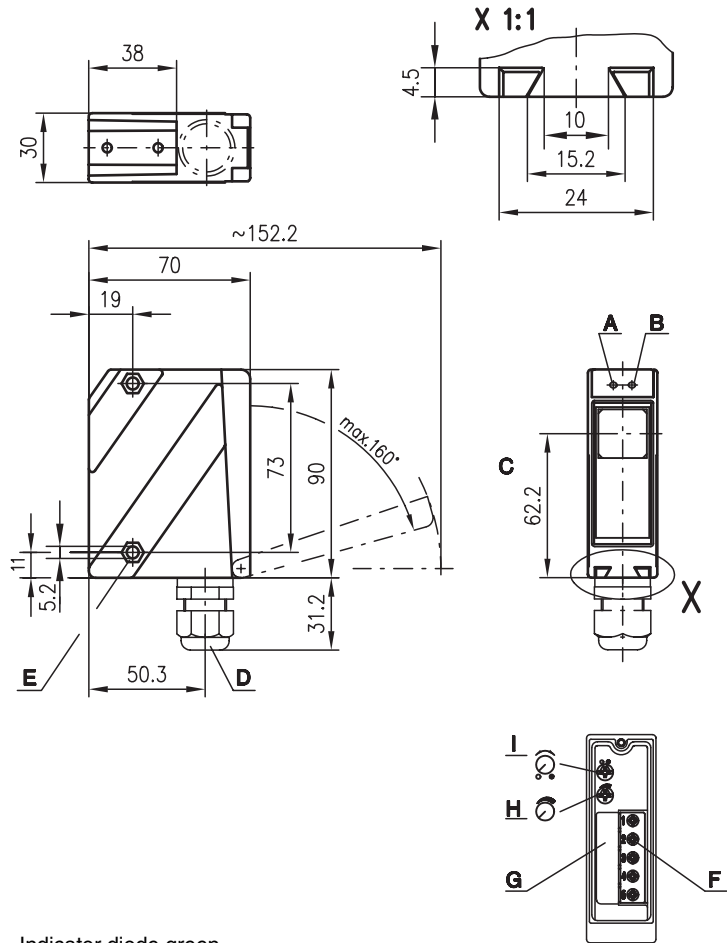


Accessories:

(available separately • see page 484)

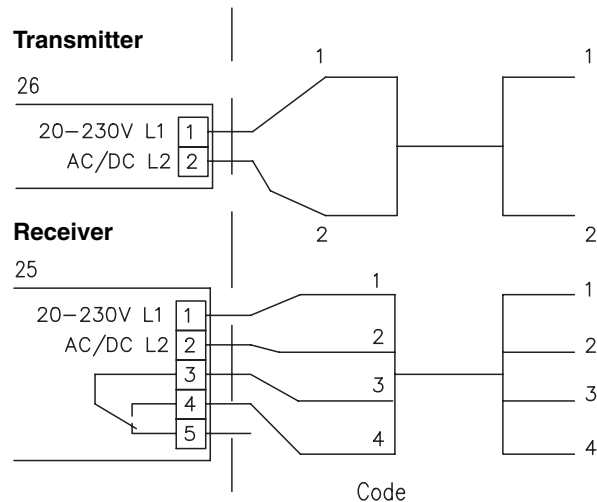
- Mounting systems (BT 96, BT 96.1, BT 96.4, UMS 96, BT 450.1-96)
- Spark extinction
- Alignment aid ARH 96

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- E Countersinking for SK nut M5, 4.2 deep
- F Connection terminals
- G Cable entry
- H Sensitivity adjustment
- I Light/dark switching

Electrical connection (example)



We reserve the right to make changes • 96_a06e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 39m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	660nm (red light)

Timing

Switching frequency	20Hz
Response time	25ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	20 ... 230VAC, 50/60Hz 20 ... 230VDC ± 10%
Power consumption	≤ 1.5VA
Switching output ³⁾	relay, 1 change-over contact
Function characteristics	light/dark switching (reversible)
Switching voltage, relay	250 VAC/DC
Switching current, relay	250 VAC, 3A/30V, 3A
Bias current	750 VA, cosφ=1
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals transmitter cable 3x0.5mm ² (oil flex 110), 1.5m receiver cable 3x0.5mm ² (oil flex 110), 1.5m

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 5) Rating voltage 250 VAC

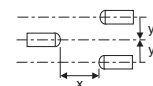
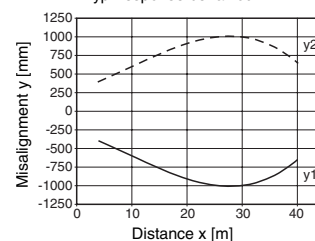
Tables

0	30	39
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<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Order guide

Selection table		Order code →	LS 96M/R-176W-2 Part No. 500 32004 (Tr) Part No. 500 32003 (Re)						
Equipment ↓									
Housing	metal		●						
Light source	red light (50m)		●						
Connection	terminals		●						
	cable tail 1.5m								

Remarks

- Angle at a distance of 3m:
transmitter:
 angle of radiation typ. 10°
receiver:
 receiving angle typ. 12°
- Cable version
 wire assignment:
 1,2 = supply
 3,4 = break-contact

LS = Pair consisting of
 LSS = Transmitter
 LSE = Receiver

LS 96M/R-176W-2
 LSS 96M-175W-26
 LSE 96M/R-176W-25

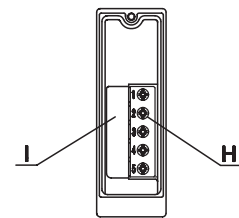
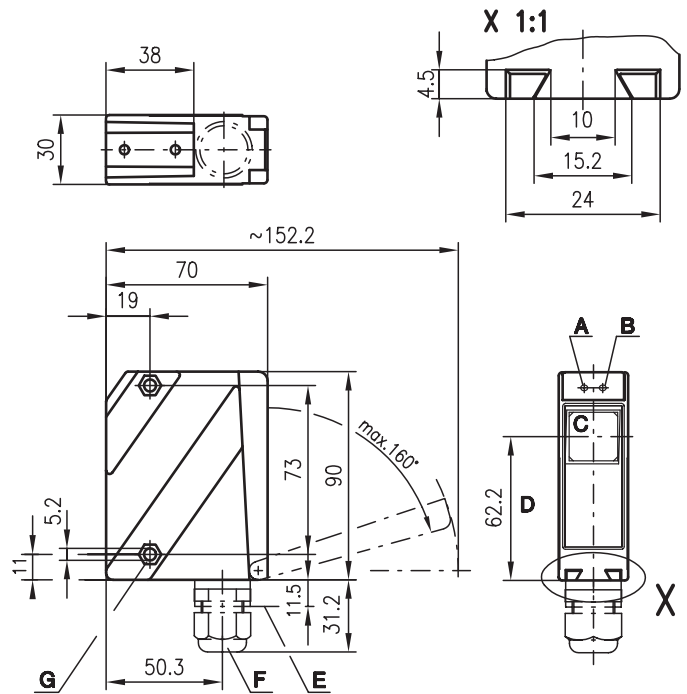


SLS 96

Protective throughbeam photoelectric sensors



Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter/receiver
- D Optical axis
- E Device plug M12x1
- F Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G Countersinking for SK nut M5, 4.2 deep
- H Connection terminals
- I Cable entry

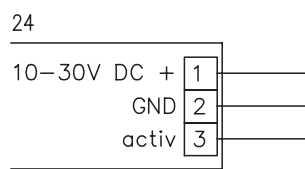


65m
39m

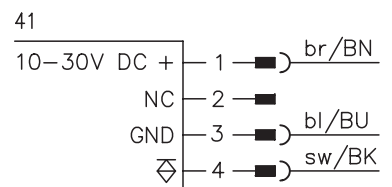
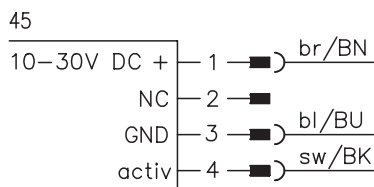
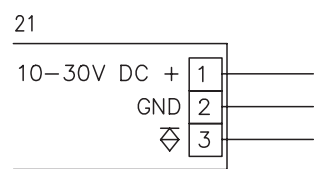
- Protective throughbeam photoelectric sensor cat. 2 (testing) with high performance reserve in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- 2 indicators each at the transmitter and receiver for displaying their status when commissioning and in operation
- Optics heating for use with low temperatures
- Connection via M12 connector or terminal compartment

Electrical connection

Transmitter



Receiver



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 96_a07e.fm



Specifications

Optical data	Infrared light	Red light
Typ. operating range limit ¹⁾	0 ... 65m	0 ... 39m
Operating range ²⁾	0 ... 50m	0 ... 30m
Light source	LED (modulated light)	LED (modulated light)
Wavelength	880nm	660nm
Timing		
Sensor switching frequency	500Hz	
Sensor response time	1ms	
Delay before start-up	≤ 200ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 50mA	
Switching output	PNP transistor	
Function characteristics	light switching	
Signal voltage high/low	≥ (U _B -2V)/≤ 2V	
Output current	max. 100mA	
Indicators		
LED green	ready	
Receiver		
LED yellow	light path free	
LED yellow flashing	light path free, no performance reserve	
Transmitter		
LED yellow	transmitter active	
Mechanical data	Metal housing	
Housing	diecast zinc	
Optics cover	glass	
Weight	380g	
Connection type	terminals or M12 connector	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C	
Protective circuit ³⁾	1, 2, 3	
VDE safety class ⁴⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	
Options		
Optics heating	for temperature changes, prevents fogging	
Low temperature	to -35°C	
Activation input active		
Transmitter active/not active	≥ 8V/≤ 2V	
Activation/disable delay	≤ 1ms	
Input resistance	10KΩ ± 10%	

1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object dia: Ø 28mm.

SLS = Pair consisting of
 SLSS = Transmitter
 SLSE = Receiver

Order guide

Selection table		Order code →						
Equipment ↓		SLS 96M/P-1070-T2-2 Part No. 500 25213 (Tr) Part No. 500 25192 (Re)	SLS 96M/P-1070-T2-4 Part No. 500 25215 (Tr) Part No. 500 25193 (Re)	SLS 96M/P-1071-T2-2 Part No. 500 29454 (Tr) Part No. 500 29455 (Re)	SLS 96M/P-1071-T2-4 Part No. 500 80478 (Tr) Part No. 500 80479 (Re)	SLS 96M/P-1200-T2-2 Part No. 500 25209 (Tr) Part No. 500 31562 (Re)	SLS 96M/P-1200-T2-4 Part No. 500 31249 (Tr) Part No. 500 31250 (Re)	
Housing	metal	●	●	●	●	●	●	
	plastic							
Light source	red light (30m)					●	●	
	infrared light (50m)	●	●	●	●			
Connection	terminals	●		●		●		
	M12 connector		●		●		●	
Features	optics heating/low temp.			●	●			
	activation input	●	●	●	●	●	●	
	filter for multi-axis operation							

- SLS 96M/P-1070-T2-2**
 SLSS 96M-1080-T2-24
 SLSE 96M/P-1070-T2-21
- SLS 96M/P-1070-T2-4**
 SLSS 96M-1080-T2-45
 SLSE 96M/P-1070-T2-41
- SLS 96M/P-1071-T2-2**
 SLSS 96M-1090-T2-24
 SLSE 96M/P-1071-T2-21
- SLS 96M/P-1071-T2-4**
 SLSS 96M-1090-T2-45
 SLSE 96M/P-1071-T2-41
- SLS 96M/P-1200-T2-2**
 SLSS 96M-1210-T2-24
 SLSE 96M/P-1200-T2-21
- SLS 96M/P-1200-T2-4**
 SLSS 96M-1210-T2-45
 SLSE 96M/P-1200-T2-41



SLS 96

Protective throughbeam photoelectric sensors



65m
39m



- Protective throughbeam photoelectric sensor cat. 2 (testing) with high performance reserve in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- 2 indicators each at the transmitter and receiver for displaying their status when commissioning and in operation
- Optics heating for use with low temperatures
- Connection via M12 connector or terminal compartment

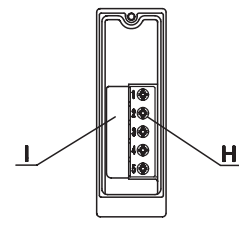
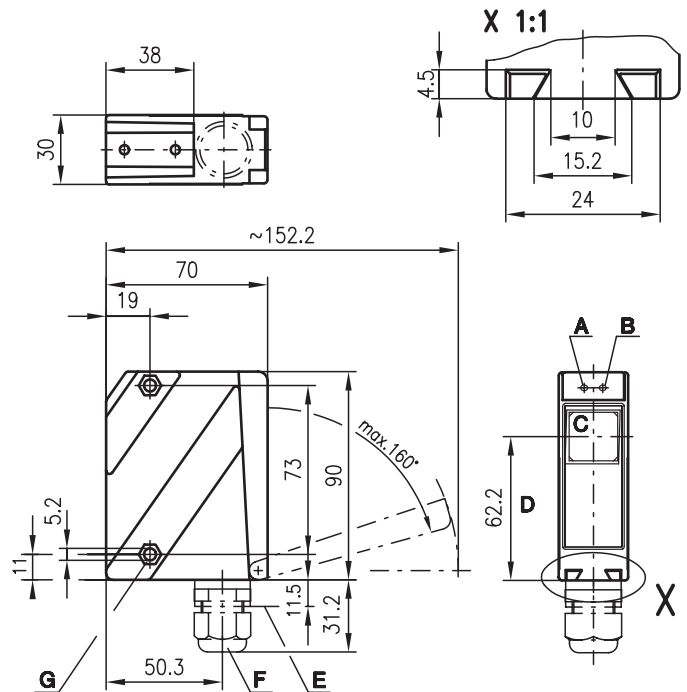


Accessories:

(available separately • see page 484)

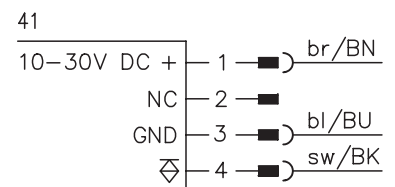
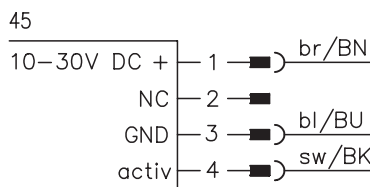
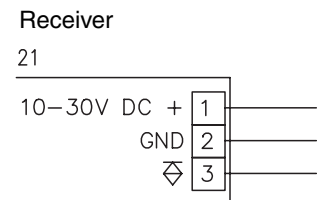
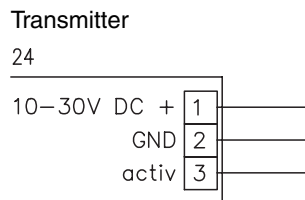
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter/receiver
- D Optical axis
- E Device plug M12x1
- F Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G Countersinking for SK nut M5, 4.2 deep
- H Connection terminals
- I Cable entry

Electrical connection



We reserve the right to make changes • 96_a12e.fm



Specifications

Optical data	Infrared light	Red light
Typ. operating range limit ¹⁾	0 ... 65m	0 ... 39m
Operating range ²⁾	0 ... 50m	0 ... 30m
Light source	LED (modulated light)	LED (modulated light)
Wavelength	880nm	660nm
Timing		
Sensor switching frequency	500Hz	
Sensor response time	1ms	
Delay before start-up	≤ 200ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 50mA	
Switching output	PNP transistor	
Function characteristics	light switching	
Signal voltage high/low	≥ (U _B -2V)/≤ 2V	
Output current	max. 100mA	
Indicators		
LED green	ready	
Receiver		
LED yellow	light path free	
LED yellow flashing	light path free, no performance reserve	
Transmitter		
LED yellow	transmitter active	
Mechanical data	Plastic housing	
Housing	polycarbonate	
Optics cover	plastic	
Weight	150g	
Connection type	terminals or M12 connector	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C	
Protective circuit ³⁾	1, 2, 3	
VDE safety class ⁴⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	
Options		
Optics heating	for temperature changes, prevents fogging	
Low temperature	to -35°C	
Activation input active		
Transmitter active/not active	≥ 8V/≤ 2V	
Activation/disable delay	≤ 1ms	
Input resistance	10KΩ ± 10%	

1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object dia: Ø 28mm.

Order guide

Selection table		Order code →					
Equipment ↓		SLS 96K/P-1070-T2-2 Part No. 500 81292 (Tr) Part No. 500 81293 (Re)	SLS 96K/P-1070-T2-4 Part No. 500 31559 (Tr) Part No. 500 31561 (Re)	SLS 96K/P-1200-T2-2 Part No. 500 28009 (Tr) Part No. 500 28010 (Re)	SLS 96K/P-1200-T2-4 Part No. 500 28011 (Tr) Part No. 500 28012 (Re)	SLS 96K/P-1207-T2-2 Part No. 500 28009 (Tr) Part No. 500 35078 (Re)	
Housing	metal						
	plastic	●	●	●	●	●	
Light source	red light (30m)			●	●	●	
	infrared light (50m)	●	●				
Connection	terminals	●		●		●	
	M 12 connector		●		●		
Features	optics heating/low temp.						
	activation input	●	●	●	●	●	
	filter for multi-axis operation					●	

SLS = Pair consisting of
 SLSS = Transmitter
 SLSE = Receiver

- SLS 96K/P-1070-T2-2**
 SLSS 96K-1080-T2-24
 SLSE 96K/P-1070-T2-21
- SLS 96K/P-1070-T2-4**
 SLSS 96K-1080-T2-45
 SLSE 96K/P-1070-T2-41
- SLS 96K/P-1200-T2-2**
 SLSS 96K-1210-T2-24
 SLSE 96K/P-1200-T2-21
- SLS 96K/P-1200-T2-4**
 SLSS 96K-1210-T2-45
 SLSE 96K/P-1200-T2-41
- SLS 96K/P-1207-T2-2**
 SLSS 96K-1210-T2-24
 SLSE 96K/P-1207-T2-21



LS 96

Throughbeam photoelectric sensors



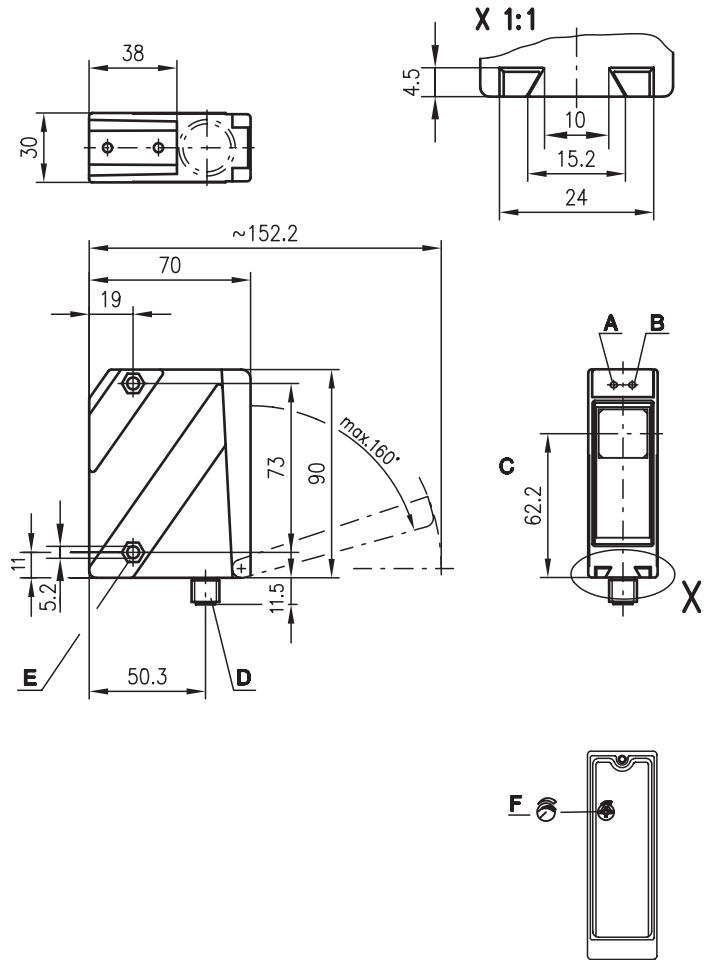
65m



- Throughbeam photoelectric sensors with high performance reserve in infrared light
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- Access to all sensor functions via an AS-interface without additional wiring
- Transmitter and receiver with integrated AS-i slave technology
- Sensitivity adjustment and ready indicator for optimal adaptation to the application

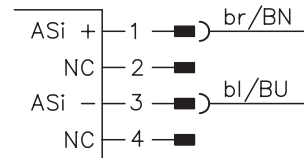


Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Countersinking for SK nut M5, 4.2 deep
- F Sensitivity adjustment for LSE 96M/A

Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 96_a08e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 65 m
Operating range ²⁾	0 ... 50 m
Light source	LED (modulated light)
Wavelength	880 nm (infrared light)

Timing

Sensor switching frequency	500 Hz
Sensor response time	1 ms
Delay before start-up	≤ 200 ms
Electrical data	
Operating voltage U _B	26.5 V ... 31.6 V (according to AS-i specification)
Bias current	≤ 35 mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380 g
Connection type	M 12 connector

Environmental data

Ambient temp. (operation/storage)	-20 °C ... +60 °C / -40 °C ... +70 °C
Protective circuit ³⁾	1, 2
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for transmitter

I/O code	D
ID code	1
Cycle time acc. to AS-i specification	5 ms
AS-i standard according to profile	S-D.1

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection
- 4) Rating voltage 250 VAC

Assignment: data bits, Programming to host level (parameter bits are not used here)			
D ₀	switching output	∅ no reflection	system output
		1 reflection	

AS-i data for receiver

I/O code	1
ID code	1
Cycle time acc. to AS-i specification	5 ms
AS-i standard according to profile	S-1.1

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection		1			
D ₁	warning output autoControl	∅ active	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1 not active		1 light switching			
D ₂	ready output	∅ sensor not ready	system input	*P ₂	NC	∅	system parameter
		1 sensor ready		1			
*D ₃	NC	∅		*P ₃	NC	∅	system parameter
		1		1			

* default = 1

Order guide

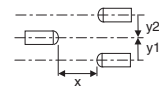
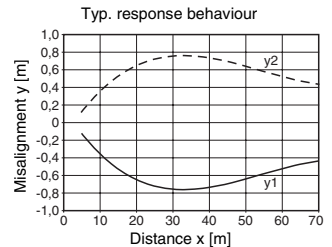
	Designation	Part No.
Transmitter and receiver	LS 96 M/A-1270-4	
Transmitter	LSS 96 M-1280-44	500 25221
Receiver	LSE 96 M/A-1270-44	500 25199

Tables

0	50	65
---	----	----

	Operating range [m]
	Typ. operating range limit [m]

Diagrams



Remarks



LS 96

Throughbeam photoelectric sensors

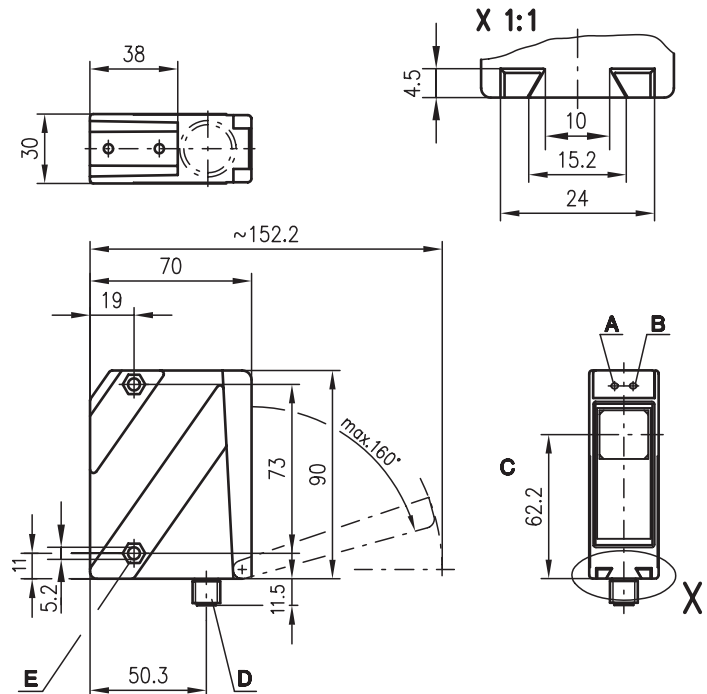


39m



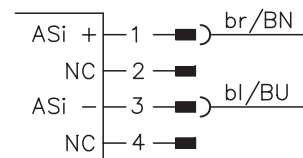
- Throughbeam photoelectric sensors with high performance reserve in red light
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- Receiver with integrated AS-i slave technology
- Transmitter without integrated AS-i slave technology; receives voltage supply via AS-i line
- Wide angle version to simplify the alignment

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Countersinking for SK nut M5, 4.2 deep

Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors
- Alignment aid ARH 96

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules, intermediate cables, etc.

We reserve the right to make changes • 96_a09e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 39m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	660nm (red light)

Timing

Sensor switching frequency	500Hz
Sensor response time	1ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	26.5V ... 31.6V (according to AS-i specification)
Bias current receiver	≤ 35mA
Bias current transmitter	≤ 15mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	M 12 connector

Metal housing

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for receiver

I/O code	1
ID code	1
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 2=polarity reversal protection

4) Rating voltage 250 VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection	system input	*P ₀	NC	∅	system parameter
		1 reflection	input			1	parameter
D ₁	warning output autoControl	∅ active	system input	*P ₁	light/dark switching	∅ dark switching	system parameter
		1 not active	input			1 light switching	parameter
D ₂	ready output	∅ sensor not ready	system input	*P ₂	NC	∅	system parameter
		1 sensor ready	input			1	parameter
*D ₃	NC	∅		*P ₃	NC	∅	system parameter
		1				1	parameter

* default = 1

Order guide

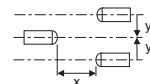
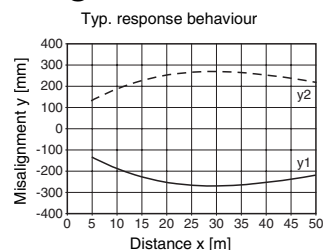
	Designation	Part No.
Transmitter and receiver	LS 96M/A-1820-4	
Transmitter	LSS 96 M-1800-44	500 80045
Receiver	LSE 96 M/A-1820-44	500 80046
Transmitter and receiver	LS 96M/A-182W-4	
Transmitter	LSS 96 M-180W-44	500 82040
Receiver	LSE 96 M/A-182W-44	500 82039

Tables

0	30	39
---	----	----

	Operating range [m]
	Typ. operating range limit [m]

Diagrams



Remarks

- The transmitter has no integrated AS-i slave technology.
- The low current consumption of the transmitter enables power supply via AS-i line.
- Transmitter and receiver behave like a slave in an AS-i branch.

LS 96M/A-182W-4

Angle at 3m distance:

Transmitter:

Angle of radiation typ.: 10°

Receiver:

Receiving angle typ.: 12°



LS 96

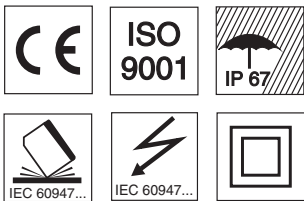
Throughbeam photoelectric sensors



39m
65m



- Throughbeam photoelectric sensors with high performance reserve in visible red light or infrared light
- Robust plastic housing, protection class IP 67 for industrial application
- Complementary PNP switching outputs for PLC applications (light/dark switching)
- Exact alignment through status display
- Connection via M12 connector or terminal compartment

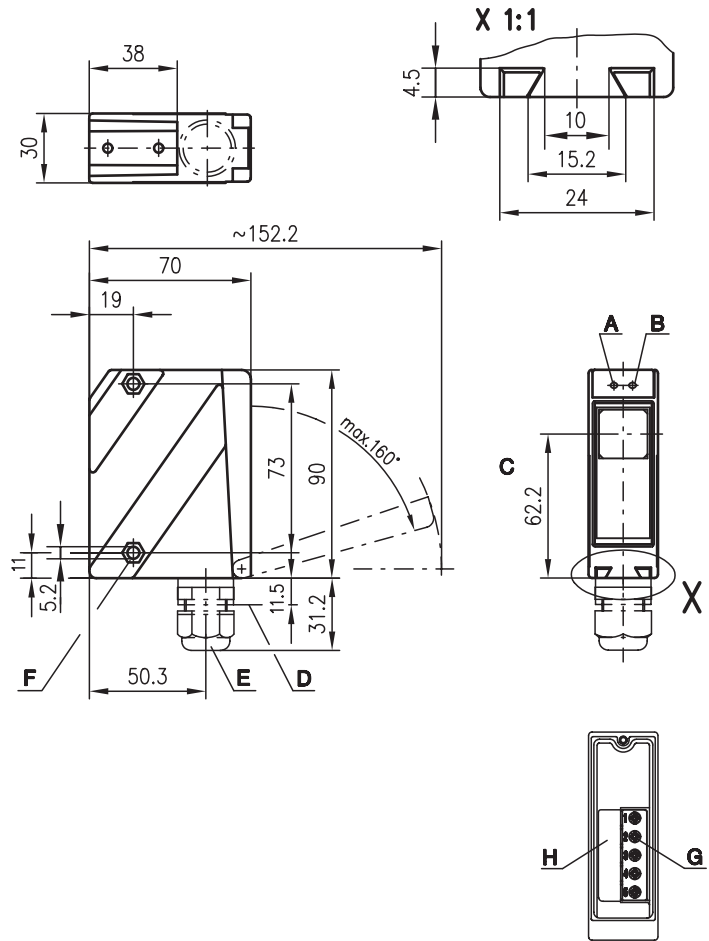


Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96

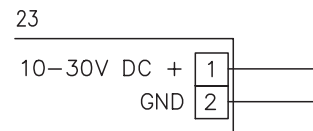
Dimensioned drawing



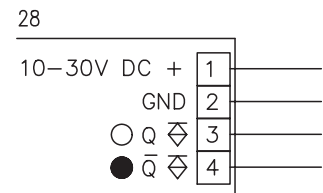
- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- F Countersinking for SK nut M5, 4.2 deep
- G Connection terminals
- H Cable entry

Electrical connection

Transmitter



Receiver



We reserve the right to make changes • 96_a10e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

Infrared light

0 ... 65m
 0 ... 50m
 LED (modulated light)
 880nm

Red light

0 ... 39m
 0 ... 30m
 LED (modulated light)
 660nm

Timing

Switching frequency 200Hz
 Response time 2.5ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (including residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 50mA
 Switching output 2 PNP transistor outputs, complementary
 Function characteristics light/dark switching
 Signal voltage high/low ≥ (U_B -2V)/≤ 2V (PNP)
 Output current max. 100mA

Indicators

LED yellow light path free

Mechanical data

Housing polycarbonate
 Optics cover plastic
 Weight 150g
 Connection type terminals, M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

Red light

0	30	39
---	----	----

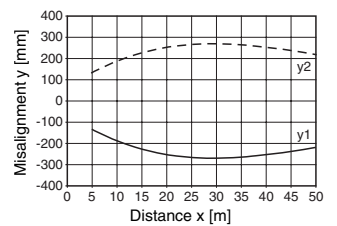
Infrared light

0	50	65
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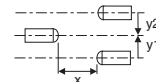
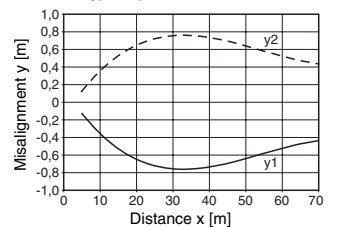
Operating range [m]
 Typ. operating range limit [m]

Diagrams

Red light, 30/39m operating range
 Typ. response behaviour



Infrared light, 50/65m operating range
 Typ. response behaviour



Order guide

Selection table		Order code →					
Equipment ↓		LS 96K/P-2010-2 Part No. 500 82061 (Tr) Part No. 500 82062 (Re)	LS 96K/P-2140-2 Part No. 500 82063 (Tr) Part No. 500 82064 (Re)				
Housing	plastic	●	●				
Light source	red light (30m)		●				
	infrared light (50m)	●					
Connection	terminals	●	●				
	M12 connector						
Features	compl. switch. outputs	●	●				

Remarks

LS = Pair consisting of
 LSS = Transmitter
 LSE = Receiver

LS 96K/P-2010-2

LSS 96K-2070-23
 LSE 96K/P-2010-28

LS 96K/P-2140-2

LSS 96K-2200-23
 LSE 96K/P-2140-28



RK 96

Retro-reflective photoelectric sensors

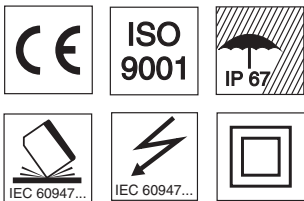


18m



10 - 30 V
DC

- Retro-reflective photoelectric sensors with a long operating range
- Invisible infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5mm²

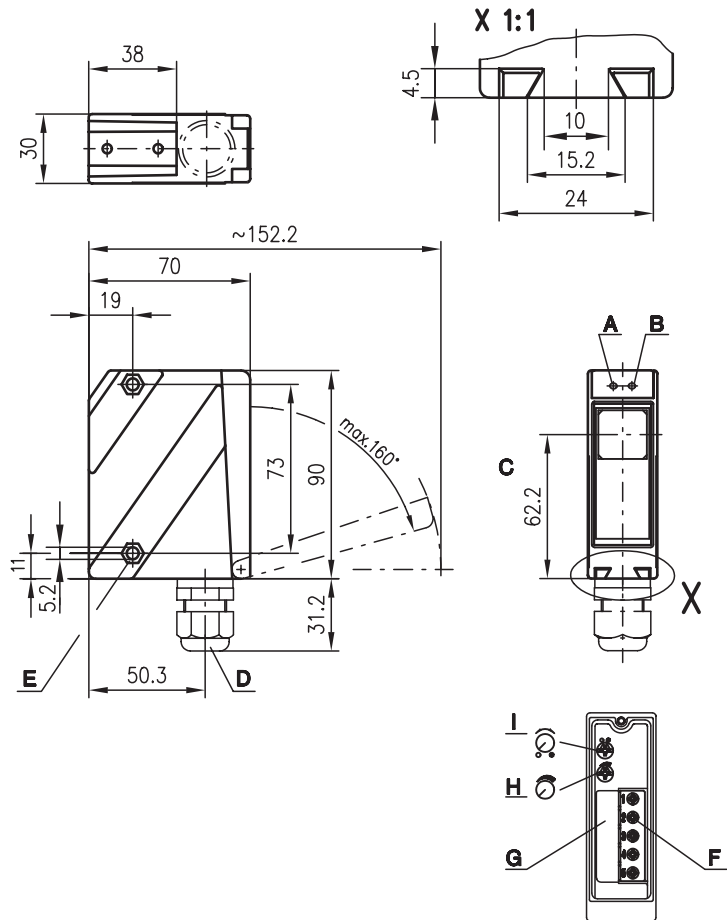


Accessories:

(available separately • see page 484)

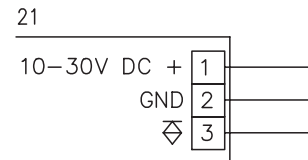
- Mounting systems (BT 96, UMS 96, BT 450.1-96)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- E Countersinking for SK nut M5, 4.2 deep
- F Connection terminals
- G Cable entry
- H Sensitivity adjustment
- I Light/dark switching

Electrical connection



We reserve the right to make changes • 96_b01e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	18m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	PNP transistor
Function characteristics	light/dark switching (reversible)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	Metal housing diecast zinc	Plastic housing polycarbonate
Optics cover	glass	plastic
Weight	380g	150g
Connection type	terminals	

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.3 ... 15m
2	MTK(S) 50x50	0.3 ... 11m
3	TK(S) 30x50	0.3 ... 6m
4	TK(S) 20x40	0.3 ... 5m
5	TK(S) 82	0.3 ... 11m
6	Tape 2 100x100	0.3 ... 6m

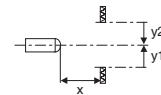
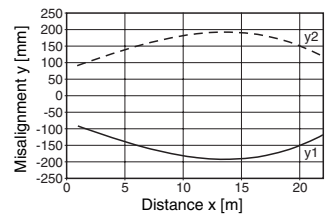
1	0.1	15	18
2	0.1	11	12
3	0.1	6	7.1
4	0.1	5	6
5	0.1	11	12
6	0.1	6	8

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Order guide

	Designation	Part No.
Metal housing	RK 96M/P-1440-21	500 30648
Plastic housing	RK 96K/P-1440-21	500 80265

Remarks

- Light source: invisible infrared light



RK 96

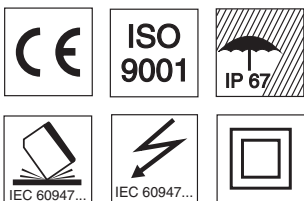
Retro-reflective photoelectric sensors



18m



- Retro-reflective photoelectric sensor with a large operating range
- Robust plastic housing, protection class IP 67 for industrial application
- All-mains design 20 ... 230 VAC/DC with relay output
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5 mm²

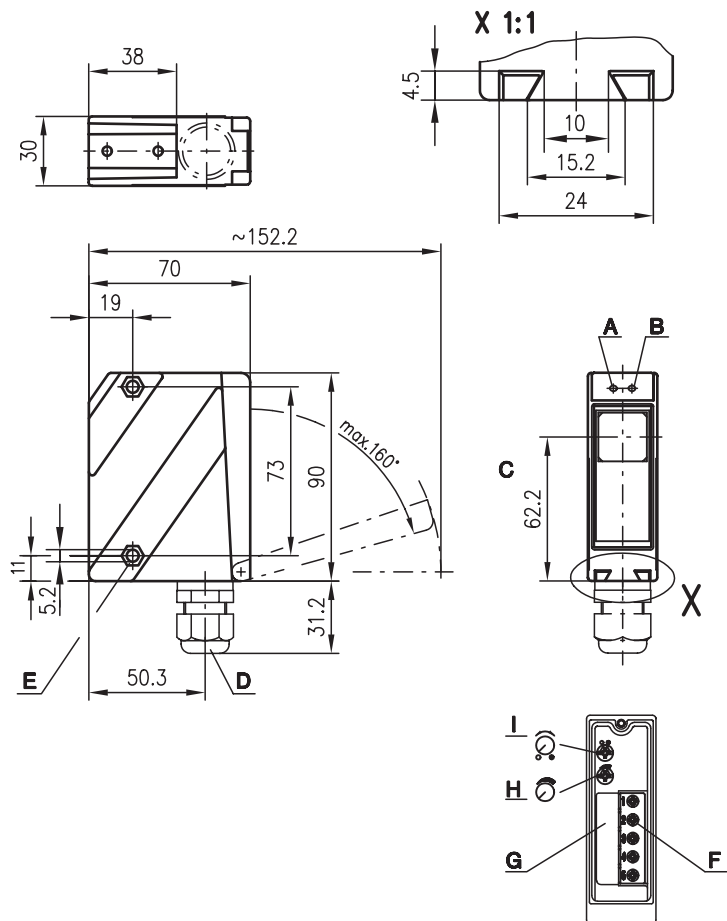


Accessories:

(available separately • see page 484)

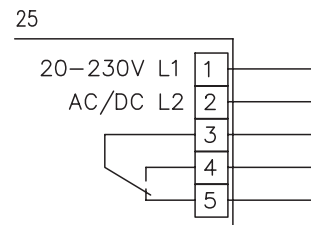
- Mounting systems (BT 96, UMS 96, BT 450.1-96)
- Spark extinction
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- E Countersinking for SK nut M5, 4.2 deep
- F Connection terminals
- G Cable entry
- H Sensitivity adjustment
- I Light/dark switching

Electrical connection



We reserve the right to make changes • 96_b02e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	18m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm (invisible infrared light)

Timing

Switching frequency	20Hz
Response time	25ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	20 ... 230VAC, 50/60Hz 20 ... 230VDC ±10%
Power consumption	≤ 1.5VA
Switching output ³⁾	relay, 1 change-over contact
Function characteristics	light/dark switching (reversible)
Switching voltage, relay	250VAC/DC
Switching current, relay	250VAC, 3A/30VDC, 3A
Switching power, relay	750VA, $\cos\phi=1$
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	polycarbonate
Optics cover	plastic
Weight	150g
Connection type	terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ⁴⁾	1, 4
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) suitable spark extinction must be provided with inductive or capacitive loads.
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Order guide

Designation	Part No.
RK 96K/R-1560-25	500 80484
RK 96K/R-156P-25	500 30404

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.3 ... 15m
2	MTK(S) 50x50	0.3 ... 11m
3	TK(S) 30x50	0.3 ... 6m
4	TK(S) 20x40	0.3 ... 5m
5	TK(S) 82	0.3 ... 11m
6	Tape 2 100x100	0.3 ... 6m

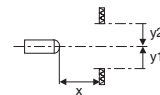
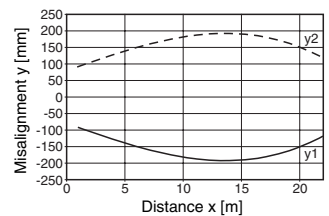
1	0.1	15	18
2	0.1	11	12
3	0.1	6	7.1
4	0.1	5	6
5	0.1	11	12
6	0.1	6	8

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Remarks

- PRK 96 K/R-156P-25
P = Reduction M16
- Light source:
invisible infrared light



PRK 96

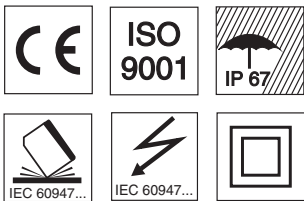
Retro-reflective photoelectric sensors with polarisation filter



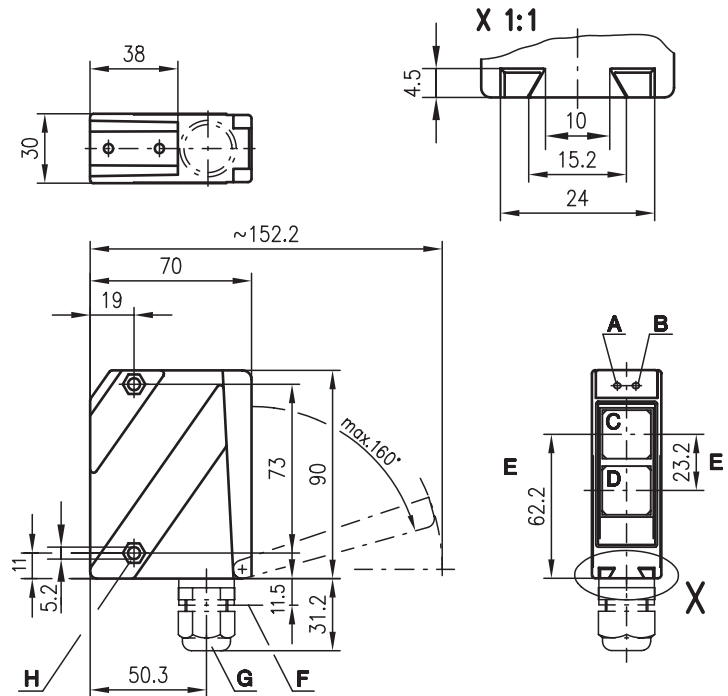
10m
18m

10 - 30 V
DC

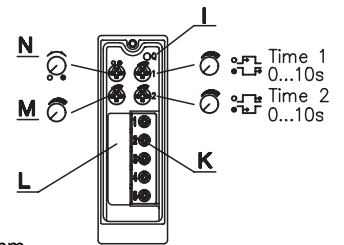
- Polarised retro-reflective photoelectric sensor with large operating range in visible red light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures



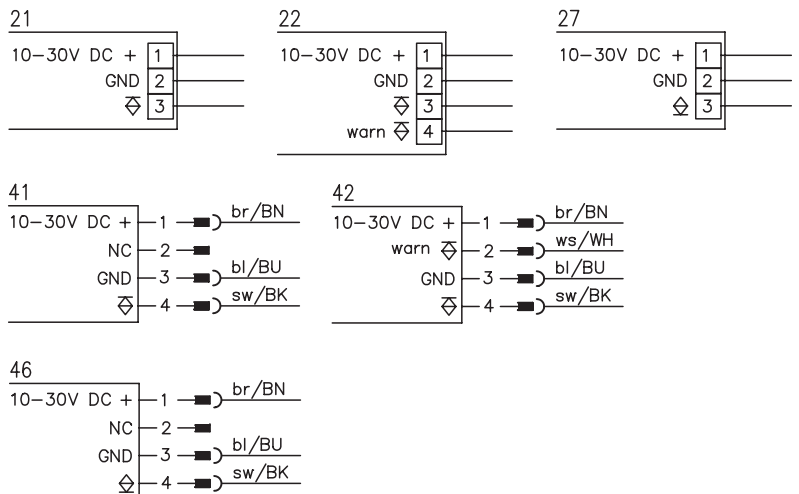
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Output with option switching delay
- K Connection terminals
- L Cable entry
- M Sensitivity adjustment
- N Light/dark switching



Electrical connection



We reserve the right to make changes • 96_b03e.fm

Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	10m/18m
Operating range ²⁾	see table
Light spot diameter	approx. 130mm at 6m
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5 ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 40mA, ≤ 75mA with optics heating
Switching output	PNP transistor
Function characteristics	light/dark switching (reversible)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Warning output autoControl warn	PNP transistor, 100mA, counting principle for temperature changes, prevents fogging to -35°C
Optics heating	
Low temperature	
Switching delay (slow oper./release)	0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Order guide

Selection table		PRK 96M/P-1360-21 Part No. 500 80291	PRK 96M/P-1370-22 Part No. 500 25182	PRK 96M/P-1370-42 Part No. 500 25186	PRK 96M/P-1390-22 Part No. 500 25180	PRK 96M/P-1390-42 Part No. 500 25184	PRK 96M/P-1400-22 Part No. 500 25178	PRK 96M/N-1360-27 Part No. 500 31294	PRK 96M/P-3380-41 Part No. 500 61452	PRK 96M/P-3360-21 Part No. 500 82065	PRK 96M/P-3360-41 Part No. 500 31550
Order code →											
Equipment ↓	metal	●	●	●	●	●	●	●	●	●	●
	plastic										
Light source	red light (8m)	●	●	●	●	●	●				
	red light (15m)								●	●	●
Connection	terminals	●	●		●	●	●			●	
	M12 connector			●		●			●		●
	M18 connector										
Features	optics heating/low temp.						●				
	switching delay				●	●	●		●		
	warning output		●	●	●	●	●				
	activation input										
	NPN switching output							●			

Tables

10m models

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 8m
2 MTK(S) 50x50	0.3 ... 7m
3 TK(S) 30x50	0.3 ... 4.5m
4 TK(S) 20x40	0.3 ... 3m
5 TK(S) 82	0.3 ... 6m
6 Tape 2 100x100	0.3 ... 4m

1	0.1			8	10
2	0.1			7	8.5
3	0.1		4.5		5
4	0.1	3			4
5	0.1			6	7.5
6	0.1		4		5.5

18m models

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 15m
2 MTK(S) 50x50	0.3 ... 11m
3 TK(S) 30x50	0.3 ... 6m
4 TK(S) 20x40	0.3 ... 5m
5 TK(S) 82	0.3 ... 11m
6 Tape 2 100x100	0.3 ... 6m

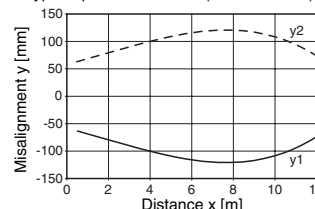
1	0.1			15	18
2	0.1			11	12
3	0.1		6		7.5
4	0.1	5			6
5	0.1			11	11.5
6	0.1		6		7.5

Operating range [m]
 Typ. operating range limit [m]

Diagrams

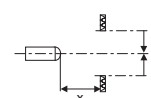
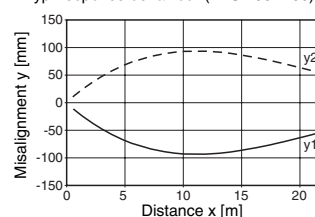
10m models

Typ. response behaviour (TKS 100x100)



18m models

Typ. response behaviour (TKS 100x100)



Remarks

- The polarised retro-reflective photoelectric sensor is also available with an integrated AS-i chip for direct connection to the AS-i system.
- **Output LED** (with option switching delay)
Display reacts like switching output – e.g. delayed.



PRK 96

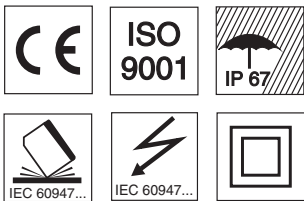
Retro-reflective photoelectric sensors with polarisation filter



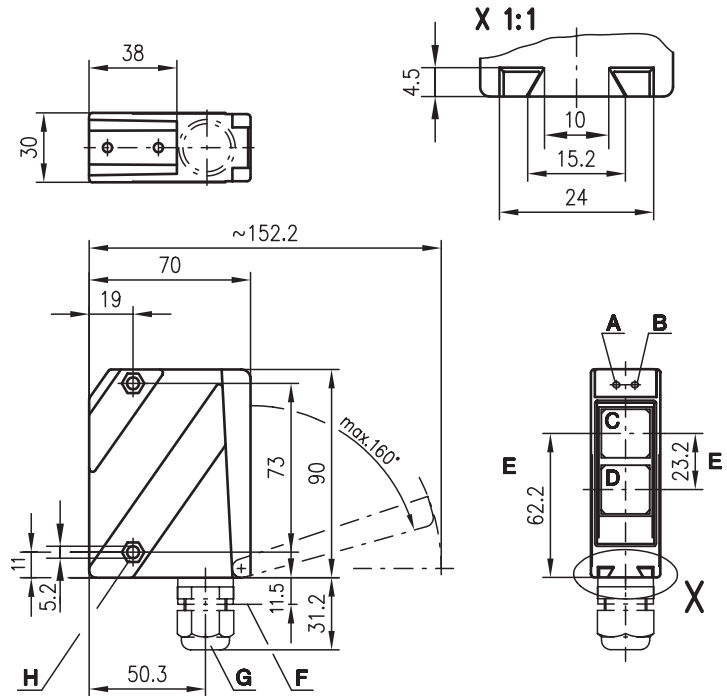
10m



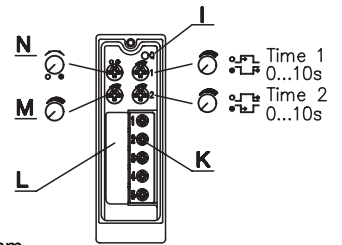
- Polarised retro-reflective photoelectric sensor with large operating range in visible red light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures



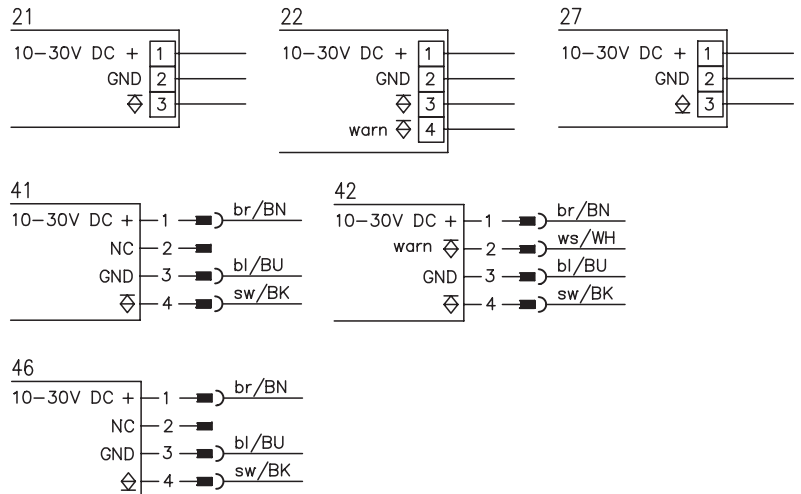
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Output with option switching delay
- K Connection terminals
- L Cable entry
- M Sensitivity adjustment
- N Light/dark switching



Electrical connection



We reserve the right to make changes • 96_b14e.fm

Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	10m
Operating range ²⁾	see table
Light spot diameter	approx. 130mm at 6m
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA, ≤ 75mA with optics heating
Switching output	PNP transistor
Function characteristics	light/dark switching (reversible)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	polycarbonate
Optics cover	plastic
Weight	150g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Warning output autoControl warn	PNP transistor, 100mA, counting principle for temperature changes, prevents fogging down to -35°C
Optics heating	
Low temperature	
Switching delay (slow oper./release)	0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Order guide

Selection table		PRK 96K/P-1360-21 Part No. 500 25163	PRK 96K/P-1360-41 Part No. 500 25165	PRK 96K/P-1380-21 Part No. 500 25164	PRK 96K/P-1380-41 Part No. 500 25166	PRK 96K/N-1360-46 Part No. 500 26732		
	Order code →							
Equipment ↓								
Housing	metal							
	plastic	●	●	●	●	●		
Light source	red light (8m)	●	●	●	●	●		
	red light (15m)							
Connection	terminals	●		●				
	M12 connector		●		●	●		
	M18 connector							
Features	optics heating/low temp.							
	switching delay			●	●			
	warning output							
	activation input							
	NPN switching output					●		

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 8m
2 MTK(S) 50x50	0.3 ... 7m
3 TK(S) 30x50	0.3 ... 4.5m
4 TK(S) 20x40	0.3 ... 3m
5 TK(S) 82	0.3 ... 6m
6 Tape 2 100x100	0.3 ... 4m

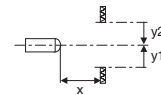
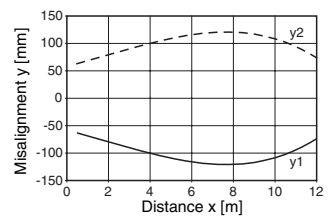
1	0.1	8	10
2	0.1	7	8.5
3	0.1	4.5	5
4	0.1	3	4
5	0.1	6	7.5
6	0.1	4	5.5

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Remarks

- The polarised retro-reflective photoelectric sensor is also available with an integrated AS-i chip for direct connection to the AS-i system.
- **Output LED**
(with option switching delay) Display reacts like switching output - e.g. delayed



PRK 96

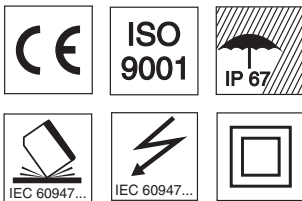
Retro-reflective photoelectric sensors with polarisation filter



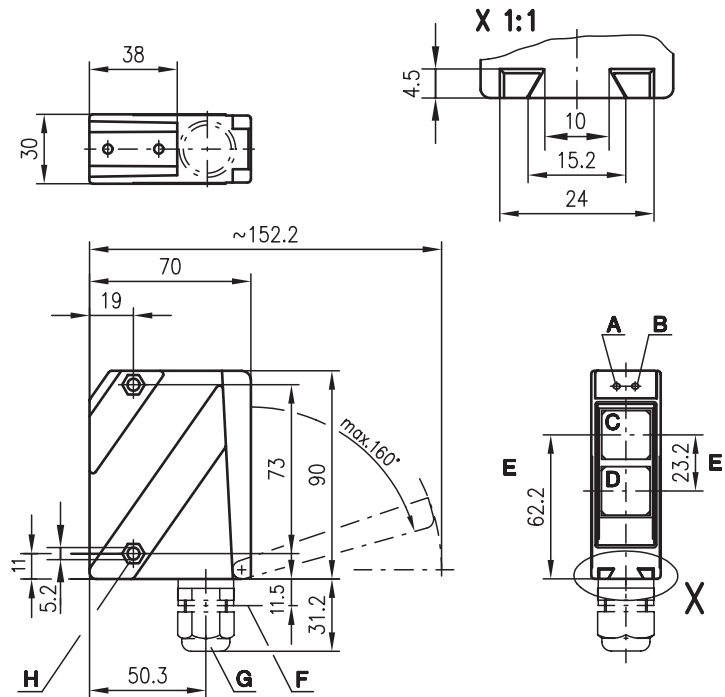
10m



- Polarised retro-reflective photoelectric sensor with large operating range in visible red light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Activation input for e.g. muting applications

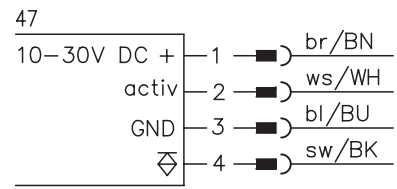
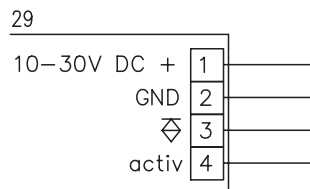


Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Connection terminals
- K Cable entry
- L Sensitivity adjustment
- M Light/dark switching

Electrical connection



We reserve the right to make changes • 96_b04e.fm

Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	10m
Operating range ²⁾	see table
Light spot diameter	approx. 130mm at 6m
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 40mA
Switching output	PNP transistor
Function characteristics	light/dark switching (reversible)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc	Plastic housing	polycarbonate
Optics cover	glass		plastic
Weight	380g		150g
Connection type	terminals or M12 connector		

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input active	≥ 8V/≤ 2V (≥ 2V/≤ 2V) ⁵⁾
Transmitter active/not active	≤ 0.5 ms
Activation/disable delay	
Input resistance	47KΩ ± 10%

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC
- 5) Active low

Order guide

Selection table		Order code →				
Equipment ↓		PRK 96K/P-1361-29 Part No. 500 80476	PRK 96K/P-1361-47 Part No. 500 80475	PRK 96M/P-1361-47 Part No. 500 82092	PRK 96K/P-1363-29 Part No. 500 80656	PRK 96M/P-1362-47 Part No. 500 80477
Housing	metal			●		●
	plastic	●	●		●	●
Light source	red light (8m)	●	●	●	●	●
Connection	terminals	●			●	
	M12 connector		●	●		●
Features	activation input	●	●	●	● ⁵⁾	●
	optics heating/low temperature	●	●	●	●	●

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 8m
2 MTK(S) 50x50	0.3 ... 7m
3 TK(S) 30x50	0.3 ... 4.5m
4 TK(S) 20x40	0.3 ... 3m
5 TK(S) 82	0.3 ... 6m
6 Tape 2 100x100	0.3 ... 4m

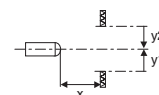
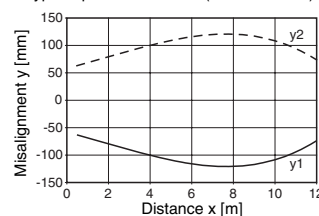
1	0.1	8	10
2	0.1	7	8.5
3	0.1	4.5	5
4	0.1	3	4
5	0.1	6	7.5
6	0.1	4	5.5

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Remarks

- The polarised retro-reflective photoelectric sensor is also available with an integrated AS-i chip for direct connection to the AS-i system.
- **PRK 96K/P-1363-29**
Activation via active low signal



PRK 96

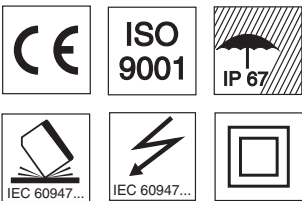
Retro-reflective photoelectric sensors with polarisation filter



10m
18m



- Polarised retro-reflective photoelectric sensor with large operating range in visible red light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- All-mains design 20 ... 230 VAC/DC with relay output
- General light/dark switching, sensitivity adjustment, delay before start-up and various options provide for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5mm²



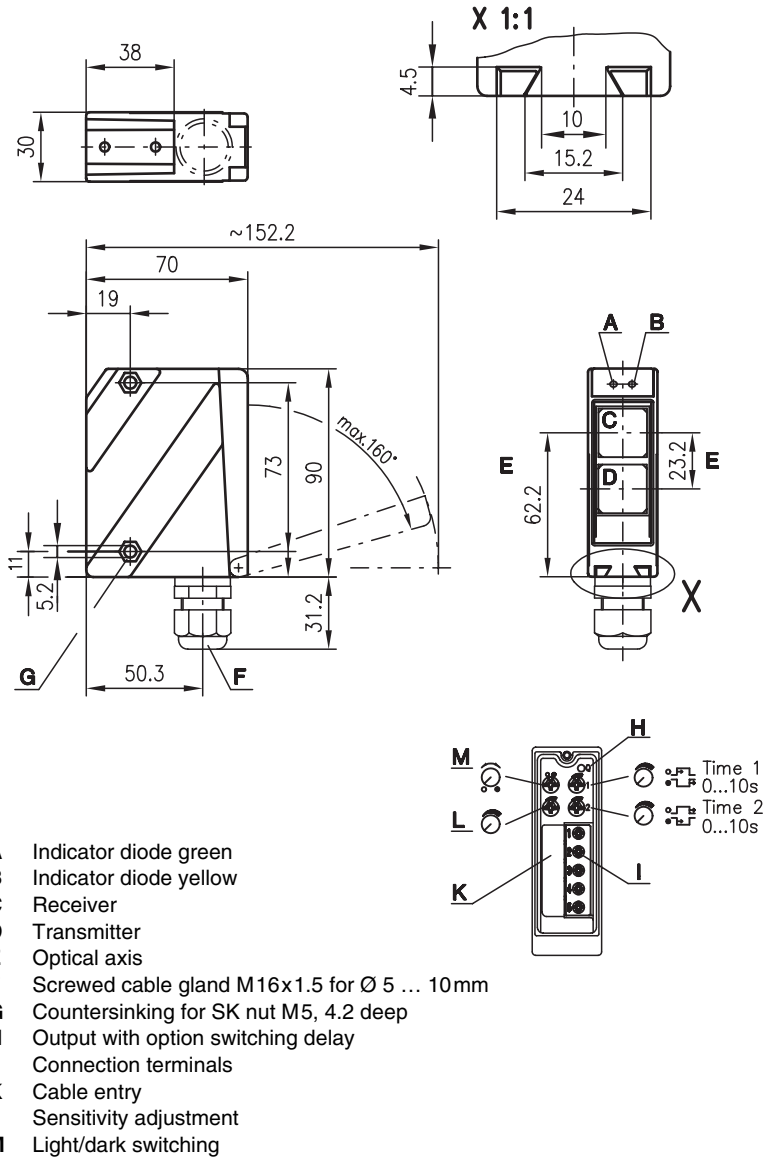
We reserve the right to make changes • 96_b05e.fm

Accessories:

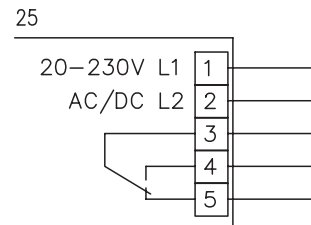
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction
- Reflectors
- Reflective tapes

Dimensioned drawing



Electrical connection





Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 10m/18m
 Operating range ²⁾ see table
 Light spot diameter approx. 130mm at 6m
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 20Hz
 Response time 25ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 20 ... 230VAC, 50/60Hz
 20 ... 230VDC ± 10%
 Power consumption ≤ 1,5VA
 Switching output ³⁾ relay, 1 change-over contact
 Function characteristics light/dark switching (reversible)
 Switching voltage, relay 250VAC/DC
 Switching current, relay 250VAC, 3A/30VDC, 3A
 Switching power, relay 750VA, cosφ=1
 Sensitivity adjustable

Indicators

LED green ready
 LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals

Environmental data

Ambient temp. (operation/storage) -20°C ... +55°C/-40°C ... +55°C
 Protective circuit ⁴⁾ 1, 4
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Order guide

Selection table		Order code →						
Equipment ↓		PRK 96M/R-1420-25 Part No. 500 80078	PRK 96M/R-1430-25 Part No. 500 80077	PRK 96M/R-3420-25 Part No. 500 82066	PRK 96M/R-3430-25 Part No. 500 61111			
Housing	metal	●	●	●	●			
	plastic							
Light source	red light (8m)	●	●					
	red light (15m)			●	●			
	red light (20m)							
Connection	terminals	●	●	●	●			
	M12 connector							
Features	optics heating/low temp.							
	switching delay		●		●			

Tables

10m models

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 8m
2 MTK(S) 50x50	0.3 ... 7m
3 TK(S) 30x50	0.3 ... 4.5m
4 TK(S) 20x40	0.3 ... 3m
5 TK(S) 82	0.3 ... 6m
6 Tape 2 100x100	0.3 ... 4m

1	0.1	8	10
2	0.1	7	8.5
3	0.1	4.5	5
4	0.1	3	4
5	0.1	6	7.5
6	0.1	4	5.5

18m models

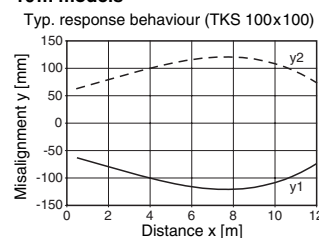
Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 15m
2 MTK(S) 50x50	0.3 ... 11m
3 TK(S) 30x50	0.3 ... 6m
4 TK(S) 20x40	0.3 ... 5m
5 TK(S) 82	0.3 ... 11m
6 Tape 2 100x100	0.3 ... 6m

1	0.1	15	18
2	0.1	11	12
3	0.1	6	7.5
4	0.1	5	6
5	0.1	11	11.5
6	0.1	6	7.5

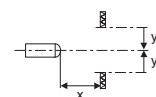
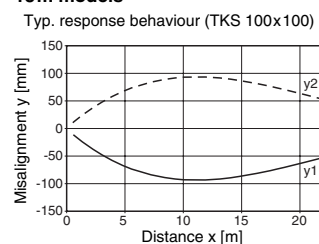
□ Operating range [m]
 ▒ Typ. operating range limit [m]

Diagrams

10m models



18m models



Remarks

- **Output-LED**
 (with option switching delay) The display reacts like the switching output – e.g. delayed.



PRK 96

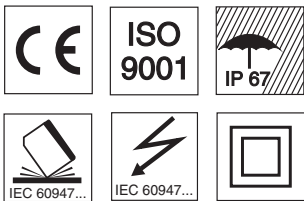
Retro-reflective photoelectric sensors with polarisation filter



10m
24m



- Polarised retro-reflective photoelectric sensor with large operating range in visible red light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- All-mains design 20 ... 230 VAC/DC with relay output
- General light/dark switching, sensitivity adjustment, delay before start-up and various options provide for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5mm²

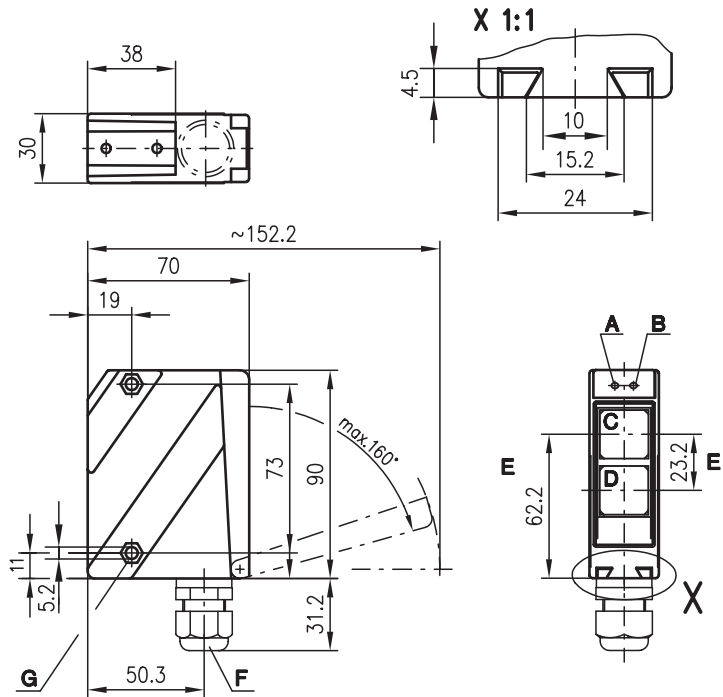


Accessories:

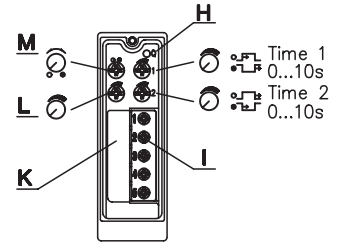
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction
- Reflectors
- Reflective tapes

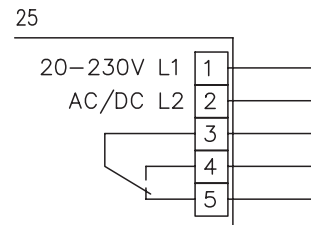
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G Countersinking for SK nut M5, 4.2 deep
- H Output with option switching delay
- I Connection terminals
- K Cable entry
- L Sensitivity adjustment
- M Light/dark switching



Electrical connection



We reserve the right to make changes • 96_b15e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 10m/24m
 Operating range ²⁾ see table
 Light spot diameter approx. 130mm at 6m
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 20Hz
 Response time 25ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 20 ... 230VAC, 50/60Hz
 20 ... 230VDC ± 10%
 Power consumption ≤ 1,5VA
 Switching output ³⁾ relay, 1 change-over contact
 Function characteristics light/dark switching (reversible)
 Switching voltage, relay 250VAC/DC
 Switching current, relay 250VAC, 3A/30VDC, 3A
 Switching power, relay 750VA, cosφ=1
 Sensitivity adjustable

Indicators

LED green ready
 LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing polycarbonate
 Optics cover plastic
 Weight 150g
 Connection type terminals

Environmental data

Ambient temp. (operation/storage) -20°C ... +55°C/-40°C ... +55°C
 Protective circuit ⁴⁾ 1, 4
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Order guide

Selection table		Order code →							
Equipment ↓		PRK 96K/R-1420-25 Part No. 500 25167	PRK 96K/R-1430-25 Part No. 500 25168	PRK 96K/R-3428-25 Part No. 500 35351					
Housing	metal								
	plastic	●	●	●					
Light source	red light (8m)	●	●						
	red light (15m)								
	red light (20m)			●					
Connection	terminals	●	●	●					
	M12 connector								
Features	optics heating/low temp.								
	switching delay		●						

Tables

10m models

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 8m
2 MTK(S) 50x50	0.3 ... 7m
3 TK(S) 30x50	0.3 ... 4.5m
4 TK(S) 20x40	0.3 ... 3m
5 TK(S) 82	0.3 ... 6m
6 Tape 2 100x100	0.3 ... 4m

1	0.1	8	10
2	0.1	7	8.5
3	0.1	4.5	5
4	0.1	3	4
5	0.1	6	7.5
6	0.1	4	5.5

24m models

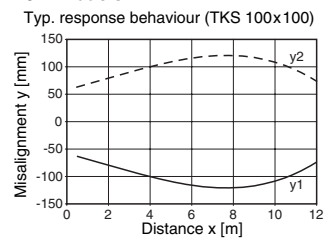
Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 20m
2 MTK(S) 50x50	0.3 ... 15m
3 TK(S) 30x50	0.3 ... 10m
4 TK(S) 20x40	0.3 ... 8m
5 TK(S) 82	0.3 ... 15m
6 Tape 2 100x100	0.3 ... 10m

1	0.1	20	24
2	0.1	15	16
3	0.1	10	12
4	0.1	8	9
5	0.1	15	17
6	0.1	10	12

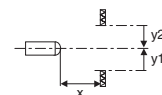
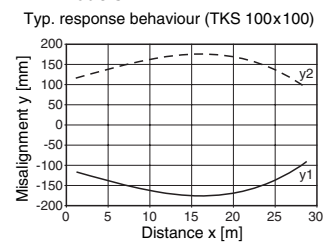
- Operating range [m]
- Typ. operating range limit [m]

Diagrams

10m models



24m models



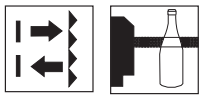
Remarks

- **Output-LED**
 (with option switching delay) The display reacts like the switching output - e.g. delayed



PRK 96

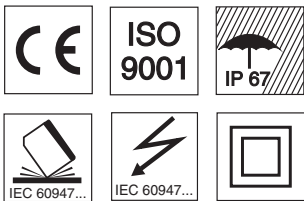
Retro-reflective photoelectric sensors with polarisation filter



0 ... 1.85m

10 - 30 V
DC

- Retro-reflective photoelectric sensor for safe detection of transparent media (e.g. clear glass, PE, foil)
- Reliable detection of the smallest gaps between transparent objects
- User controlled sensitivity adjustment with high resolution
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- High switching frequency for detection of fast events
- Connection via M12 connector or terminal compartment

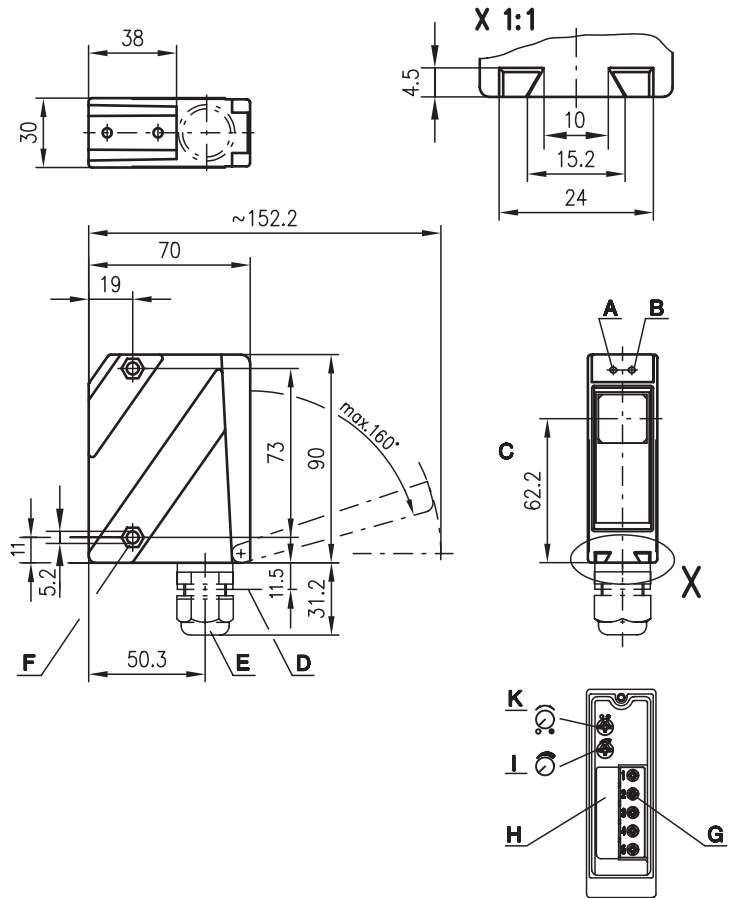


Accessories:

(available separately • see page 484)

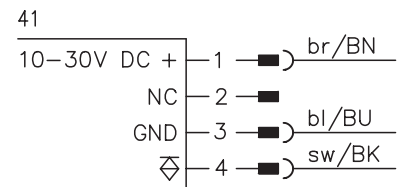
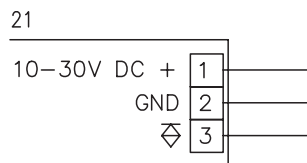
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes
- Alignment aid ARH 96

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- F Countersinking for SK nut M5, 4.2 deep
- G Connection terminals
- H Cable entry
- I Sensitivity adjustment
- K Light/dark switching

Electrical connection



We reserve the right to make changes • 96_b06e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 50x50) ¹⁾	0 ... 1.85 m
Operating range ²⁾	0 ... 1.5 m
Light source	LED (modulated light)
Wavelength	660nm (visible red light/polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 40mA
Switching output	PNP transistor
Function characteristics	light/dark switching (reversible)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 10 turn potentiometer

Indicators

LED green	ready
LED yellow	clear glass - adjustment range 1 transition from quickly flashing to slowly flashing
	coloured glass - adjustment range 2 transition from cont. illuminated to quickly flashing
	other - adjustment range 3 continuously illuminated

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Order guide




	Designation	Part No.
with terminals	PRK 96M/P-1830-21	500 28975
with M12 connector	PRK 96M/P-1830-41	500 80469

Tables

Diagrams

Remarks

- Integrated slit diaphragm: 3.7x20mm

Objects	Adjustment (indicator LED yellow)
Clear glass, PET, foil	area 1 operating point 1 
Coloured glass	area 2 operating point 2 
Other	area 3 

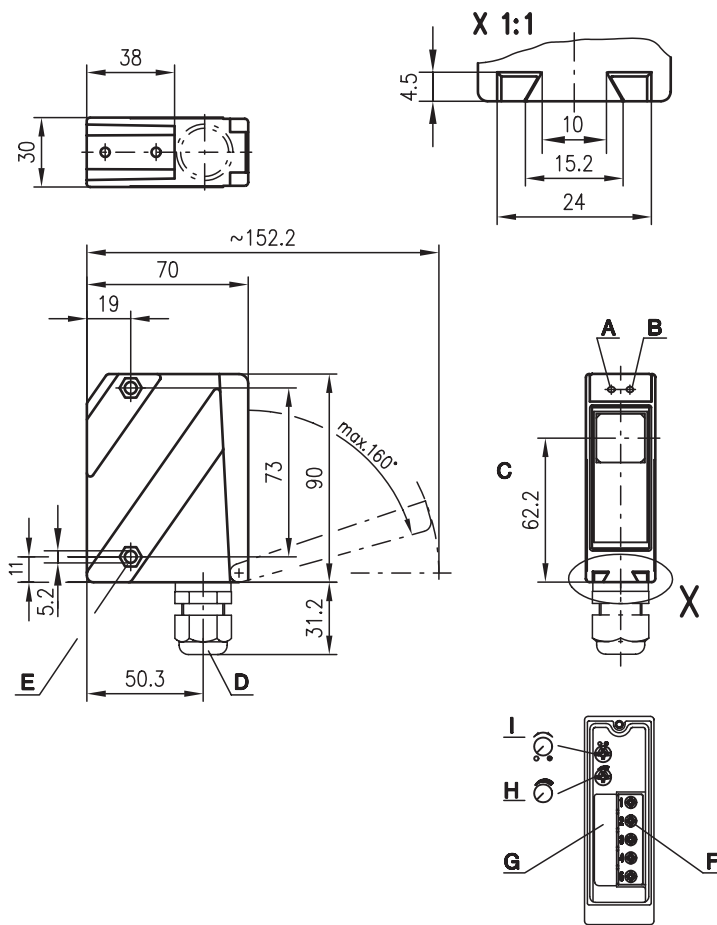


PRK 96

Retro-reflective photoelectric sensors with polarisation filter



Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- E Countersinking for SK nut M5, 4.2 deep
- F Connection terminals
- G Cable entry
- H Sensitivity adjustment
- I Light/dark switching

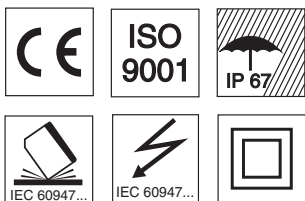
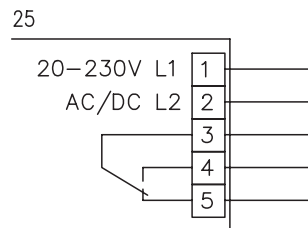
0 ... 1.85m



20-230 V
AC / DC

- Retro-reflective photoelectric sensor for safe detection of transparent media (e.g. clear glass, PE, foil)
- Reliable detection of the smallest gaps between transparent objects
- User controlled sensitivity adjustment with high resolution
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- All-mains design 20 ... 230 VAC/DC with relay output
- Connection via comfortable terminal compartment up to 1.5mm²

Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction
- Reflectors
- Reflective tapes
- Alignment aid ARH 96

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Specifications

Optical data

Typ. operating range limit (TK(S) 50x50) ¹⁾	0 ... 1.85 m
Operating range ²⁾	0 ... 1.5 m
Light source	LED (modulated light)
Wavelength	660nm (visible red light/polarised)

Timing

Switching frequency	20Hz
Response time	25ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	20 ... 230VAC, 50/60Hz 20 ... 230VDC ±10%
Power consumption	≤ 1.5VA
Switching output ³⁾	relay, 1 change-over contact
Function characteristics	light/dark switching (reversible)
Switching voltage, relay	250 VAC/DC
Switching current, relay	250 VAC, 3A/30VDC, 3A
Switching power, relay	750VA, cos φ=1
Sensitivity	adjustable with 10-turn potentiometer

Indicators

LED green	ready
LED yellow	clear glass - adjustment range 1 transition from quickly flashing to slowly flashing coloured glass - adjustment range 2 transition from cont. illuminated to quickly flashing other - adjustment range 3 continuously illuminated

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ⁴⁾	1, 4
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Switching delay (slow oper./release)	0 ... 10s (separately adjustable)
---	-----------------------------------

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Order guide



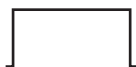
Designation	Part No.
PRK 96M/R-1850-25	500 80470

Tables

Diagrams

Remarks

- Integrated slit diaphragm: 3.7x20mm

Objects	Adjustment (indicator LED yellow)
Clear glass, PE, foil	area 1 operating point 1 
Coloured glass	area 2 operating point 2 
Other	area 3 



PRK 96

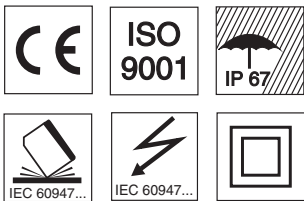
Retro-reflective photoelectric sensors with polarisation filter



0 ... 8.5m



- Retro-reflective photoelectric sensor for safe detection of transparent media (e.g. clear glass, PE, foil)
- User controlled sensitivity adjustment with high resolution
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- High switching frequency for detection of fast events
- Connection via M12 connector or terminal compartment



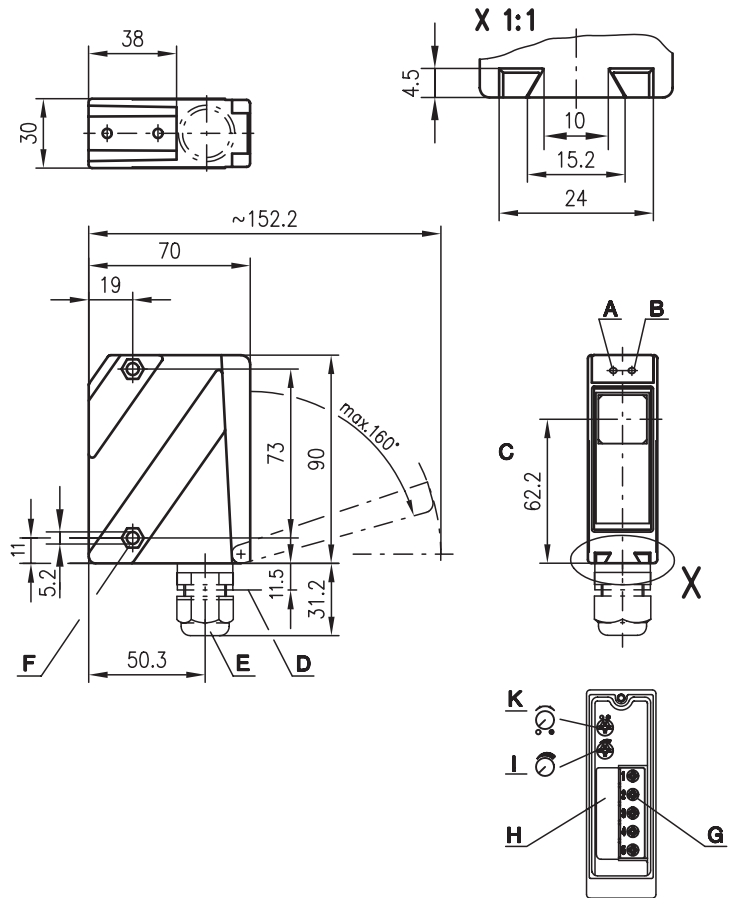
We reserve the right to make changes • 96_b08e.fm

Accessories:

(available separately • see page 484)

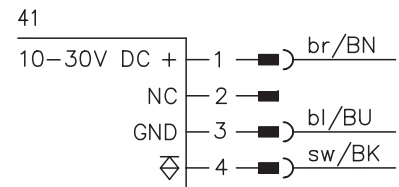
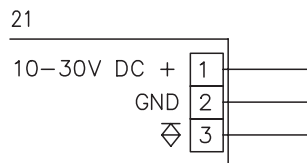
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Spark extinction
- Reflectors
- Reflective tapes
- Alignment aid ARH 96

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- F Countersinking for SK nut M5, 4.2 deep
- G Connection terminals
- H Cable entry
- I Sensitivity adjustment
- K Light/dark switching

Electrical connection





Specifications

Optical data

Typ. operating range limit (TK(S) 50x50) ¹⁾	0 ... 8.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light/polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 40mA
Switching output	PNP transistor
Function characteristics	light/dark switching (reversible)
Signal voltage high/low	≥ (U _B -2V) ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with 10-turn potentiometer

Indicators

LED green	ready
LED yellow	clear glass - adjustment range 1 transition from quickly flashing to slowly flashing
	coloured glass - adjustment range 2 transition from cont. illuminated to quickly flashing
	other - adjustment range 3 continuously illuminated

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with terminals	PRK 96M/P-1838-21	500 29880
with M12 connector	PRK 96M/P-1838-41	500 80760

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 7m
2 MTK(S) 50x50	0 ... 6m
3 TK(S) 30x50	0 ... 4m
4 TK(S) 20x40	0 ... 3.5m
5 TK(S) 82	0 ... 5m
6 Tape 2 100x100	0 ... 3m

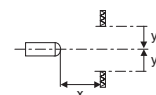
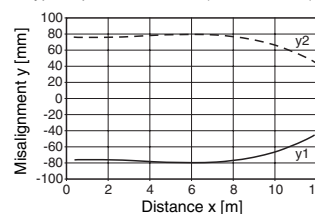
1	0.1	7	8.5
2	0.1	6	7.5
3	0.1	4	5
4	0.1	3.5	4
5	0.1	5	6
6	0.1	3	3.5

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



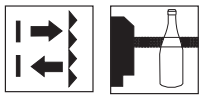
Remarks

Objects	Adjustment (indicator LED yellow)
Clear glass, PET, foil	area 1 operating point 1
Coloured glass	area 2 operating point 2
Other	area 3



PRK 96

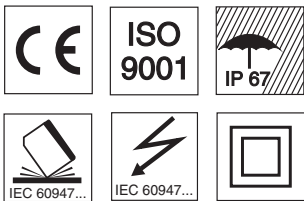
Retro-reflective photoelectric sensors with polarisation filter



0 ... 8.5m



- Retro-reflective photoelectric sensor for safe detection of transparent media (e.g. clear glass, PE, foil)
- User controlled sensitivity adjustment with high resolution
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- All-mains design 20 ... 230 VAC/DC with relay output
- Connection via comfortable terminal compartment up to 1.5mm²

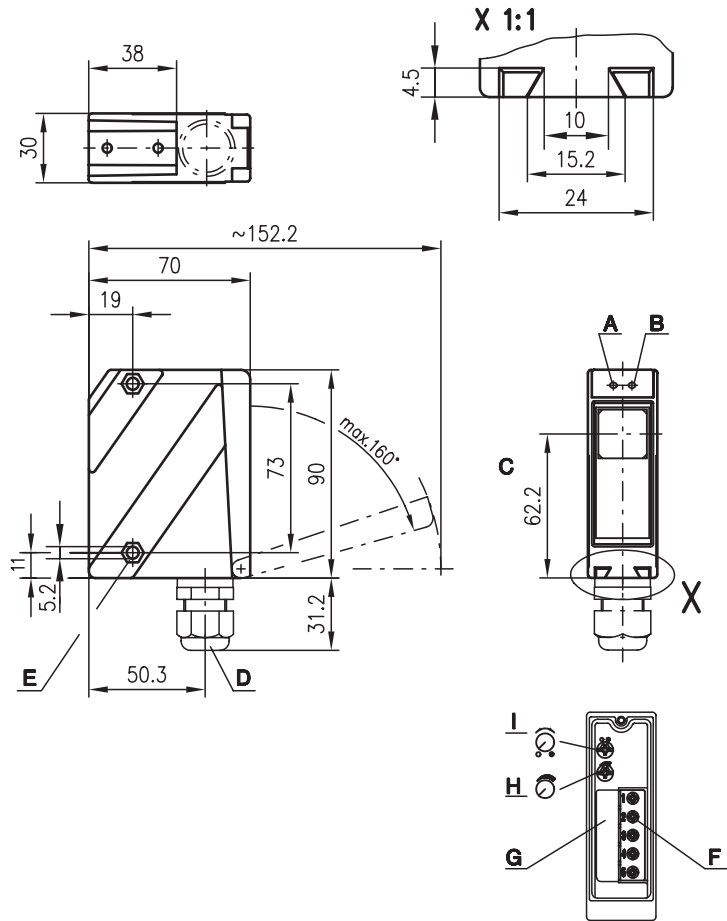


Accessories:

(available separately • see page 484)

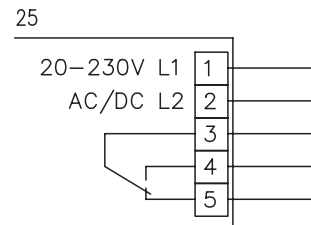
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction
- Reflectors
- Reflective tapes
- Alignment aid ARH 96

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- E Countersinking for SK nut M5, 4.2 deep
- F Connection terminals
- G Cable entry
- H Sensitivity adjustment
- I Light/dark switching

Electrical connection



We reserve the right to make changes • 96_b09e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 50x50) ¹⁾	0 ... 8.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light/polarised)

Timing

Switching frequency	20Hz
Response time	25ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	20 ... 230VAC; 50/60Hz 20 ... 230VDC ± 10%
Power consumption	≤ 1.5VA
Switching output ³⁾	relay, 1 change-over contact
Function characteristics	light/dark switching (reversible)
Switching voltage, relay	250VAC/DC
Switching current, relay	250VAC, 3A/30VDC, 3A
Switching power, relay	750VA, $\cos\phi=1$
Sensitivity	adjustable with 10 turn potentiometer

Indicators

LED green	ready
LED yellow	clear glass - adjustment range 1 transition from quickly flashing to slowly flashing
	coloured glass - adjustment range 2 transition from cont. illuminated to quickly flashing
	other - adjustment range 3 continuously illuminated

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ⁴⁾	1, 4
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Switching delay (slow oper./release)	0 ... 10s (separately adjustable)
---	-----------------------------------

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) Suitable spark extinction must be provided with inductive or capacitive loads
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Order guide

Designation	Part No.
PRK 96M/R-1858-25	500 29881

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 7m
2 MTK(S) 50x50	0 ... 6m
3 TK(S) 30x50	0 ... 4m
4 TK(S) 20x40	0 ... 3.5m
5 TK(S) 82	0 ... 5m
6 Tape 2 100x100	0 ... 3m

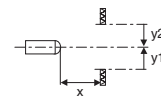
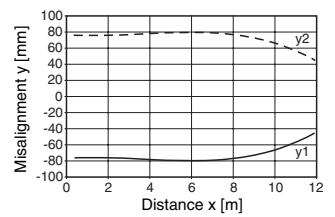
1	0.1	7	8.5
2	0.1	6	7.5
3	0.1	4	5
4	0.1	3.5	4
5	0.1	5	6
6	0.1	3	3.5

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Remarks

Objects	Adjustment (indicator LED yellow)
Clear glass, PET, foil	area 1 operating point 1
Coloured glass	area 2 operating point 2
Other	area 3



PRK 96

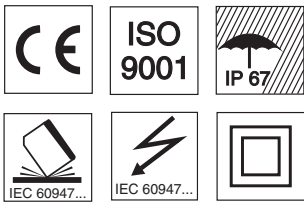
Retro-reflective photoelectric sensors with polarisation filter



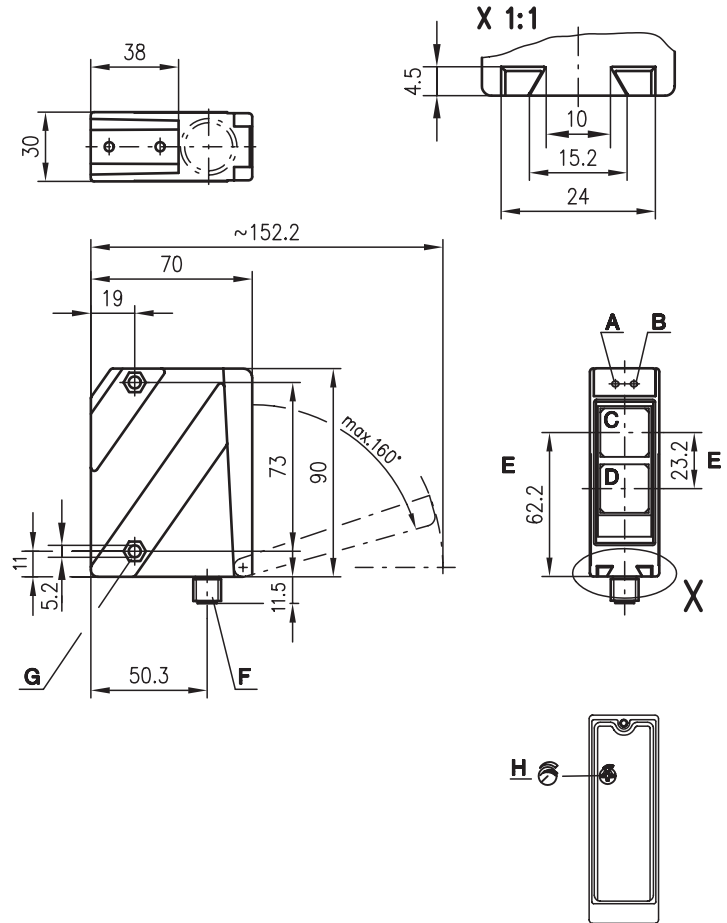
10m
18m



- Metal housing with glass cover, protection class IP 67 for industrial application
- Access to all sensor functions via an ASi-interface without additional wiring
- Sensitivity adjustment and ready indicator for optimal adaptation to the application
- Common conductor for both power and data reduces installation work

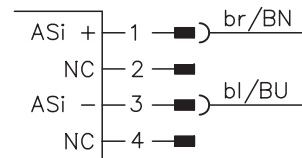


Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12x1
- G Countersinking for SK nut M5, 4.2 deep
- H Sensitivity adjustment

Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Spark extinction
- Reflectors
- Reflective tapes

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 96_b10e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	10m/18m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Sensor switching frequency	1000Hz
Sensor response time	0.5ms
Delay before start-up	≤ 200ms
Electrical data	
Operating voltage U _B	26.5V ... 31.6V (according to AS-i specification)
Bias current	≤ 40mA per sensor

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-40°C ... +55°C
Protective circuit ³⁾	1, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

AS-i data for receiver

I/O code	1
ID code	1
Address	programmed by the user in the range of 1 to 31 (default=0)
Cycle time acc. to AS-i specification	5ms
AS-i standard according to profile	S-1.1

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 4=interference blanking

4) Rating voltage 250 VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	∅ no reflection 1 reflection	system input	*P ₀	NC	∅ 1	system parameter
D ₁	warning output autoControl	∅ active 1 not active	system input	*P ₁	light/dark switching	∅ dark switching 1 light switching	system parameter
D ₂	ready output	∅ sensor not ready 1 sensor ready	system input	*P ₂	NC	∅ 1	system parameter
*D ₃	Activation input	∅ transmitter on 1 transmitter off	system output	*P ₃	NC	∅ 1	system parameter

* default=1

Order guide

10m
18m

Designation	Part No.
PRK 96M/A-1410-44	500 25176
PRK 96M/A-3410-44	500 82067

Tables

10m models

Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 8m
2 MTK(S) 50x50	0.3 ... 7m
3 TK(S) 30x50	0.3 ... 4.5m
4 TK(S) 20x40	0.3 ... 3m
5 TK(S) 82	0.3 ... 6m
6 Tape 2 100x100	0.3 ... 4m

1 0.1	8	10
2 0.1	7	8.5
3 0.1	4.5	5
4 0.1	3	4
5 0.1	6	7.5
6 0.1	4	5.5

18m models

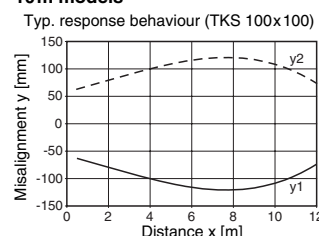
Reflectors	Operating range
1 TK(S) 100x100	0.3 ... 15m
2 MTK(S) 50x50	0.3 ... 11m
3 TK(S) 30x50	0.3 ... 6m
4 TK(S) 20x40	0.3 ... 5m
5 TK(S) 82	0.3 ... 11m
6 Tape 2 100x100	0.3 ... 6m

1 0.1	15	18
2 0.1	11	12
3 0.1	6	7.5
4 0.1	5	6
5 0.1	11	11.5
6 0.1	6	7.5

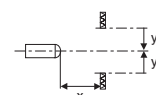
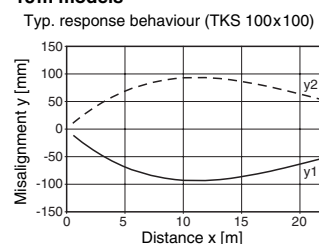
Operating range [m]
 Typ. operating range limit [m]

Diagrams

10m models



18m models



Remarks



PRK 96

Retro-reflective photoelectric sensors with polarisation filter

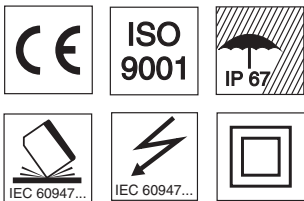


10m

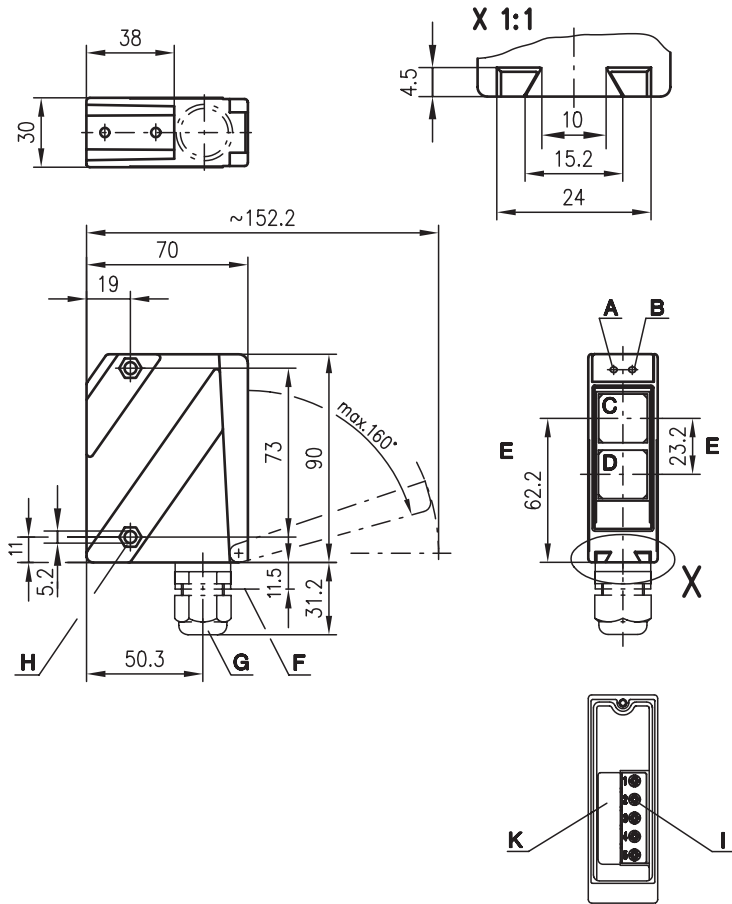


10 - 30 V
DC

- Polarised retro-reflective photoelectric sensor with large operating range in visible red light
- Robust plastic housing, protection class IP 67 for industrial application
- Complementary PNP switching outputs for PLC applications (light/dark switching)
- Status display with integrated blink mode for soiling and misalignment

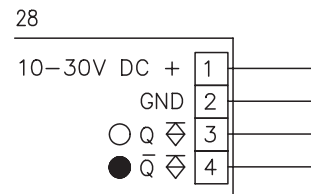


Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Connection terminals
- K Cable entry

Electrical connection



We reserve the right to make changes • 96_b11e.fm

Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction
- Reflectors
- Reflective tapes



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 10m
 Operating range ²⁾ see table
 Light spot diameter approx. 130mm at 6m
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 500Hz
 Response time 1ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 40mA
 Switching output 2 PNP transistor outputs, complementary
 Function characteristics light/dark switching
 Signal voltage high/low ≥ (U_B-2V)/≤ 2V
 Output current max. 100mA

Indicators

LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing polycarbonate
 Optics cover plastic
 Weight 150g
 Connection type terminals

Environmental data

Ambient temp. (operation/storage) -20°C ... +55°C/-40°C ... +55°C
 Protective circuit ³⁾ 1, 2, 3, 4
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Tables

Reflectors		Operating range
1	TK(S) 100x100	0.3 ... 8m
2	MTK(S) 50x50	0.3 ... 7m
3	TK(S) 30x50	0.3 ... 4.5m
4	TK(S) 20x40	0.3 ... 3m
5	TK(S) 82	0.3 ... 6m
6	Tape 2 100x100	0.3 ... 4m

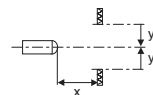
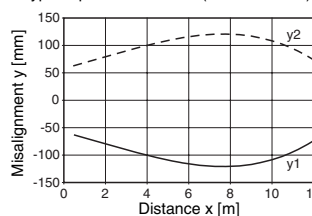
1	0.1	8	10
2	0.1	7	8.5
3	0.1	4.5	5
4	0.1	3	4
5	0.1	6	7.5
6	0.1	4	5.5

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Order guide

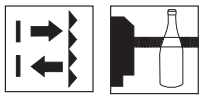
Selection table		Order code →	PRK 96K/P-2360-28 Part No. 500 82056							
Equipment ↓										
Housing	metal									
	plastic	●								
Light source	red light (8m)	●								
Connection	terminals	●								
	M12 connector									
Features	compl. switch. outputs	●								

Remarks



PRK 96

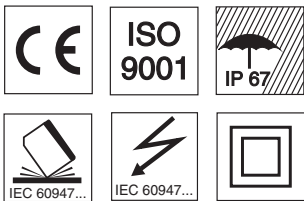
Retro-reflective photoelectric sensors with polarisation filter



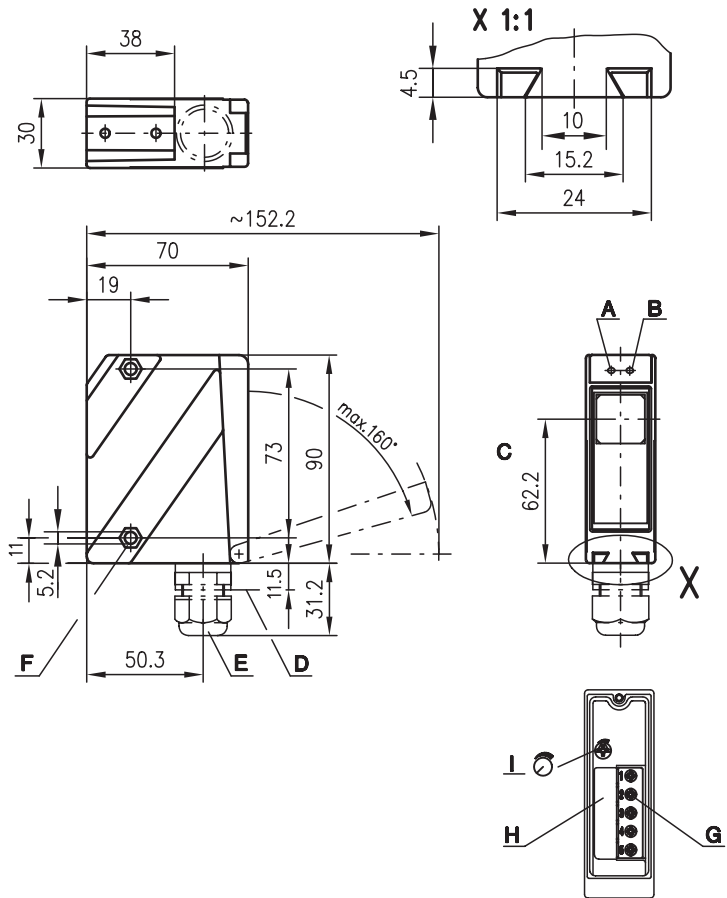
0 ... 8.5m



- Retro-reflective photoelectric sensor for detection of transparent media
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- User controlled sensitivity adjustment
- The autocollimation principle used ensures that the device functions reliably over the entire range (0 ... max.)
- High switching frequency for detection of fast events
- Connection via M12 connector or terminal compartment

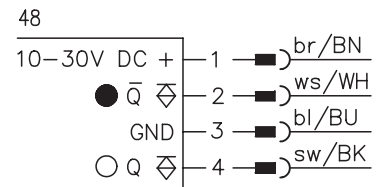
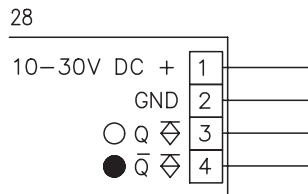


Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Optical axis
- D Device plug M12x1
- E Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- F Countersinking for SK nut M5, 4.2 deep
- G Connection terminals
- H Cable entry
- I Sensitivity adjustment

Electrical connection



We reserve the right to make changes • 96_b12e.fm

Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes
- Alignment aid ARH 96

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0 ... 8.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light/polarised)

Timing

Switching frequency	500Hz
Response time	1 ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	2 PNP transistor outputs, complementary light/dark switching
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with potentiometer

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C / -40°C ... +55°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Tables

Reflectors	Operating range
1 TK(S) 100x100	0 ... 7m
2 MTK(S) 50x50	0 ... 6m
3 TK(S) 30x50	0 ... 4m
4 TK(S) 20x40	0 ... 3.5m
5 TK(S) 82	0 ... 5m
6 Tape 2 100x100	0 ... 3m

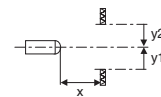
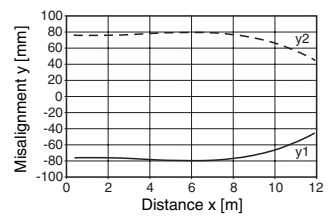
1	0.1	7	8.5
2	0.1	6	7.5
3	0.1	4	5
4	0.1	3.5	4
5	0.1	5	6
6	0.1	3	3.5

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TKS 100x100)



Order guide

	Designation	Part No.
with terminals	PRK 96M/P-2838-28	500 82060
with M12 connector	PRK 96M/P-2838-48	(optional)

Remarks



RT 96

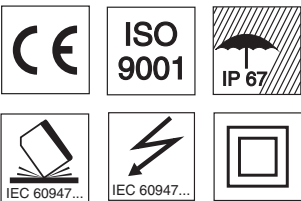
Energetic diffuse reflection light scanners



50 ... 700 mm
50 ... 1200 mm



- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Minimal short range
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures

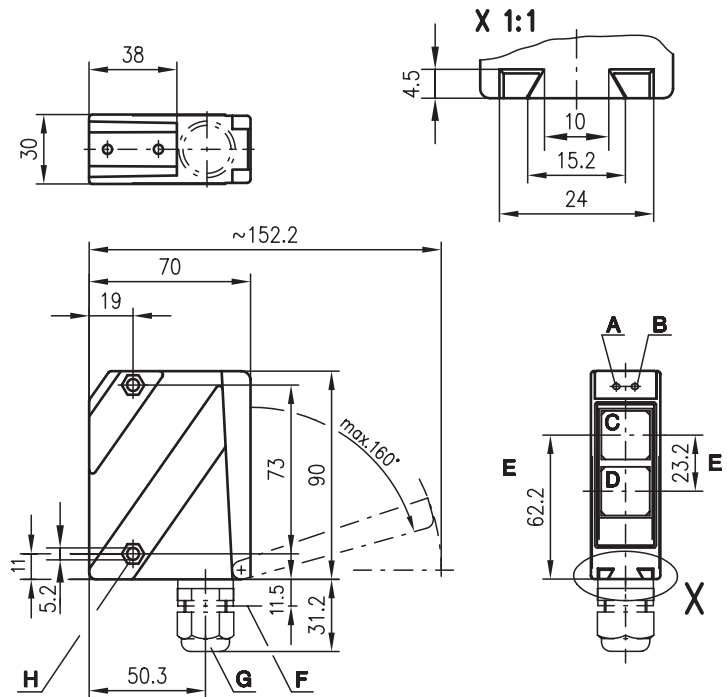


Accessories:

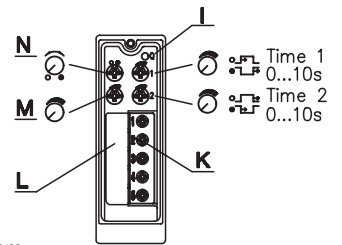
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

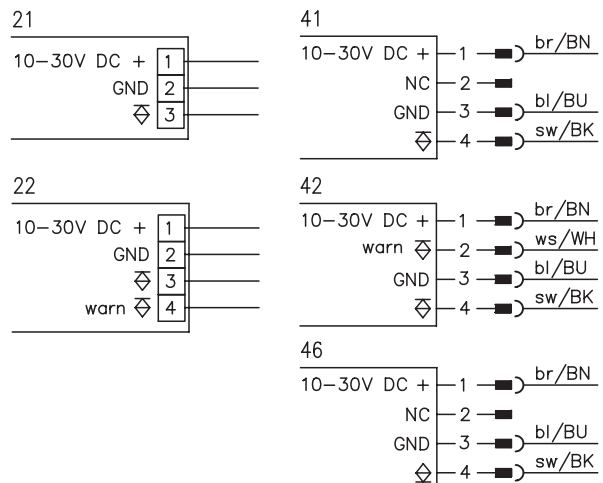
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Output with option switching delay
- K Connection terminals
- L Cable entry
- M Sensitivity adjustment
- N Light/dark switching



Electrical connection



We reserve the right to make changes • 96_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared light

50 ... 1200mm
 50 ... 800mm
 0 ... 100%
 LED (modulated light)
 880nm

Red light

50 ... 700mm
 50 ... 500mm
 0 ... 100%
 LED (modulated light)
 660nm

Timing

Switching frequency 300Hz
 Response time 1.67ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 40mA, ≤ 75mA with optics heating
 Switching output PNP transistor
 Function characteristics light/dark switching (reversible)
 Signal voltage high/low $\geq (U_B - 2V) \leq 2V$
 Output current max. 100mA
 Sensitivity adjustable

Indicators

LED green ready
 LED yellow reflection
 LED yellow flashing reflection, no performance reserve

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals or M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-40°C ... +70°C
 Protective circuit³⁾ 1, 2, 3, 4
 VDE safety class⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Warning output autoControl warn PNP transistor, 100mA, counting principle for temperature changes, prevents fogging down to -35°C
Optics heating
Low temperature
Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Tables

Red light

1	30	500	700
2	65	320	430
3	90	200	370

Infrared light

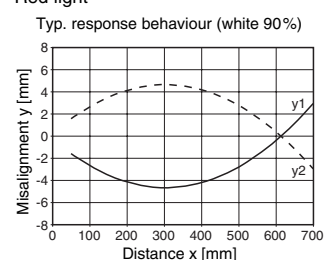
1	20	800	1200
2	60	420	950
3	80	290	570

1	white 90%
2	grey 18%
3	black 6%

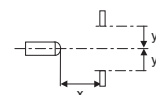
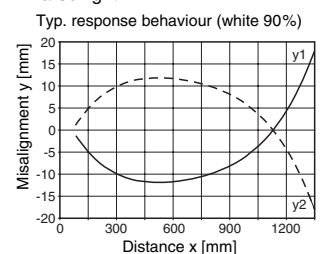
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

Red light



Infrared light



Order guide

Selection table		Order code →						
Equipment ↓		RT 96M/P-1370-500-22 Part No. 500 25172	RT 96M/P-1370-500-42 Part No. 500 25174	RT 96M/P-1450-800-22 Part No. 500 25130	RT 96M/P-1450-800-42 Part No. 500 25121	RT 96M/P-1470-800-42 Part No. 500 80111	RT 96M/P-1480-800-22 Part No. 500 25128	
Housing	metal	●	●	●	●	●	●	
	plastic							
Light source	red light (500mm)	●	●					
	infrared light (800mm)			●	●	●	●	
Connection	terminals	●		●			●	
	M12 connector		●		●	●		
	M18 connector							
Features	optics heating/low temp.						●	
	switching delay					●	●	
	warning output	●	●	●	●	●	●	
	short range (20mm)							
	NPN switching output							

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- **Short range** objects are detected down to a minimum distance of 20mm (with standard types approx. 50mm).
- **Output-LED** (with option switching delay) display reacts like switching output - e.g. delayed.



RT 96

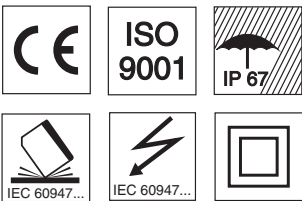
Energetic diffuse reflection light scanners



50 ... 1200 mm
20 ... 1200 mm



- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Minimal short range
- Connection via M12 connector or terminal compartment
- Multiple options with warning output, activation input, switching delays and optics heating for use at low temperatures

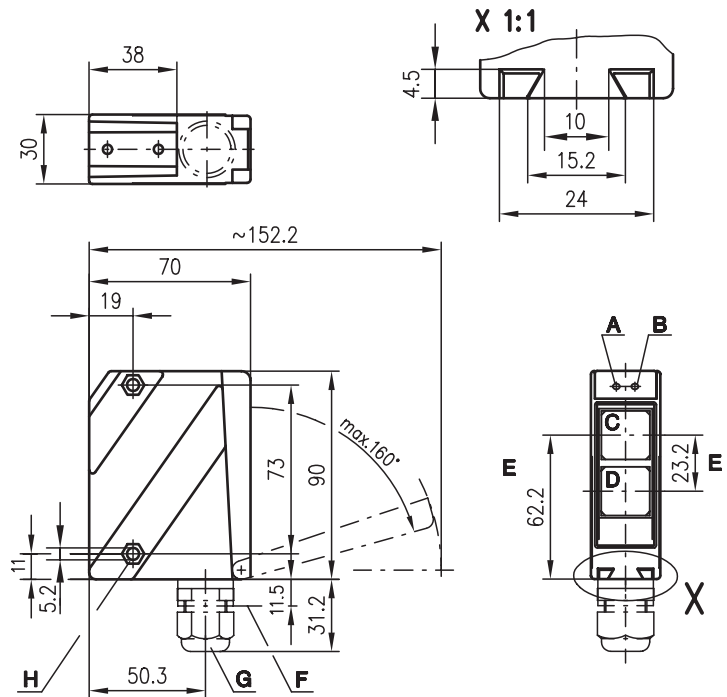


Accessories:

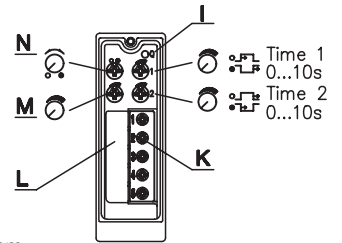
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

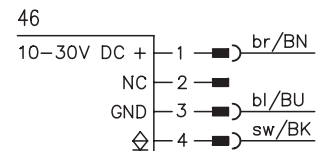
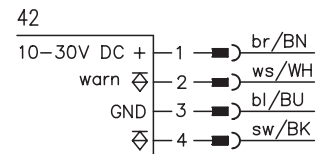
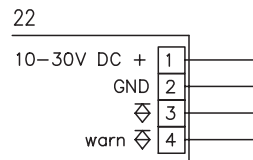
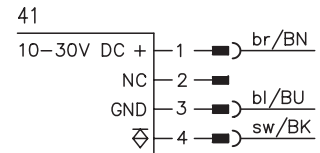
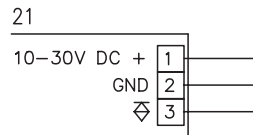
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Output with option switching delay
- K Connection terminals
- L Cable entry
- M Sensitivity adjustment
- N Light/dark switching



Electrical connection



We reserve the right to make changes • 96_c04e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
Scanning range ²⁾

Adjustment range
Light source
Wavelength

Timing

Switching frequency
Response time
Delay before start-up

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current
Sensitivity

Indicators

LED green
LED yellow
LED yellow flashing

Mechanical data

Housing
Optics cover
Weight
Connection type

Environmental data

Ambient temp. (operation/storage)
Protective circuit ³⁾
VDE safety class ⁴⁾
Protection class
Standards applied

Options

Warning output autoControl warn
Optics heating
Low temperature
Switching delay (slow oper./release)

Infrared light

50 ... 1200mm
50 ... 800mm
(20 ... 800mm, close range)
0 ... 100%
LED (modulated light)
880nm

300Hz
1.67 ms
≤ 200ms

10 ... 30VDC (incl. residual ripple)
≤ 15% of U_B
≤ 40mA, ≤ 75mA with optics heating
PNP transistor
light/dark switching (reversible)
≥ ($U_B - 2V$) / ≤ 2V
max. 100mA
adjustable

ready
reflection
reflection, no performance reserve

Plastic housing

polycarbonate
plastic
150g
terminals or M12 connector

-20°C ... +60°C / -40°C ... +70°C
1, 2, 3, 4
II, all-insulated
IP 67
IEC 60947-5-2

PNP transistor, 100mA, counting principle
for temperature changes, prevents fogging
down to -35°C
0 ... 10s (separately adjustable)

- 1) Typ. scanning range limit: max. attainable range without performance reserve
2) Scanning range: recommended range with performance reserve
3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
4) Rating voltage 250VAC

Tables

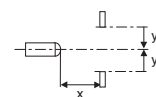
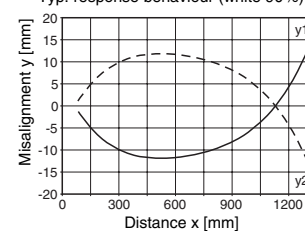
1	20	800	1200
2	60	420	950
3	80	290	570

1	white 90%
2	grey 18%
3	black 6%

□ Scanning range [mm]
▒ Typ. scanning range limit [mm]

Diagrams

Typ. response behaviour (white 90%)



Order guide

Selection table		Order code →					
Equipment ↓		RT 96K/P-1440-800-21 Part No. 500 25151	RT 96K/P-1440-800-41 Part No. 500 25153	RT 96K/P-1444-800-21 Part No. 500 81177	RT 96K/P-1444-800-41 Part No. 500 81178	RT 96K/P-1460-800-21 Part No. 500 25152	RT 96K/N-1440-800-46 Part No. 500 35825
Housing	metal						
	plastic	●	●	●	●	●	●
Light source	red light (500mm)						
	infrared light (800mm)	●	●	●	●	●	●
Connection	terminals	●		●		●	
	M12 connector		●		●		●
Features	optics heating/low temp.						
	switching delay					●	
	warning output						
	short range (20mm)			●	●		
	NPN switching output						●

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- **Short range** objects are detected down to a minimum distance of 20mm (with standard types approx. 50mm).
- **Output-LED** (with option switching delay) display reacts like switching output - e.g. delayed.



RT 96

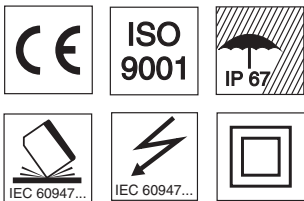
Energetic diffuse reflection light scanners



50 ... 700 mm
50 ... 1200 mm



- Energetic scanner with sensitivity adjustment in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Version with additional switching delay
- Connection via comfortable terminal compartment up to 1.5mm²

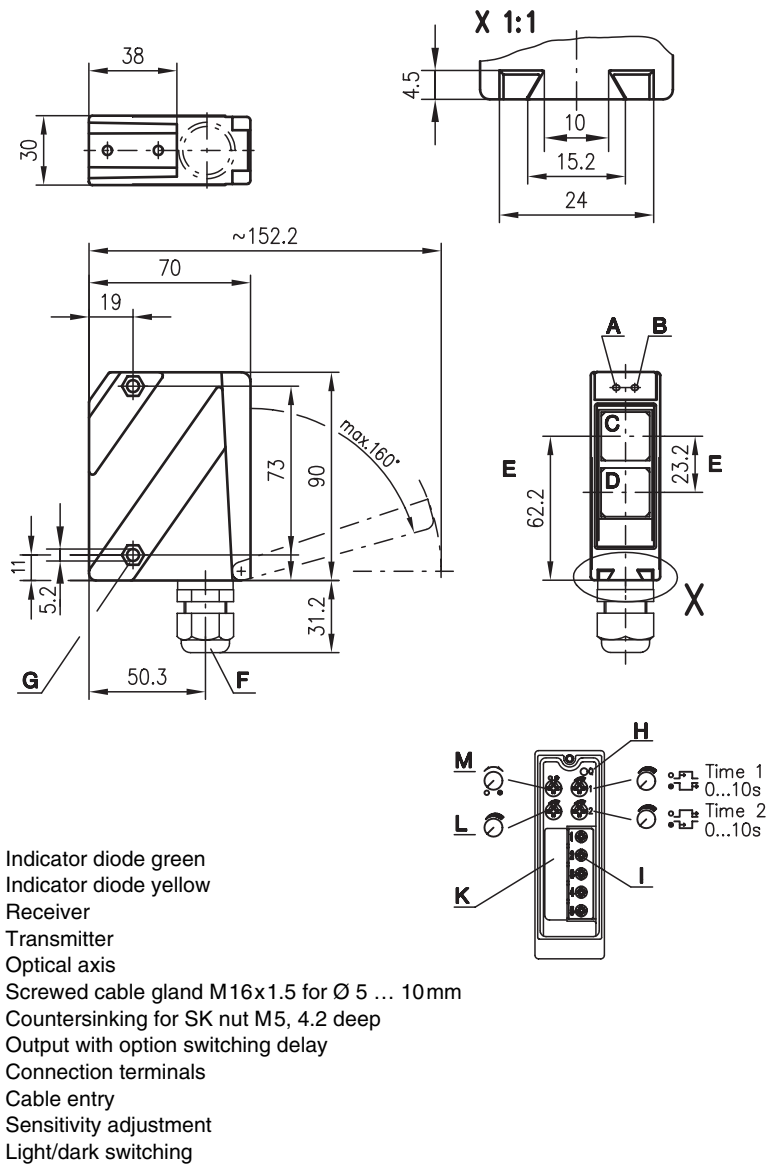


Accessories:

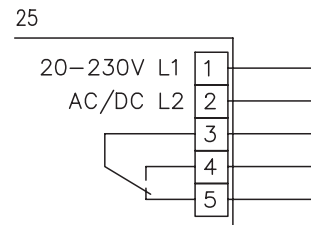
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction

Dimensioned drawing



Electrical connection



We reserve the right to make changes • 96_c02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared light

50 ... 1200mm
 50 ... 800mm
 0 ... 100%
 LED (modulated light)
 880nm

Red light

50 ... 700mm
 50 ... 500mm
 0 ... 100%
 LED (modulated light)
 660nm

Timing

Switching frequency 20Hz
 Response time 25ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 20 ... 230VAC, 50/60Hz
 20 ... 230VDC ± 10%
 Power consumption ≤ 2VA
 Switching output ³⁾ relay, 1 change-over contact
 Function characteristics light/dark switching (reversible)
 Switching voltage, relay 250VAC/DC
 Switching current, relay 250VAC, 3A/30VDC, 3A
 Switching power 750VA, $\cos\phi=1$

Indicators

LED green
 LED yellow
 LED yellow flashing

ready
 reflection
 reflection, no performance reserve

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

Metal housing

diecast zinc
 glass
 380g
 terminals

Plastic housing

polycarbonate
 plastic
 150g
 terminals

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-40°C ... +70°C
 Protective circuit ⁴⁾ 1, 4
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) suitable spark extinction must be provided with inductive or capacitive loads.
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

Tables

Red light

1	30	500	700
2	65	320	430
3	90	200	370

Infrared light

1	20	800	1200
2	60	420	950
3	80	290	570

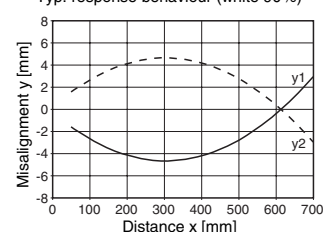
1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

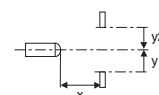
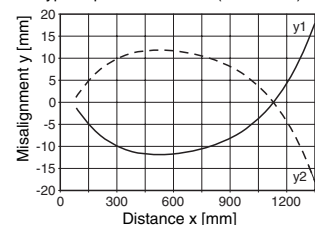
Red light

Typ. response behaviour (white 90%)



Infrared light

Typ. response behaviour (white 90%)



Order guide

Selection table		Order code →							
Equipment ↓		RT 96M/R-1560-800-25 Part No. 500 80079	RT 96M/R-1580-500-25 Part No. 500 81442	RT 96K/R-1560-800-25 Part No. 500 25155	RT 96K/R-1570-800-25 Part No. 500 25156				
Housing	metal	●	●						
	plastic			●	●				
Light source	red light (500mm)		●						
	infrared light (800mm)	●		●	●				
Connection	terminals	●	●	●	●				
Features	switching delay				●				

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- **Output-LED** (with option switching delay) display reacts like switching output - e.g. delayed.



RT 96

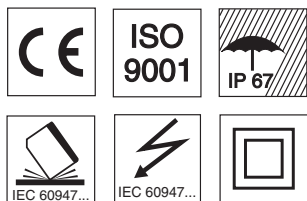
Energetic diffuse reflection light scanners



50 ... 700 mm
50 ... 1200 mm
20 ... 1200 mm



- Energetic scanner with sensitivity adjustment in visible red light or infrared light
- Robust plastic housing, protection class IP 67 for industrial application
- Complementary PNP switching outputs for PLC applications (light/dark switching)
- Display of changes in reflection properties of the objects to be detected through status display with integrated blink mode
- Connection via M12 connector or terminal compartment

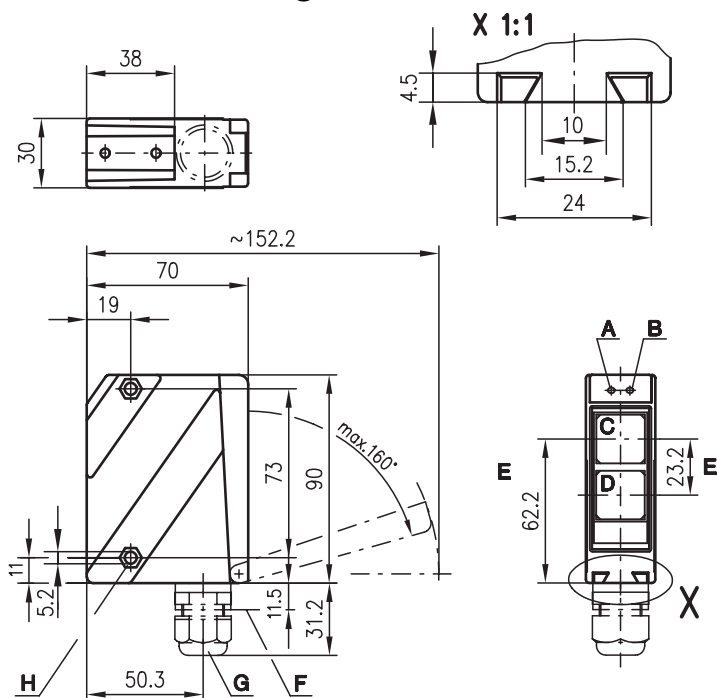


Accessories:

(available separately • see page 484)

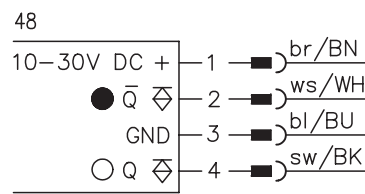
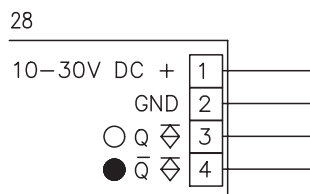
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Receiver
- D Transmitter
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- H Countersinking for SK nut M5, 4.2 deep
- I Connection terminals
- K Cable entry
- L Sensitivity adjustment

Electrical connection



We reserve the right to make changes • 96_c03e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
Scanning range ²⁾

Adjustment range
Light source
Wavelength

Timing

Switching frequency
Response time
Delay before start-up

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current
Sensitivity

Indicators

LED green
LED yellow
LED yellow flashing

Mechanical data

Housing
Optics cover
Weight
Connection type

Environmental data

Ambient temp. (operation/storage)
Protective circuit ³⁾
VDE safety class ⁴⁾
Protection class
Standards applied

Infrared light

50 ... 1200mm
50 ... 800mm
(20 ... 800mm, close range)
0 ... 100%
LED (modulated light)
880nm

Red light

50 ... 700mm
50 ... 500mm
0 ... 100%
LED (modulated light)
660nm

500Hz
1 ms
≤ 200ms

10 ... 30VDC (incl. residual ripple)
≤ 15% of U_B
≤ 30mA
2 PNP transistor outputs, complementary
light/dark switching (reversible)
≥ ($U_B - 2V$) / ≤ 2V
max. 100mA
adjustable

ready
reflection
reflection, no performance reserve

Plastic housing

polycarbonate
plastic
150g
terminals or M12 connector

-20°C ... +60°C / -40°C ... +70°C
1, 2, 3, 4
II, all-insulated
IP 67
IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Tables

Red light

1	30	500	700
2	65	320	430
3	90	200	370

Infrared light

1	20	800	1200
2	60	420	950
3	80	290	570

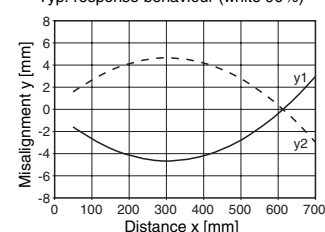
1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

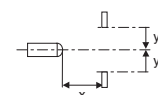
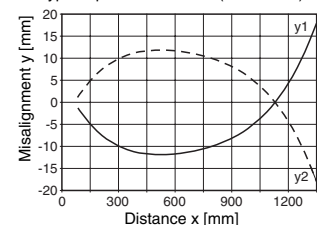
Red light

Typ. response behaviour (white 90%)



Infrared light

Typ. response behaviour (white 90%)



Order guide

Selection table		Order code →	RT 96K/P-2440-800-28 Part No. 500 82058	RT 96K/P-2444-800-28 Part No. 500 82057	RT 96K/P-2360-500-28 Part No. 500 82059					
Equipment ↓	Housing	metal								
		plastic	●	●	●					
Light source		red light (500mm)			●					
		infrared light (800mm)	●	●						
Connection		terminals	●	●	●					
		M12 connector								
Features		compl. switch. outputs	●	●	●					
		short range (20mm)		●						

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- **Short range**
objects are detected down to a minimum distance of 20mm (with standard types approx. 50mm).



HRT 96

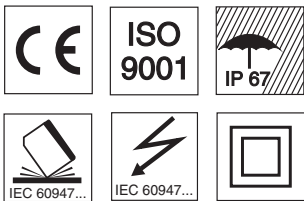
Diffuse reflection light scanner with background suppression



100 ... 1800 mm
100 ... 1200 mm



- Scanner with adjustable background suppression in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, scanning range adjustment and delay before start-up for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with switching delays, activation input and optics heating for use at low temperatures

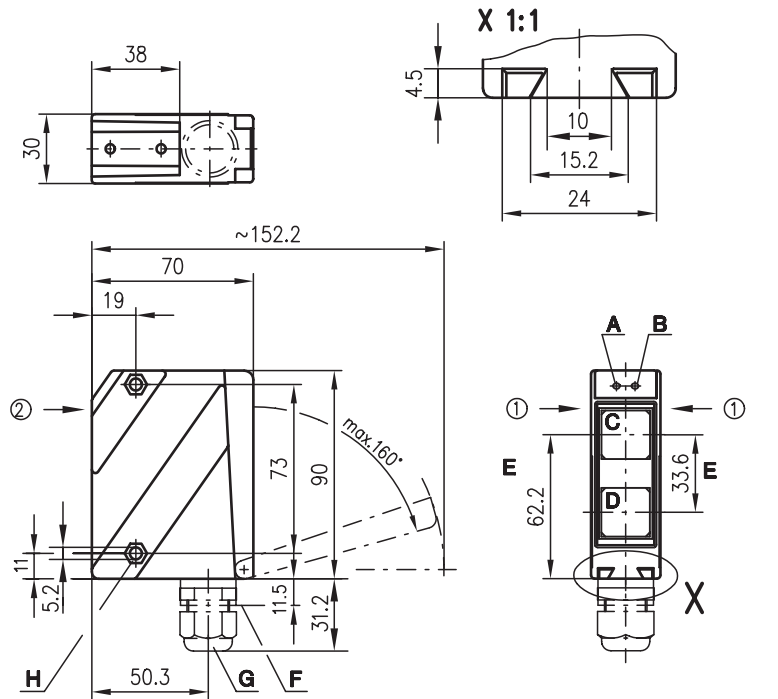


Accessories:

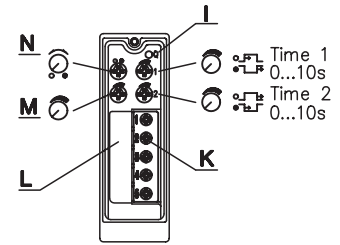
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

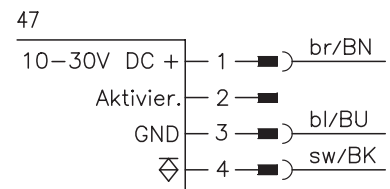
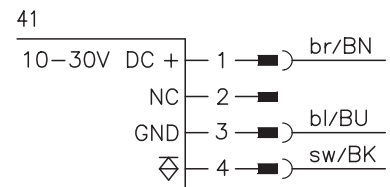
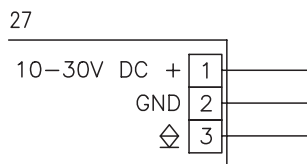
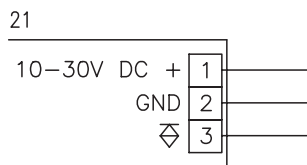
Dimensioned drawing



- A Indicator diode green
 - B Indicator diode yellow
 - C Transmitter
 - D Receiver
 - E Optical axis
 - F Device plug M12x1
 - G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
 - H Countersinking for SK nut M5, 4.2 deep
 - I Output with option switching delay
 - K Connection terminals
 - L Cable entry
 - M Scanning range adjustment
 - N Light/dark switching
- Preferred entry direction for objects ① + ②



Electrical connection



We reserve the right to make changes • 96_d01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared light

100 ... 1800mm
 see table
 150 ... 1200mm
 LED (modulated light)
 880nm

Red light

100 ... 1200mm
 see table
 100 ... 800mm
 LED (modulated light)
 660nm

Timing

Switching frequency 300Hz
 Response time 1.67ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 35mA, ≤ 75mA with optics heating
 Switching output PNP transistor
 Function characteristics light/dark switching (reversible)
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current max. 100mA

Indicators

LED green ready
 LED yellow reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals or M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3, 4
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Optics heating for temperature changes, prevents fogging
Low temperature down to -35°C
Switching delay (slow oper./release) 0 ... 10s (separately adjustable)
Activation input active ≥ 8V / ≤ 2V
 Transmitter active/not active ≤ 0.5ms
 Activation/disable delay 47KΩ ± 10%
 Input resistance

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protect., 2=polarity reversal protect., 3=short circuit protect. for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.
- The diffuse reflection light scanner is also available with integrated AS-i chip for direct connection to the AS-i system.
- **Output-LED**
 (with option switching delay) display reacts like switching output - e.g. delayed.

Order guide

Selection table		HRT 96M/P-1630-800-41 Part No. 500 80047	HRT 96M/P-1640-800-21 Part No. 500 25124	HRT 96M/P-1640-800-41 Part No. 500 25126	HRT 96M/P-1610-1200-21 Part No. 500 25116	HRT 96M/P-1610-1200-41 Part No. 500 25118	HRT 96M/P-1620-1200-21 Part No. 500 25114	HRT 96M/P-1620-1200-41 Part No. 500 61102	HRT 96M/N-1600-1200-27 Part No. 500 26036
Equipment ↓	Order code →								
	Light source	red light (800mm)	●	●	●				
Connection	infrared light (1200mm)				●	●	●	●	●
	terminals		●		●		●		●
Features	M12 connector	●		●		●		●	
	optics heating/low temp.						●	●	
	switching delay		●	●	●	●	●	●	
	activation input								
	NPN switching output								●

Tables

Red light

1	100	800	1200
2	100	770	1140
3	100	730	1050

Infrared light

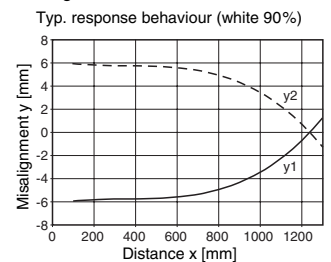
1	100	1200	1800
2	100	1100	1600
3	100	1000	1350

1	white 90%
2	grey 18%
3	black 6%

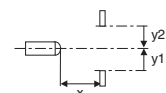
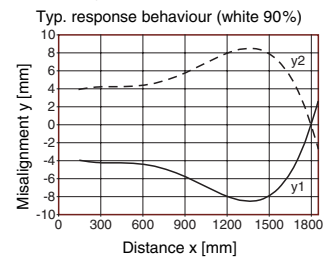
□ Scanning range [mm]
 ■ Typ. scanning range limit [mm]

Diagrams

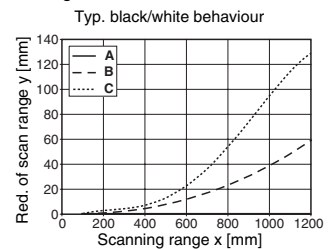
Red light



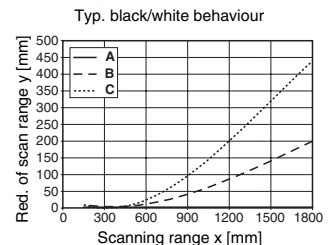
Infrared light



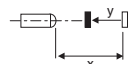
Red light



Infrared light



A white 90%
 B grey 18%
 C black 6%





HRT 96

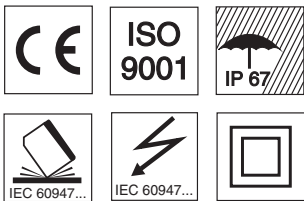
Diffuse reflection light scanner with background suppression



100 ... 1800 mm
100 ... 1200 mm



- Scanner with adjustable background suppression in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- General light/dark switching, scanning range adjustment and delay before start-up for optimal adaptation to the application
- Connection via M12 connector or terminal compartment
- Multiple options with switching delays, activation input and optics heating for use at low temperatures

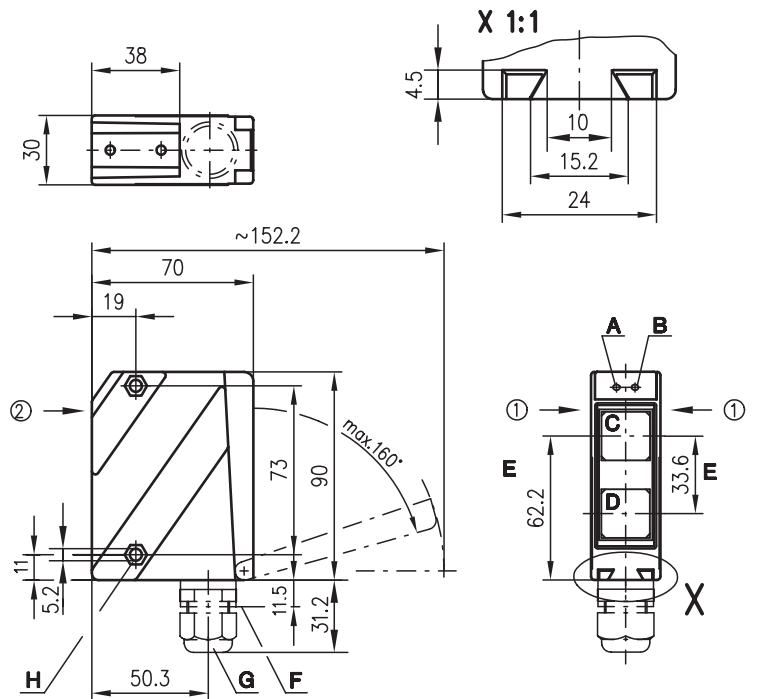


Accessories:

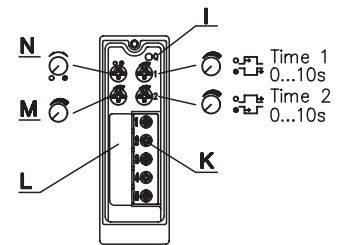
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

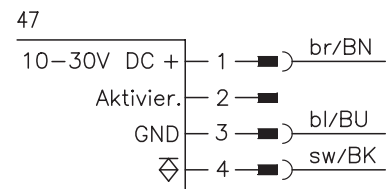
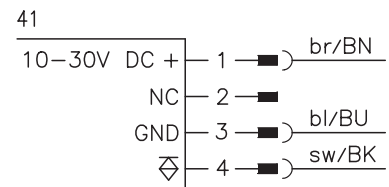
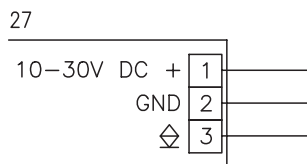
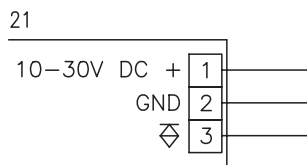
Dimensioned drawing



- A Indicator diode green
 - B Indicator diode yellow
 - C Transmitter
 - D Receiver
 - E Optical axis
 - F Device plug M12x1
 - G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
 - H Countersinking for SK nut M5, 4.2 deep
 - I Output with option switching delay
 - K Connection terminals
 - L Cable entry
 - M Scanning range adjustment
 - N Light/dark switching
- Preferred entry direction for objects ① + ②



Electrical connection



We reserve the right to make changes • 96_d09e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
Scanning range ²⁾
Adjustment range
Light source
Wavelength

Infrared light

100 ... 1800mm
see table
150 ... 1200mm
LED (modulated light)
880nm

Red light

100 ... 1200mm
see table
100 ... 800mm
LED (modulated light)
660nm

Timing

Switching frequency 300Hz
Response time 1.67ms
Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
Residual ripple ≤ 15% of U_B
Bias current ≤ 35mA, ≤ 75mA with optics heating
Switching output PNP transistor
Function characteristics light/dark switching (reversible)
Signal voltage high/low ≥ (U_B-2V)/≤ 2V
Output current max. 100mA

Indicators

LED green ready
LED yellow reflection

Mechanical data

Housing polycarbonate
Optics cover plastic
Weight 150g
Connection type terminals or M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-40°C ... +70°C
Protective circuit³⁾ 1, 2, 3, 4
VDE safety class⁴⁾ II, all-insulated
Protection class IP 67
Standards applied IEC 60947-5-2

Options

Optics heating for temperature changes, prevents fogging
Low temperature down to -35°C
Switching delay (slow oper./release) 0 ... 10s (separately adjustable)
Activation input active (high) ≥ 8V/≤ 2V
Transmitter active/not active ≤ 0.5ms
Activation/disable delay 47KΩ ± 10%
Input resistance

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protect., 2=polarity reversal protect., 3=short circuit protect. for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.
- The diffuse reflection light scanner is also available with integrated AS-i chip for direct connection to the AS-i system.
- **Output-LED**
(with option switching delay) display reacts like switching output - e.g. delayed.

Order guide

Selection table		HRT 96K/P-1630-800-41 Part No. 500 80242	HRT 96K/P-1600-1200-21 Part No. 500 25135	HRT 96K/P-1600-1200-41 Part No. 500 25133	HRT 96K/P-1610-1200-21 Part No. 500 25134	HRT 96K/P-1630-800-21 Part No. 500 80327	HRT 96K/P-1640-800-41 Part No. 500 81464	HRT 96K/P-1631-800-47 Part No. 500 38471
Order code →								
Equipment ↓	Light source	red light (800mm)	•			•	•	•
		infrared light (1200mm)		•	•	•		
Connection	terminals		•		•	•		
	M12 connector	•		•			•	•
Features	optics heating/low temp.							
	switching delay				•		•	
	activation input							•
	NPN switching output							

Tables

Red light

1	100	800	1200
2	100	770	1140
3	100	730	1050

Infrared light

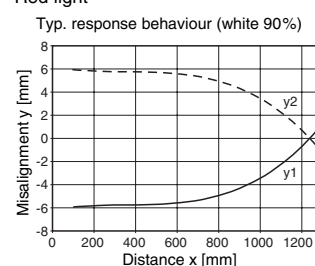
1	100	1200	1800
2	100	1100	1600
3	100	1000	1350

1	white 90%
2	grey 18%
3	black 6%

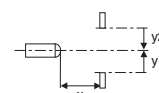
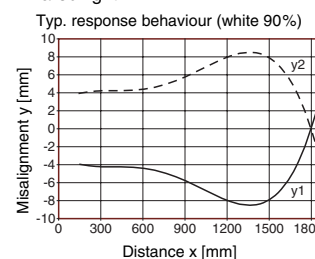
□ Scanning range [mm]
▒ Typ. scanning range limit [mm]

Diagrams

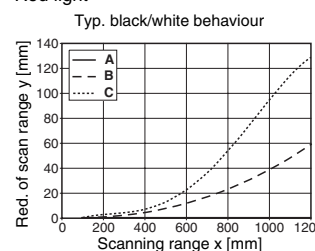
Red light



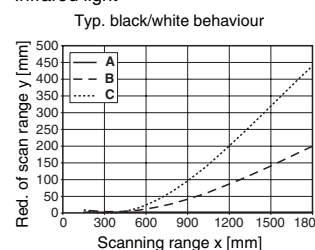
Infrared light



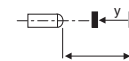
Red light



Infrared light



A white 90%
B grey 18%
C black 6%





HRT 96

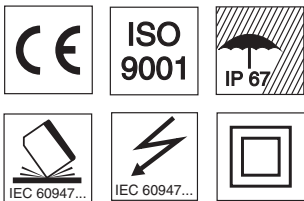
Diffuse reflection light scanner with background suppression



100 ... 1800 mm



- Scanner with adjustable background suppression in infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- All-mains design 20 ... 230 VAC/DC with relay output
- General light/dark switching, scanning range adjustment and delay before start-up for optimal adaptation to the application
- Connection via comfortable terminal compartment up to 1.5 mm²
- Version with additional switching delay

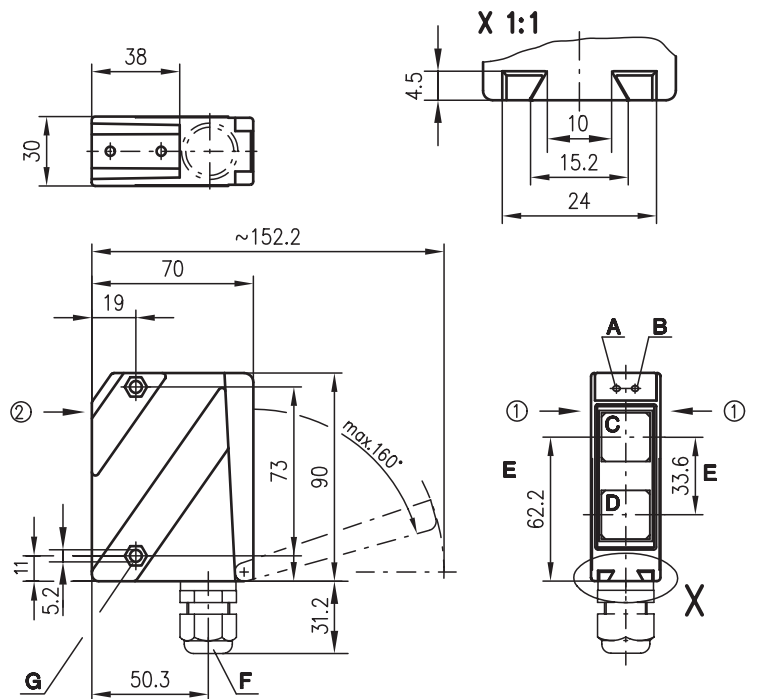


Accessories:

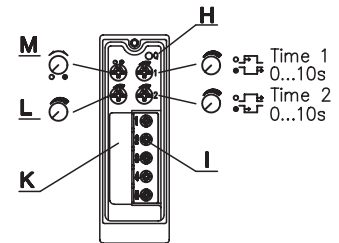
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- Spark extinction

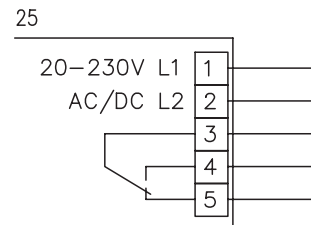
Dimensioned drawing



- A Indicator diode green
 - B Indicator diode yellow
 - C Transmitter
 - D Receiver
 - E Optical axis
 - F Screwed cable gland M16x1.5 for Ø 5 ... 10 mm
 - G Countersinking for SK nut M5, 4.2 deep
 - H Output with option switching delay
 - I Connection terminals
 - K Cable entry
 - L Scanning range adjustment
 - M Light/dark switching
- Preferred entry direction for objects ① + ②



Electrical connection



We reserve the right to make changes • 96_d02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared light

100 ... 1800mm
 see table
 150 ... 1200mm
 LED (modulated light)
 880nm (infrared)

Timing

Switching frequency 20Hz
 Response time 25ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 20 ... 230VAC, 50/60Hz
 20 ... 230VDC ± 10%
 Power consumption ≤ 1,5VA
 Switching output ³⁾ relay, 1 change-over contact
 Function characteristics light/dark switching (reversible)
 Switching voltage, relay 250VAC/DC
 Switching current, relay 250VAC, 3A/30VDC, 3A
 Switching power, relay 750VA, $\cos\phi=1$

Indicators

LED green ready
 LED yellow reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals

Plastic housing

polycarbonate
 plastic
 150g
 terminals

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-40°C ... +70°C
 Protective circuit ⁴⁾ 1, 4
 VDE safety class ⁵⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Switching delay (slow oper./release) 0 ... 10s (separately adjustable)

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) suitable spark extinction must be provided with inductive or capacitive loads.
- 4) 1=transient protection, 4=interference blanking
- 5) Rating voltage 250VAC

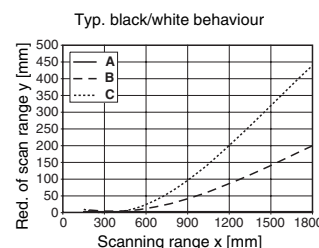
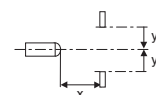
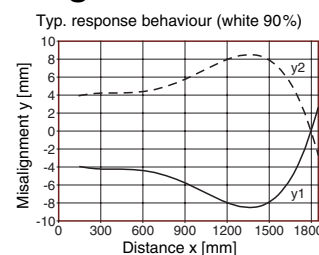
Tables

1	100	1200	1800
2	100	1100	1600
3	100	1000	1350

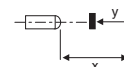
1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams



- A white 90%
- B grey 18%
- C black 6%



Order guide

Selection table		Order code →								
Equipment ↓		HRT 96K/R-1680-1200-25 Part No. 500 25132	HRT 96K/R-1690-1200-25 Part No. 500 25131	HRT 96M/R-1680-1200-25 Part No. 500 80076	HRT 96M/R-1690-1200-25 Part No. 500 80075					
Housing	metal			●	●					
	plastic	●	●							
Light source	infrared light (1200mm)	●	●	●	●					
Connection	terminals	●	●	●	●					
Features	switching delay		●		●					

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.
- **Output-LED** (with option switching delay) display reacts like switching output - e.g. delayed.



HRT 96

Diffuse reflection light scanner with background suppression

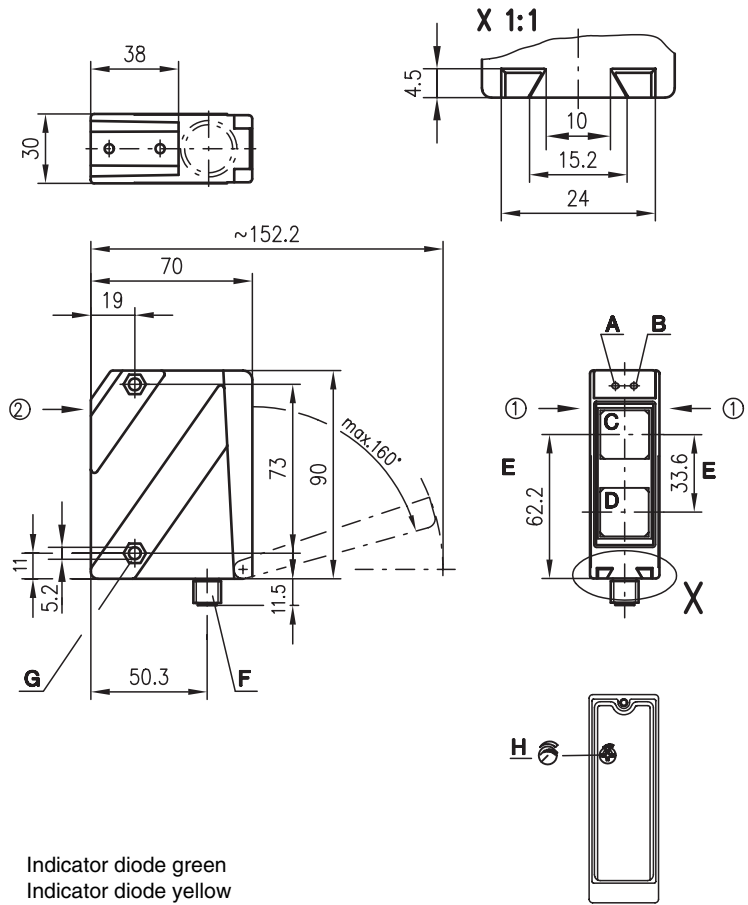


100 ... 1800 mm
100 ... 1200 mm



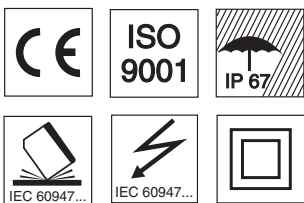
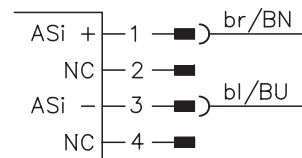
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- Access to all sensor functions via an AS-interface without additional wiring
- Scanning range adjustment and ready indicator for optimal adaptation to the application
- Common conductor for both power and data reduces installation work

Dimensioned drawing



- A Indicator diode green
 - B Indicator diode yellow
 - C Receiver
 - D Transmitter
 - E Optical axis
 - F Device plug M12x1
 - G Countersinking for SK nut M5, 4.2 deep
 - H Scanning range adjustment
- Preferred entry direction for objects ① + ②

Electrical connection



Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

AS-i Accessories:

(available separately)

- Bus terminals
- AS-i ribbon cable
- Address programming device
- Coupling modules
- Intermediate cables etc.

We reserve the right to make changes • 96_d03e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

Infrared

100 ... 1800mm
 see table
 150 ... 1200mm
 LED (modulated light)
 880nm (infrared)

Red light

100 ... 1200mm
 see table
 100 ... 800mm
 LED (modulated light)
 660nm

Timing

Sensor switching frequency
 Sensor response time
 Delay before start-up
 Electrical data
 Operating voltage U_B
 Bias current

300Hz
 1.67ms
 ≤ 200 ms

26.5V ... 31.6V (according to AS-i specification)
 ≤ 40 mA per sensor

Indicators

LED green
 LED yellow

ready
 reflection

Mechanical data

Housing
 Optics cover
 Weight
 Connection type

Metal housing

diecast zinc
 glass
 380g
 M12 connector

Environmental data

Ambient temp. (operation/storage)
 Protective circuit ³⁾
 VDE safety class ⁴⁾
 Protection class
 Standards applied

-20°C ... +60°C/-40°C ... +70°C
 1, 4
 II, all-insulated
 IP 67
 IEC 60947-5-2

AS-i data for receiver

I/O code 1
 ID code 1
 Address programmed by the user in the range of 1 to 31 (default=0)
 Cycle time acc. to AS-i specification 5ms
 AS-i standard according to profile S-1.1

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 4=interference blanking
- 4) Rating voltage 250 VAC

Assignment: data bits				Assignment: parameter bits			
		Programming (host level)				Programming (host level)	
D ₀	switching output	0 no reflection 1 reflection	system input	*P ₀	NC	0 1	system parameter
D ₁	NC	0 1	system input	*P ₁	light/dark switching	0 dark switching 1 light switching	system parameter
D ₂	ready output	0 sensor not ready 1 sensor ready	system input	*P ₂	NC	0 1	system parameter
*D ₃	Activation input	0 transmitter on 1 transmitter off	system output	*P ₃	NC	0 1	system parameter

* default = 1

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Order guide

	Designation	Part No.
Infrared light	HRT 96M/A-1660-1200-44	500 25112
Red light	HRT 96M/A-1670-800-44	500 80048

Tables

Red light

1	100	800	1200
2	100	770	1140
3	100	730	1050

Infrared light

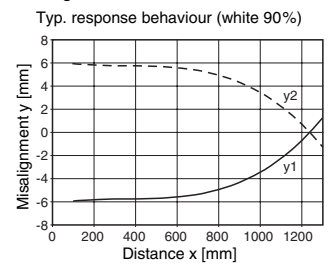
1	100	1200	1800
2	100	1100	1600
3	100	1000	1350

1	white 90%
2	grey 18%
3	black 6%

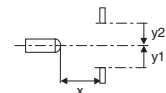
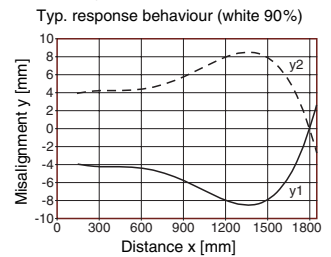
Scanning range [mm]
 Typ. scanning range limit [mm]

Diagrams

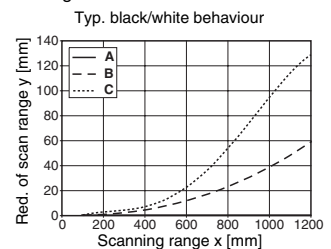
Red light



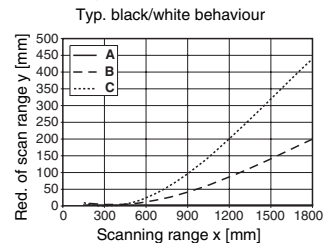
Infrared light



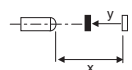
Red light



Infrared light



A white 90%
 B grey 18%
 C black 6%





HRT 96

Diffuse reflection light scanner with background suppression

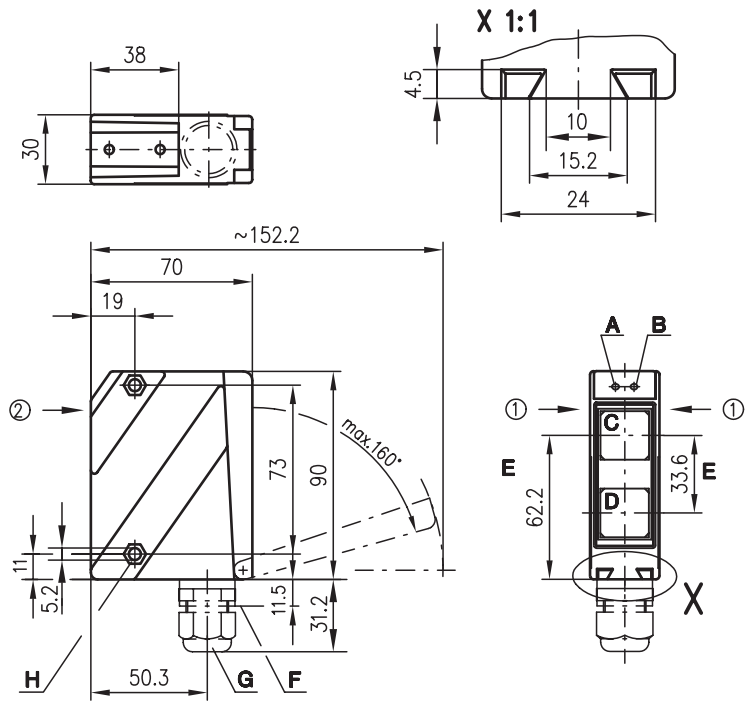


100 ... 1800 mm
100 ... 1200 mm

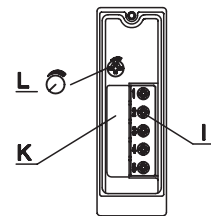


- Scanner with adjustable background suppression in visible red light or infrared light
- Robust plastic housing, protection class IP 67 for industrial application
- Complementary PNP switching outputs for PLC applications (light/dark switching)
- Exact switching for different surface properties
- Connection via M12 connector or terminal compartment

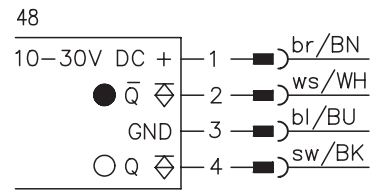
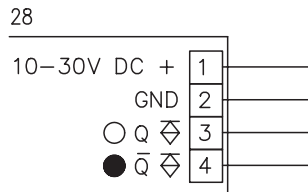
Dimensioned drawing



- A Indicator diode green
 - B Indicator diode yellow
 - C Transmitter
 - D Receiver
 - E Optical axis
 - F Device plug M12x1
 - G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
 - H Countersinking for SK nut M5, 4.2 deep
 - I Connection terminals
 - K Cable entry
 - L Scanning range adjustment
- Preferred entry direction for objects ① + ②



Electrical connection

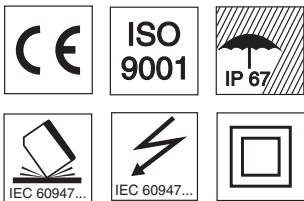


Accessories:

(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)

We reserve the right to make changes • 96_d04e.fm





Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾
Scanning range ²⁾
Adjustment range
Light source
Wavelength

Infrared light

100 ... 1800mm
see table
150 ... 1200mm
LED (modulated light)
880nm

Red light

100 ... 1200mm
see table
100 ... 800mm
LED (modulated light)
660nm

Timing

Switching frequency
Response time
Delay before start-up

300Hz
1.67ms
≤ 200ms

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current

10 ... 30VDC (incl. residual ripple)
≤ 15% of U_B
≤ 35mA
2 PNP transistor outputs, complementary
light/dark switching
≥ (U_B-2V)/≤ 2V
max. 100mA

Indicators

LED green
LED yellow

ready
reflection

Mechanical data

Housing
Optics cover
Weight
Connection type

Plastic housing

polycarbonate
Plastic
150g
terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)
Protective circuit³⁾
VDE safety class⁴⁾
Protection class
Standards applied

-20°C ... +60°C/-40°C ... +70°C
1, 2, 3, 4
II, all-insulated
IP 67
IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Order guide

Selection table		HRT 96K/P-2600-1200-28 Part No. 500 82054	HRT 96K/P-2630-800-28 Part No. 500 82055	HRT 96K/P-2630-800-48 Part No. 500 33249			
Order code →							
Equipment ↓							
Housing	plastic	●	●	●			
Light source	red light (800mm)		●	●			
	infrared light (1200mm)	●					
Connection	terminals	●	●				
	M12 connector			●			
Features	switching delay						

Tables

Red light

1	100	800	1200
2	100	770	1140
3	100	730	1050

Infrared light

1	100	1200	1800
2	100	1100	1600
3	100	1000	1350

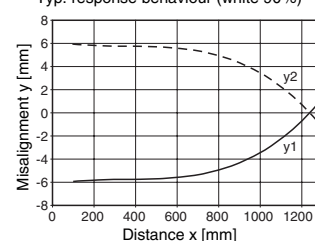
1	white 90%
2	grey 18%
3	black 6%

□ Scanning range [mm]
 ■ Typ. scanning range limit [mm]

Diagrams

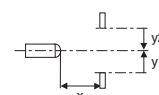
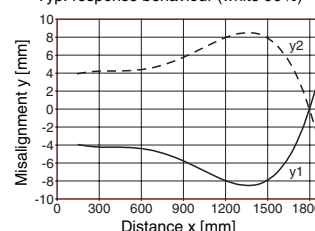
Red light

Typ. response behaviour (white 90%)



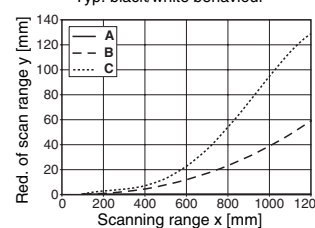
Infrared light

Typ. response behaviour (white 90%)



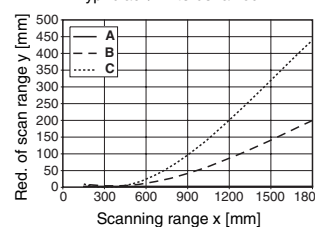
Red light

Typ. black/white behaviour

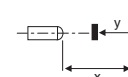


Infrared light

Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%





HRT 96

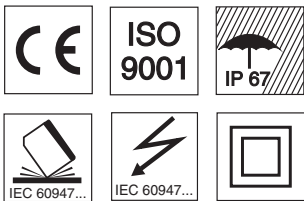
Diffuse reflection light scanner with background suppression



100 ... 2500mm



- Scanner with adjustable background suppression
- Two switching points
- Individual adaptation to applications by means of programming and diagnosis software
- Universal sensor application through optional foreground suppression or exact edge detection
- General light/dark switching or complementary switching output, scanning range adjustment and delay before start-up for optimal adaptation to the application
- Robust metal housing with glass cover, protection class IP 67 for industrial application

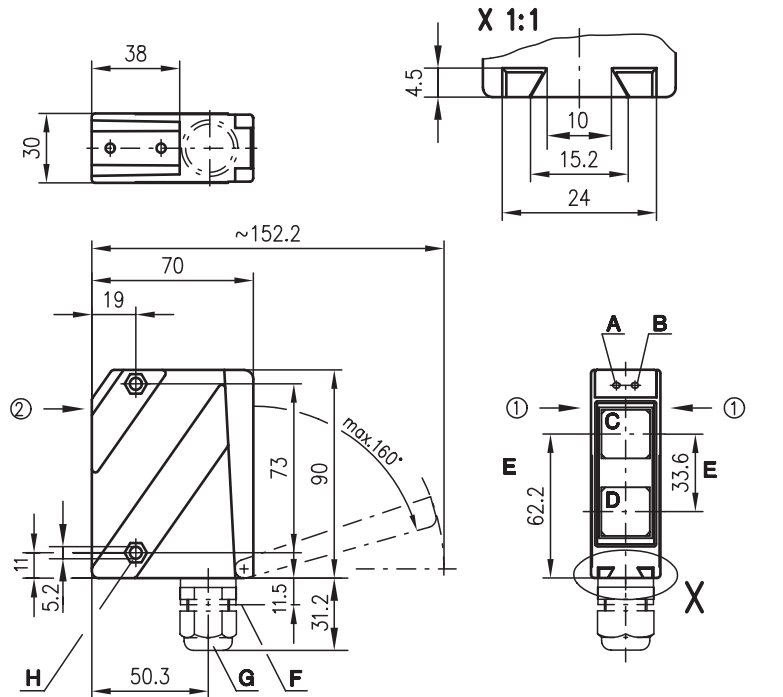


Accessories:

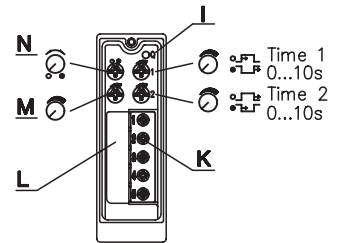
(available separately • see page 484)

- Mounting systems (BT 96, BT 96.1, BT 450.1-96, UMS 96)
- Programming device UPG-2, Programming software
- M 12 connectors (KD ...)

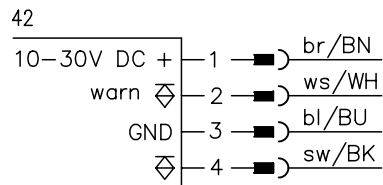
Dimensioned drawing



- A Indicator diode green
 - B Indicator diode yellow
 - C Transmitter
 - D Receiver
 - E Optical axis
 - F Device plug M12x1
 - G Screwed cable gland M16x1.5 for Ø 5 ... 10mm
 - H Countersinking for SK nut M5, 4.2 deep
 - I Output with option switching delay
 - K Connection terminals
 - L Cable feeding
 - M Scanning range adjustment
 - N Light/dark switching
- Preferred entry direction for objects ① + ②



Electrical connection



We reserve the right to make changes • 96_d06e.fm

Specifications

Optical Data

Typ. scanning range limit (white 90%) ¹⁾
 Scanning range ²⁾
 Adjustment range
 Light source
 Wavelength

HRT...1600...
 100 ... 2500mm
 see table
 150 ... 2000mm
 LED (modulated light)
 880nm

HRT...3604...
 10 ... 2500mm
 see table
 150 ... 2000mm

Timing

Switching frequency 300Hz
 Response time 1.67ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30 V DC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 35mA
 Switching output PNP transistor
 Function characteristics light / dark switching (switchable)
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$
 Output current max. 100mA

Indicators

Sensor front

LED green ready
 LED yellow reflection

Sensor back

ready
 reflection

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type M 12 connector

Metal housing

Environmental data

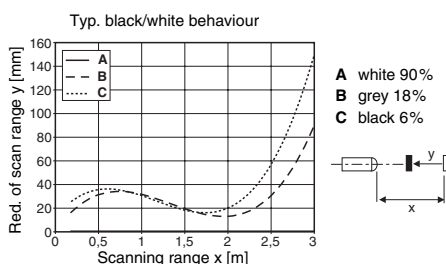
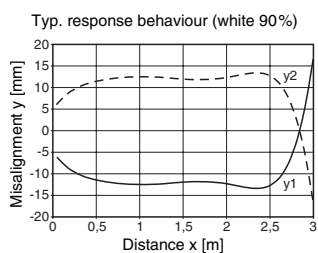
Ambient temp. (operation/storage) -20°C ... +60°C / -40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3, 4
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Switching delay (pickup/dropout delay) 0 ... 10s (separately adjustable)

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protect., 2=polarity reversal protect., 3=short circuit protect. for all outputs, 4=interference blanking
- 4) Rating voltage 250 V AC

Diagrams



Order guide

Selection table		Order code →								
		HRT 96M/IP-1600-2000-42	HRT 96M/IP-3604-2000-42							
		Part No. 500 60857	Part No. 500 60858							
Equipment ↓										
Housing	metal	●	●							
Light source	infrared light (2000mm)	●	●							
Connection	M 12 pin connector	●	●							
	short range		●							
	2 switching points		●							
Features	switching delay	●	●							
	compl. switch. outputs	●								

HRT 96 M/P-1600-2000-42 - 02
 HRT 96 M/P-3604-2000-42 - 02

Tables

1	100	2000	2500
2	100	1990	2470
3	100	1980	2430

1	white 90%
2	grey 18%
3	black 6%

□ Scanning range [mm]
 □ Typ. scanning range limit [mm]

Switching points	LED red	LED green	LED yellow
no reflection	on	on	off
no detection (reflection on background)	off	off	off
detection distant range	off	on	on
detection close range	on	on	on

Remarks

- **General**
 With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.
- **Red light**
 Scanning range reduction by approx. 20% compared to infrared sensor.

HRT 96...3604...

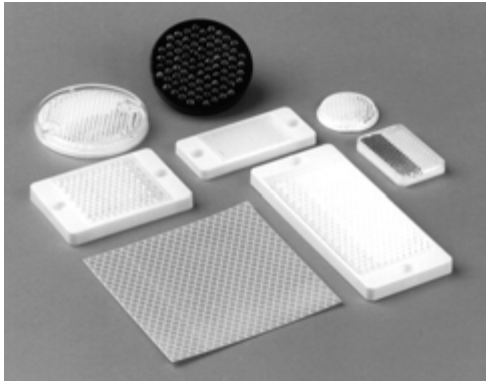
- **Switching points**
 Fixed ratio between short and distant range s.r. ~0.5 x.d.r. Adjusting the distant range also sets the short range.
- **Switching output**
 Pin/terminal
 4/3=distant range
 2/4=short range (standard)
 2/4=programmable (e.g. activation input, compl. switching output)

HRT 96...1600...

- **Switching output**
 Pin/terminal
 4/3=switching output
 2/4=compl. switching output



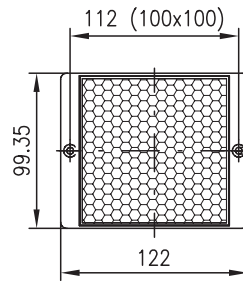
Reflectors



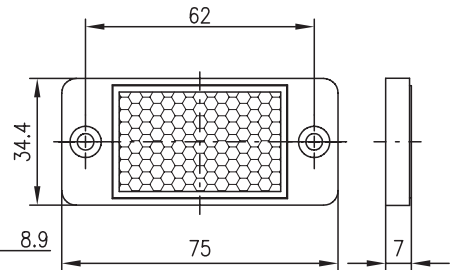
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

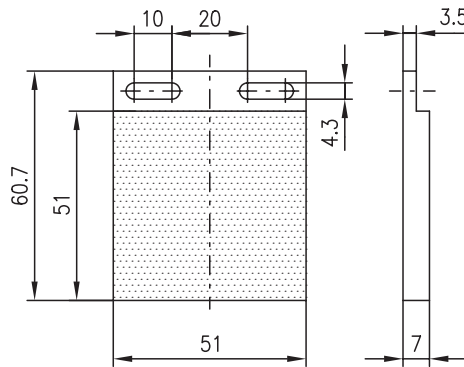
TKS 100 x 100



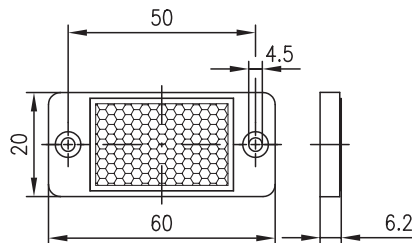
TKS 30 x 50



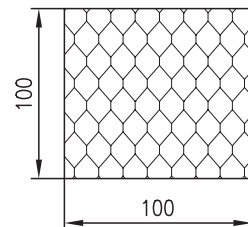
MTKS 50 x 50



TKS 20 x 40



Tape No. 2



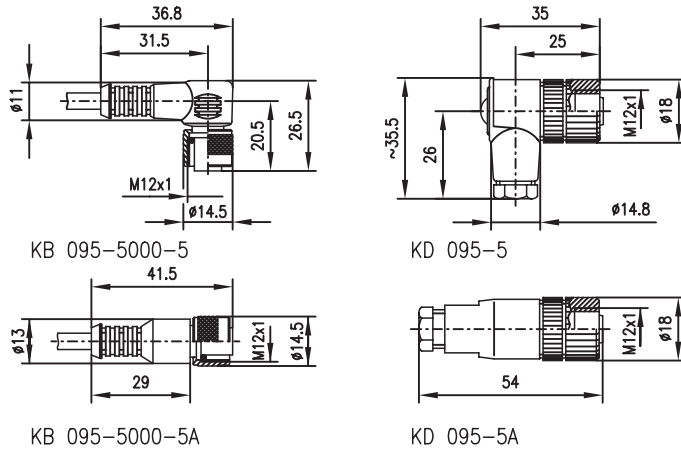
Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 96_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
TK(S) 82	500 03187
Tape 2	500 11523
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 96	500 25570
BT 96.1	500 80614
UMS 96	500 26204
UMS 96-82	500 27191
BT 450.1-96	500 82084
ARH 96	500 80502

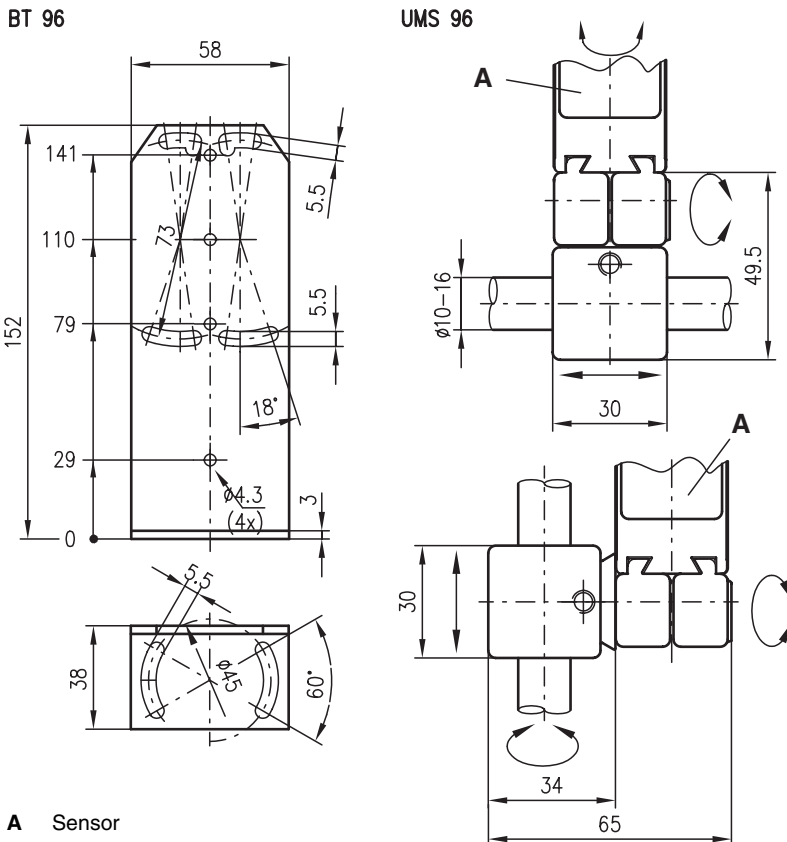
Dimensioned drawings



Selection table

M12 connectors				
with cable		without cable		
M12	KB 418-5000-3	KB 418-5000-3A	KD 095-5	KD 095-5A
M12	KB xxx-xxxx-x Ready-made cables for 450 series	KB xxx-xxxx-xA Ready-made cables for 450 series		

Dimensioned drawings



Connectors, plugs, cables

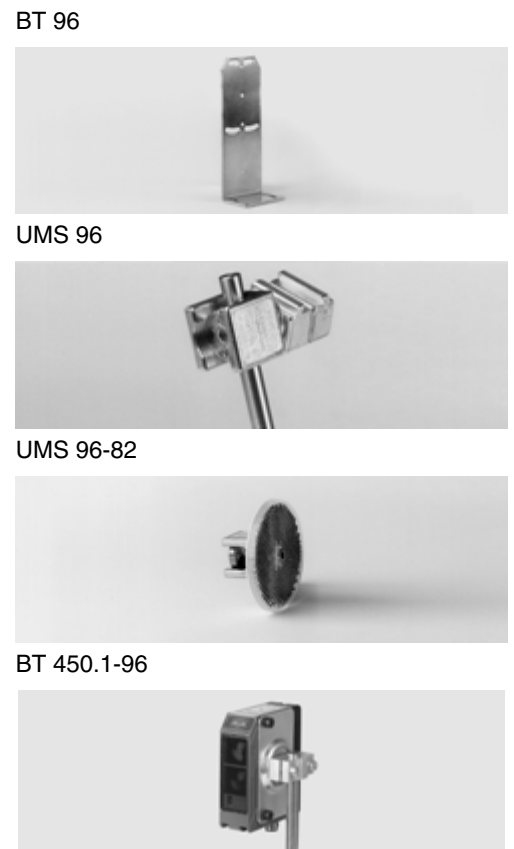


For devices with M12 connectors, there are available: 2 connectors with ready-made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050) plugged and screwed: IP 67

Important: With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems





85 Series

Overview and advantages

Extensive sensor series:

- In robust metal housing with glass optics
- In protection class IP 65

Operating principles:

- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression

- Visible red light for easy alignment
- Infrared light for increased indifference to ambient light
- Large operating range

- 10 ... 30VDC voltage with PNP (NPN) transistor output
- 22 ... 250V all mains voltage with relay output
- Various special voltages

M12 connector or standard plug with screw connection

Mounting holes for fast mounting

Options:

- Warning output
- Switching delay
- De-humidifying system





Operating principle	Designation	Typ. operating range limit/ scanning range	Housing	Light source		Operating voltage				
				Red light	Infrared	22 ... 250 VAC/DC	10 ... 30 VDC	24 VDC	230 VAC	Special voltages
			Metal							
	LS 85/4	65m	•		•		•			
	ILS 85/4	65m	•		•		•			
	LS 85/4 W.2	13m	•		•		•			
	LS 85/4 W.3	13m	•		•		•			
	LS 85/4 L.1	65m	•		•		•			
	LS 85/2	65m	•		•			•		
	LS 85/7	65m	•		•				•	•
	SLS 85M/P-1750-T2-4	78m	•		•		•			
SLS 85M/P-1750-T2-8	78m	•		•		•				
	RK 85/4	7.5m	•		•		•			
	IRK 85/4	7.5m	•		•		•			
	RK 85/2	7.5m	•		•		•			
	RK 85/7	6m	•		•				•	•
	RK 85/7 Z1	6m	•		•				•	•
	RK 85/7-10	10m	•		•				•	
	RK 85/7-10 UC	10m	•		•	•				
	PRK 85/4	7.5m	•	•			•			
	PRK 85/7 UC	7.5m	•	•		•				
		RK 85/4-300	0.3m	•		•		•		
RK 85/4-800		0.8m	•		•		•			
RK 85/4-2000		2m	•		•		•			
RK 85/2-300		0.3m	•		•		•			
RK 85/2-800		0.8m	•		•		•			
RK 85/2-2000		2m	•		•		•			
RK 85/7-300		0.3m	•		•				•	•
RK 85/7-800		0.8m	•		•				•	•
RK 85/7-2000		2m	•		•				•	•
	FRK 85/4-800	0.8m	•		•		•			
	FRK 85/4-800 L.1	0.8m	•		•		•			
	FRK 85/2-800	0.8m	•		•		•			



Output			Switching frequency	Switching		Connection		Options							Page
PNP transistor	NPN transistor	Relay		Light	Dark	M12 connector	Standard plug	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Transparent media	Switching delay	
•			100Hz	•			•								491
•			100Hz	•			•	•							491
•			100Hz	•			•								491
•			100Hz	•			•								491
•			100Hz	•		•									491
	•		100Hz	•			•								491
		•	20Hz	•			•								493
•			300Hz	•		•					•				495
•			300Hz	•			•				•				495
•			200Hz	•	•		•								497
•			200Hz	•	•		•	•							497
	•		200Hz	•	•		•								497
		•	20Hz	•	•		•								499
		•	20Hz	•	•		•							•	499
		•	20Hz	•	•		•								499
		•	20Hz	•	•		•								499
•			200Hz	•	•		•		•						501
		•	20Hz	•	•		•		•						503
•			200Hz	•	•		•					•			505
•			200Hz	•	•		•					•			505
•			200Hz	•	•		•					•			505
	•		200Hz	•	•		•					•			505
	•		200Hz	•	•		•					•			505
	•		200Hz	•	•		•					•			505
		•	20Hz	•	•		•					•			507
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•			100Hz	•	•	•				•					509
	•		100Hz	•	•		•			•					509



LS 85

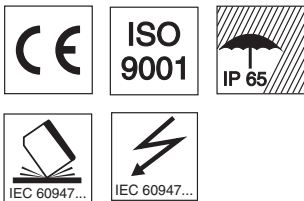
Throughbeam photoelectric sensors



65m

10 - 30 V
DC

- Wide voltage range 10 ... 30V with NPN or PNP switching output for PLC applications
- Light switching and delay before start-up for optimal adaptation to applications
- Wide angle version as an option
- Connection via M12 connector or standard plug with screw connector up to 1.5mm²

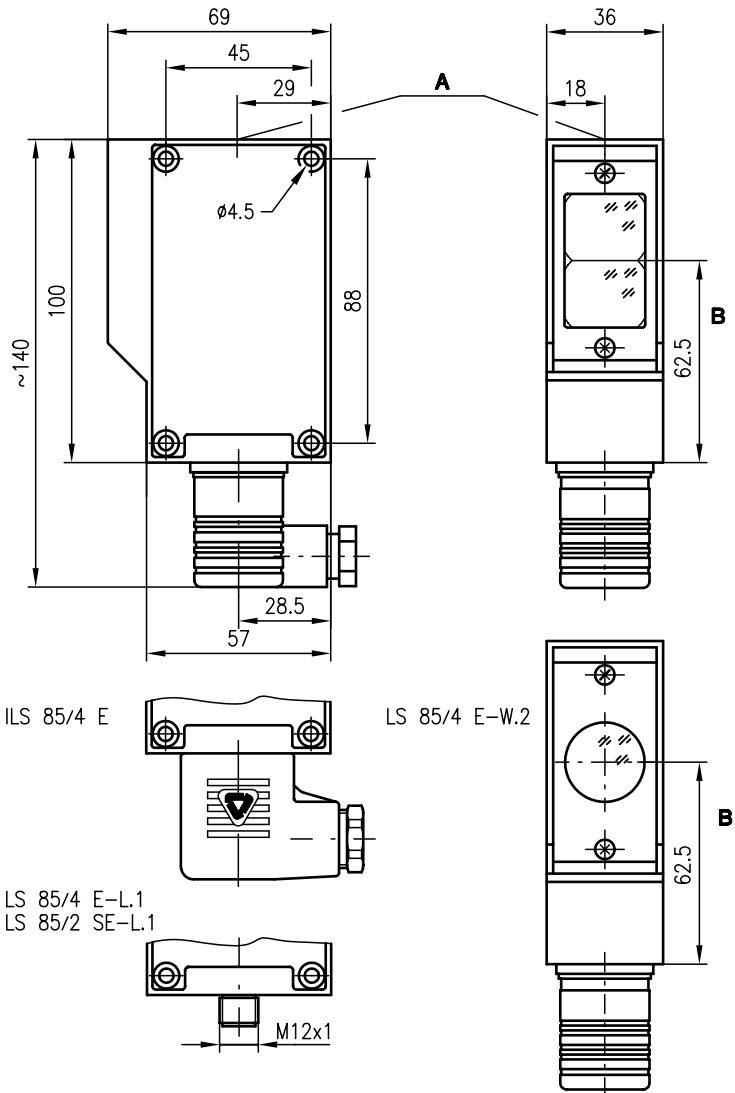


Accessories:

(available separately • see page 510)

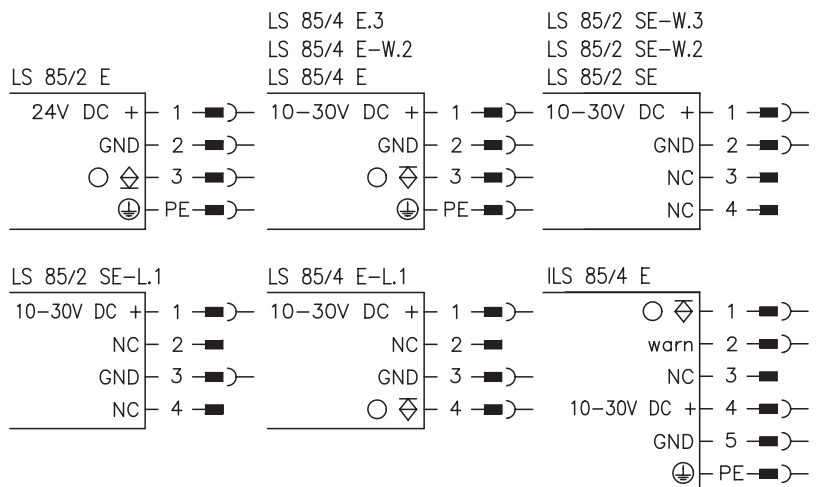
- Mounting systems (BT 85)
- M12 connectors (KD ...)
- Alignment aid ARH 2

Dimensioned drawing



- A Indicator diode only at receiver
- B Optical axis

Electrical connection



We reserve the right to make changes • 85_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 65m (13/wide angle version)
Operating range ²⁾	0 ... 50m (10/wide angle version)
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz
Sensor response time	2.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple) 24V ± 10%
Residual ripple	≤ 15% of U _B
Bias current	≤ 30mA
Switching output	PNP/NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA

Indicators

LED yellow	light path free, alignment aid
------------	--------------------------------

Mechanical data

Housing	diecast aluminium
Weight	transmitter 350g, receiver 350g
Optics cover	glass
Connection type	M12 connector or standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage) ³⁾	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class ⁵⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Warning output autoControl warn	PNP transistor, 100mA, counting principle
De-humidifying system	to prevent condensation on the optics (due to temperature changes)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
- 5) Rating voltage 250VAC

Tables

Diagrams

Order guide

Selection table		Order code →							Remarks
Equipment ↓		LS 85/4 Part No. 500 00246 (SE) Part No. 500 00248 (E)	ILS 85/4 Part No. 500 00246 (SE) Part No. 500 10975 (E)	LS 85/4 W/2 Part No. 500 17945 (SE) Part No. 500 17946 (E)	LS 85/4 W/3 Part No. 500 27085 (SE) Part No. 500 23739 (E)	LS 85/4 L/1 Part No. 500 20263 (SE) Part No. 500 20264 (E)	LS 85/2 Part No. 500 00246 (SE) Part No. 500 00247 (E)		
Housing	metal	●	●	●	●	●	●		
Operating range	50m	●	●			●	●		
	10m			●	●				
Connection	standard plug	●	●	●	●		●		
	M12 connector ¹⁾					●			
Features									
Voltage supply	10 ... 30V	●	●	●	●	●			
	24V						●		
Switching output	PNP	●	●	●	●	●			
	NPN						●		
Warning output			●						
Wide angle				●	●				
Dehumidification		●	●			●	●		
Clocked output (30Hz)				●					

1) not part of the delivery contents



LS 85

Throughbeam photoelectric sensors

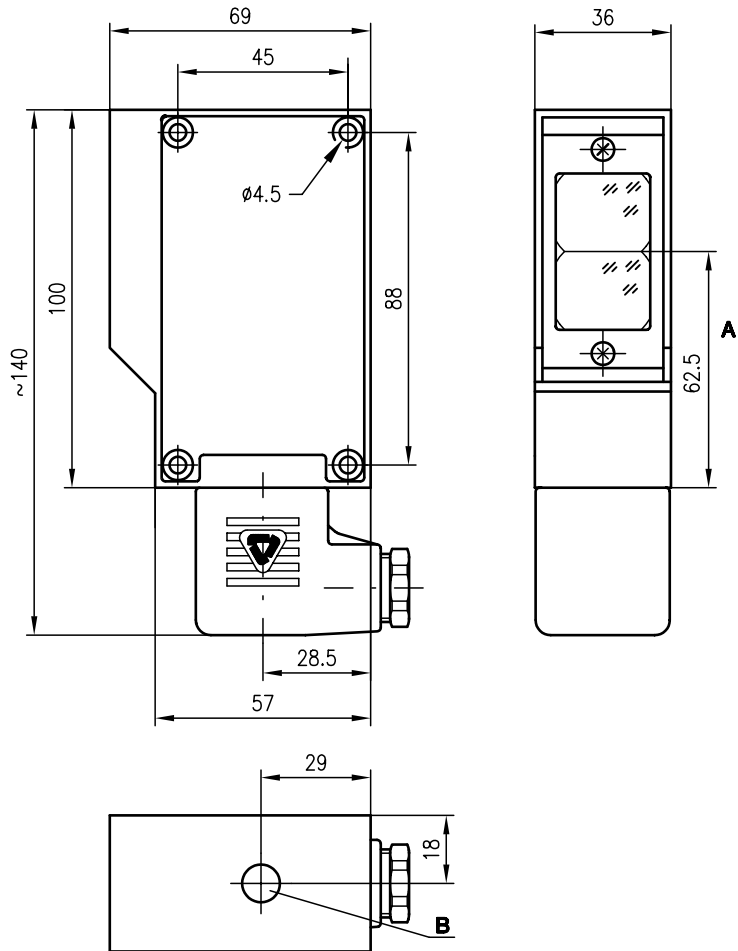


65m



- AC version 230VAC with relay output
- Special voltages for universal application
- Light switching and delay before start-up for optimal adaptation to applications
- Connection via standard plug with screw connector up to 1.5mm²

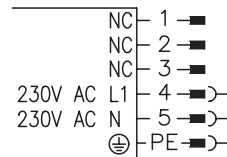
Dimensioned drawing



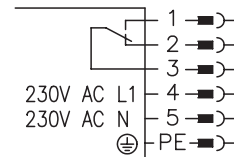
- A Optical axis
- B Indicator diode

Electrical connection

Transmitter



Receiver



Accessories:

(available separately • see page 510)

- Mounting systems (BT 85)
- Alignment aid ARH 2

We reserve the right to make changes • 85_a02e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 65 m
Operating range ²⁾	0 ... 50 m
Light source	LED (modulated light)
Wavelength	880 nm

Timing

Sensor switching frequency	20 Hz
Sensor response time	25 ms
Delay before start-up	≤ 200 ms

Electrical data

Operating voltage U _B	230 VAC ± 10% 50/60 Hz
Power consumption	2.5 VA/3 VA
Switching output	relay, 1 change-over contact
Function characteristics	light switching
Switching voltage, relay	250 VAC/DC
Switching current, relay	250 VAC 3 A / 30 V DC 3 A
Switching power, relay	250 VAC – 50 W 250 VAC 60 VA ind. load

Indicators

LED yellow	light path free, alignment aid
------------	--------------------------------

Mechanical data

Housing	diecast aluminium
Weight	transmitter 460 g, receiver 480 g
Optics cover	glass
Connection type	standard plug with screw connector up to 1.5 mm ²

Environmental data

Ambient temp. (operation/storage) ³⁾	-20 °C ... +60 °C / -30 °C ... +70 °C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class ⁵⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics (due to temperature changes)
------------------------------	--

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30 °C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
- 5) Rating voltage 250 VAC

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 85/7	
Transmitter	LS 85/7 SE	500 00250
Receiver	LS 85/7 E	500 00251

Remarks



SLS 85

Protective throughbeam photoelectric sensors



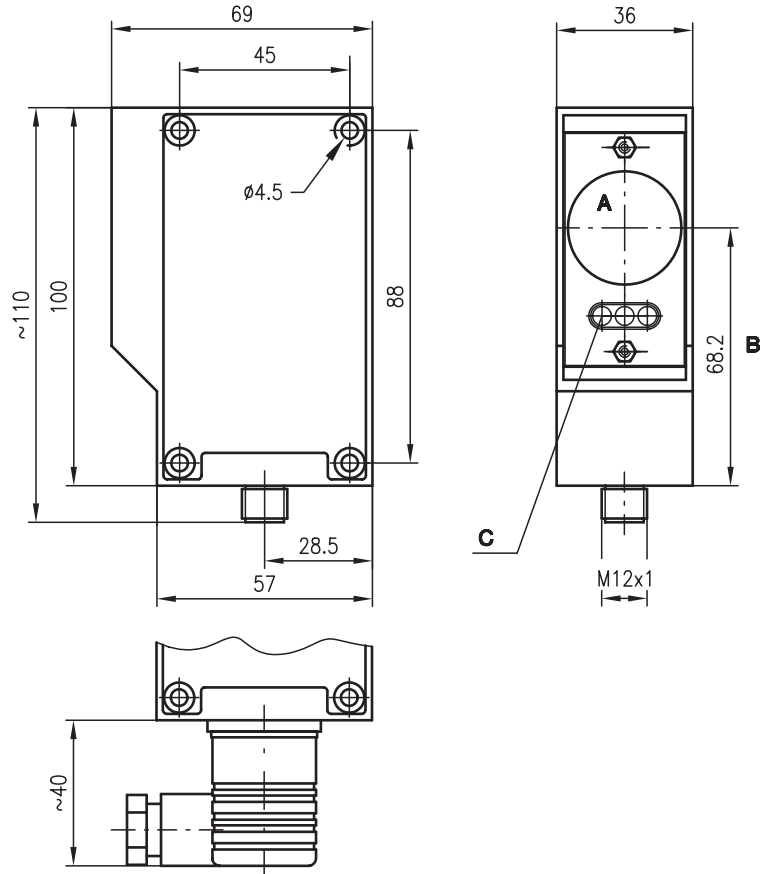
Dimensioned drawing



0 ... 78m



- Activation input for testing and interlinking
- LED indicator in transmitter and receiver
- Connection via M12 connector or standard plug with screw connector up to 1.5mm²
- Integrated optics heating

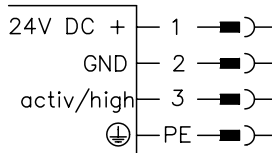


- A Transmitter/receiver
- B Optical axis
- C Indicator diode

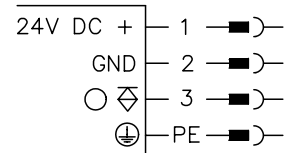


Electrical connection

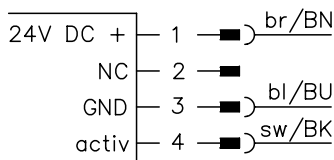
83 Transmitter



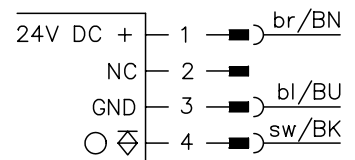
81 Receiver



45 Transmitter



41 Receiver



Accessories:

(available separately • see page 510)

- Fastening and adjustment angle BT 85
- M12 connection cable (KB ...)
- M12 connectors - with screw terminals (KD ...)
- Laser alignment aid ARH 78
- Test-monitoring unit:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

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Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 78m
Operating range ²⁾	0 ... 60m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	300Hz
Response time	min. 1.7ms
Delay before start-up	≤ 5ms

Electrical data

Operating voltage U_B	24V DC ± 15%
Residual ripple	≤ 15%
Bias current	receiver ≤ 35mA transmitter ≤ 60mA
Switching output ³⁾	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ $(U_B - 2V) / \leq 2V$
Output current	max. 200mA

Indicators

Receiver

LED red	light path interrupted
LED green	light path free
LED green flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
------------	----------------

Mechanical data

Housing	diecast aluminium
Optics	glass
Weight	280g
Connection type	M 12 connector or standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-30°C ... +70°C
VDE safety class	I for SLS... - 83/81
VDE safety class ⁴⁾	II for SLS... - 41/45
Protective circuit ⁵⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7kΩ ± 10%

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 4) Rating voltage 250 VAC
 5) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
with standard plug		
Transmitter and receiver	SLS 85M/P-1750-T2-8	
Transmitter	SLSS 85M-1720-T2-83	500 24733
Receiver	SLSE 85M/P-1730-T2-81	500 24734
with M 12 connector ¹⁾		
Transmitter and receiver	SLS 85M/P-1750-T2-4	
Transmitter	SLSS 85M-1720-T2-45	500 26255
Receiver	SLSE 85M/P-1730-T2-41	500 26267

1) not part of the delivery contents

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1 category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø30mm.



(I)RK 85

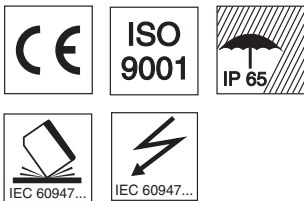
Retro-reflective photoelectric sensors



7.5m



- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- General light/dark switching and delay before start-up for optimal adaptation to applications
- Warning output for contamination control
- Connection via standard plug with screw connector up to 1.5mm²



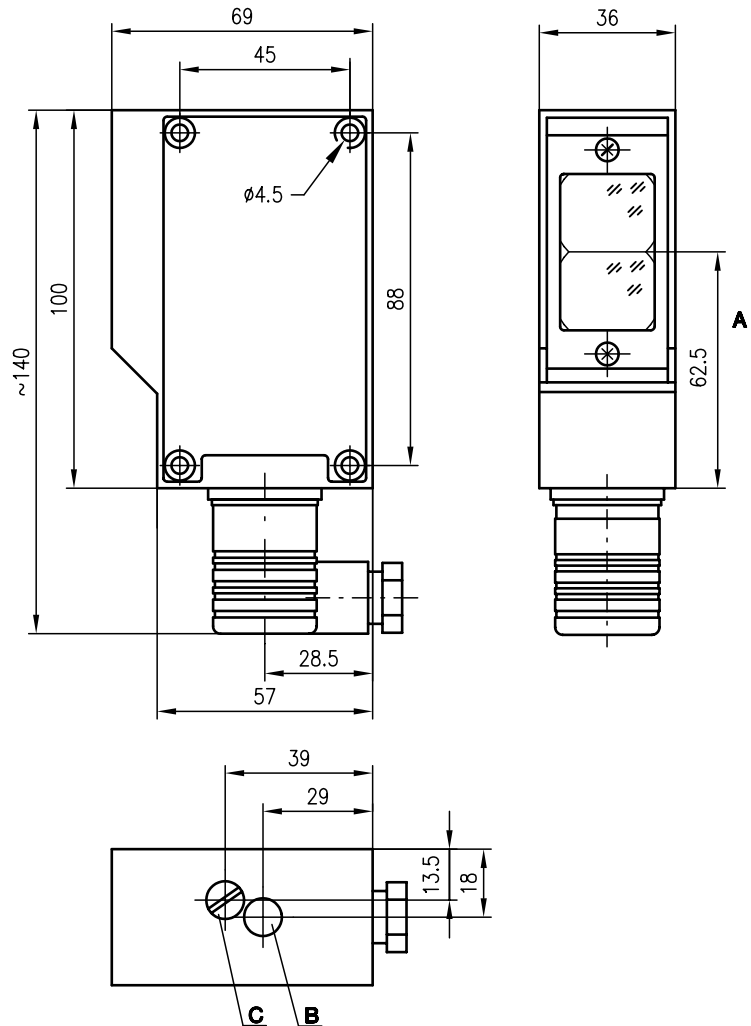
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Accessories:

(available separately • see page 510)

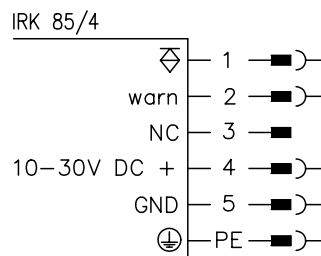
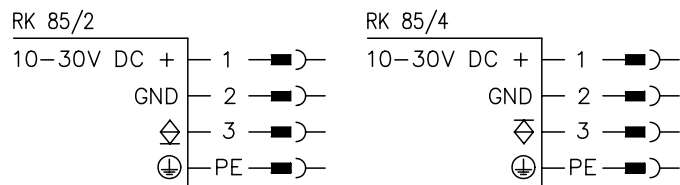
- Mounting systems (BT 85)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Optical axis
- B Indicator diode
- C Light/dark switching

Electrical connection





Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	7.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	PNP/NPN transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	diecast aluminium
Optics cover	glass
Weight	340g
Connection type	standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage) ³⁾	-20°C ... +55°C / -30°C ... +55°C
Protective circuit ⁴⁾	1, 2, 3, 4
VDE safety class ⁵⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Warning output autoControl warn	PNP transistor, 100mA, counting principle
De-humidifying system	to prevent condensation on the optics (due to temperature changes)

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) -30°C with operating voltage continuously applied
 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
 5) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.3 ... 6.0m
TK(S)	50x100	0.3 ... 5.5m
TK(S)	50x50	0.3 ... 4.5m
TK	82	0.5 ... 6.0m
Tape 2	100x100	0.4 ... 3.5m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		RK 85/4 Part No. 500 00492	RK 85/2 Part No. 500 00488	IRK 85/4 Part No. 500 10797			
Housing	metal	●	●	●			
Connection	standard plug	●	●	●			
	M12 connector						
Features							
Voltage supply	10 ... 30V	●	●	●			
Switching output	PNP	●		●			
	NPN		●				
Warning output				●			
Dehumidification		●	●	●			

Remarks



RK 85

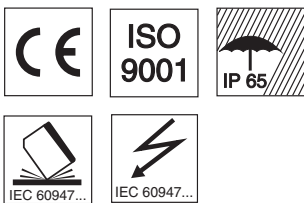
Retro-reflective photoelectric sensors



6m
10m



- All-mains design
22 ... 250VAC/DC with relay output
- Detection of transparent media
- Special voltages for universal application
- General light/dark switching and delay before start-up for optimal adaptation to applications
- Connection via standard plug with screw connector up to 1.5mm²

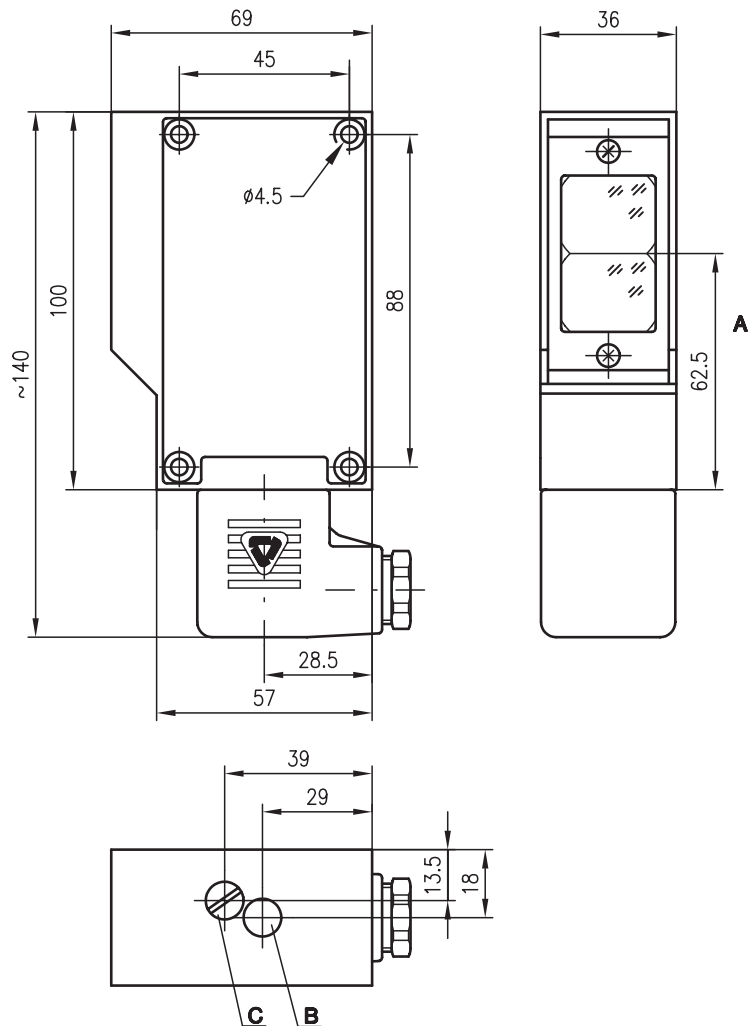


Accessories:

(available separately • see page 510)

- Mounting systems (BT 85)
- Reflectors
- Reflective tapes

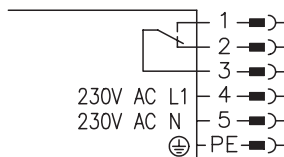
Dimensioned drawing



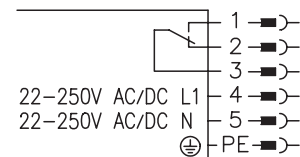
- A Optical axis
- B Indicator diode
- C Light/dark switching

Electrical connection

RK 85/7 Z1
RK 85/7
RK 85/7-10



RK 85/7-10 UC



We reserve the right to make changes • 85_b02e.fm



Specifications

Optical data

Operating range ¹⁾	see table
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	20Hz
Response time	25ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	22 ... 250VAC (50/60Hz) 22 ... 250VDC ± 10% 230VAC ± 10% 50/60Hz
Power consumption	≤ 1.5VA
Switching output	relay, 1 change-over contact
Function characteristics	light or dark switching (reversible)
Switching voltage, relay	250VAC/DC
Switching current, relay	250VAC 3A/30VDC 3A
Switching power, relay	250VAC – 50W 250VAC 60VA ind. load

Indicators ²⁾

LED green	ready
LED yellow	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	diecast aluminium
Optics cover	glass
Weight	340g
Connection type	standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage) ³⁾	-20°C ... +55°C/-30°C ... +55°C
Protective circuit ⁴⁾	1, 2, 3, 4
VDE safety class ⁵⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Switching delay (activation)	25ms ... 5s (can be retrigged)
De-humidifying system	to prevent condensation on the optics (due to temperature changes)

- 1) Operating range: recommended range with performance reserve
- 2) RK 85/7-10UC LED red: receive indicator
LED red flashing: switching state (LEDs illuminate at interruption)
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 5) Rating voltage 250VAC

Order guide

Selection table		Order code →					
Equipment ↓		RK 85/7 Part No. 500 00497	RK 85/7 Z1 Part No. 500 00503	RK 85/7-10 Part No. 500 00522	RK 85/7-10 UC Part No. 500 21126		
Housing	metal	●	●	●	●		
Operating range	6m	●	●		●		
	10m			●			
Connection	standard plug	●	●	●	●		
Features							
Voltage supply	230VAC	●	●	●			
	UC				●		
	special voltage	●	●				
Switching output	relay	●	●	●	●		
Switching delay			●				
Dehumidification		●	●	●	●		

Tables

RK 85/7
RK 85/7-Z.1
RK 85/7 UC

Reflectors		Operating range
TK(S)	100x100	0.3 ... 6.0m
TK(S)	50x100	0.3 ... 5.5m
TK(S)	50x50	0.3 ... 4.5m
TK	82	0.5 ... 6.0m
Tape 2	100x100	0.4 ... 3.5m

RK 85/7-10

Reflectors		Operating range
2xTK	100x100	0.5 ... 10m
TK(S)	100x100	0.3 ... 6.0m
2xTK	82	0.5 ... 10m
TK(S)	82	0.5 ... 6.0m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Remarks



PRK 85

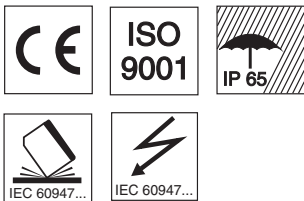
Retro-reflective photoelectric sensor with polarisation filter



7.5m



- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- General light/dark switching and delay before start-up for optimal adaptation to applications
- Connection via standard plug with screw connector up to 1.5mm²

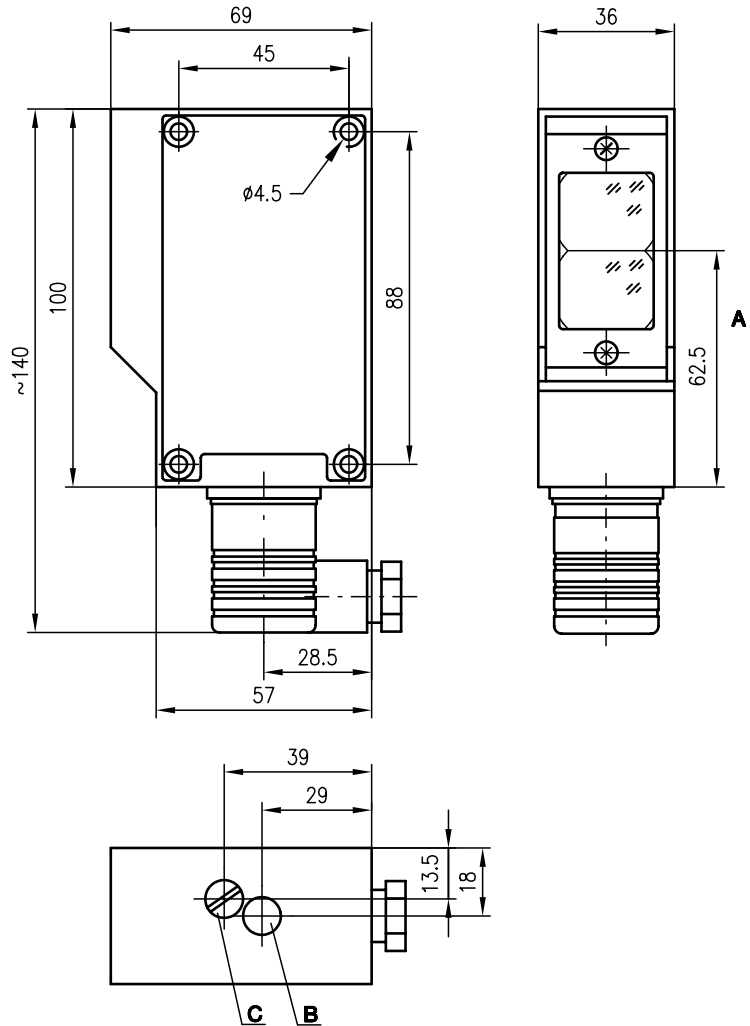


Accessories:

(available separately • see page 510)

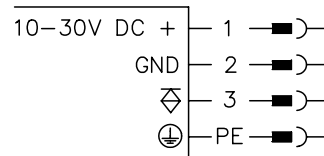
- Mounting systems (BT 85)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Optical axis
- B Indicator diode
- C Light/dark switching

Electrical connection



We reserve the right to make changes • 85_b03e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 7.5m
 Operating range ²⁾ see table
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 200Hz
 Response time 2.5ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 40mA
 Switching output PNP transistor output
 Function characteristics light or dark switching (reversible)
 Signal voltage high/low ≥ (U_B-2V) ≤ 2V
 Output current max. 100mA

Indicators

LED red light path free
 LED red flashing light path free, no performance reserve

Mechanical data

Housing diecast aluminium
 Optics cover glass
 Weight 350g
 Connection type standard plug with screw connector up to 1.5mm²

Environmental data

Ambient temp. (operation/storage) ³⁾ -20°C ... +55°C / -30°C ... +55°C
 Protective circuit ⁴⁾ 1, 2, 3, 4
 VDE safety class ⁵⁾ III, all-insulated
 Protection class IP 65
 Standards applied IEC 60947-5-2

Options

De-humidifying system to prevent condensation on the optics (due to temperature changes)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 5) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.3 ... 6.0m
TK(S)	50x100	0.3 ... 5.5m
TK(S)	50x50	0.3 ... 4.5m
TK	82	0.5 ... 6.0m
Tape 2	100x100	0.4 ... 3.5m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

Designation	Part No.
PRK 85/4	500 00599

Remarks



PRK 85

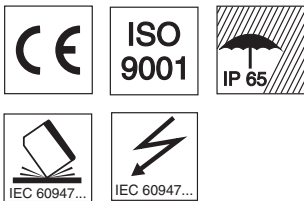
Retro-reflective photoelectric sensor with polarisation filter



7.5m



- All-mains design
22 ... 250VAC/DC with relay output
- General light/dark switching and delay before start-up for optimal adaptation to applications
- Connection via standard plug with screw connector up to 1.5mm²

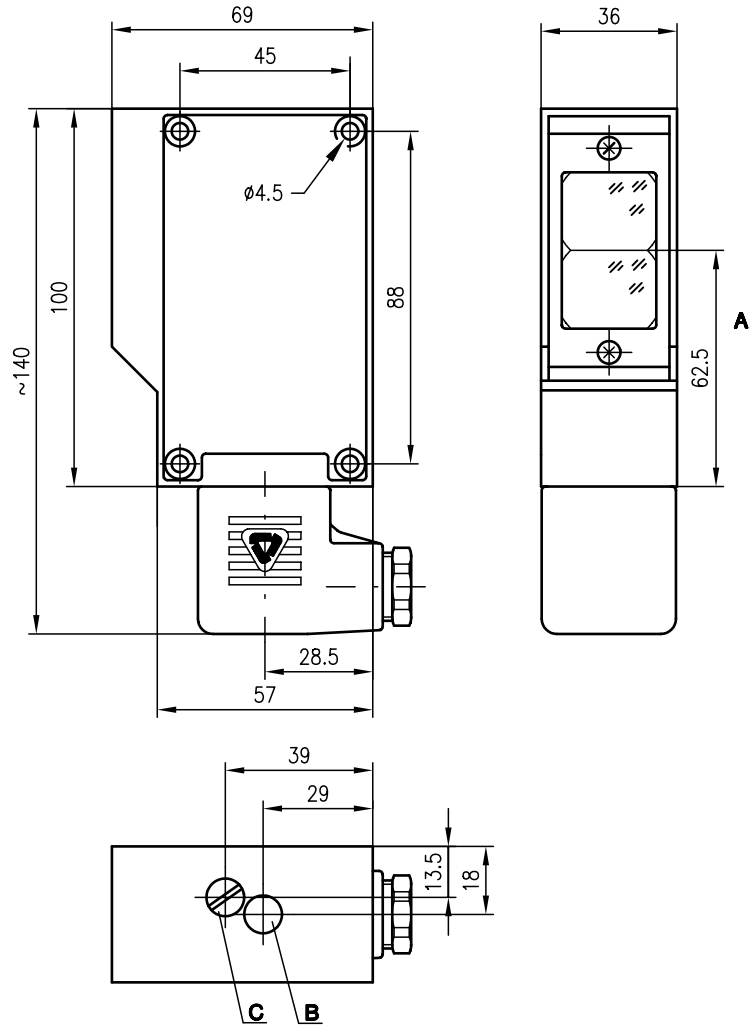


Accessories:

(available separately • see page 510)

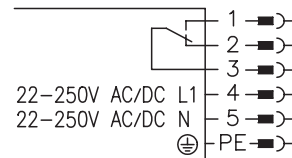
- Mounting systems (BT 85)
- Reflectors
- Reflective tapes

Dimensioned drawing



- A Optical axis
- B Indicator diode
- C Light/dark switching

Electrical connection



We reserve the right to make changes • 85_b04e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 7.5m
 Operating range ²⁾ see table
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 20Hz
 Response time 25ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 22 ... 250VAC 50/60Hz
 22 ... 250VDC ± 10%
 Power consumption ≤ 1.5VA
 Switching output relay, 1 change-over contact
 Function characteristics light or dark switching (reversible)
 Switching voltage, relay 250VAC/DC
 Switching current, relay 250VAC 3A/30VDC 3A
 Switching power, relay 250VAC – 50W
 250VAC 60VA ind. load

Indicators

LED red light path free
 LED red flashing light path free, no performance reserve

Mechanical data

Housing diecast aluminium
 Optics cover glass
 Weight 350g
 Connection type standard plug with screw connector up to 1.5mm²

Environmental data

Ambient temp. (operation/storage) ³⁾ -20°C ... +55°C/-30°C ... +55°C
 Protective circuit ⁴⁾ 1, 2, 3, 4
 VDE safety class ⁵⁾ III, all-insulated
 Protection class IP 65
 Standards applied IEC 60947-5-2

Options

De-humidifying system to prevent condensation on the optics (due to temperature changes)

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 5) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.3 ... 6.0m
TK(S)	50x100	0.3 ... 5.5m
TK(S)	50x50	0.3 ... 4.5m
TK	82	0.5 ... 6.0m
Tape 2	100x100	0.4 ... 3.5m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

Designation	Part No.
PRK 85/7 UC	500 21127

Remarks



RK 85

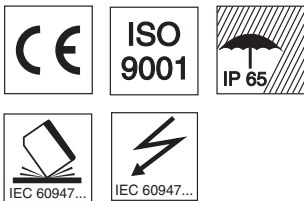
Energetic diffuse reflection light scanner



0 ... 0.3m
0 ... 0.8m
0 ... 2.0m



- Wide voltage range 10 ... 30V with NPN or PNP switching output for PLC applications
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via standard plug with screw connector up to 1.5mm²

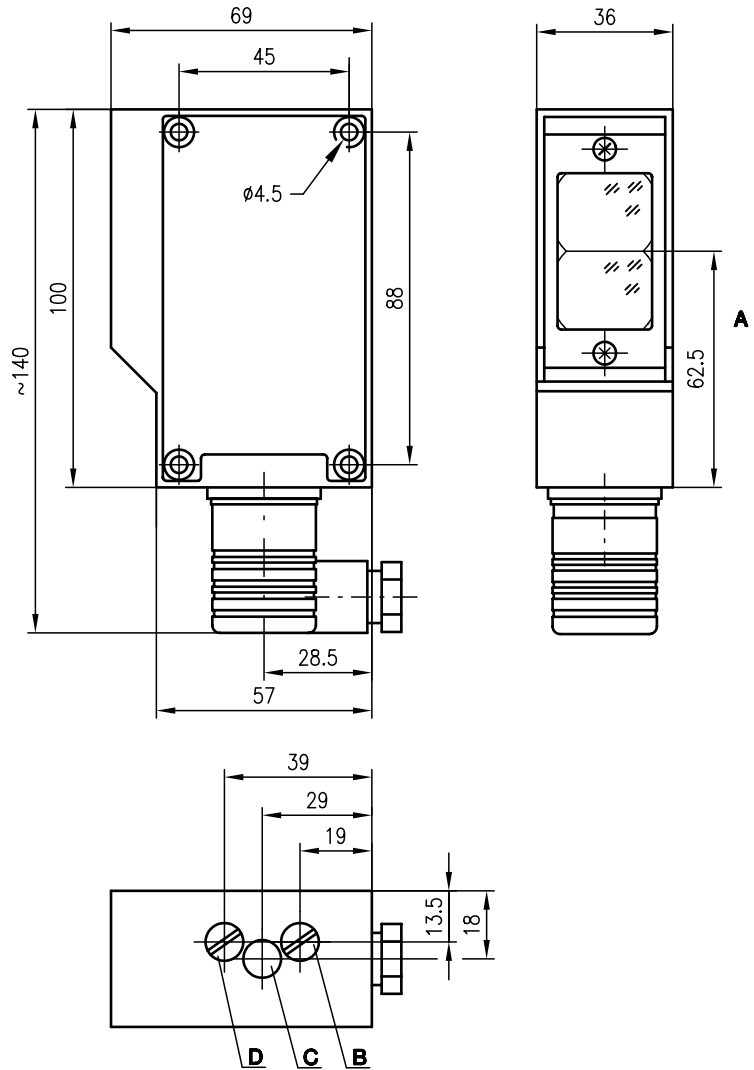


Accessories:

(available separately • see page 510)

- Mounting systems (BT 85)

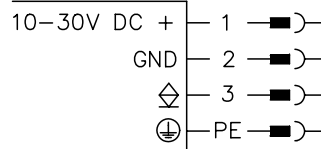
Dimensioned drawing



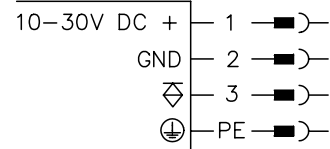
- A Optical axis
- B Sensitivity adjustment
- C Indicator diode
- D Light/dark switching

Electrical connection

RK 85/2-300
RK 85/2-800
RK 85/2-2000



RK 85/4-300
RK 85/4-800
RK 85/4-2000



We reserve the right to make changes • 85_c01e.fm



Specifications

Optical data

Scanning range (white 90%) ¹⁾	0 ... 300mm, 0 ... 800mm, 0 ... 2000mm
Adjustment range	5 ... 100%
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz
Sensor response time	2.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	PNP/NPN transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	reflection
LED red flashing	reflection, no performance reserve

Mechanical data

Housing	diecast aluminium
Weight	350g
Optics cover	glass
Connection type	standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage) ²⁾	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics (due to temperature changes)
------------------------------	--

- 1) Scanning range: recommended range with performance reserve
 2) -30°C with operating voltage continuously applied
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
 4) Rating voltage 250VAC

Tables

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		RK 85/4-300 Part No. 500 00494	RK 85/4-800 Part No. 500 00495	RK 85/4-2000 Part No. 500 00496	RK 85/2-300 Part No. 500 00489	RK 85/2-800 Part No. 500 00490	RK 85/2-2000 Part No. 500 00491
Housing	metal	●	●	●	●	●	●
Scanning range	300mm	●			●		
	800mm		●			●	
	2000mm			●			●
Connection	standard plug	●	●	●	●	●	●
Features							
Voltage supply	10 ... 30V	●	●	●	●	●	●
Switching output	PNP	●	●	●			
	NPN				●	●	●
Dehumidification		●	●	●	●	●	●

Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.

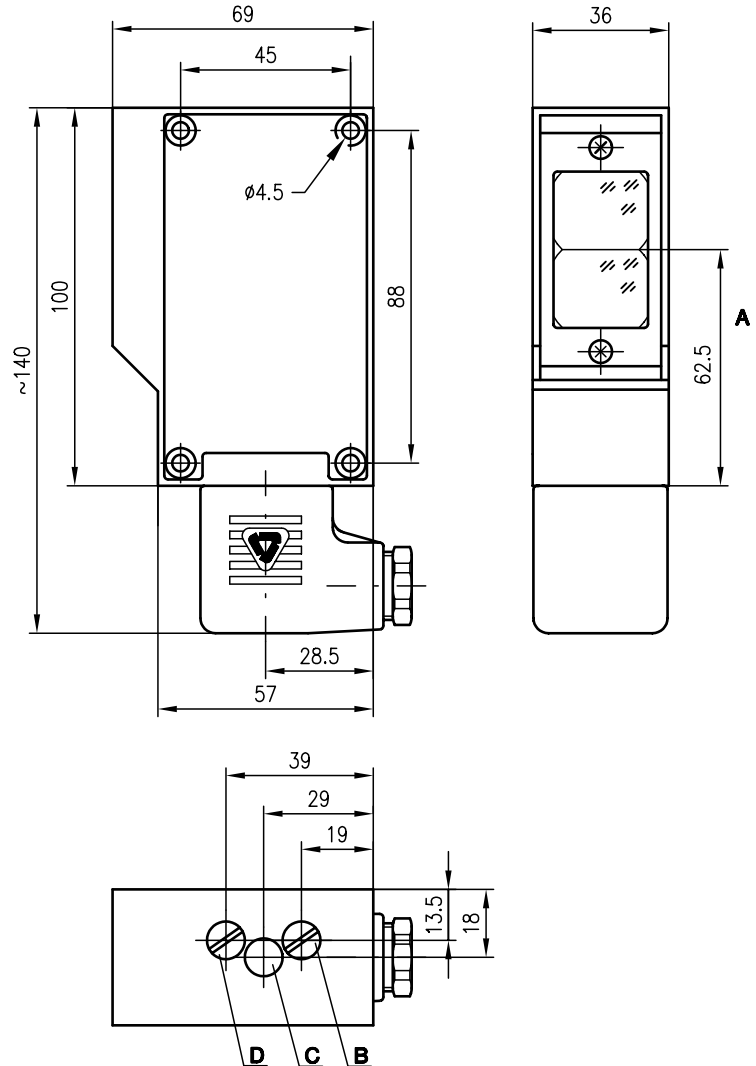


RK 85

Energetic diffuse reflection light scanner



Dimensioned drawing



- A Optical axis
- B Sensitivity adjustment
- C Indicator diode
- D Light/dark switching



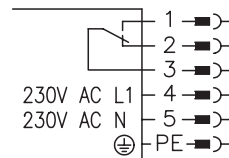
0 ... 0.3m
 0 ... 0.8m
 0 ... 2.0m



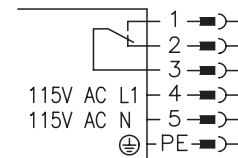
- AC version 230VAC with relay output
- Special voltages for universal application
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via standard plug with screw connector up to 1.5mm²

Electrical connection

RK 85/7-300
 RK 85/7-2000



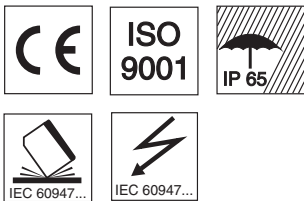
RK 85/7-800



Accessories:

(available separately • see page 510)

- Mounting systems (BT 85)



We reserve the right to make changes • 85_c02e.fm



Specifications

Optical data

Scanning range (white 90%) ¹⁾	0 ... 300mm, 0 ... 800mm, 0 ... 2000mm
Adjustment range	5 ... 100%
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	20Hz
Sensor response time	25ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage UB	230 VAC ± 10% 50/60Hz
Power consumption	4VA
Switching output	relay, 1 change-over contact
Function characteristics	light or dark switching (reversible)
Switching voltage, relay	250 VAC/DC
Switching current, relay	250 VAC 3A/30VDC 3A
Switching power, relay	250 VAC 50watt
	250 VAC 60VA ind. load
Sensitivity	adjustable

Indicators

LED red	no reflection, operating voltage applied
LED green	reflection, with performance reserve
LED yellow	reflection, no performance reserve

Mechanical data

Housing	diecast aluminium
Weight	490g
Optics cover	glass
Connection type	standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage) ²⁾	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics (due to temperature changes)
------------------------------	--

- 1) Scanning range: recommended range with performance reserve
- 2) -30°C with operating voltage continuously applied
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
- 4) Rating voltage 250VAC

Tables

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		RK 85/7-300 Part No. 500 00507	RK 85/7-800 Part No. 500 00512	RK 85/7-2000 Part No. 500 00517			
Housing	metal	●	●	●			
Scanning range	300mm	●					
	800mm		●				
	2000mm			●			
Connection	plug	●	●	●			
Features							
Voltage supply	230VAC	●	●	●			
	special voltage						
Switching output	relay	●	●	●			
Dehumidification		●	●	●			

Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.

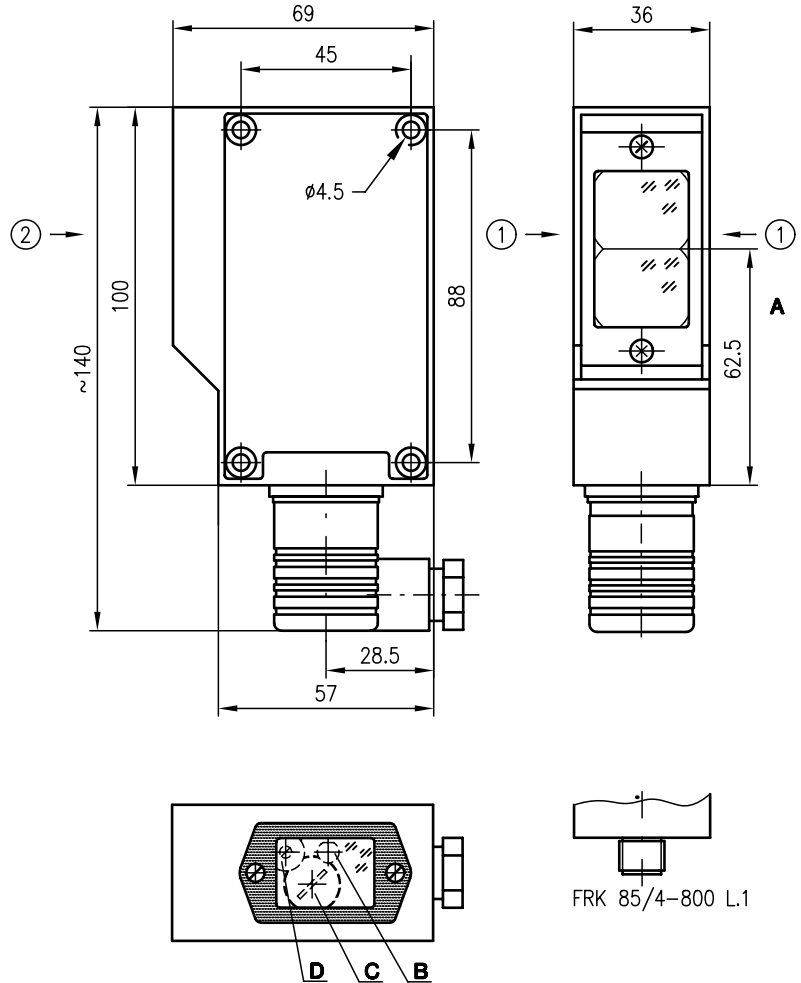


FRK 85

Diffuse reflection light scanner with background suppression



Dimensioned drawing



- A Optical axis
 - B Indicator diode
 - C Scanning range adjustment
 - D Light/dark switching
- Preferred entry direction for objects ① + ②

FRK 85/4-800 L.1

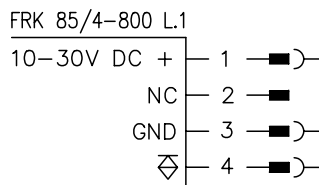
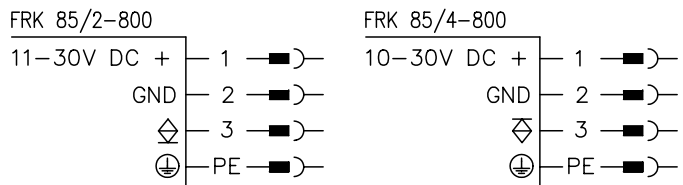


0.1 ... 0.8m



- Wide voltage range 10 ... 30V with NPN or PNP switching output for PLC applications
- General light/dark switching, sensitivity adjustment and delay before start-up provide for optimal adaptation to the application
- Connection via M12 connector or standard plug with screw connector up to 1.5mm²

Electrical connection



Accessories:

(available separately • see page 510)

- Mounting systems (BT 85)
- M12 connectors (KD ...)

We reserve the right to make changes • 85_d01e.fm



Specifications

Optical data

Scanning range (white 90%) ¹⁾	100 ... 800mm,
Adjustment range	120 ... 800mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz
Sensor response time	5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 40mA
Switching output	PNP/NPN transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA

Indicators

LED yellow on	reflection
LED yellow off	no reflection

Mechanical data

Housing	diecast aluminium
Weight	340g
Optics cover	glass
Connection type	M12 connector or standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage) ²⁾	-20°C ... +60°C/-30°C ...+70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics (due to temperature changes)
------------------------------	--

- 1) Scanning range: recommended range with performance reserve
 2) -30°C with operating voltage continuously applied
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
 4) Rating voltage 250VAC

Tables

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		FRK 85/4-800 Part No. 500 11203	FRK 85/4-800 L.1 Part No. 500 21434	FRK 85/2-800 Part No. 500 11573			
Housing	metal	●	●	●			
Scanning range	300mm						
	800mm	●	●	●			
	2000mm						
Connection	standard plug	●		●			
	M12 connector ¹⁾		●				
Features							
Voltage supply	10 ... 30V	●	●	●			
Switching output	PNP	●	●				
	NPN			●			

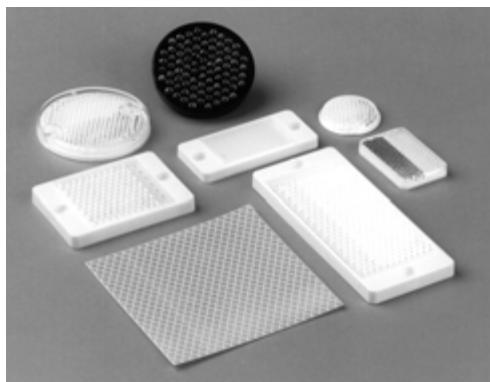
Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

1) not part of the delivery contents



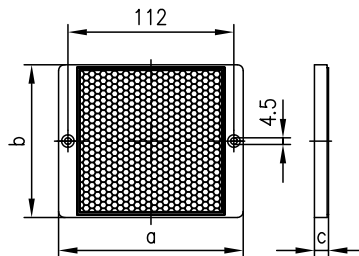
Reflectors



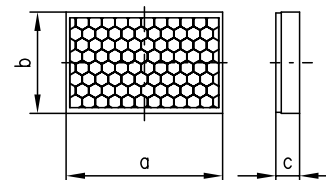
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

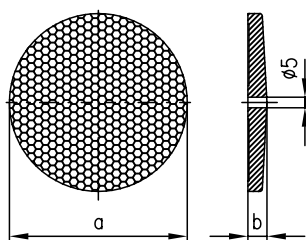
TKS 100 x 100



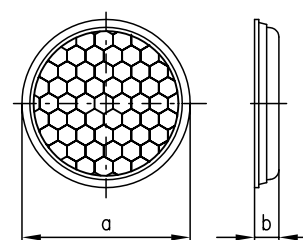
TK 30 x 50



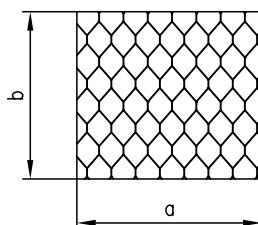
TK 82



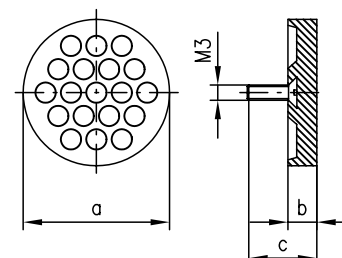
TK 35



Tape No. 2



TG 29



Order codes:

Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 50x50	500 22814
TKS 30x50	500 23525
TK 30x50	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
Tape 2	500 11523
TG 60	500 03179
TG 29	500 09374
TG 6	500 03176
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 85	500 03376
ARH 2	500 23547

Selection table

Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 ²⁾	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 ²⁾	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 ²⁾	-20°C/+60°C	48	32	6.8	○	●
TK 82 ¹⁾	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
TK 45	-20°C/+60°C	46	8			●
TK 35	-20°C/+60°C	35.5	5			●
Tape 2	-20°C/+60°C	100	100			●
TG 60	-20°C/+120°C	60	9	24	●	
TG 29	-20°C/+120°C	29	6.5	14.5	●	
TG 6	-20°C/+120°C	6	5			●

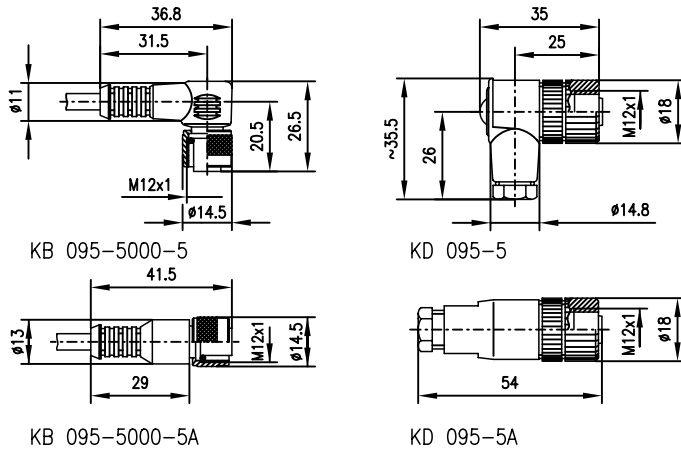
1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 85_zu_e.fm



Dimensioned drawings

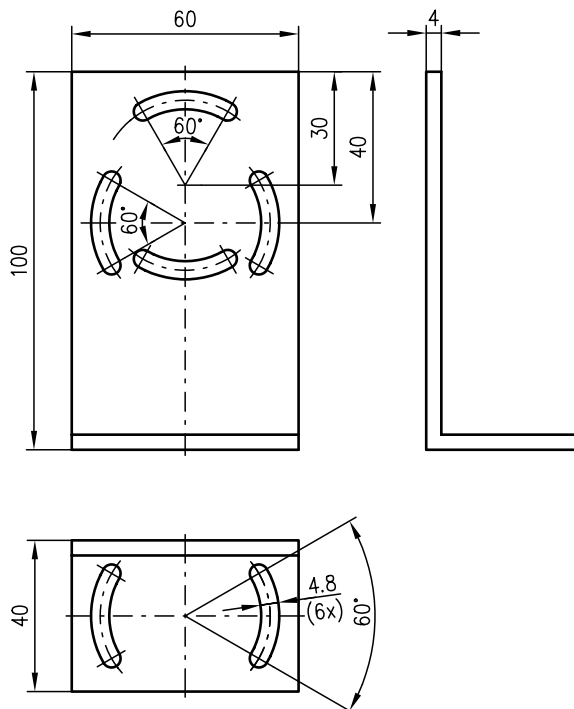


Selection table

M12 connectors			
with cable (5m cable length)		without cable	
KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A

Dimensioned drawings

BT 85



Connectors, plugs, cables



Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices. Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: 4 connectors with ready-made 5m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

Mounting systems

BT 85





78 Series

Overview and advantages

Extensive sensor series:

- In robust metal housing with glass optics
- In protection class IP 65

Operating principles:

- Throughbeam photoelectric sensors
- Protective throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression

- Infrared light for increased indifference to ambient light
- Large operating range

- Numerous AC/DC supply voltage possibilities:
12 ... 30VDC, 10 ... 30VDC, 115/230VAC, 24/42VAC,
24/48VAC
- Different outputs: NPN, PNP, relay

Comfortable terminal compartment for individual electrical connection

Universal mounting system for better alignment

Options:

- Activation input
- Switching delay
- De-humidifying system
- Optics heating





Operating principle	Designation	Typ. operating range limit/scanning range	Housing	Light source	Operating voltage							
					Metal	Infrared	11 ... 30VDC	10 ... 30VDC	115/230 VAC	24 VDC	24/42VAC	24/48VAC
	LS 78/24 R	180m	•	•	•							
	LS 78/4.8.1	180m	•	•		•						
	LS 78/7	180m	•	•			•					
	LS 78/7.2	450m	•	•			•					
	LS 78/7 Z4	180m	•	•			•					
	LS 78/74 R.8	180m	•	•			•	•				
	LS 78/7 24/42 V	180m	•	•					•			
	LS 78/7 24/48 V	180m	•	•						•		
	SLS 78M/P-1730-T2-4	150m	•	•				•				
	SLS 78M/P-1750-T2-2	150m	•	•				•				
	SLS 78M/PR-1761-T2-2	150m	•	•				•				
	RK 78/2	7.5m	•	•	•							
	RK 78/4 R	7.5m	•	•	•							
	RK 78/7	7.5m	•	•			•					
	RK 78/7-24-48 V	7.5m	•	•				•			•	
	RK 78/7 Z1-42 VS	7.5m	•	•								•
	RK 78/7 Z4	7.5m	•	•			•					
	RK 78/7 Z4-24-48 V	7.5m	•	•				•			•	
	RK 78/4 R-300	300mm	•	•	•							
	RK 78/4 R-800	800mm	•	•	•							
	RK 78/4 R-2000	2m	•	•	•							
	RK 78/7-300	300mm	•	•			•					
	RK 78/7-800	800mm	•	•			•					
	RK 78/7-2000	2m	•	•			•					
	RK 78/7-300-24-48 V	300mm	•	•	•						•	
	RK 78/7-800-24-48 V	800mm	•	•	•						•	
	RK 78/7-2000-24-48 V	2m	•	•	•						•	
	FRK 78/4 R-800	800mm	•	•	•							
	FRK 78/7-800	800mm	•	•			•					
	FRK 78/7-800-24-48 V	800mm	•	•				•			•	



Output			Switching frequency		Switching		Connection		Options	Remark		Page
NPN transistor	PNP transistor	Relay	NPN/PNP transistor	Relay	Light	Dark	Terminals	M12 connector	Activation input	Time modules ZK 7810 and ZK 7820 pluggable	Time module ZK 7820 already integrated	
•	•	•	100Hz	20Hz	•	•	•			•		517
	•	•	100Hz		•	•	•		•	•		517
		•		20Hz	•	•	•			•		519
		•		20Hz	•	•	•			•		519
		•		20Hz	•	•	•				•	519
	•	•	100Hz	20Hz	•	•	•		•	•		519
		•		20Hz	•	•	•			•		519
		•		20Hz	•	•	•			•		519
	•		300Hz		•			•	•			521
	•		200Hz		•		•		•			523
	•	•	200Hz	20Hz	•		•		•			523
•			100Hz		•	•	•			•		525
	•	•	100Hz	20Hz	•	•	•			•		525
		•		20Hz	•	•	•			•		525
		•		20Hz	•	•	•			•		525
		•		20Hz	•	•	•				•	525
		•		20Hz	•	•	•				•	525
		•		20Hz	•	•	•				•	525
	•	•	100Hz	20Hz	•	•	•			•		527
	•	•	100Hz	20Hz	•	•	•			•		527
	•	•	100Hz	20Hz	•	•	•			•		527
		•		20Hz	•	•	•			•		527
		•		20Hz	•	•	•			•		527
		•		20Hz	•	•	•			•		527
		•		20Hz	•	•	•			•		527
		•		20Hz	•	•	•			•		527
	•	•	100Hz	20Hz	•	•	•			•		529
		•		20Hz	•	•	•			•		529
		•		20Hz	•	•	•			•		529



LS 78

Throughbeam photoelectric sensors

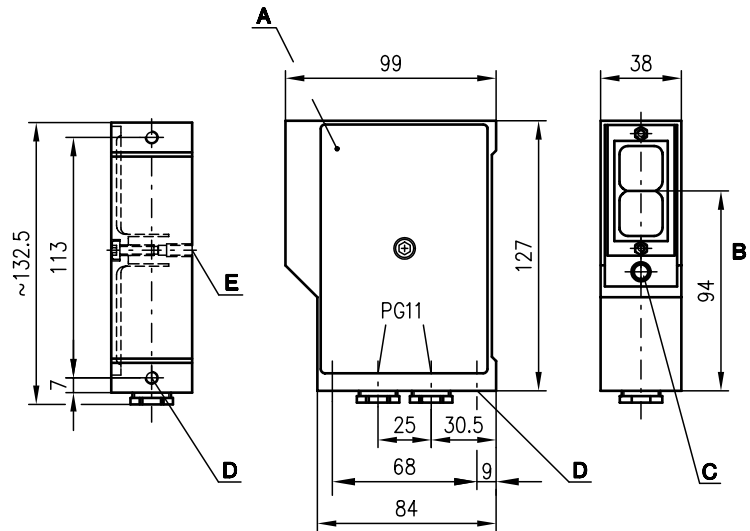


180m

10 - 30 V
DC

- Voltage ranges from 12 ... 30V and 10 ... 30V with NPN, PNP and/or relay outputs
- Light/dark switching in each device
- Universal connection via terminals
- Additional plug-in time module
- Special type with activation input
- Integrated optics heating

Dimensioned drawing

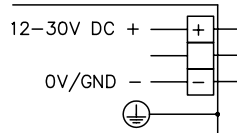


- A** Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B** Optical axis
- C** Indicator diodes
- D** Device fixture M6x9
- E** Device fixture M6x12

Electrical connection

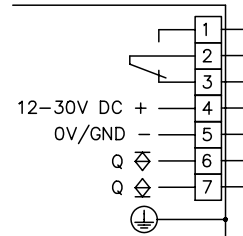
Transmitter

LS 78/2 SE

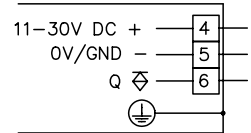


Receiver

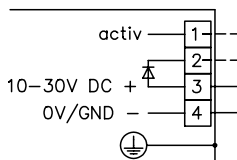
LS 78/24 RE



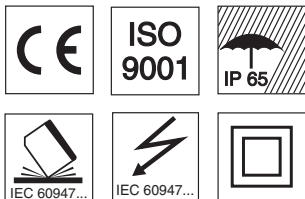
LS 78/4 E.1



LS 78/2.8 SE.1



1. Operation with activation: no connection between 1 and 2
2. Operation without activation: make a connection between 1 and 2



Accessories:

(available separately • see page 530)

- Mounting systems (BT 16, UMS 78)
- Fastening adapter BT 08
- Diaphragm BL 04
- Time module transient pulses ZK 7810
- Time module slow operation/release ZK 7820
- Alignment aid ARH 2

We reserve the right to make changes • 78_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	180m
Operating range ²⁾	120m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz (PNP/NPN) 20Hz (relay)
Sensor response time	5ms (PNP/NPN) approx. 25ms (relay)
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	12 ... 30VDC, 10 ... 30VDC
Power consumption	approx. 600mW (PNP/NPN) approx. 3.5VA (relay)
Residual ripple	≤ 15% of U_B
Bias current	≤ 70mA (PNP/NPN) max. 120mA (relay)
Switching output	PNP/NPN transistor output or relay
Function characteristics	Light/dark switching through sliding switch
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$ (PNP/NPN)
Output current	max. 100mA (PNP/NPN)
Switching voltage, relay	max. 240VAC with resistive load
Switching current, relay	max. 2.5AAC with resistive load

Indicators

LED red	light path interrupted
LED green	light path free (for LS78/4 E.1, LS78/74R)
LED yellow	transmitter ready (for LS78/2.8SE.1)

Mechanical data

Housing	diecast aluminium
Weight	transmitter 600g, receiver 600g
Optics	glass lens
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage) ³⁾	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class ⁵⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	$\geq 8V / \leq 2V$ or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7kΩ ± 10%
De-humidifying system	to prevent condensation on the optics due to temperature changes

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
- 5) Rating voltage 250VAC

Order guide

Selection table		Order code →			
Equipment ↓		LS 78/24 R Part No. 500 00229 (Tr) Part No. 500 06684 (Re)	LS 78/4.8.1 Part No. 500 20617 (Tr) Part No. 500 20618 (Re)		
Housing	metal	●	●		
Operating range	120m	●	●		
Connection	terminals	●	●		
Features					
Voltage supply	12 ... 30V	●			
	10 ... 30V		●		
Switching output	NPN	●			
	PNP	●	●		
	relay	●	●		
Activation input			●		
Integrated time module					
Time modules ZK 7810, ZK 7820 retrofittable		●	●		

LS 78/24 R - 02
LS 78/4.8.1 - 02

Tables

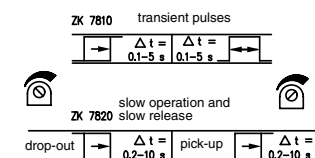
Diagrams

Remarks

The standard devices (see table) are expandable through plug-in time modules:

- Time module ZK 7810 (transient pulses), slow operation and pulse length adjustable from 0.1s ... 5s.
- Time module ZK 7820 (slow operation and release), slow operation and release separately adjustable from 0.2s ... 10s.

See figure for adjustment:





LS 78

Throughbeam photoelectric sensors

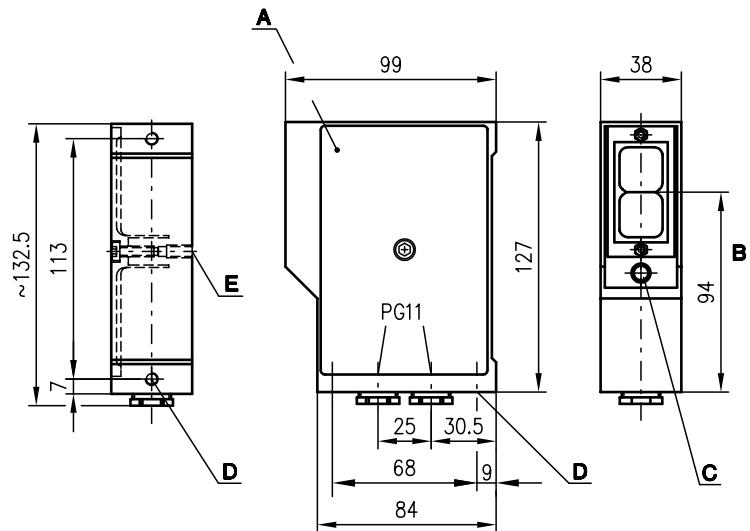


180 m
450 m



- AC voltage 115/230V, 24/42V, 24/48V and DC voltage 24V
- Light/dark switching in each device
- Universal connection via terminals
- Devices with integrated or separate add-on time module
- Special type with activation input

Dimensioned drawing



- A** Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B** Optical axis
- C** Indicator diodes
- D** Device fixture M6x9
- E** Device fixture M6x12



Accessories:

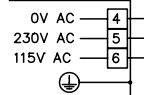
(available separately • see page 530)

- Mounting systems (BT 16, UMS 78)
- Alignment aid ARH 2
- Test monitoring unit:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)

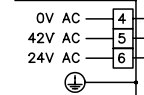
Electrical connection

Transmitter

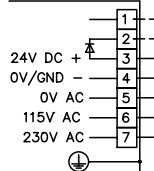
LS 78/7 SE



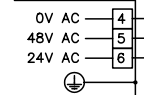
LS 78/7 SE-24/42V



LS 78/72.8 SE

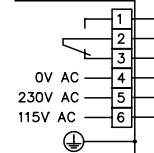


LS 78/7 SE-24/48V

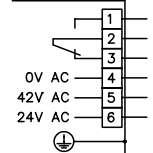


Receiver

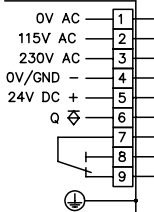
LS 78/7 E
LS 78/7 E.2



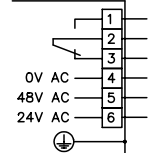
LS 78/7 E-24/42V



LS 78/74 RE



LS 78/7 E-24/48V



1. Operation with activation:
no connection between 1 and 2
2. Operation without activation:
make a connection between 1 and 2

Specifications

Optical data		LS 78/7.2
Typ. operating range limit ¹⁾	180m	450m
Operating range ²⁾	120m	300m
Light source	LED (modulated light)	
Wavelength	880 nm	
Timing		
Sensor switching frequency	100Hz (PNP) 20Hz (relay)	
Sensor response time	5 ms (PNP) approx. 25ms (relay)	
Delay before start-up	≤ 200ms	
Electrical data		
Operating voltage U_B	115/230VAC, 24VDC, 24/42VAC, 24/48VAC	
Power consumption	approx. 600mW (PNP) approx. 3.5VA (relay)	
Bias current	≤ 70mA (PNP) max. 120mA (relay)	
Switching output	PNP transistor output, relay: 1 change-over contact	
Function characteristics	Light/dark switching through sliding switch	
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$ (PNP)	
Output current	max. 100mA (PNP)	
Switching voltage, relay	max. 240VAC with resistive load	
Switching current, relay	max. 2.5AAC with resistive load	
Indicators		
LED red	light path interrupted	
LED green	light path free (for LS 78/4E.1, LS 78/74R)	
Mechanical data		
Housing	diecast aluminium	
Weight	transmitter 600g, receiver 600g	
Optics	glass lens	
Connection type	screw terminals	
Environmental data		
Ambient temp. (operation/storage) ³⁾	-20°C ... +60°C / -30°C ... +70°C	
Protective circuit ⁴⁾	1, 2, 3	
VDE safety class ⁵⁾	III, all-insulated	
Protection class	IP 65	
Standards applied	IEC 60947-5-2	
Options		
Activation input activ	≥ 8V/≤ 2V or not connected	
Transmitter active/not active	≥ 400µs	
Activation/disable delay	4.7kΩ ± 10%	
Input resistance	to prevent condensation on the optics due to temperature changes	
De-humidifying system		

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) -30°C with operating voltage continuously applied
 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
 5) Rating voltage 250VAC

Order guide

Selection table		Order code →						
Equipment ↓		LS 78/7 Part No. 500 00235 (Tr) Part No. 500 00240 (Re)	LS 78/7.2 Part No. 500 00235 (Tr) Part No. 500 25512 (Re)	LS 78/7 Z4 Part No. 500 00235 (Tr) Part No. 500 00241 (Re)	LS 78/74 R.8 Part No. 500 12680 (Tr) Part No. 500 12681 (Re)	LS 78/7 24/42 V Part No. 500 00236 (Tr) Part No. 500 00237 (Re)	LS 78/7 24/48 V Part No. 500 25233 (Tr) Part No. 500 25232 (Re)	
Housing	metal	●	●	●	●	●	●	
Operating range	120m	●		●	●	●	●	
	300m		●					
Connection	terminals	●	●	●	●	●	●	
Features								
Voltage supply	115/230VAC	●	●	●	●			
	24VDC				●			
	24/42VAC					●		
	24/48VAC						●	
Switching output	PNP				●			
	relay	●	●	●	●	●	●	
Activation input					●			
Integrated time module				●				
Time modules ZK 7810, ZK 7820 retrofittable		●	●		●	●	●	

LS 78/7 ... - 02

Tables

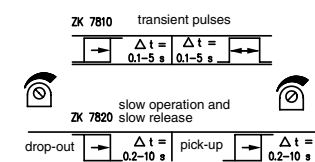
Diagrams

Remarks

The standard devices (see table) are expandable through plug-in time modules:

- Time module ZK 7810 (transient pulses), slow operation and pulse length adjustable from 0.1 s ... 5s.
- Time module ZK 7820 (slow operation and release), slow operation and release separately adjustable from 0.2s ... 10s.

See figure for adjustment:



0202



SLS 78

Protective throughbeam photoelectric sensors



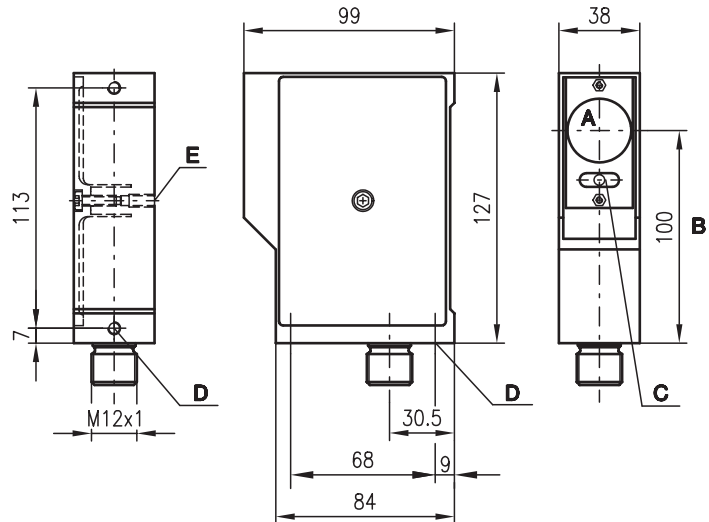
Dimensioned drawing



0 ... 150m



- Activation input for testing and interlinking
- Connection via M12 connector
- Integrated optics heating



- A Transmitter/receiver
- B Optical axis
- C Indicator diodes
- D Device fixture M6x9
- E Device fixture M6x12



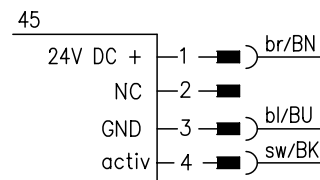
Electrical connection

Accessories:

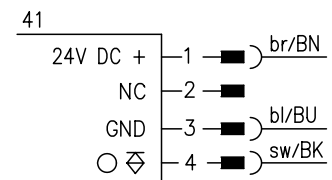
(available separately • see page 530)

- Mounting systems (BT 16, UMS 78)
- Alignment aid ARH 2
- M12 connectors (KD ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

Transmitter



Receiver



We reserve the right to make changes • 78_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 150m
Operating range ²⁾	0 ... 120m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	300Hz
Response time	1.7ms
Delay before start-up	≤ 200ms
Input pulse	min. 1.7ms

Electrical data

Operating voltage U_B	24VDC ± 20%
Residual ripple	≤ 15% of U_B
Bias current	receiver ≤ 35mA transmitter ≤ 60mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA

Indicators

Receiver

LED red	light path interrupted
LED green	light path free
LED green flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
------------	----------------

Mechanical data

Housing	diecast aluminium
Optics	glass, eff. angle of radiation ± 4° acc. to prEN 50100-2 (edition 08/94)
Weight	463g
Connection type	M12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -30°C ... +70°C
VDE safety class	III
Protective circuit ³⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7kΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
Transmitter and receiver	SLS 78M/P-1730-T2-4	
Transmitter	SLSS 78M-1720-T2-45	500 29536
Receiver	SLSE 78 M/P-1730-T2-41	500 80323

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø30mm.

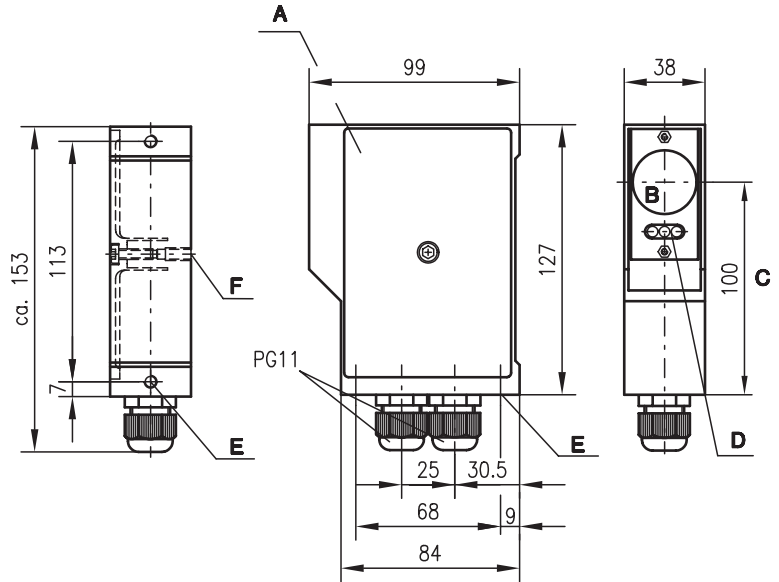


SLS 78

Protective throughbeam photoelectric sensors



Dimensioned drawing



- A Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B Transmitter/receiver
- C Optical axis
- D Indicator diodes
- E Device fixture M6x9
- F Device fixture M6x12



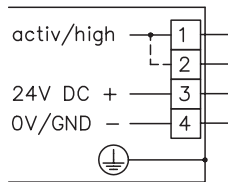
0 ... 150m



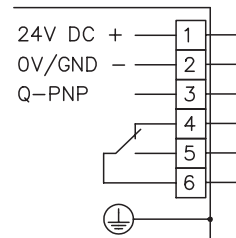
- Robust metal housing with glass lens, protection class IP 65 for industrial application
- Additional relay output with switching delay (slow release) without security function
- Integrated optics heating

Electrical connection

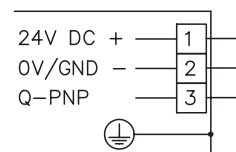
SLSS 78M-1720-T2-24



SLSE 78M/PR-1741-T2-29



SLSE 78M/P-1730-T2-21



Accessories:

(available separately • see page 530)

- Mounting systems (BT 16, UMS 78)
- Alignment aid ARH 2
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 78_a04e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 150m
Operating range ²⁾	0 ... 120m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 200ms
Input pulse	min. 2ms

Electrical data

Operating voltage U_B	24VDC ± 20%
Residual ripple	≤ 15% of U_B
Bias current	receiver ≤ 55mA transmitter ≤ 70mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA
Relay output	slow release 0 ... 10s without security function

Indicators

Receiver

LED red	light path interrupted
LED green	light path free
LED green flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
------------	----------------

Mechanical data

Housing	diecast aluminium
Optics	glass, eff. angle of radiation ± 4° acc. to prEN 50100-2 (edition 08/94)
Weight	463g
Connection type	terminals, max. 2.5mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -30°C ... +70°C
VDE safety class	III
Protective circuit ³⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7kΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
Transmitter and receiver	SLS 78M/P-1750-T2-2	
Transmitter	SLSS 78M-1720-T2-24	500 24730
Receiver	SLSE 78M/P-1730-T2-21	500 24731
Transmitter and receiver	SLS 78M/PR-1761-T2-2	
Transmitter	SLSS 78M-1720-T2-24	500 24730
Receiver	SLSE 78M/PR-1741-T2-29	500 24732

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø30mm.



RK 78

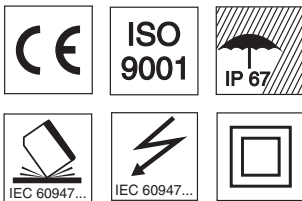
Retro-reflective photoelectric sensors



7.5m

12 - 30 V DC	115/230 V AC	24/48 V AC
-----------------	-----------------	---------------

- AC voltage 115/230V, 24/48V, 42V and DC voltage 12 ... 30V and 24VDC
- With NPN, PNP and/or relay outputs
- Light/dark switching in each device
- Universal connection via terminals
- Devices with integrated or separate add-on time module

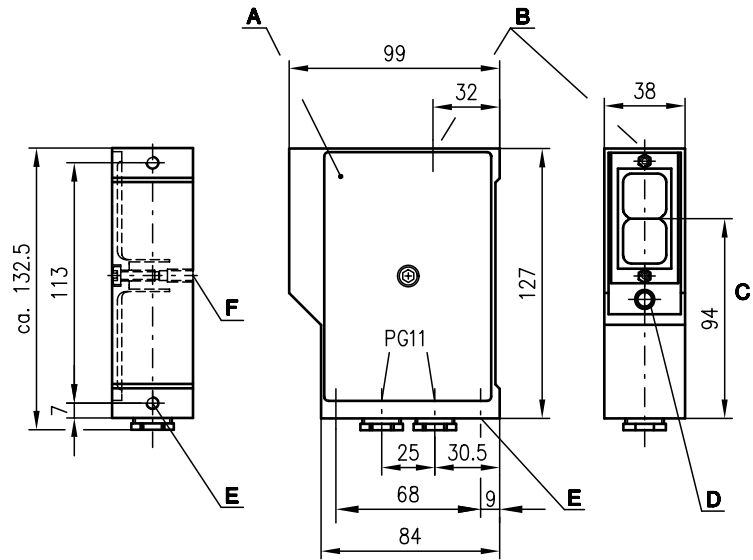


Accessories:

(available separately • see page 530)

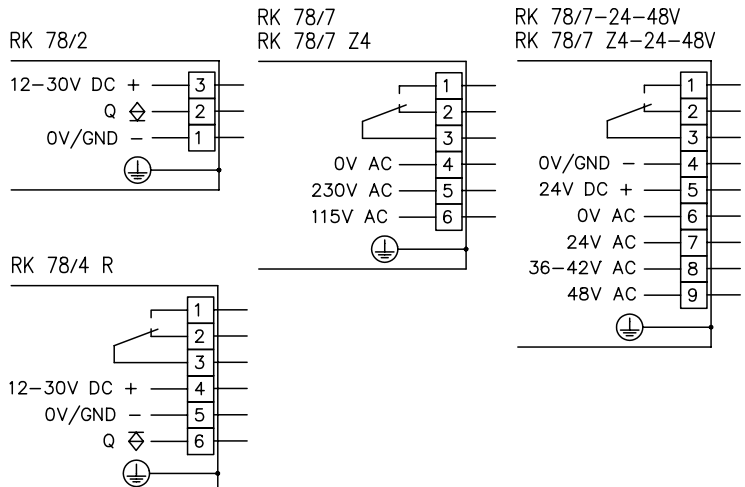
- Mounting systems (BT 16, UMS 78)
- Fastening adapter BT 08
- Diaphragm BL 04
- Time module transient pulses ZK 7810
- Time module slow operation and release ZK 7820
- Alignment aid ARH 2

Dimensioned drawing



- A** Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B** Sensitivity adjustment
- C** Optical axis
- D** Indicator diodes
- E** Device fixture M6x9
- F** Device fixture M6x12

Electrical connection



We reserve the right to make changes • 78_b01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	7.5m
Operating range ²⁾	6m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz (PNP/NPN) 20Hz (relay)
Sensor response time	5ms (PNP/NPN) approx. 25ms (relay)
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	24VDC, 12 ... 30VDC, 115/230VAC, 42VAC, 24/48VAC
Power consumption	approx. 600mW (PNP/NPN) approx. 3.5VA (relay)
Residual ripple	≤ 15% of U_B
Bias current	≤ 70mA (PNP/NPN) max. 120mA (relay)
Switching output	PNP/NPN transistor output or relay
Function characteristics	Light/dark switching through sliding switch
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$ (PNP/NPN)
Output current	max. 100mA (PNP/NPN)
Switching voltage, relay	max. 240VAC with resistive load
Switching current, relay	max. 2.5AAC with resistive load

Indicators

LED red	light path interrupted
---------	------------------------

Mechanical data

Housing	diecast aluminium
Weight	transmitter 600g, receiver 600g
Optics	glass lens
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage) ³⁾	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ⁴⁾	1, 2, 3
VDE safety class ⁵⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics due to temperature changes
------------------------------	--

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) -30°C with operating voltage continuously applied
- 4) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
- 5) Rating voltage 250VAC

Order guide

Selection table		Order code →							
Equipment ↓		RK 78/2 Part No. 500 00429	RK 78/4 R Part No. 500 00443	RK 78/7 Part No. 500 00448	RK 78/7-24-48 V Part No. 500 00449	RK 78/7 Z1-42 VS Part No. 500 00458	RK 78/7 Z4 Part No. 500 00457	RK 78/7 Z4-24-48 V Part No. 500 00456	
Housing	metal	●	●	●	●	●	●	●	
Operating range	6m	●	●	●	●	●	●	●	
Connection	terminals	●	●	●	●	●	●	●	
Features									
Voltage supply	12 ... 30VDC	●	●						
	115/230VAC			●			●		
	24VDC				●			●	
	24/48VAC				●			●	
Switching output	42VAC					●			
	NPN	●							
	PNP		●						
Integrated time module	relay		●	●	●	●	●	●	
	Time modules ZK 7810, ZK 7820 retrofittable	●	●	●	●	●	●	●	

Tables

Reflectors		Operating range
TK(S)	100x100	0 ... 6.0m
TK(S)	50x50	0 ... 5.5m
TK	82	0.5 ... 6.0m
TK	60	0 ... 2.5m
TK	45	0.5 ... 4.5m
TG	60	1.0 ... 3.5m
Tape 2	100x100	0.5 ... 2.5m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

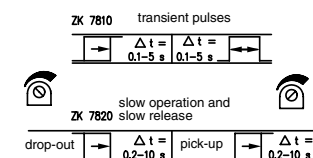
Remarks

Operation without relay through splitting of bridge "B" (RK 78/4 R).

The standard devices (see table) are expandable through plug-in time modules:

- Time module ZK 7810 (transient pulses), slow operation and pulse length adjustable from 0.1 s ... 5s.
- Time module ZK 7820 (slow operation and release), slow operation and release separately adjustable from 0.2s ... 10s.

See figure for adjustment:





RK 78

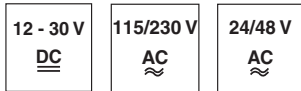
Energetic diffuse reflection light scanner



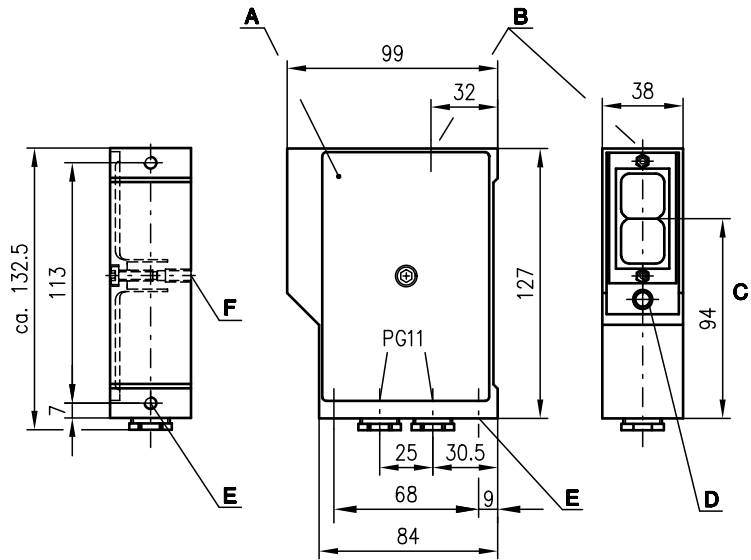
Dimensioned drawing



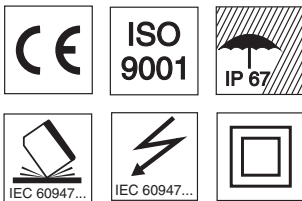
0 ... 0.3m
0 ... 0.8m
0 ... 2.0m



- AC voltage 115/230V, 24/48V and DC voltage 12 ... 30V
- With PNP switching output and/or relay outputs
- Light/dark switching in each device
- Universal connection via terminals
- Additional plug-in time module



- A** Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B** Sensitivity adjustment
- C** Optical axis
- D** Indicator diodes
- E** Device fixture M6x9
- F** Device fixture M6x12

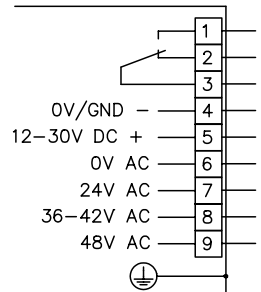
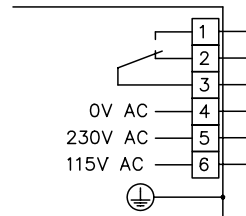
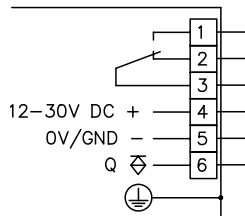


Electrical connection

RK 78/4 R-300
RK 78/4 R-800
RK 78/4 R-2000

RK 78/7-300
RK 78/7-800
RK 78/7-2000

RK 78/7-300-24-48V
RK 78/7-800-24-48V
RK 78/7-2000-24-48V



Accessories:

(available separately • see page 530)

- Mounting systems (BT 16, UMS 78)
- Fastening adapter BT 08
- Diaphragm BL 04
- Time module transient pulses ZK 7810
- Time module slow operation and release ZK 7820
- Alignment aid ARH 2

We reserve the right to make changes • 78_c01e.fm



Specifications

Optical data

Scanning range (white 90%) ¹⁾	0 ... 300mm, 0 ... 800mm, 0 ... 2000mm
Adjustment range	5 ... 100%
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz (PNP) 20Hz (relay)
Sensor response time	5ms (PNP) approx. 25ms (relay)
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	12 ... 30VDC, 115/230VAC, 24/48VAC
Power consumption	approx. 600mW (PNP) approx. 3.5VA (relay)
Residual ripple	≤ 15% of U_B
Bias current	≤ 70mA (PNP/NPN) max. 120mA (relay)
Switching output	PNP transistor output, relay: 1 change-over contact
Function characteristics	Light/dark switching through sliding switch
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V (PNP)
Output current	max. 100mA (PNP)
Switching voltage, relay	max. 240VAC with resistive load
Switching current, relay	max. 2.5AAC with resistive load

Indicators

LED red	light path interrupted
---------	------------------------

Mechanical data

Housing	diecast aluminium
Weight	transmitter 600g, receiver 600g
Optics	glass lens
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage) ²⁾	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics due to temperature changes
------------------------------	--

- 1) Scanning range: recommended range with performance reserve
- 2) -30°C with operating voltage continuously applied
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection
- 4) Rating voltage 250VAC

Order guide

Selection table		Order code →								
Equipment ↓		RK 78/4 R-300 Part No. 500 00445	RK 78/4 R-800 Part No. 500 00446	RK 78/4 R-2000 Part No. 500 00447	RK 78/7-300 Part No. 500 00450	RK 78/7-800 Part No. 500 00452	RK 78/7-2000 Part No. 500 00454	RK 78/7-300-24-48 V Part No. 500 00451	RK 78/7-800-24-48 V Part No. 500 00453	RK 78/7-2000-24-48 V Part No. 500 00455
Housing	metal	●	●	●	●	●	●	●	●	●
Scanning range	300mm	●			●			●		
	800mm		●			●			●	
	2000mm			●			●			●
Connection	terminals	●	●	●	●	●	●	●	●	●
Features										
Voltage supply	12 ... 30VDC	●	●	●				●	●	●
	115/230VAC				●	●	●			
	24/48VDC							●	●	●
Switching output	PNP	●	●	●						
	relay	●	●	●	●	●	●	●	●	●
Time modules ZK 7810, ZK 7820 retrofittable		●	●	●	●	●	●	●	●	●

Tables

Diagrams

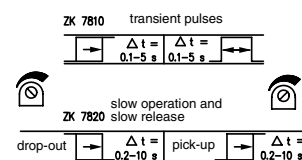
Remarks

Operation without relay through splitting of bridge "B" (RK 78/4 R).

The standard devices (see table) are expandable through plug-in time modules:

- Time module ZK 7810 (transient pulses), slow operation and pulse length adjustable from 0.1 s ... 5s.
- Time module ZK 7820 (slow operation and release), slow operation and release separately adjustable from 0.2s ... 10s.

See figure for adjustment:



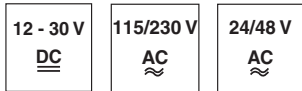


FRK 78

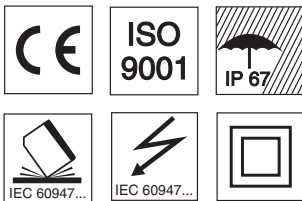
Diffuse reflection light scanner with background suppression



50 ... 800 mm



- With PNP switching output and/or relay outputs
- Light/dark switching in each device
- Universal connection via terminals
- Additional plug-in time module

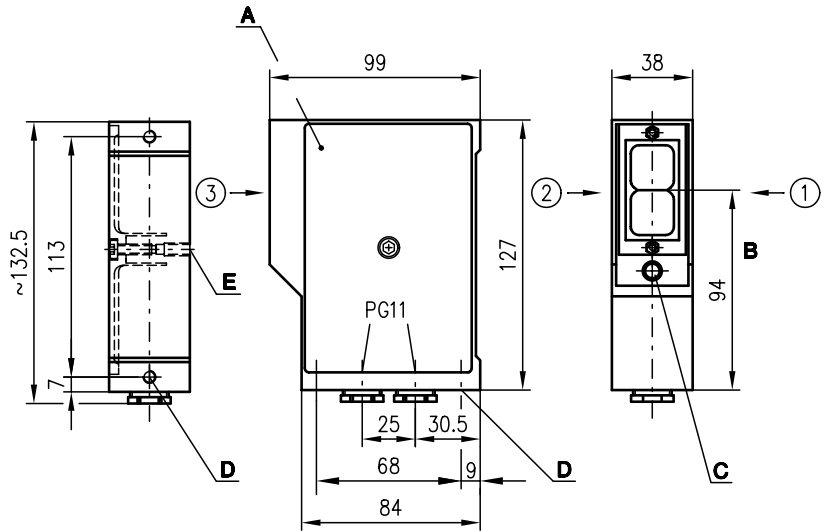


Accessories:

(available separately • see page 530)

- Mounting systems (BT 16, UMS 78)
- Fastening adapter BT 08
- Diaphragm BL 04
- Time module transient pulses ZK 7810
- Time module slow operation and release ZK 7820
- Alignment aid ARH 2

Dimensioned drawing

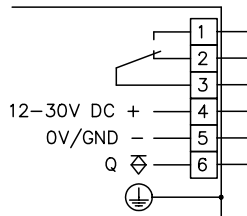


- A Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B Optical axis
- C Indicator diodes
- D Device fixture M6x9
- E Device fixture M6x12

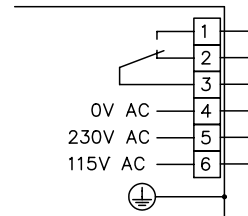
Preferred entry direction for objects ① + ② + ③

Electrical connection

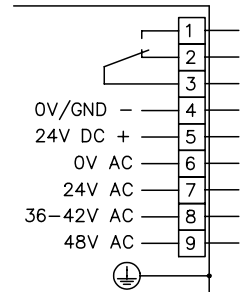
FRK 78/4 R-800



FRK 78/7-800



FRK 78/7-800-24-48V



We reserve the right to make changes • 78_d01e.fm



Specifications

Optical data

Scanning range ¹⁾	50 ... 800mm
Adjustment range	100 ... 800mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Sensor switching frequency	100Hz (PNP) 20Hz (relay)
Sensor response time	5ms (PNP) approx. 25ms (relay)
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	12 ... 30VDC, 115/230VAC, 24VDC, 24/48VAC
Power consumption	approx. 600mW (PNP) approx. 3.5VA (relay)
Residual ripple	≤ 15% of U_B
Bias current	≤ 70mA (PNP / NPN) max. 120mA (relay)
Switching output	PNP transistor output, relay: 1 change-over contact
Function characteristics	Light/dark switching through sliding switch
Signal voltage high/low	≥ ($U_B - 2V$) ≤ 2V (PNP)
Output current	max. 100mA (PNP)
Switching voltage, relay	max. 240VAC with resistive load
Switching current, relay	max. 2.5AAC with resistive load

Indicators

LED red	light path interrupted
---------	------------------------

Mechanical data

Housing	diecast aluminium
Weight	transmitter 600g, receiver 600g
Optics	glass lens
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage) ²⁾	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	III, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

De-humidifying system	to prevent condensation on the optics due to temperature changes
------------------------------	--

1) Scanning range: adjustable through spindle drive inside the housing

2) -30°C with operating voltage continuously applied

3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

4) Rating voltage 250VAC

Order guide

Selection table		Order code →								
Equipment ↓		FRK 78/4 R-800 Part No. 500 00590	FRK 78/7-800 Part No. 500 00591	FRK 78/7-800-24-48 V Part No. 500 00365						
Housing	metal	●	●	●						
Scanning range	300mm	●	●	●						
Connection	terminals	●	●	●						
Features										
Voltage supply	12 ... 30VDC	●								
	115/230VAC		●							
	24VDC			●						
	24/48VDC			●						
Switching output	PNP	●								
	relay	●	●	●						
Time modules ZK 7810, ZK 7820 retrofittable		●	●	●						

Tables

Diagrams

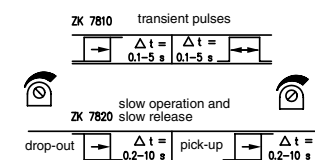
Remarks

Operation without relay through splitting of bridge "B" (FRK 78/4 R-800).

The standard devices (see table) are expandable through plug-in time modules:

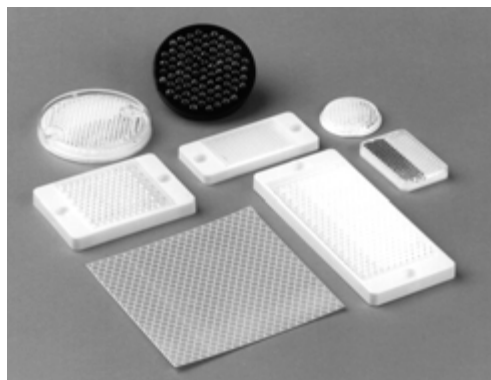
- Time module ZK 7810 (transient pulses), slow operation and pulse length adjustable from 0.1 s ... 5s.
- Time module ZK 7820 (slow operation and release), slow operation and release separately adjustable from 0.2s ... 10s.

See figure for adjustment:





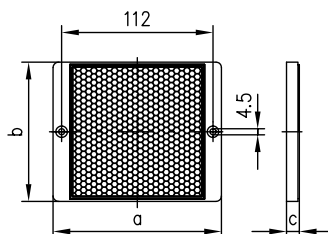
Reflectors



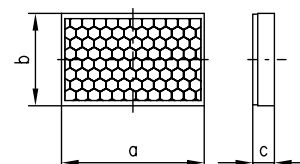
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

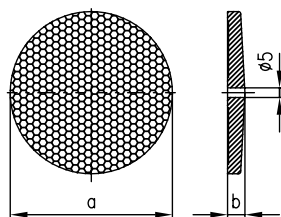
TKS 100 x 100



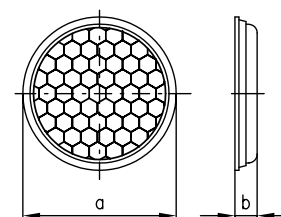
TK 30 x 50



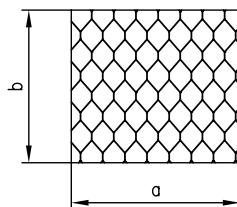
TK 82



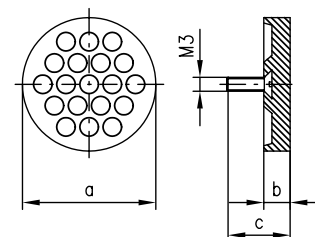
TK 35



Tape No. 2



TG 29



Order codes:

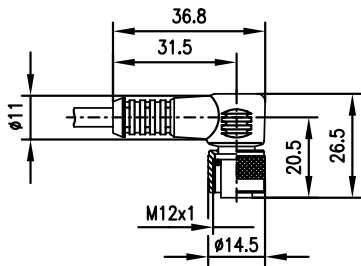
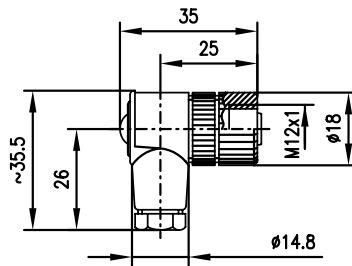
Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 50x50	500 22814
TKS 30x50	500 23525
TK 30x50	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
Tape 2	500 11523
TG 60	500 03179
TG 29	500 09374
TG 6	500 03176
KB 095-5000-5	500 20500
KB 095-5000-5A	500 20499
KD 095-5	500 20502
KD 095-5A	500 20501
BT 16	500 06902
BT 78	500 03374
BT 08	500 09417
BL 04	500 08506
ZK 7810	500 00672
ZK 7820	500 00673
ARH 2	500 23547

Selection table

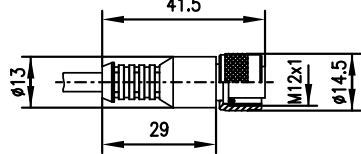
Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 ²⁾	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 ²⁾	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 ²⁾	-20°C/+60°C	48	32	6.8	○	●
TK 82 ¹⁾	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
TK 45	-20°C/+60°C	46	8			●
TK 35	-20°C/+60°C	35.5	5			●
Tape 2	-20°C/+60°C	100	100			●
TG 60	-20°C/+120°C	60	9	24	●	
TG 29	-20°C/+120°C	29	6.5	14.5	●	
TG 6	-20°C/+120°C	6	5			●

1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket

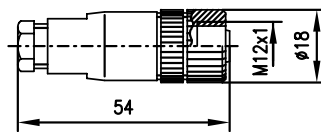
Additional information in section "Accessories" from page 925 onwards!
We reserve the right to make changes * 78_zu_e.fm

Dimensioned drawings

 KB 095-5000-5
41.5


KD 095-5





KB 095-5000-5A



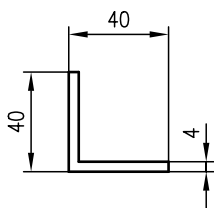
KD 095-5A

Selection table

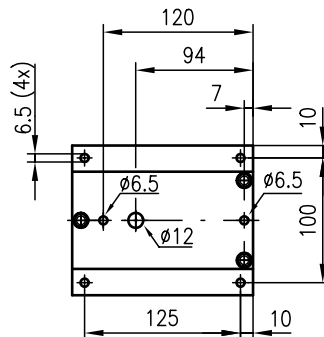
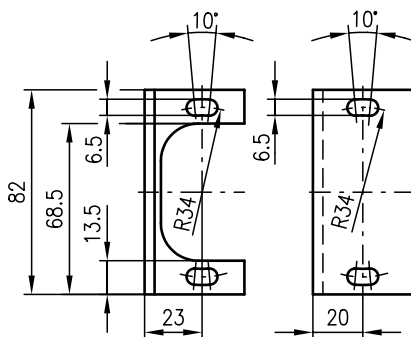
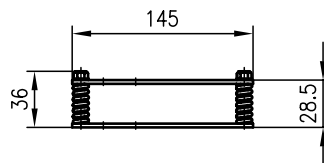
M12 connectors			
 with cable (5 m cable length)		 without cable	
KB 095-5000-5	KB 095-5000-5A	KD 095-5	KD 095-5A

Dimensioned drawings

BT 78



BT 16


Connectors, plugs, cables


Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices.

Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: 4 connectors with ready-made 5m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

Mounting systems

BT 78



BT 16







Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

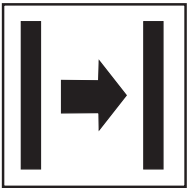
Further Product Range

Appendix – Index



Cylindrical Sensors - Selection Tables Overview

Table 1



Throughbeam photoelectric sensors

Transmitter and receiver are contained in different housings. The sensor beam travels the whole way only once. Large operating ranges are possible. Those devices are especially suited if heavy contamination occurs.

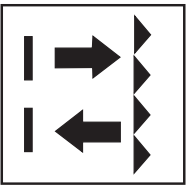
The Selection Table

Even though the product variety is huge, it is easy to find the right optical sensor for the corresponding application.

By using the clear selection tables, the correct device can be found in no time.

Basic questions are answered quickly with the optical ABC. In cases where technical problems can not be solved, the people at Leuze are available to serve you with their special knowledge.

Table 2



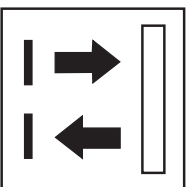
Retro-reflective photoelectric sensors

Transmitter and receiver are located in one housing. The beam of the transmitter meets the reflector and is retrodirected to the receiver of the photoelectric sensor. The electrical wiring is therefore only required on one side.

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Table 3







Diffuse reflection light scanners

Transmitter and receiver are located in one housing. The transmitters' beam however, is returned by the surface to be scanned itself. The scanning range depends on the sensor performance and the reflective properties of the material surface.

The Selection



Table 1 - Throughbeam photoelectric sensors





Figure	Series	Typ. operating range limit in m				
		8m	10m	12m	20m	45m
	318 Series	13		20	45	
	412 Series	8				
	518 Series	10		11		
	618 Series	12				



Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection			Housing			Options			Application	Page							
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment	Time delay	Low temperature/optics heating	Protective photoelectric sensor AOPD type 2	Dynamic	
	•		•			•	•			1000Hz	•	•		•				•		•	•								543
•			•			•				500Hz	•	•		•				•	•					•					571
	•		•			•	•			1000Hz	•	•		•				•		•			•	•					583
	•		•			•				500Hz	•	•		•				•						•					605



Table 2 - Retro-reflective photoelectric sensors





Figure	Series	Typ. operating range limit in m				
		1m	3m	4m	5m	7m
	318 Series	3.4		4.8	6	
	412 Series	1.6	3			
	518 Series	3		3.5	4.5	
	618 Series	7				



Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection			Housing			Options			Application		Page						
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment	Time delay	Low temperature/optics heating	Polarisation filter	Transparent media	
•	•		•			•	•			1000Hz	•	•		•				•		•	•						•	•	543
•			•			•				700Hz	•	•		•				•		•							•		571
•	•		•			•	•			1000Hz	•	•		•				•			•		•	•			•		583
•			•			•				500Hz	•	•		•					•								•		605



Table 3 - Diffuse reflection light scanners

Figure	Series	Typ. scanning range limit in mm				
		100mm	200mm	300mm	500mm	800mm
	318 Series	110	250	500	700	
	412 Series	400				
	518 Series	130	250	500	800	
	618 Series	300				



Light source			Operating voltage			Switching output			Switching frequency	Switching		Connection				Housing			Options				Application		Page				
Red light	Infrared	Laser	DC	AC/DC	AS-interface	PNP transistor	NPN transistor	Relay	AS-interface	Hz (transistor/relay)	Light	Dark	M8 connector	M12 connector	M18 connector	Plug	Terminals	Cable	Metal	Stainless steel	Plastic	Warning output	Activation input	Sensitivity adjustment/Scanning range	Time delay	Low temperature/optics heating	Background suppression	Focussing	
	•		•			•	•			1000Hz	•	•		•				•		•	•						•		543
•			•			•				500Hz	•	•		•				•		•									571
	•		•			•	•			1000Hz	•	•		•				•			•								583
	•		•			•				500Hz	•	•		•					•										605



318 Series

Overview and advantages



M18 cylindrical sensor series in robust stainless steel and plastic housing



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensor with and without polarisation filter
- Energetic diffuse reflection light scanners
- Diffuse reflection light scanners with background suppression



10 ... 30VDC voltage with PNP transistor output



M12 connectors for fast mounting or with cable connection



Options:

- Activation input





Operating principle	Designation	Typ. operating range limit/ Typ. scanning range limit	Housing				Light source		Operating voltage
			Plastic	Stainless steel	Straight optics	Angle optics	Red light	Infrared	
	LS 318K/P-70-S12	0 ... 45.0m	•		•			•	
	LS 318K/P-70	0 ... 45.0m	•		•			•	
	LS 318M/P-70-S12	0 ... 45.0m		•	•			•	
	LS 318M/P-70	0 ... 45.0m		•	•			•	
	LS 318K/P-S12	0 ... 20.0m	•		•			•	
	LS 318K/P	0 ... 20.0m	•		•			•	
	LS 318M/P-S12	0 ... 20.0m		•	•			•	
	LS 318M/P	0 ... 20.0m		•	•			•	
	LS 318WK/P-S12	0 ... 13.0m	•			•		•	
	LS 318WK/P	0 ... 13.0m	•			•		•	
	LS 318WM/P-S12	0 ... 13.0m		•		•		•	
	LS 318WM/P	0 ... 13.0m		•		•		•	
	RK 318K/P-S12	0.02 ... 6.0m	•		•			•	
	RK 318K/P	0.02 ... 6.0m	•		•			•	
	RK 318M/P-S12	0.02 ... 6.0m		•	•			•	
	RK 318M/P	0.02 ... 6.0m		•	•			•	
	RK 318WK/P-S12	0.03 ... 4.8m	•			•		•	
	RK 318WK/P	0.03 ... 4.8m	•			•		•	
	RK 318WM/P-S12	0.03 ... 4.8m		•		•		•	
	RK 318WM/P	0.03 ... 4.8m		•		•		•	
	PRK 318K/P-S12	0.02 ... 6.0m	•		•		•	•	
	PRK 318K/P	0.02 ... 6.0m	•		•		•	•	
	PRK 318M/P-S12	0.02 ... 6.0m		•	•		•	•	
	PRK 318M/P	0.02 ... 6.0m		•	•		•	•	
	PRK 318K/P-40-S12	0.10 ... 3.4m	•		•		•	•	
	PRK 318K/P-40	0.10 ... 3.4m	•		•		•	•	
	PRK 318M/P-40-S12	0.10 ... 3.4m		•	•		•	•	
	PRK 318M/P-40	0.10 ... 3.4m		•	•		•	•	
	PRK 318WK/P-S12	0.03 ... 4.5m	•			•	•	•	
	PRK 318WK/P	0.03 ... 4.5m	•			•	•	•	
	PRK 318WM/P-S12	0.03 ... 4.5m		•		•	•	•	
	PRK 318WM/P	0.03 ... 4.5m		•		•	•	•	



Output		Switching frequency	Switching	Connection		Options			Page
PNP transistor	NPN transistor 1)			Complementary	M12 connector	Cable, 2m	Activation input	Polarisation filter	
•		1000Hz	•	•		•		•	549
•		1000Hz	•		•	•		•	549
•		1000Hz	•	•		•		•	549
•		1000Hz	•		•	•		•	549
•		1000Hz	•	•		•		•	549
•		1000Hz	•		•	•		•	549
•		1000Hz	•	•		•		•	549
•		1000Hz	•		•	•		•	549
•		1000Hz	•	•		•		•	551
•		1000Hz	•		•	•		•	551
•		1000Hz	•	•		•		•	551
•		1000Hz	•		•	•		•	551
•		1000Hz	•	•				•	553
•		1000Hz	•		•			•	553
•		1000Hz	•	•				•	553
•		1000Hz	•		•			•	553
•		1000Hz	•	•				•	555
•		1000Hz	•		•			•	555
•		1000Hz	•	•				•	555
•		1000Hz	•		•			•	555
•		1000Hz	•	•			•	•	557
•		1000Hz	•		•		•	•	557
•		1000Hz	•	•			•	•	557
•		1000Hz	•		•		•	•	557
•		1000Hz	•	•			•	•	559
•		1000Hz	•		•		•	•	559
•		1000Hz	•	•			•	•	559
•		1000Hz	•		•		•	•	559
•		1000Hz	•	•			•	•	561
•		1000Hz	•		•		•	•	561
•		1000Hz	•	•			•	•	561
•		1000Hz	•		•		•	•	561

1) Models with NPN transistor output on request



Operating principle	Designation	Typ. operating range limit/ Typ. scanning range limit	Housing				Light source		Operating voltage
			Plastic	Stainless steel	Straight optics	Angle optics	Red light	Infrared	
	RT 318K/P-550-S12	0 ... 700mm	•		•			•	•
	RT 318K/P-550	0 ... 700mm	•		•			•	•
	RT 318M/P-550-S12	0 ... 700mm		•	•			•	•
	RT 318M/P-550	0 ... 700mm		•	•			•	•
	RT 318K/P-400-S12	0 ... 500mm	•		•			•	•
	RT 318K/P-400	0 ... 500mm	•		•			•	•
	RT 318M/P-400-S12	0 ... 500mm		•	•			•	•
	RT 318M/P-400	0 ... 500mm		•	•			•	•
	RT 318K/P-200-S12	0 ... 250mm	•		•			•	•
	RT 318K/P-200	0 ... 250mm	•		•			•	•
	RT 318M/P-200-S12	0 ... 250mm		•	•			•	•
	RT 318M/P-200	0 ... 250mm		•	•			•	•
	RT 318WK/P-400-S12	0 ... 500mm	•			•		•	•
	RT 318WK/P-400	0 ... 500mm	•			•		•	•
	RT 318WM/P-400-S12	0 ... 500mm		•		•		•	•
	RT 318WM/P-400	0 ... 500mm		•		•		•	•
	RT 318WK/P-100-S12	0 ... 130mm	•			•		•	•
	RT 318WK/P-100	0 ... 130mm	•			•		•	•
	RT 318WM/P-100-S12	0 ... 130mm		•		•		•	•
	RT 318WM/P-100	0 ... 130mm		•		•		•	•
	HRT 318K/P-100-S12	5 ... 110mm	•		•			•	•
	HRT 318K/P-100	5 ... 110mm	•		•			•	•
	HRT 318M/P-100-S12	5 ... 110mm		•	•			•	•
	HRT 318M/P-100	5 ... 110mm		•	•			•	•



Output		Switching frequency	Switching	Connection		Options			Page
PNP transistor	NPN transistor 1)			Complementary	M12 connector	Cable, 2m	Activation input	Polarisation filter	
•		1000Hz	•	•				•	563
•		1000Hz	•		•			•	563
•		1000Hz	•	•				•	563
•		1000Hz	•		•			•	563
•		1000Hz	•	•				•	563
•		1000Hz	•		•			•	563
•		1000Hz	•	•				•	563
•		1000Hz	•		•			•	563
•		1000Hz	•	•				•	563
•		1000Hz	•		•			•	563
•		1000Hz	•	•				•	563
•		1000Hz	•		•			•	563
•		1000Hz	•	•				•	565
•		1000Hz	•		•			•	565
•		1000Hz	•	•				•	565
•		1000Hz	•		•			•	565
•		1000Hz	•	•				•	565
•		1000Hz	•		•			•	565
•		1000Hz	•	•				•	565
•		1000Hz	•		•			•	565
•		1000Hz	•	•				•	565
•		1000Hz	•		•			•	565
•		1000Hz	•	•				•	567
•		1000Hz	•		•			•	567
•		1000Hz	•	•				•	567
•		1000Hz	•		•			•	567

1) Models with NPN transistor output on request



LS 318

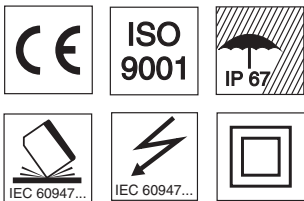
Throughbeam photoelectric sensors



0 ... 20m
0 ... 45m



- Throughbeam photoelectric sensors with long operating range in infrared light and straight optics
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Activation input for testing and interlinking
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces



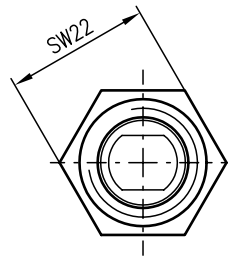
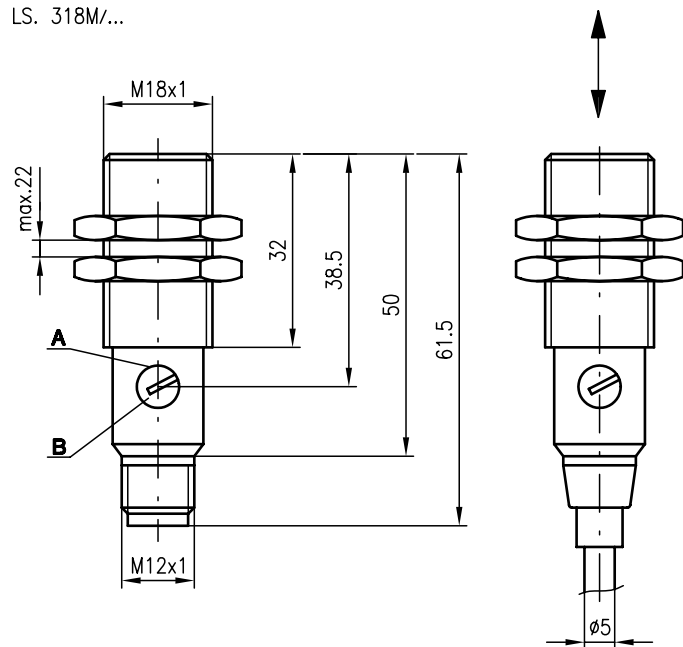
Accessories:

(available separately • see page 568)

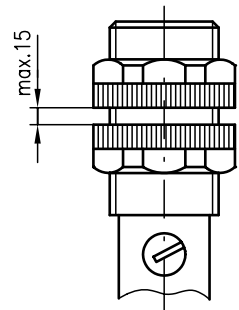
- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing

LS. 318M/...



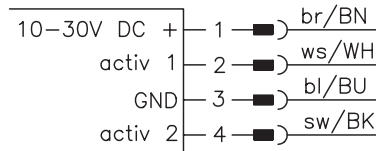
LS. 318K/...



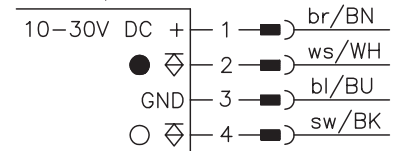
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

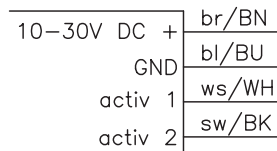
LSS 318M-S12
LSS 318K-S12
LSS 318M-70-S12
LSS 318K-70-S12



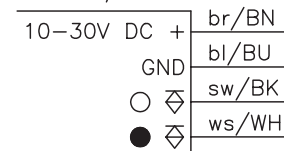
LSE 318M/P-S12
LSE 318K/P-S12



LSS 318M
LSS 318K
LSS 318M-70
LSS 318K-70



LSE 318M/P
LSE 318K/P



We reserve the right to make changes • 318_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 20m, 0 ... 45m
Operating range ²⁾	0 ... 15m, 0 ... 35m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 10% of U _B
Bias current	≤ 25mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -1.6V)/≤ 1.6V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input activ 1	
Transmitter active/not active	≥ 8V or not connected/≤ 1.5V
Activation input activ 2	
Transmitter active/not active	≤ 1.5V or not connected/≥ 8V

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Order guide

Selection table		Order code →							
Equipment ↓		LS 318K/P-70-S12 Part No. 500 82195 (Tr) Part No. 500 81336 (Re)	LS 318K/P-S12 Part No. 500 81335 (Tr) Part No. 500 81336 (Re)	LS 318M/P-70-S12 Part No. 500 82177 (Tr) Part No. 500 81340 (Re)	LS 318M/P-S12 Part No. 500 81339 (Tr) Part No. 500 81340 (Re)	LS 318K/P-70 Part No. 500 82176 (Tr) Part No. 500 81338 (Re)	LS 318K/P Part No. 500 81337 (Tr) Part No. 500 81338 (Re)	LS 318M/P-70 Part No. 500 82188 (Tr) Part No. 500 81342 (Re)	LS 318M/P Part No. 500 81341 (Tr) Part No. 500 81342 (Re)
Housing	plastic	●	●			●	●		
	stainless steel			●	●			●	●
Connection	M12 connector	●	●	●	●				
	cable					●	●	●	●
Switching output	PNP	●	●	●	●	●	●	●	●
	NPN								
Operating range	15m		●		●		●		●
	35m	●		●		●		●	

Tables

LS 318...-70...

0	35	45
---	----	----

LS 318...

0	15	20
---	----	----

- Operating range [m]
- Typ. operating range limit [m]

Model with integrated pin or slit diaphragm for detection of small parts or precise positioning tasks on request.

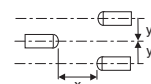
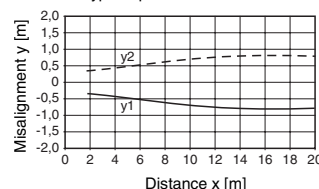
Slit diaphragm	Operating range
0.5mmx9mm	2.4m
1.0mmx9mm	4.0m
1.5mmx9mm	6.5m

Pin diaphragm	Operating range
Ø 1.0mm	0.45m
Ø 1.5mm	1.05m
Ø 2.0mm	2.15m

Diagrams

LS 318...

Typ. response behaviour



Remarks

- Models with NPN transistor output on request.



LS 318 W

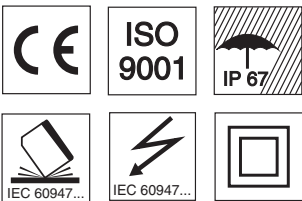
Throughbeam photoelectric sensors



0 ... 13m



- Throughbeam photoelectric sensors with long operating range in infrared light and angle optics
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Activation input for testing and interlinking
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces

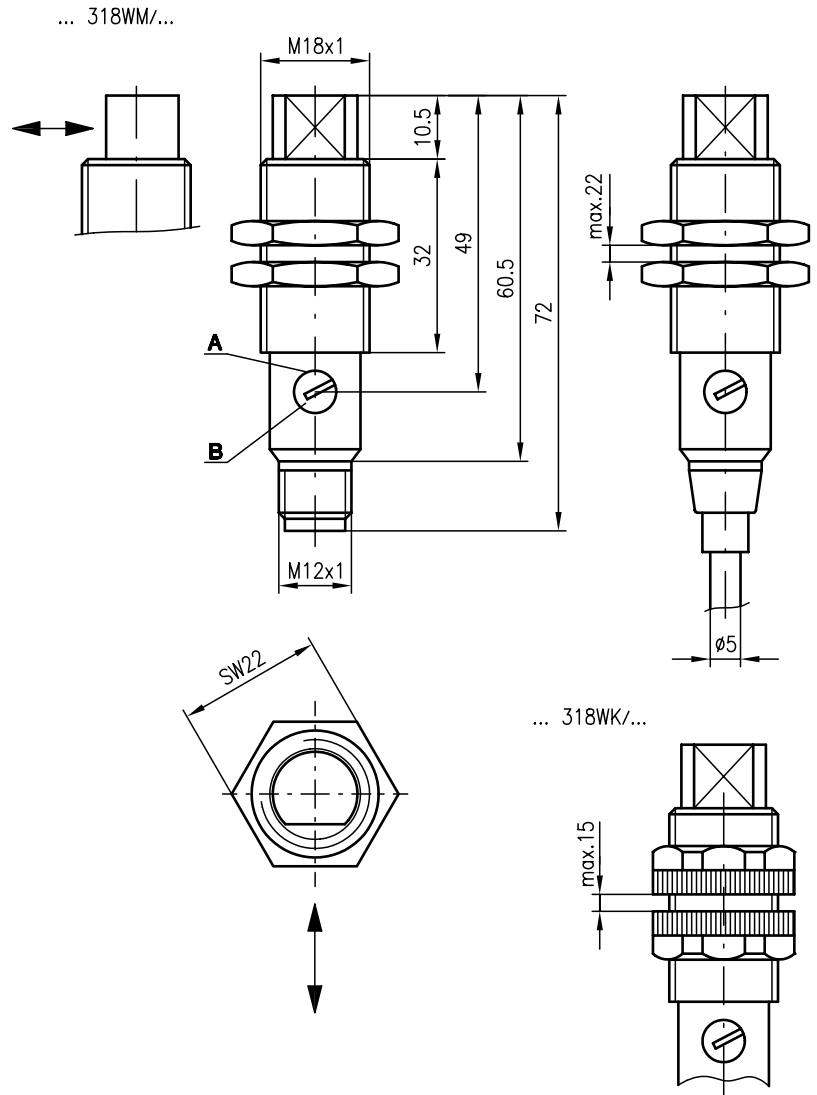


Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

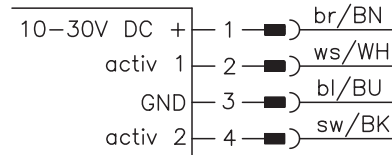
Dimensioned drawing



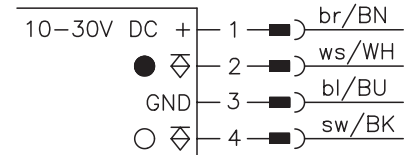
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

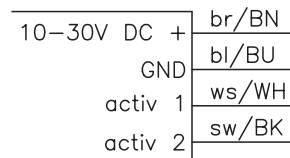
LSS 318WM-S12
LSS 318WK-S12



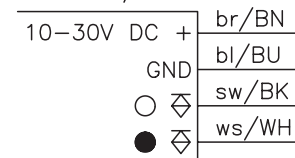
LSE 318WM/P-S12
LSE 318WK/P-S12



LSS 318WM
LSS 318WK



LSE 318WM/P
LSE 318WK/P



We reserve the right to make changes • 318_a02e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 13m
Operating range ²⁾	0 ... 10m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 10% of U _B
Bias current	≤ 25mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -1.6V)/≤ 1.6V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input activ 1	
Transmitter active/not active	≥ 8V or not connected/≤ 1.5V
Activation input activ 2	
Transmitter active/not active	≤ 1.5V or not connected/≥ 8V

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Tables

0	10	13
---	----	----

- Operating range [m]
- Typ. operating range limit [m]

Diagrams

Order guide

Selection table		Order code →					
Equipment ↓		LS 318W/K/P-S12 Part No. 500 82153 (Tr) Part No. 500 82157 (Re)	LS 318W/K/P Part No. 500 82151 (Tr) Part No. 500 82155 (Re)	LS 318W/M/P-S12 Part No. 500 82154 (Tr) Part No. 500 82158 (Re)	LS 318W/M/P Part No. 500 82152 (Tr) Part No. 500 82156 (Re)		
Housing	plastic	●	●				
	stainless steel			●	●		
Connection	M12 connector	●		●			
	cable		●		●		
Switching output	PNP	●	●	●	●		
	NPN						

Remarks

- Models with NPN transistor output on request.



RK 318

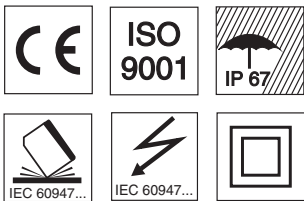
Retro-reflective photoelectric sensors



0.02 ... 6.0m

10 - 30 V
DC

- Retro-reflective photoelectric sensors with straight optics using infrared light
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces

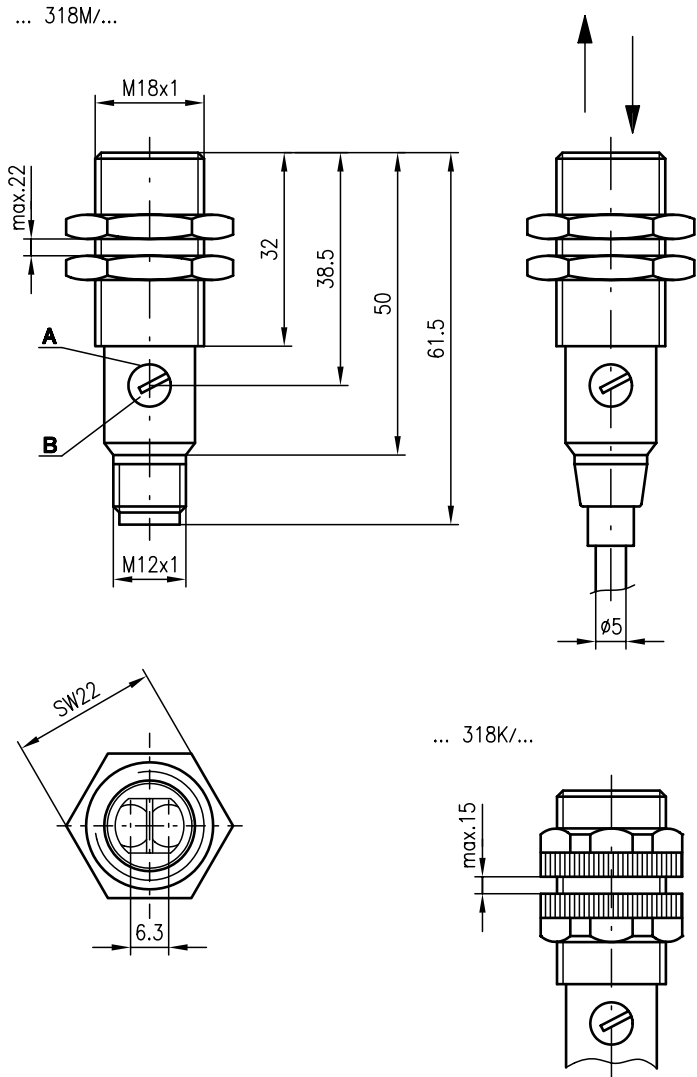


Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

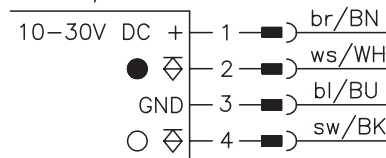
Dimensioned drawing



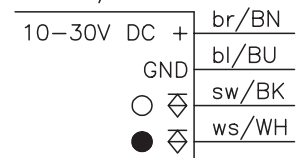
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

RK 318M/P-S12
RK 318K/P-S12



RK 318M/P
RK 318K/P



We reserve the right to make changes • 318_b03e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.02 ... 6.0m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	950nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Order guide

Selection table		Order code →							
Equipment ↓		RK 318K/P-S12 Part No. 500 81343	RK 318K/P Part No. 500 81344	RK 318M/P-S12 Part No. 500 81345	RK 318M/P Part No. 500 81346				
Housing	plastic	●	●						
	stainless steel			●	●				
Connection	M12 connector	●		●					
	cable		●		●				
Switching output	PNP	●	●	●	●				
	NPN								

Tables

Reflectors	Operating range
1 TK(S) 100x100	0.03 ... 4.6m
2 TK(S) 47x47	0.02 ... 4.0m
3 TK(S) 30x50	0.03 ... 2.2m
4 TK(S) 20x40	0.06 ... 1.9m
5 Tape 2 100x100	0.15 ... 2.5m

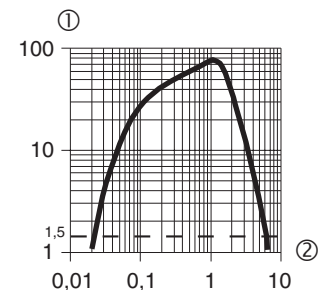
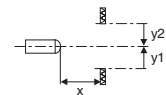
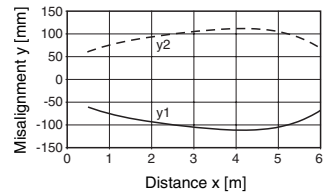
1	0.03		4.6	6.0
2	0.02		4.0	5.4
3	0.03	2.2	3.2	
4	0.06	1.9	2.9	
5	0.15	2.5	3.5	

- Operating range [m]
- Typ. operating range limit [m]

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Typical behaviour reflector distance/relative intensity of received light
(with reflector TK(S) 100x100)

- ① relative intensity of received light
- ② reflector distance [m]

Remarks

- Models with NPN transistor output on request.



RK 318 W

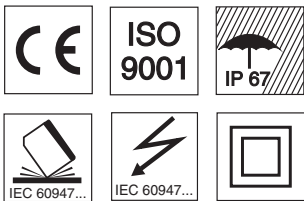
Retro-reflective photoelectric sensors



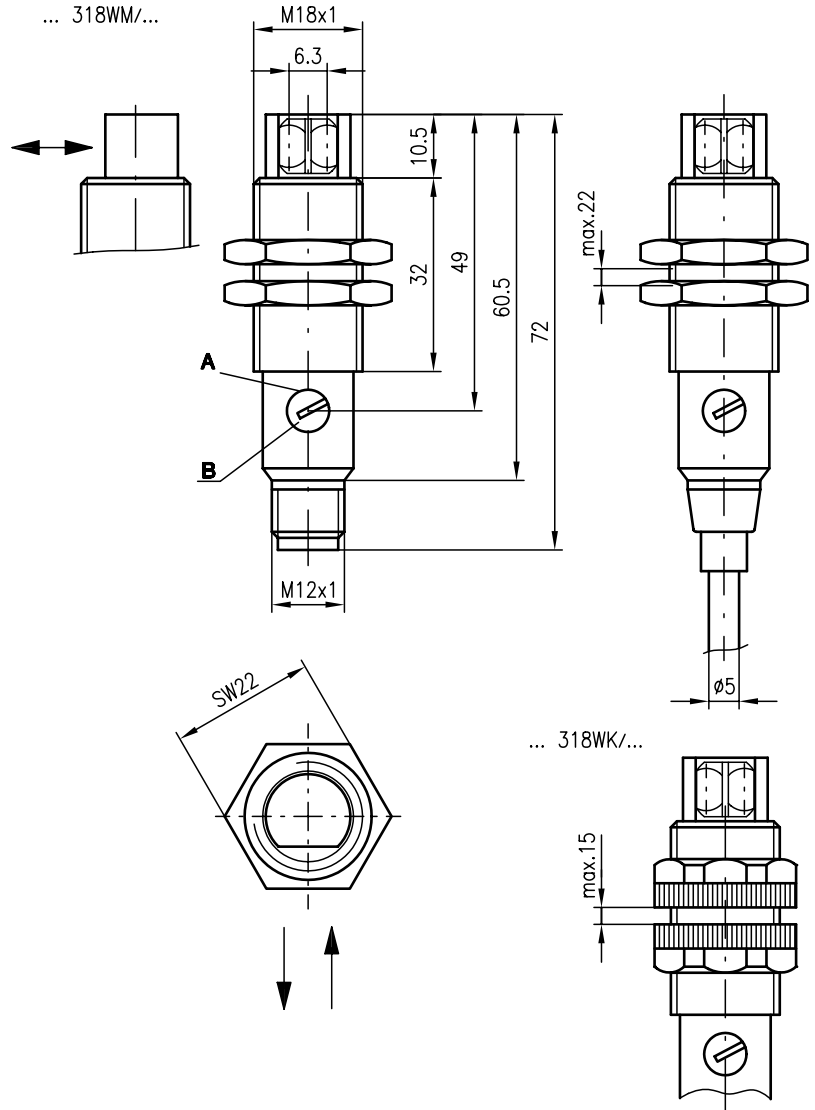
0.03 ... 4.8m



- Retro-reflective photoelectric sensors with angle optics using infrared light
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces



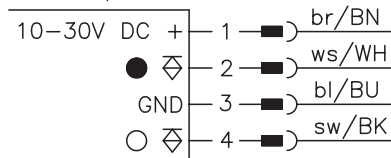
Dimensioned drawing



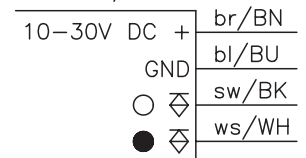
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

RK 318WM/P-S12
RK 318WK/P-S12



RK 318WM/P
RK 318WK/P



We reserve the right to make changes • 318_b04e.fm

Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.03 ... 4.8m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	950nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 10% of U _B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -1.6V)/≤ 1.6V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
 4) Rating voltage 250 VAC

Tables

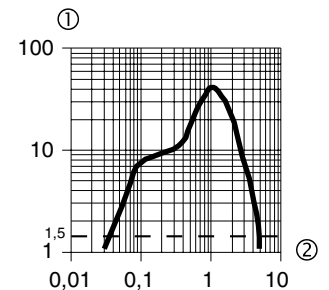
Reflectors			Operating range
1	TK(S)	100x100	0.05 ... 3.7m
2	TK(S)	47x47	0.05 ... 3.2m
3	TK(S)	30x50	0.05 ... 1.8m
4	TK(S)	20x40	0.24 ... 1.5m
5	Tape 2	100x100	0.36 ... 2.0m

1	0.05		3.7	4.8
2	0.05		3.2	4.3
3	0.05	1.8	2.6	
4	0.24	1.5	2.3	
5	0.36	2.0	2.8	

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TK(S) ... = screw type
 Tape 2 = adhesive

Diagrams



Typical behaviour reflector distance/relative intensity of received light
 (with reflector TK(S) 100x100)

- ① relative intensity of received light
 ② reflector distance [m]

Order guide

Selection table		Order code →							
Equipment ↓		RK 318WK/P-S12 Part No. 500 82161	RK 318WK/P Part No. 500 82159	RK 318WM/P-S12 Part No. 500 82162	RK 318WM/P Part No. 500 82160				
Housing	plastic	●	●						
	stainless steel			●	●				
Connection	M12 connector	●		●					
	cable		●		●				
Switching output	PNP	●	●	●	●				
	NPN								

Remarks

- Models with NPN transistor output on request.



PRK 318

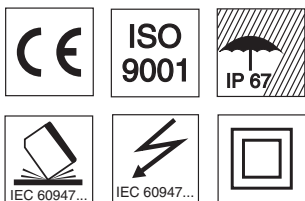
Retro-reflective photoelectric sensors with polarisation filter



0.02 ... 6.0m



- Polarised retro-reflective photoelectric sensors with straight optics using visible red light
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces



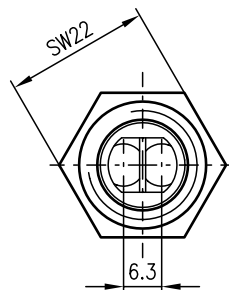
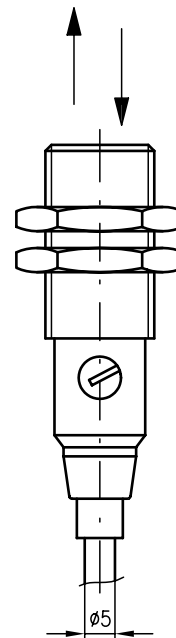
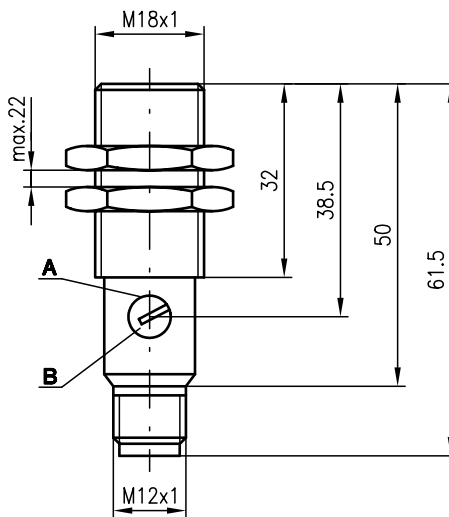
Accessories:

(available separately • see page 568)

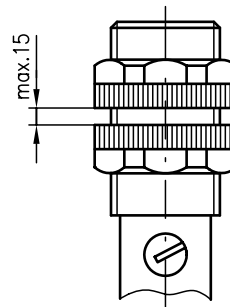
- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

Dimensioned drawing

... 318M/...



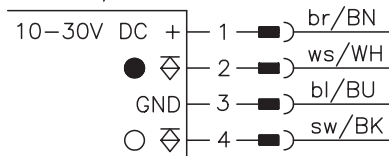
... 318K/...



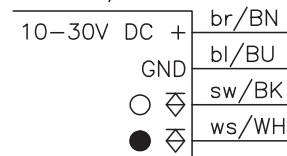
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

PRK 318M/P-S12
PRK 318K/P-S12



PRK 318M/P
PRK 318K/P



We reserve the right to make changes • 318_b01e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.02 ... 6.0m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6$ V) / ≤ 1.6 V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	acrylic
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4 x 0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Order guide

Selection table		PRK 318K/P-S12 Part No. 500 81347	PRK 318K/P Part No. 500 81348	PRK 318M/P-S12 Part No. 500 81349	PRK 318M/P Part No. 500 81350				
Equipment ↓		Order code →							
Housing	plastic	●	●						
	stainless steel			●	●				
Connection	M12 connector	●		●					
	cable		●		●				
Switching output	PNP	●	●	●	●				
	NPN								

Tables

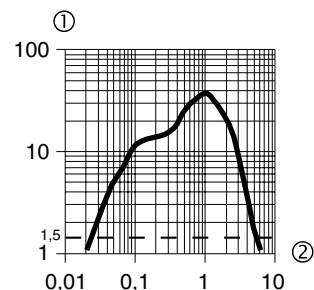
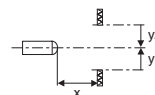
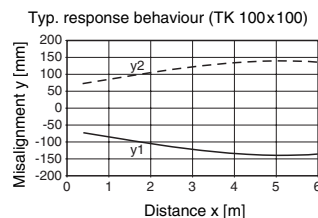
Reflectors	Operating range
1 TK(S) 100x100	0.03 ... 4.6m
2 TK(S) 47x47	0.02 ... 3.2m
3 TK(S) 30x50	0.03 ... 2.2m
4 TK(S) 20x40	0.06 ... 1.9m
5 Tape 2 100x100	0.24 ... 2.0m

1	0.03			4.6	6.0
2	0.02		3.2	4.6	
3	0.03	2.2		3.2	
4	0.06	1.9	2.9		
5	0.24	2.0	3.1		

- Operating range [m]
- Typ. operating range limit [m]

- TK ... = adhesive
- TKS ... = screw type
- Tape 2 = adhesive

Diagrams



Typical behaviour reflector distance/relative intensity of received light (with reflector TK(S) 100x100)

- ① relative intensity of received light
- ② reflector distance [m]

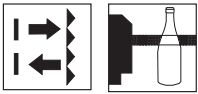
Remarks

- Models with NPN transistor output on request.



PRK 318

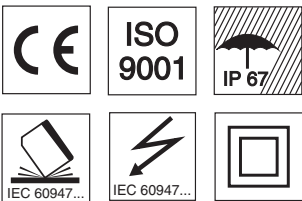
Retro-reflective photoelectric sensors with polarisation filter



0.1 ... 3.4m

10 - 30 V
DC

- Polarised retro-reflective photoelectric sensors for reliable detection of transparent objects (e.g. glass, PE, foil). The sensor uses visible red light and comes with straight optics
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces

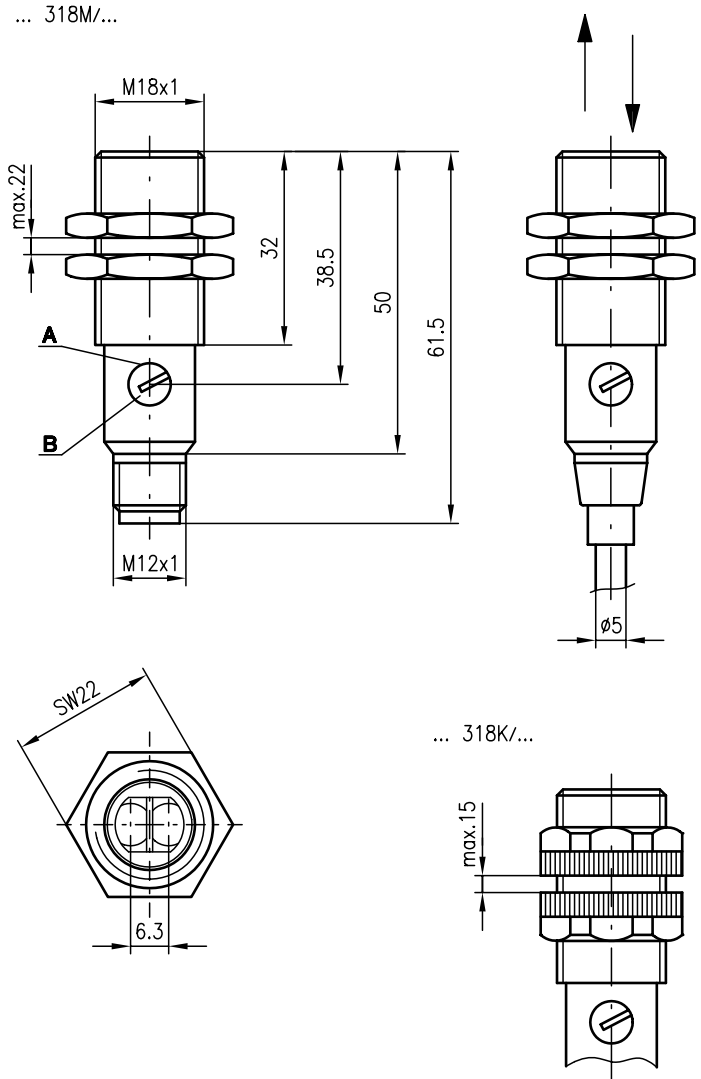


Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

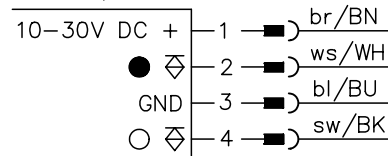
Dimensioned drawing



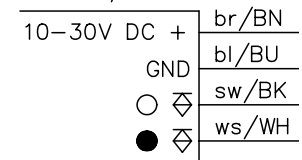
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

PRK 318M/P-40-S12
PRK 318K/P-40-S12



PRK 318M/P-40
PRK 318K/P-40



We reserve the right to make changes • 318_b05e.fm

Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 3.4m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6$ V) / ≤ 1.6 V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free for detection of transparent objects

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	acrylic
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
 4) Rating voltage 250VAC

Tables

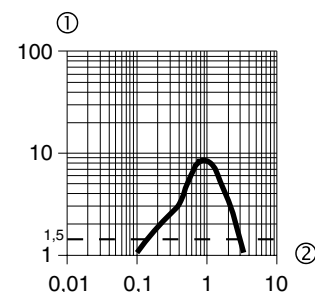
Reflectors	Operating range
1 TK(S) 100x100	0.15 ... 2.8m
2 TK(S) 47x47	0.10 ... 1.6m
3 TK(S) 30x50	0.10 ... 1.2m
4 TK(S) 20x40	0.10 ... 1.0m
5 Tape 2 100x100	0.20 ... 1.2m

1	0.15		2.8	3.4
2	0.10		1.6	2.3
3	0.10	1.2	1.5	
4	0.10	1.0	1.3	
5	0.20	1.2	1.6	

- Operating range [m]
 Typ. operating range limit [m]

- TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams



Typical behaviour reflector distance/relative intensity of received light
 (with reflector TK(S) 100x100)

- ① relative intensity of received light
 ② reflector distance [m]

Order guide

Selection table		PRK 318K/P-40-S12 Part No. 500 82191	PRK 318K/P-40 Part No. 500 82192	PRK 318M/P-40-S12 Part No. 500 82193	PRK 318M/P-40 Part No. 500 82194				
	Order code →								
Equipment ↓									
Housing	plastic	●	●						
	stainless steel			●	●				
Connection	M12 connector	●		●					
	cable		●		●				
Switching output	PNP	●	●	●	●				
	NPN								

Remarks

- Models with NPN transistor output on request.
- Reducing the sensitivity setting to the point where the LED starts flashing provides for the most reliable detection of transparent objects. In this operating state, the sensor reliably detects window glass brought into the light beam.



PRK 318 W

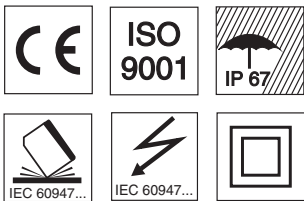
Retro-reflective photoelectric sensors with polarisation filter



0.03 ... 4.5m



- Polarised retro-reflective photoelectric sensors with angle optics using visible red light
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces

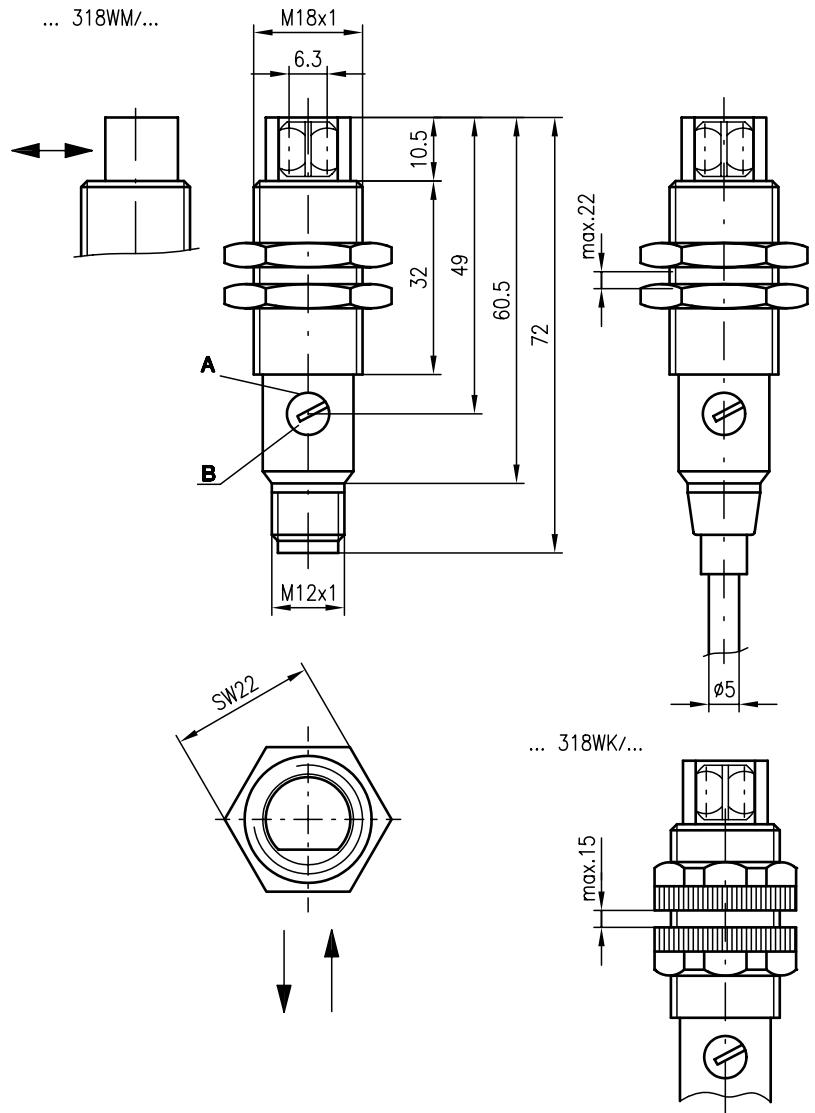


Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

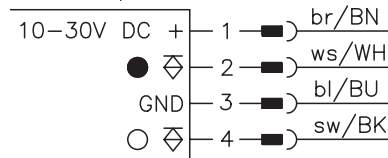
Dimensioned drawing



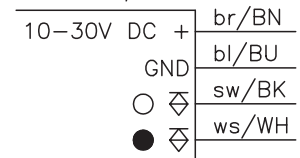
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

PRK 318WM/P-S12
PRK 318WK/P-S12



PRK 318WM/P
PRK 318WK/P



We reserve the right to make changes • 318_b02e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 0.03 ... 4.5m
 Operating range ²⁾ see table
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 1000Hz
 Response time 0.5ms
 Delay before start-up ≤ 30ms

Electrical data

Operating voltage U_B 10 ... 30VDC
 Residual ripple ≤ 10% of U_B
 Bias current ≤ 15mA
 Switching output 2 transistor outputs, complementary light/dark switching
 Function characteristics ≥ (U_B-1.6 V) ≤ 1.6 V
 Signal voltage high/low max. 100mA
 Output current adjustable
 Sensitivity adjustable

Indicators

LED red light path free
 LED red flashing light path free, no performance reserve

Mechanical data

Housing polyamide 12 or stainless steel
 Optics cover glass
 Weight 95g (cable), 25g (M12)
 Connection type M12 connector, 4-pin
 cable 2m, 4x0.25mm²

Environmental data

Ambient temp. (operation/storage) -25°C ... +65°C/-40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3, 4
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250 VAC

Tables

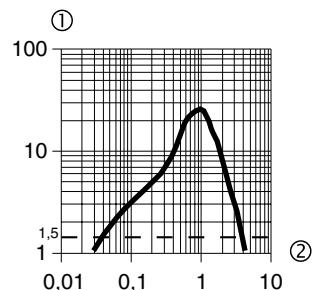
Reflectors			Operating range
1	TK(S)	100x100	0.05 ... 3.5m
2	TK(S)	47x47	0.05 ... 2.5m
3	TK(S)	30x50	0.05 ... 1.6m
4	TK(S)	20x40	0.20 ... 1.4m
5	Tape 2	100x100	0.30 ... 1.7m

1	0.05		3.5	4.5
2	0.05		2.5	3.5
3	0.05	1.6	2.2	
4	0.20	1.4	2.0	
5	0.30	1.7	2.4	

□ Operating range [m]
 ▒ Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams



Typical behaviour reflector distance/relative intensity of received light (with reflector TK(S) 100x100)

① relative intensity of received light
 ② reflector distance [m]

Order guide

Selection table		Order code →							
Equipment ↓		PRK 318WK/P-S12 Part No. 500 82165	PRK 318WK/P Part No. 500 82163	PRK 318WM/P-S12 Part No. 500 82166	PRK 318WM/P Part No. 500 82164				
Housing	plastic	●	●						
	stainless steel			●	●				
Connection	M12 connector	●		●					
	cable		●		●				
Switching output	PNP	●	●	●	●				
	NPN								

Remarks

- Models with NPN transistor output on request.



RT 318

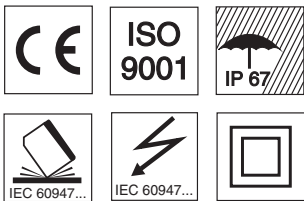
Energetic diffuse reflection light scanner



0 ... 250 mm
0 ... 500 mm
0 ... 700 mm



- Energetic diffuse reflection light scanner with infrared light and straight optics
- Robust cylindrical metal or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces

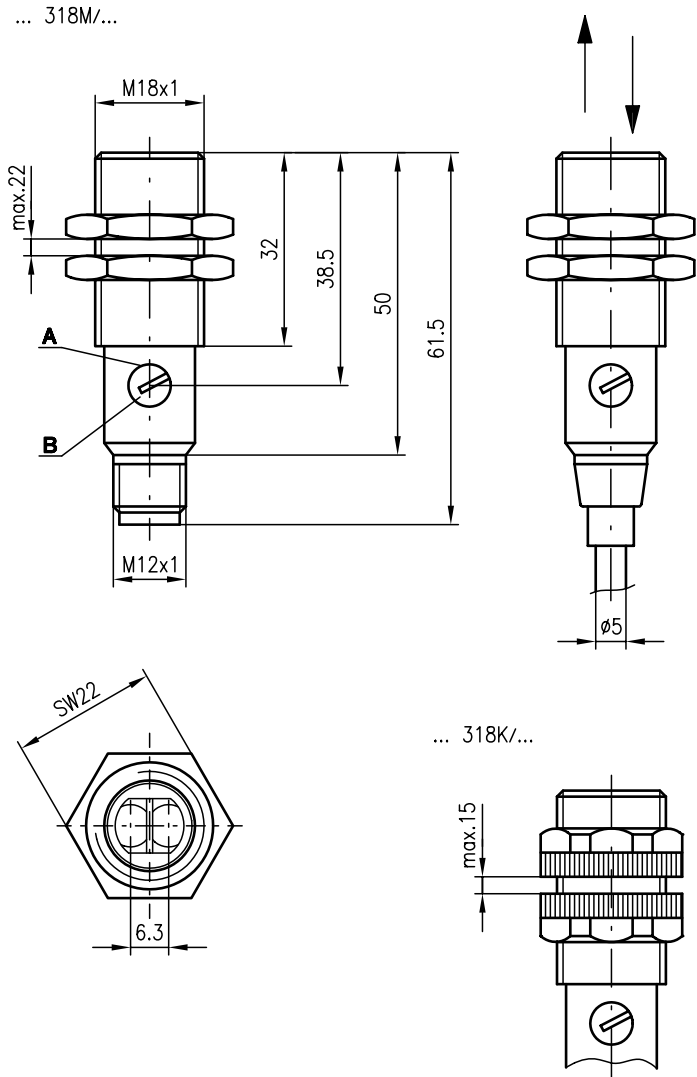


Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

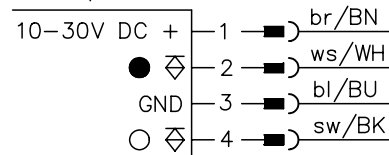
Dimensioned drawing



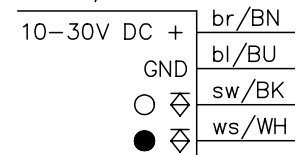
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

RT 318M/P-550-S12
 RT 318M/P-400-S12
 RT 318M/P-200-S12
 RT 318K/P-550-S12
 RT 318K/P-400-S12
 RT 318K/P-200-S12



RT 318M/P-550
 RT 318M/P-400
 RT 318M/P-200
 RT 318K/P-550
 RT 318K/P-400
 RT 318K/P-200



We reserve the right to make changes • 318_c02e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 250mm, 0 ... 500mm, 0 ... 700mm
Scanning range ²⁾	see table
Adjustment range	80 ... 250mm, 170 ... 500mm, 190 ... 700mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6 V$) ≤ 1.6 V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	reflection
LED red flashing	reflection, no performance reserve

Mechanical data

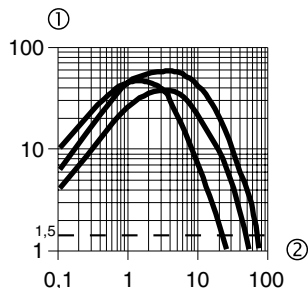
Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2 m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Diagrams



Typical behavior object distance/ relative intensity of received light
(with white 90%, 10x10cm)

- ① relative intensity of received light
- ② object distance [cm]

Order guide

Selection table		Order code →											
Equipment ↓		RT 318K/P-550-S12 Part No. 500 82175	RT 318K/P-400-S12 Part No. 500 81351	RT 318K/P-200-S12 Part No. 500 81355	RT 318M/P-550-S12 Part No. 500 82196	RT 318M/P-400-S12 Part No. 500 81353	RT 318M/P-200-S12 Part No. 500 81357	RT 318K/P-550 Part No. 500 82197	RT 318K/P-400 Part No. 500 81352	RT 318K/P-200 Part No. 500 81356	RT 318M/P-550 Part No. 500 82198	RT 318M/P-400 Part No. 500 81354	RT 318M/P-200 Part No. 500 81358
Housing	plastic	●	●	●				●	●	●			
	stainless steel				●	●	●				●	●	●
Scanning range	550mm	●									●		
	400mm		●						●				
	200mm			●						●			●
Connection	M12 connector	●	●	●	●	●	●						
	cable							●	●	●	●	●	●
Switching output	PNP	●	●	●	●	●	●	●	●	●	●	●	●
	NPN												

Tables

RT 318...-200-...

1	0	200	250
2	2	100	120
3	7	70	80

RT 318...-400-...

1	0	400	500
2	4	200	240
3	10	125	150

RT 318...-550-...

1	0	550	700
2	7	260	310
3	15	165	190

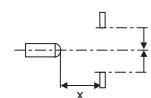
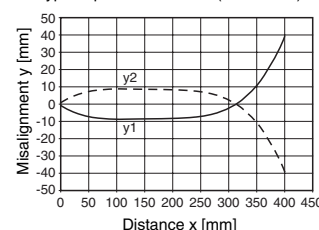
1	white 90%
2	grey 18%
3	black 6%

□	Scanning range [mm]
■	Typ. scanning range limit [mm]

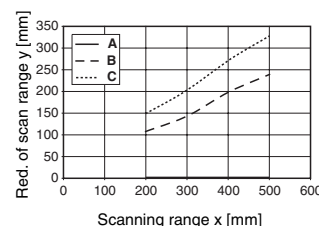
Diagrams

RT 318...-400-...

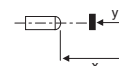
Typ. response behaviour (white 90%)



Typ. black/white behaviour



- A white 90%
- B grey 18%
- C black 6%



Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.
- Models with NPN transistor output on request.



RT 318 W

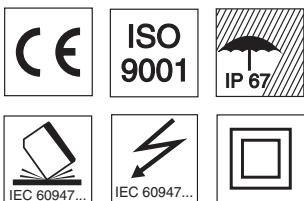
Energetic diffuse reflection light scanner



0 ... 130 mm
0 ... 500 mm



- Energetic diffuse reflection light scanner with infrared light and angle optics
- Robust cylindrical stainless steel or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces



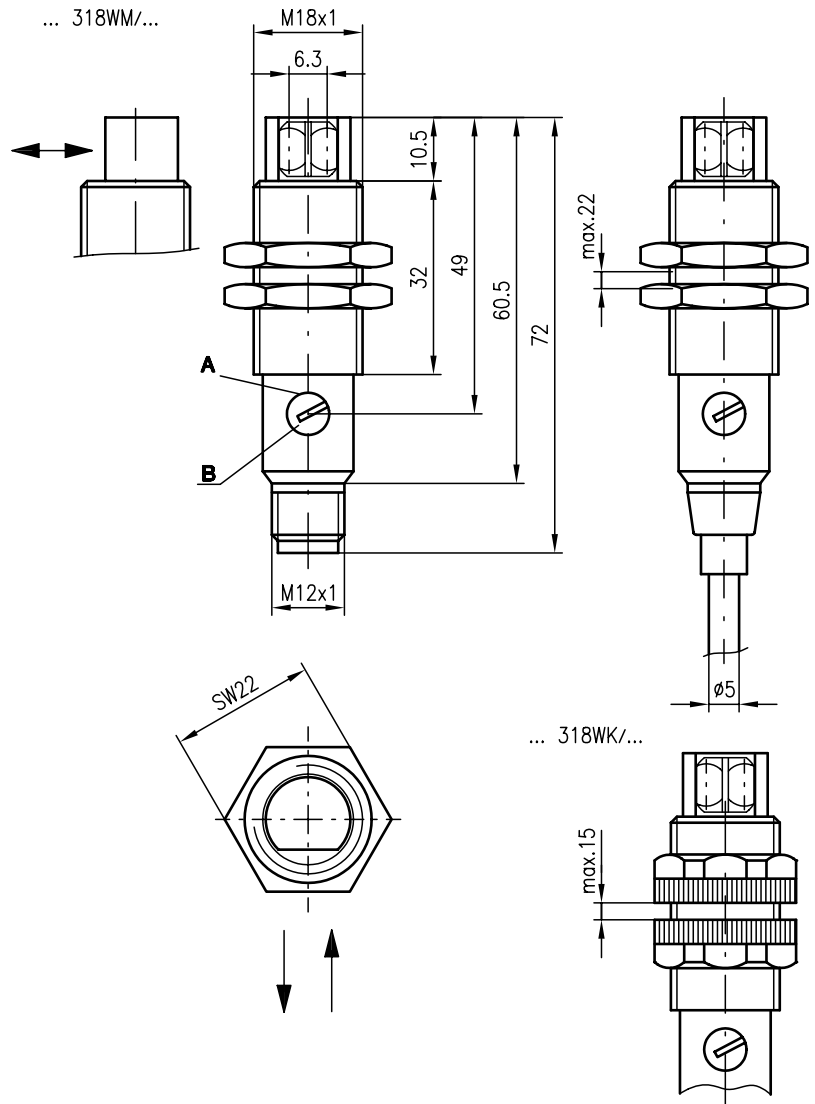
We reserve the right to make changes • 318_c01e.fm

Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

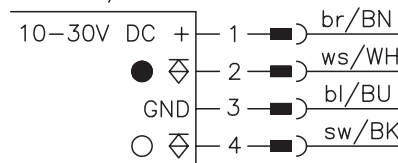
Dimensioned drawing



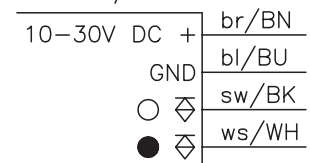
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

RT 318WM/P-400-S12
 RT 318WM/P-100-S12
 RT 318WK/P-400-S12
 RT 318WK/P-100-S12



RT 318WM/P-400
 RT 318WM/P-100
 RT 318WK/P-400
 RT 318WK/P-100





Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 130mm, 0 ... 500mm
Scanning range ²⁾	see table
Adjustment range	20 ... 130mm, 90 ... 500mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	reflection
LED red flashing	reflection, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C / -40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Tables

RT 318W...-100-...

1	0	100	130
2	2	50	65
3	3	30	40

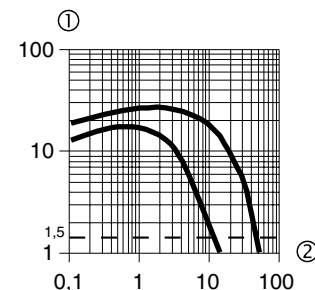
RT 318W...-400-...

1	0	400	500
2	4	200	240
3	6	130	150

1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams



Typical behaviour object distance/ relative intensity of received light (with white 90%, 10x10cm)

- ① relative intensity of received light
- ② object distance [cm]

Order guide

Selection table		Order code →							
Equipment ↓		RT 318WK/P-400-S12 Part No. 500 82173	RT 318WK/P-100-S12 Part No. 500 82169	RT 318WK/P-400 Part No. 500 82171	RT 318WK/P-100 Part No. 500 82167	RT 318WMP-400-S12 Part No. 500 82174	RT 318WMP-100-S12 Part No. 500 82170	RT 318WMP-400 Part No. 500 82172	RT 318WMP-100 Part No. 500 82168
Housing	plastic	●	●	●	●				
	stainless steel					●	●	●	●
Scanning range	400mm	●		●		●	●	●	
	100mm		●		●		●		●
Connection	M12 connector	●	●			●	●		
	cable			●	●			●	●
Switching output	PNP	●	●	●	●	●	●	●	●
	NPN								

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.
- Models with NPN transistor output on request.



HRT 318

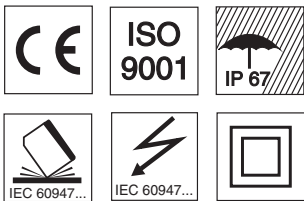
Diffuse reflection light scanner with background suppression



5 ... 110mm



- Diffuse reflection light scanner with background suppression, infrared light and straight optics
- Robust cylindrical metal or plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function
- Very short construction for application in limited spaces

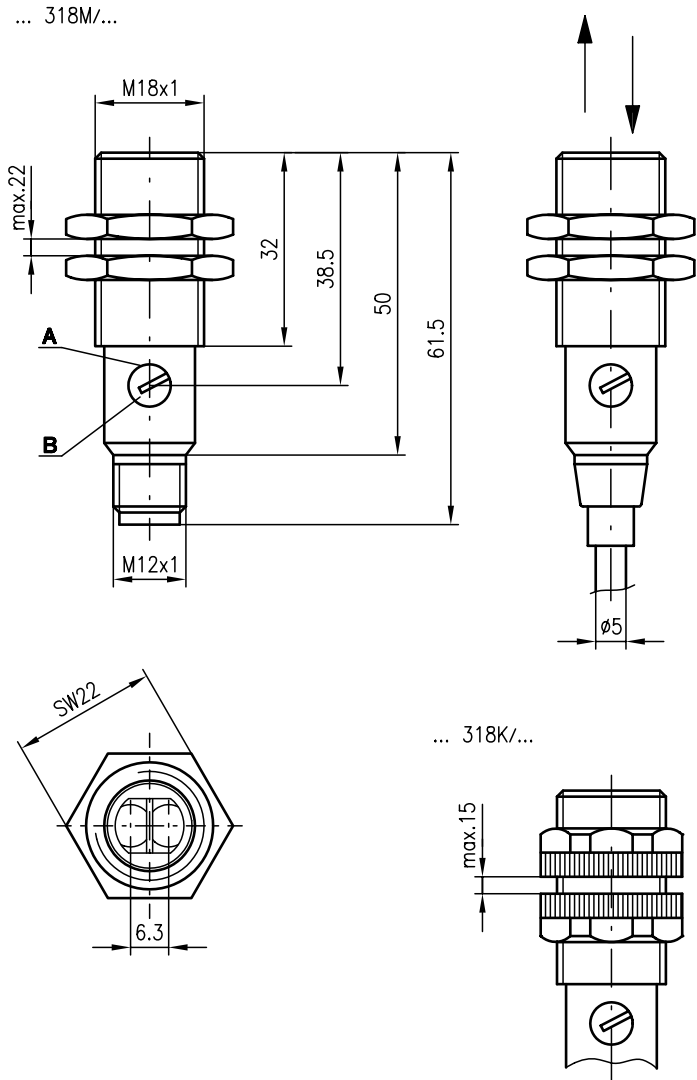


Accessories:

(available separately • see page 568)

- Mounting systems (BT 318)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

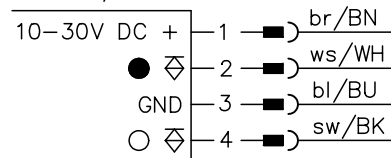
Dimensioned drawing



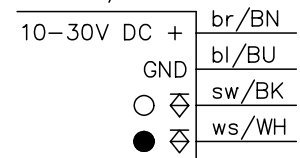
- A Indicator diode
- B Sensitivity adjustment

Electrical connection

HRT 318K/P-100-S12
HRT 318M/P-100-S12



HRT 318K/P-100
HRT 318M/P-100



We reserve the right to make changes • 318_d01e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 110mm
Scanning range ²⁾	see table
Adjustment range	50 ... 100mm
Light source	LED (modulated light)
Wavelength	950nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U _B	10 ... 30VDC
Residual ripple	≤ 10% of U _B
Bias current	≤ 35mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -1.6V)/≤ 1.6V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	reflection
LED red flashing	reflection, no performance reserve

Mechanical data

Housing	polyamide 12 or stainless steel
Optics cover	polyamide 12
Weight	90g (cable), 20g (M12)
Connection type	M 12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +65°C/-40°C ... +70°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

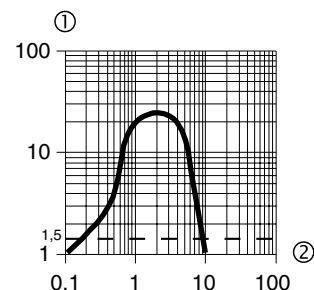
Tables

1	5	100	110
2	6	70	75
3	8	59	62

1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams



Typical behaviour object distance/relative intensity of received light (with white 90%, 10x10cm)

- ① relative intensity of received light
- ② object distance [cm]

Order guide

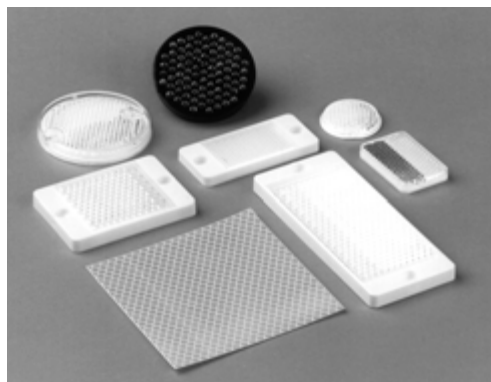
Selection table		Order code →							
		HRT 318K/P-100-S12 Part No. 500 82183	HRT 318M/P-100-S12 Part No. 500 82184	HRT 318K/P-100 Part No. 500 82189	HRT 318M/P-100 Part No. 500 82190				
Equipment ↓	Housing								
	plastic	●		●					
	stainless steel		●		●				
	Scanning range	100mm	●	●	●	●			
	Connection	M12 connector	●	●					
		cable			●	●			
	Switching output	PNP	●	●	●	●			
		NPN							

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.
- Models with NPN transistor output on request.



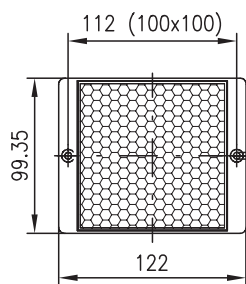
Reflectors



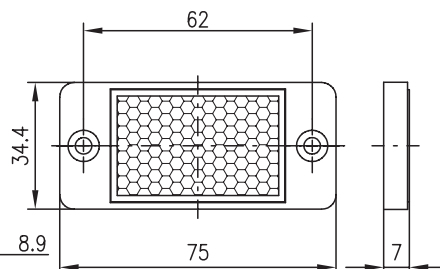
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

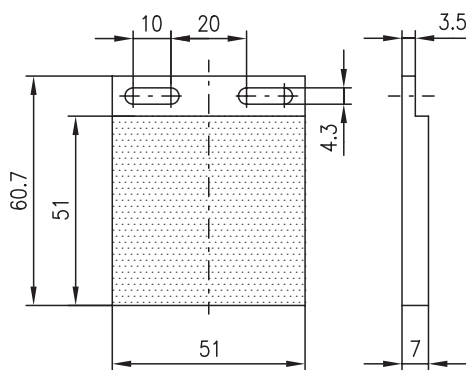
TKS 100 x 100



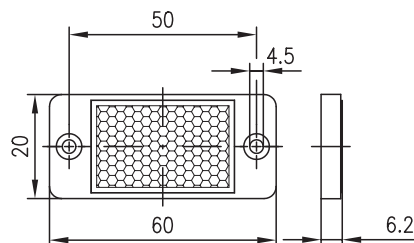
TKS 30 x 50



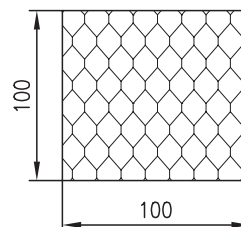
MTKS 50 x 50



TKS 20 x 40



Tape No. 2



Additional information in section "Accessories" from page 925 onwards!

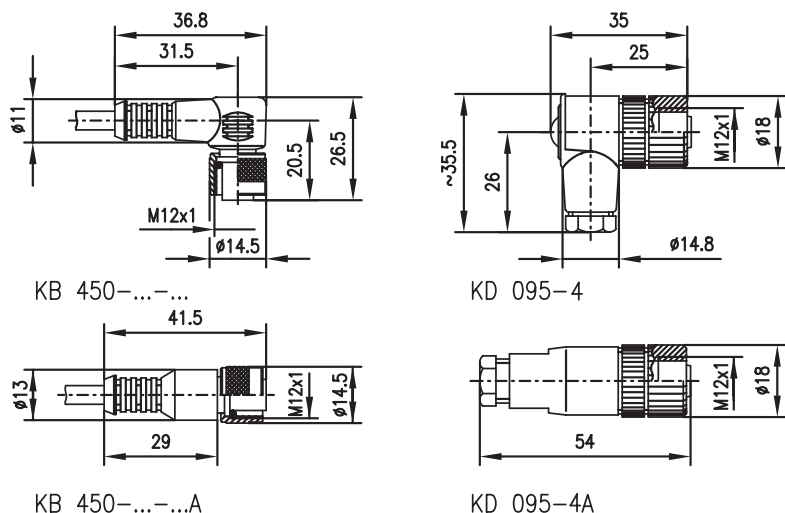
We reserve the right to make changes • 318_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-4	500 31324
KD 095-4A	500 31323
BT 318	500 33876



Dimensioned drawings



M12 connectors



For devices with M12 connectors, there are available: connectors with ready made cables and 2 conductor sockets with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

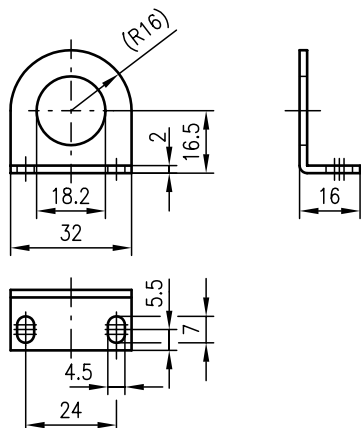
With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Selection table

M12 connectors			
with 4-wire cable		without cable	
2m cable length		KD 095-4	KD 095-4A
KB 450-2000-4	KB 450-2000-4A		
5m cable length			
KB 450-5000-4	KB 450-5000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

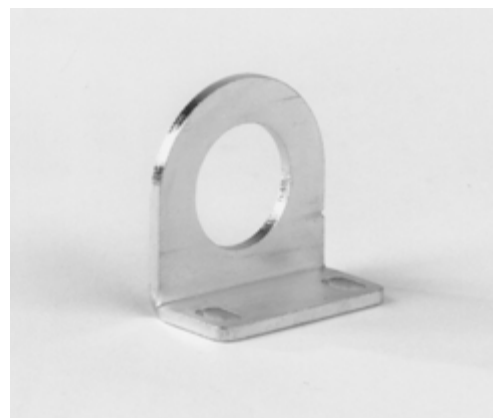
Dimensioned drawings

BT 318



Mounting systems

BT 318





412 Series Overview and advantages



Cylindrical and short M12 metal housing



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensor with/without polarisation filter
- Energetic diffuse reflection light scanners



The switching frequency of up to 700Hz enables the detection of fast events



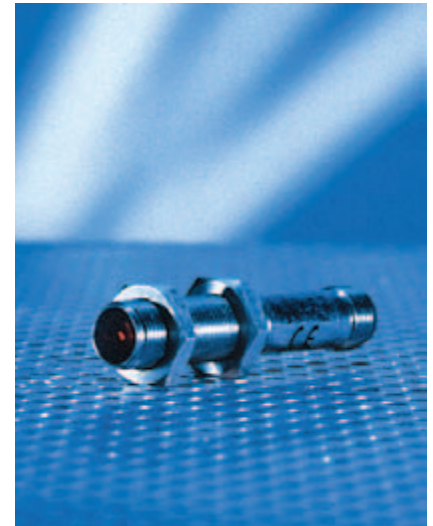
10 ... 30VDC supply voltage and PNP transistor output





M12 connector or cable



General red light for easy and fast alignment





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing				Light source		Operating voltage
			Plastic	Metal	Straight optics	Angle optics	Red light	Infrared	
	LS 412M/P-S12	0 ... 8000mm		•	•		•		•
	LS 412M/P	0 ... 8000mm		•	•		•		•
	RK 412M/P-S12	50 ... 3000mm		•	•		•		•
	RK 412M/P	50 ... 3000mm		•	•		•		•
	PRK 412M/P-S12	50 ... 1600mm		•	•		•		•
	PRK 412M/P	50 ... 1600mm		•	•		•		•
	RT 412M/P-200-S12	0 ... 400mm		•	•		•		•
	RT 412M/P-200	0 ... 400mm		•	•		•		•



Output		Switching frequency	Switching	Connection		Options			Page
PNP transistor	NPN transistor			M12 connector	Cable, 2m	Activation input	Polarisation filter	Sensitivity adjustment	
•		500Hz	•	•			•	575	
•		500Hz	•		•		•	575	
•		700Hz	•	•			•	577	
•		700Hz	•		•		•	577	
•		700Hz	•	•		•	•	577	
•		700Hz	•		•	•	•	577	
•		700Hz	•	•			•	579	
•		700Hz	•		•		•	579	



LS 412

Throughbeam photoelectric sensors

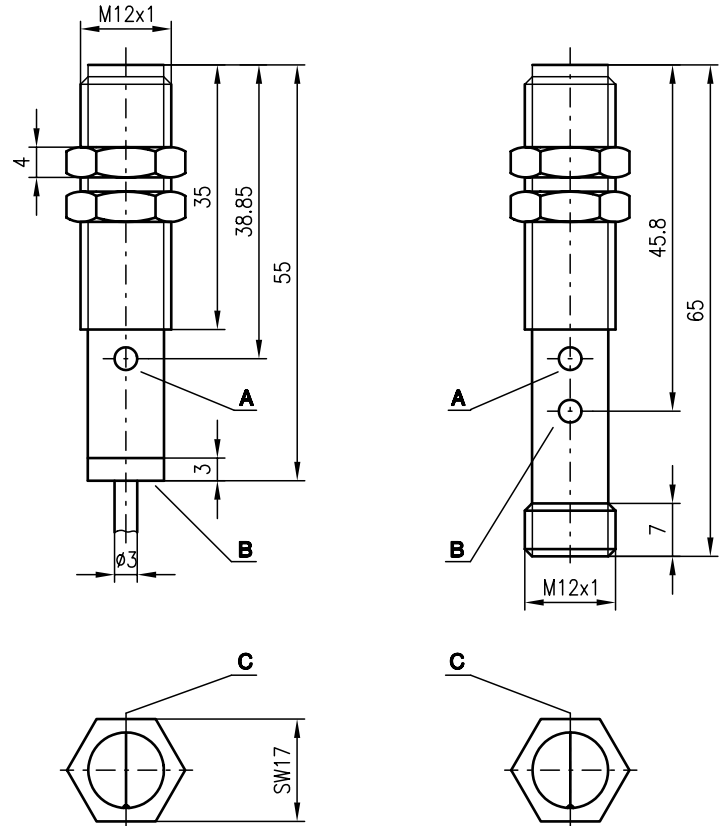


8m



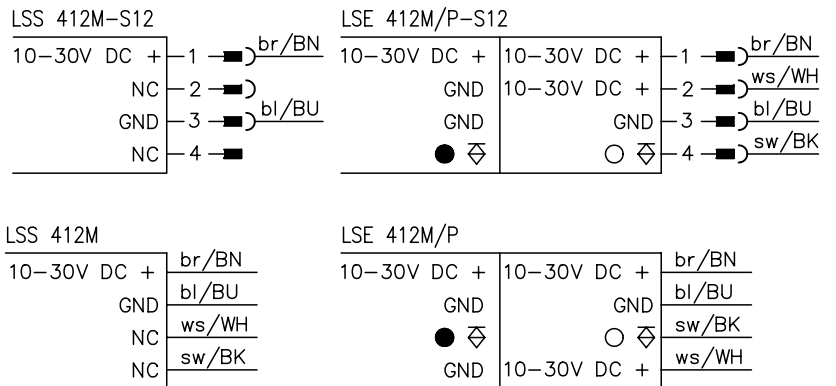
- Throughbeam photoelectric sensors using visible red light
- Slim and short cylindrical metal housing M12x1
- Sensitivity adjustment for optimal adaptation to the application
- light/dark commutation via control line

Dimensioned drawing

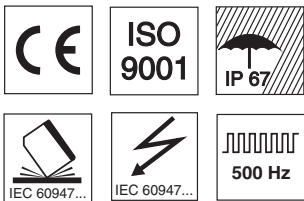


- A Sensitivity adjustment at receiver only
- B Indicator diode
- C Optical axis

Electrical connection



We reserve the right to make changes • 412_a01e.fm



Accessories:

(available separately • see page 580)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- 90° deflection head

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 8m
Operating range ²⁾	0 ... 6m
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

Timing

Switching frequency	500Hz
Response time	1 ms
Delay before start-up	≤ 25ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 20mA
Switching output	PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	≥ ($U_B - 3V$) / ≤ 3V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED green (transmitter)	ready
LED yellow (receiver)	switching state

Mechanical data

Housing	nickel-faced brass
Optics cover	plastic
Weight	15g
Connection type	M12 connector 4-pin, cable 2m, 4x0.14mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) light switching for control line (ws/WH): not connected or connected to U_B
dark switching for control line (ws/WH): connected to GND
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	LS 412M/P-S12	500 81431
with cable connection		
Transmitter and receiver	LS 412M/P	500 81432

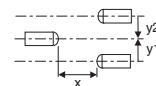
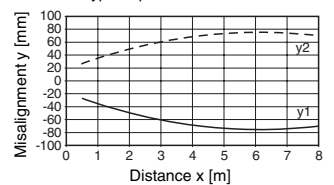
Tables

0	6	8
---	---	---

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

- Models with NPN transistor output on request.

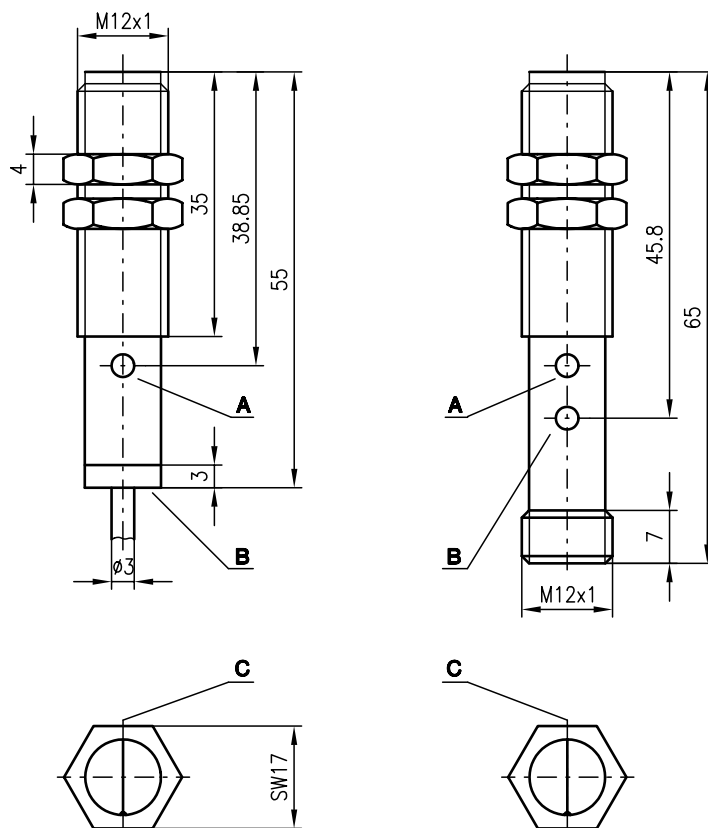


PRK 412

Retro-reflective photoelectric sensors with polarisation filter



Dimensioned drawing



- A Sensitivity adjustment at receiver only
- B Indicator diode
- C Optical axis



0.05 ... 3.0m
0.05 ... 1.6m

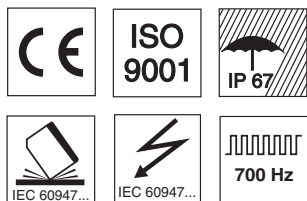


- Retro-reflective photoelectric sensors using visible red light, with and without polarisation filter
- High switching frequency for detection of fast events
- Slim and short cylindrical metal housing M12x1
- light/dark commutation via control line

Electrical connection

PRK 412M/P-S12	RK 412M/P-S12	
10-30V DC +	10-30V DC +	1 —■— br/BN
GND	10-30V DC +	2 —■— ws/WH
GND	GND	3 —■— bl/BU
● ⊕	○ ⊕	4 —■— sw/BK

PRK 412M/P	RK 412M/P	
10-30V DC +	10-30V DC +	br/BN
GND	GND	bl/BU
● ⊕	○ ⊕	sw/BK
GND	10-30V DC +	ws/WH



Accessories:

(available separately • see page 580)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape
- 90° deflection head

We reserve the right to make changes • 412_b01e.fm

Specifications

Optical data

	with polarisation filter	without polarisation filter
Typ. operating range limit (TK(S) 100x100) ¹⁾	0.05 ... 1.6m	0.05 ... 3m
Operating range ²⁾	see table	see table
Light beam characteristic	divergent	
Light source	LED (modulated light)	
Wavelength	660nm (visible red light, polarised)	

Timing

Switching frequency	700Hz
Response time	0.7ms
Delay before start-up	≤ 25ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 20mA
Switching output	PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	≥ ($U_B - 3V$) ≤ 3V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED yellow	switching state
------------	-----------------

Mechanical data

Housing	nickel-faced brass
Optics cover	plastic
Weight	15g
Connection type	M 12 connector 4-pin, cable 2m, 4x0.14mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) light switching for control line (ws/WH): not connected or connected to U_B
dark switching for control line (ws/WH): connected to GND
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

with M12 connector

without polarisation filter	RK 412M/P-S12	500 81405
with polarisation filter	PRK 412M/P-S12	500 81407

with cable connection

without polarisation filter	RK 412M/P	500 81406
with polarisation filter	PRK 412M/P	500 81408

Tables

PRK 412

Reflectors	Operating range
1 TK(S) 100x100	0.15 ... 1.3m
2 MTK(S) 50x50	0.15 ... 0.8m
3 TK(S) 30x50	0.15 ... 0.6m
4 TK(S) 20x40	0.15 ... 0.5m
5 Tape 2 100x100	0.15 ... 0.5m

1	0.05	1.3	1.6
2	0.05	0.8	1.1
3	0.05	0.6	0.8
4	0.05	0.5	0.6
5	0.05	0.5	0.6

RK 412

Reflectors	Operating range
1 TK(S) 100x100	0.15 ... 2.5m
2 MTK(S) 50x50	0.15 ... 1.8m
3 TK(S) 30x50	0.15 ... 1.0m
4 TK(S) 20x40	0.15 ... 0.7m
5 Tape 2 100x100	0.15 ... 1.0m

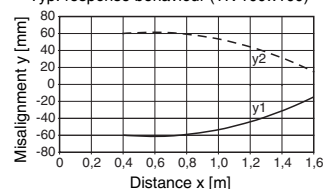
1	0.05	2.5	3.0
2	0.05	1.8	2.5
3	0.05	1.0	1.2
4	0.05	0.7	1.0
5	0.05	1.0	1.7

- Operating range [m]
- Typ. operating range limit [m]

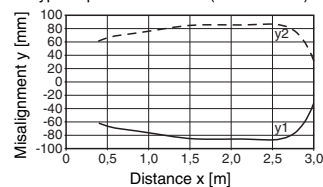
Diagrams

PRK 412

Typ. response behaviour (TK 100x100)


RK 412

Typ. response behaviour (TK 100x100)



Remarks

- Models with NPN transistor output on request.



RT 412

Energetic diffuse reflection light scanner

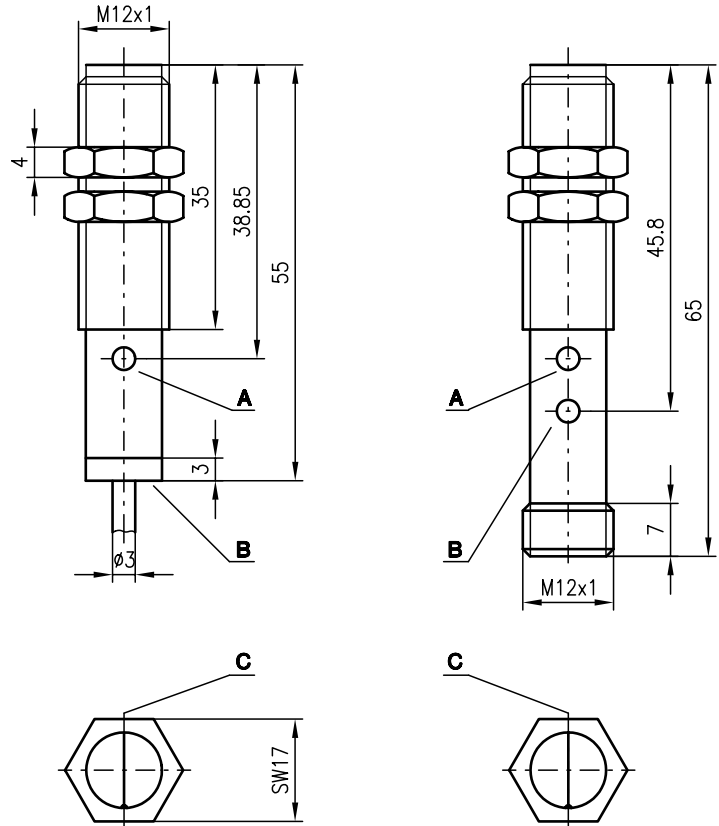


0 ... 400mm



- Energetic diffuse reflection light scanners using visible red light
- Slim and short cylindrical metal housing M12x1
- High switching frequency for detection of fast events
- light/dark commutation via control line

Dimensioned drawing



- A Sensitivity adjustment at receiver only
- B Indicator diode
- C Optical axis

Electrical connection

RT 412M/P-200-S12

10-30V DC +	10-30V DC +	1	br/BN
GND	10-30V DC +	2	ws/WH
GND	GND	3	bl/BU
● ↻	○ ↻	4	sw/BK

RT 412M/P-200

10-30V DC +	10-30V DC +	br/BN
GND	GND	bl/BU
● ↻	○ ↻	sw/BK
GND	10-30V DC +	ws/WH



Accessories:

(available separately • see page 580)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 412_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 400mm
Scanning range ²⁾	see table
Adjustment range	50 ... 400mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	700Hz
Response time	0.7ms
Delay before start-up	≤ 25ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 20mA
Switching output	PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	≥ ($U_B - 3V$) / ≤ 3V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED yellow	switching state
------------	-----------------

Mechanical data

Housing	nickel-faced brass
Optics cover	plastic
Weight	15g
Connection type	M12 connector 4-pin, cable 2m, 4x0.14mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) light switching for control line (ws/WH): not connected or connected to U_B
dark switching for control line (ws/WH): connected to GND
- 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with M12 connector	RT 412M/P-200-S12	500 81409
with cable connection	RT 412M/P-200	500 81410

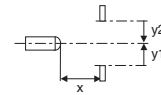
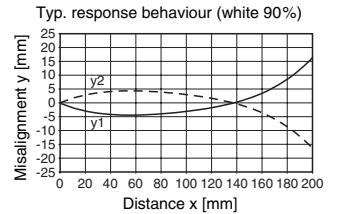
Tables

1	0	200	400
2	2	100	200
3	5	70	140

1	white 90%
2	grey 18%
3	black 6%

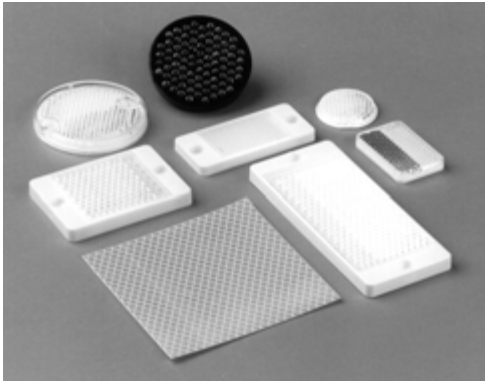
- Scanning range [mm]
- Typ. scanning range limit [mm]

Diagrams



Remarks

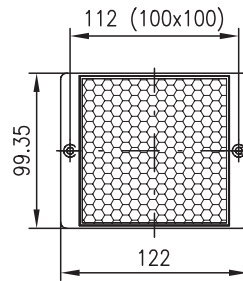
- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.
- Models with NPN transistor output on request.

Reflectors


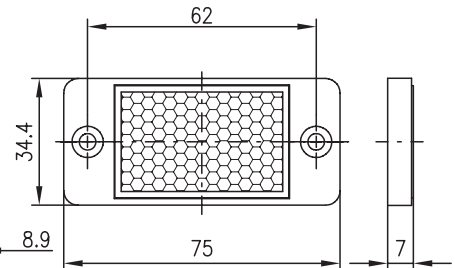
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

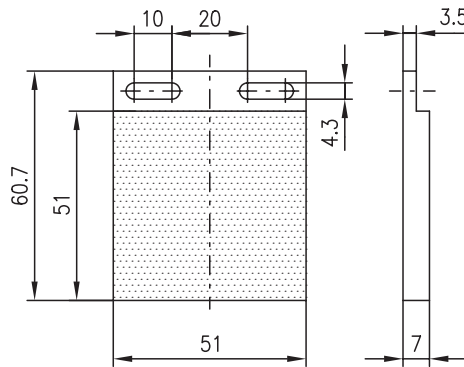
TKS 100 x 100



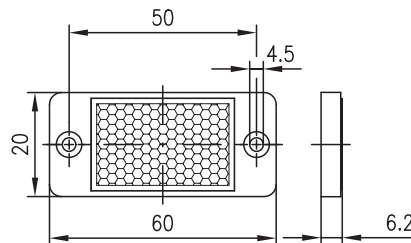
TKS 30 x 50



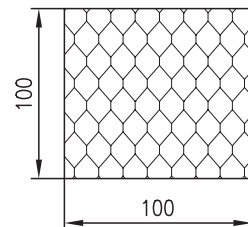
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

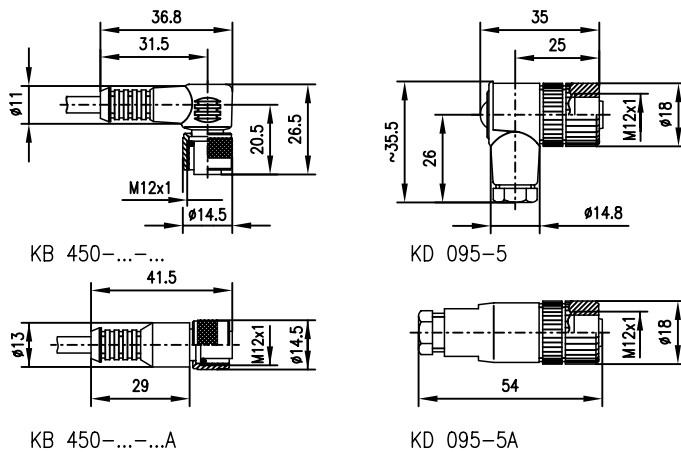

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
US 29	500 80863

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 412_zu_e.fm

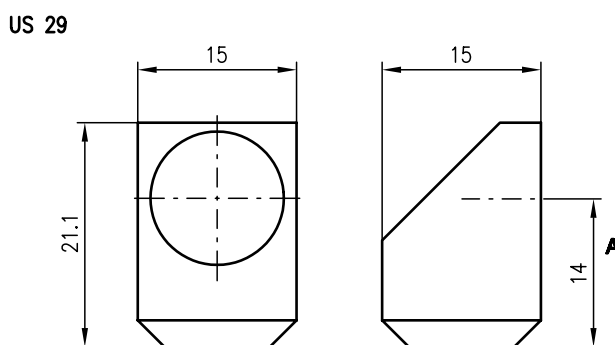
Dimensioned drawings



Selection table

M12 connectors			
with cable		without cable	
2m cable length		KD 095-5	KD 095-5A
KB 450-2000-4	KB 450-2000-4A		
5m cable length			
KB 450-5000-4	KB 450-5000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings



Selection table

Designation	US 29 Operating range/Scanning range
LS 412 ...	3.5m
RK 412 ... with TK(S) 100x100	-
PRK 412 ... with TK(S) 100x100	0.8m
RT 412 ... (200mm scanning range) relative to white 90%	-

M12 connectors



For devices with M12 connectors, there are available: connectors with ready made cables and 2 conductor sockets with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

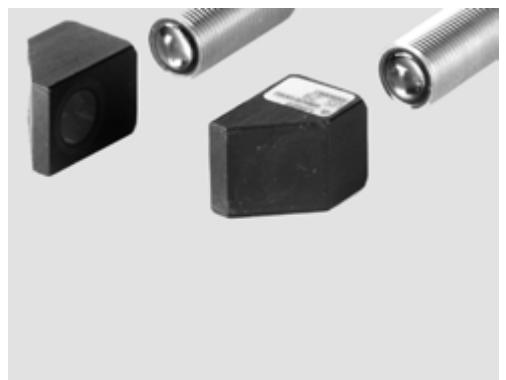
Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Accessories

US 29 (90° deflection head with glass cover)

All sensors of the 412 series can be equipped with a 90° deflection head.





518 Series

Overview and advantages

M18 cylindrical sensor series in robust plastic housing with straight or angular models

Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensor with and without polarisation filter
- Energetic diffuse reflection light scanners

Because of the special housing concept, bore respectively flat mounting is possible

10 ... 30VDC voltage with complementary PNP or NPN transistor outputs

High switching frequency 1000Hz for detection of fast events

General sensitivity adjustment for optimal adaptation to the application

Connection via M12 connectors for fast mounting, or with cable connection

Options:
- Activation input





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing			Light source		Operating voltage 10 ... 30VDC	Output	
			Plastic	Straight	Angular	Red light	Infrared		PNP transistor	NPN transistor
	LS 518 K/P-S12	0 ... 11000mm	•	•			•	•	•	
	LS 518 K/P	0 ... 11000mm	•	•			•	•	•	
	LS 518 K/N	0 ... 11000mm	•	•			•	•		•
	LS 518 WK/P-S12	0 ... 10000mm	•		•		•	•	•	
	LS 518 WK/P	0 ... 10000mm	•		•		•	•	•	
	LS 518 WK/N	0 ... 10000mm	•		•		•	•		•
	RK 518 K/P-S12	100 ... 4500mm	•	•			•	•	•	
	RK 518 K/P	100 ... 4500mm	•	•			•	•	•	
	RK 518 K/N	100 ... 4500mm	•	•			•	•		•
	RK 518 WK/P-S12	100 ... 4500mm	•		•		•	•	•	
	RK 518 WK/P	100 ... 4500mm	•		•		•	•	•	
	RK 518 WK/N	100 ... 4500mm	•		•		•	•		•
	PRK 518 K/P-S12	100 ... 3500mm	•	•		•		•	•	
	PRK 518 K/P	100 ... 3500mm	•	•		•		•	•	
	PRK 518 K/N	100 ... 3500mm	•	•		•		•		•
	PRK 518 K/P-A-S12	100 ... 3500mm	•	•		•		•	•	
	PRK 518 WK/P-S12	100 ... 3000mm	•		•	•		•	•	
	PRK 518 WK/P	100 ... 3000mm	•		•	•		•	•	
	PRK 518 WK/N	100 ... 3000mm	•		•	•		•		•
	PRK 518 WK/P-A-S12	100 ... 3000mm	•		•	•		•	•	
	RT 518 K/P-650-S12	20 ... 800mm	•	•			•	•	•	
	RT 518 K/P-400-S12	10 ... 500mm	•	•			•	•	•	
	RT 518 K/P-200-S12	10 ... 250mm	•	•			•	•	•	
	RT 518 K/P-650	20 ... 800mm	•	•			•	•	•	
	RT 518 K/P-400	10 ... 500mm	•	•			•	•	•	
	RT 518 K/P-200	10 ... 250mm	•	•			•	•	•	
	RT 518 K/N-200-S12	10 ... 250mm	•	•			•	•		•
	RT 518 K/N-400	10 ... 500mm	•	•			•	•		•
	RT 518 K/N-200	10 ... 250mm	•	•			•	•		•
	RT 518 WK/P-400-S12	10 ... 500mm	•		•		•	•	•	
	RT 518 WK/P-100-S12	5 ... 130mm	•		•		•	•	•	
	RT 518 WK/P-400	10 ... 500mm	•		•		•	•	•	
	RT 518 WK/P-100	5 ... 130mm	•		•		•	•	•	
	RT 518 WK/N-400	10 ... 500mm	•		•		•	•		•
RT 518 WK/N-100	5 ... 130mm	•		•		•	•		•	



Switching frequency	Switching		Connection		Options					Page
	Light/dark	Light	M12 connector	Cable	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	
1000Hz	•		•					•	•	587
1000Hz	•			•				•	•	587
1000Hz	•			•				•	•	587
1000Hz	•		•					•	•	589
1000Hz	•			•				•	•	589
1000Hz	•			•				•	•	589
1000Hz	•		•						•	591
1000Hz	•			•					•	591
1000Hz	•			•					•	591
1000Hz	•		•						•	593
1000Hz	•			•					•	593
1000Hz	•			•					•	593
1000Hz	•		•			•			•	595
1000Hz	•			•		•			•	595
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1000Hz	•	•	•			•		•	•	595
1000Hz	•		•			•			•	597
1000Hz	•			•		•			•	597
1000Hz	•			•		•			•	597
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1000Hz	•		•						•	599
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1000Hz	•		•						•	601
1000Hz	•			•					•	601
1000Hz	•			•					•	601
1000Hz	•			•					•	601
1000Hz	•			•					•	601
1000Hz	•			•					•	601



LS 518

Throughbeam photoelectric sensors

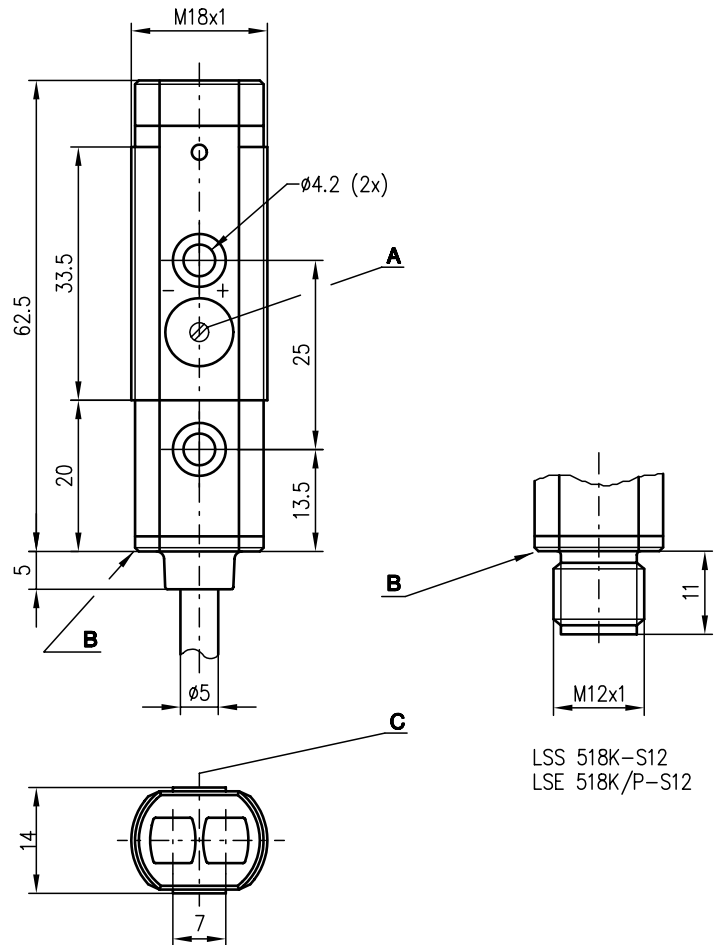


11m



- Throughbeam photoelectric sensors with high performance reserve in infrared light and straight optics
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

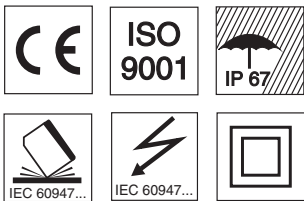
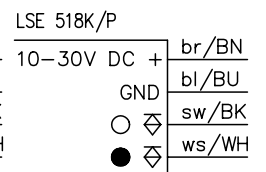
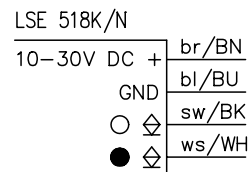
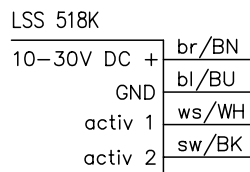
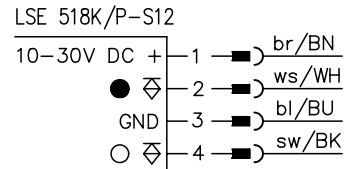
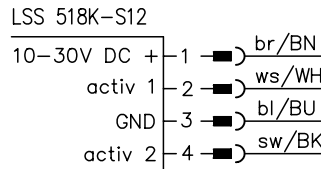
Dimensioned drawing



LSS 518K-S12
LSE 518K/P-S12

- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection



Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 518_a01e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 11 m
Operating range ²⁾	0 ... 9 m
Light source	LED (modulated light)
Wavelength	890 nm

Timing

Switching frequency	1000 Hz
Response time	0.5 ms
Delay before start-up	≤ 30 ms

Electrical data

Operating voltage U_B	10 ... 30 VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 15 mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200 mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	90 g (cable), 20 g (M12)
Connection type	M12 connector, 4-pin cable 2 m, 4x0.25 mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

Options

Activation input activ 1 Transmitter active/not active	≥ 8V or not connected / ≤ 1.5V
Activation input activ 2 Transmitter active/not active	≤ 1.5V or not connected / ≥ 8V

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250 VAC

Tables

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output		
Transmitter and receiver	LS 518 K/P-S12	
Transmitter	LSS 518 K-S12	500 80556
Receiver	LSE 518 K/P-S12	500 80557
with cable connection, PNP switching output		
Transmitter and receiver	LS 518 K/P	
Transmitter	LSS 518 K	500 80562
Receiver	LSE 518 K/P	500 80563
with cable connection, NPN switching output		
Transmitter and receiver	LS 518 K/N	
Transmitter	LSS 518 K	500 80562
Receiver	LSE 518 K/N	500 80569

Remarks

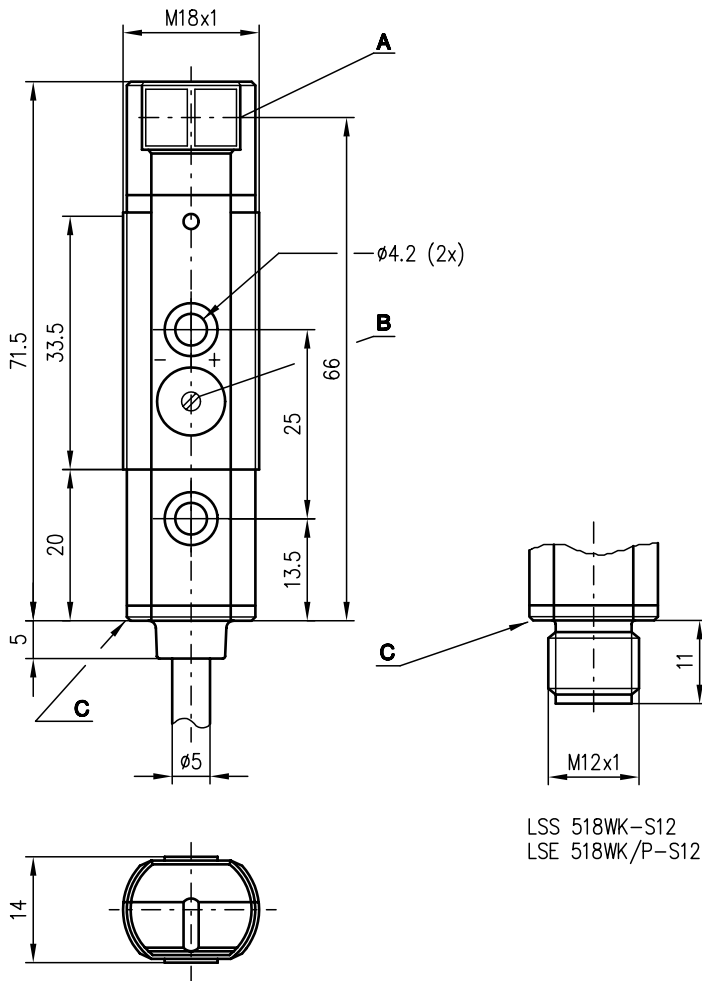


LS 518

Throughbeam photoelectric sensors



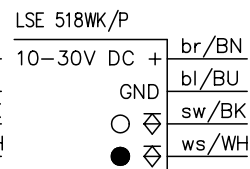
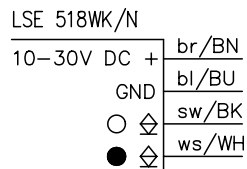
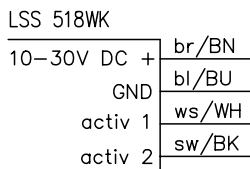
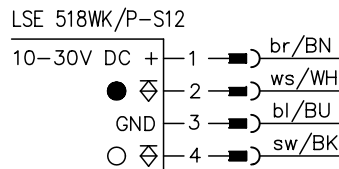
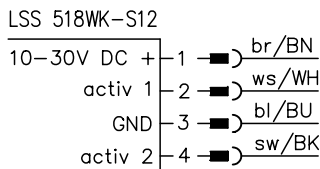
Dimensioned drawing



LSS 518WK-S12
LSE 518WK/P-S12

- A** Optical axis
- B** Sensitivity adjustment
- C** Indicator diode

Electrical connection



10m



- Throughbeam photoelectric sensors with high performance reserve in infrared light and angle optics
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function



Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 518_a02e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 10m
Operating range ²⁾	0 ... 8m
Light source	LED (modulated light)
Wavelength	890nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U _B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ (U _B -1.6V)/≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	95g (cable), 25g (M12)
Connection type	M12 connector 4-pin, cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

Options

Activation input activ 1 Transmitter active/not active	≥ 8V or not connected/≤ 1.5V
Activation input activ 2 Transmitter active/not active	≤ 1.5V or not connected/≥ 8V

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output		
Transmitter and receiver	LS 518 WK/P-S12	
Transmitter	LSS 518 WK-S12	500 80559
Receiver	LSE 518 WK/P-S12	500 80560
with cable connection, PNP switching output		
Transmitter and receiver	LS 518 WK/P	
Transmitter	LSS 518 WK	500 80565
Receiver	LSE 518 WK/P	500 80566
with cable connection, NPN switching output		
Transmitter and receiver	LS 518 WK/N	
Transmitter	LSS 518 WK	500 80565
Receiver	LSE 518 WK/N	500 80572

Remarks



RK 518

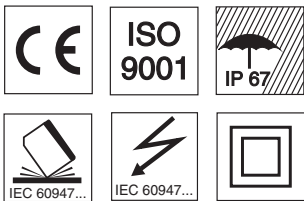
Retro-reflective photoelectric sensors



0.1 ... 4.5m



- Retro-reflective photoelectric sensors with straight optics using infrared light
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

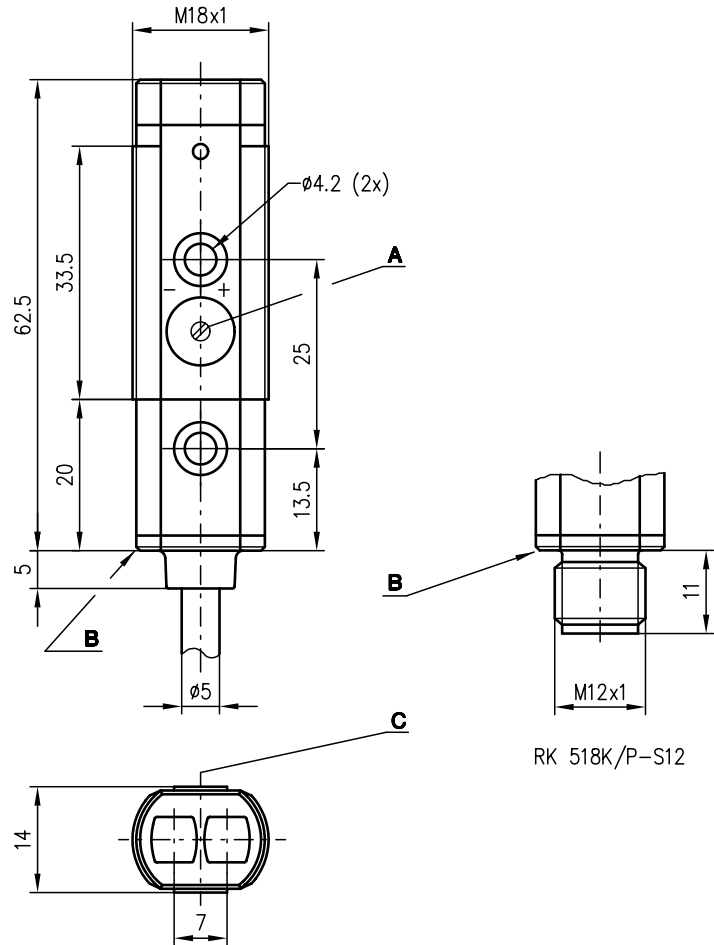


Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

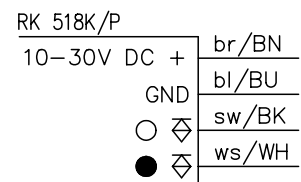
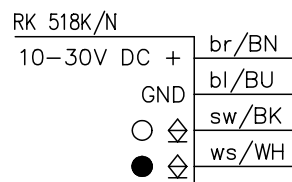
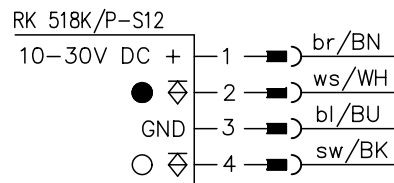
Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

RK 518K/P-S12

Electrical connection



We reserve the right to make changes • 518_b01e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 4.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	890nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 3.5m
TK(S)	50x100	0.1 ... 2.8m
TK(S)	50x50	0.1 ... 2.2m
TK(S)	30x50	0.1 ... 1.8m
TK	82	0.1 ... 2.8m
TK	60	0.1 ... 1.6m
TK	45	0.1 ... 1.3m
TK	35	0.1 ... 0.9m
Tape 2	100x100	0.1 ... 1.1m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output	RK 518 K/P-S12	500 80573
with cable connection, PNP switching output	RK 518 K/P	500 80575
with cable connection, NPN switching output	RK 518 K/N	500 80577

Remarks



RK 518

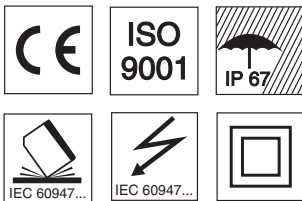
Retro-reflective photoelectric sensors



0.1 ... 4.5m



- Retro-reflective photoelectric sensors with angle optics using infrared light
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

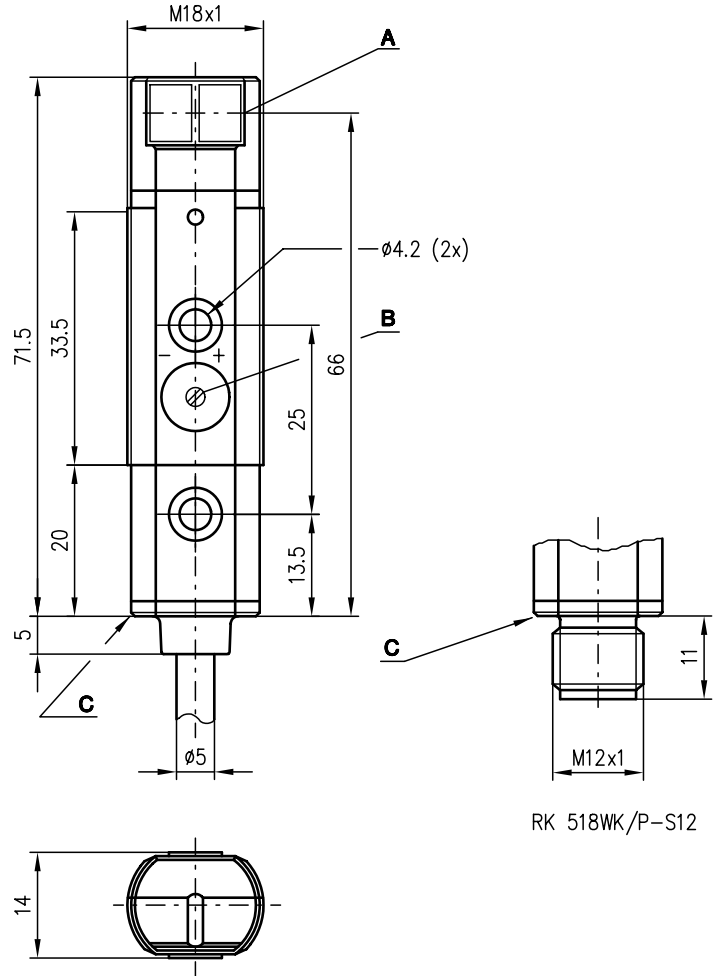


Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

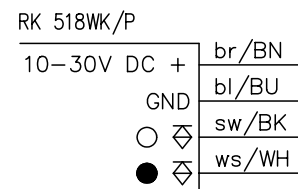
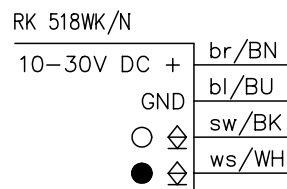
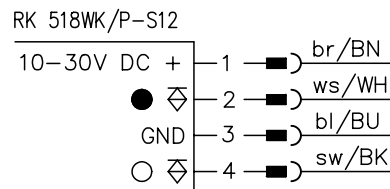
Dimensioned drawing



RK 518WK/P-S12

- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection





Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 4.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	890nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	95g (cable), 25g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 3.5m
TK(S)	50x100	0.1 ... 2.8m
TK(S)	50x50	0.1 ... 2.2m
TK(S)	30x50	0.1 ... 1.8m
TK	82	0.1 ... 2.8m
TK	60	0.1 ... 1.6m
TK	45	0.1 ... 1.3m
TK	35	0.1 ... 0.9m
Tape 2	100x100	0.1 ... 1.1m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output	RK 518 WK/P-S12	500 80574
with cable connection, PNP switching output	RK 518 WK/P	500 80576
with cable connection, NPN switching output	RK 518 WK/N	500 80578

Remarks



PRK 518

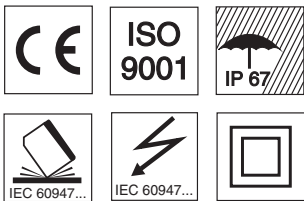
Retro-reflective photoelectric sensors with polarisation filter



0.1 ... 3.5m



- Polarised retro-reflective photoelectric sensors with straight optics using visible red light
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

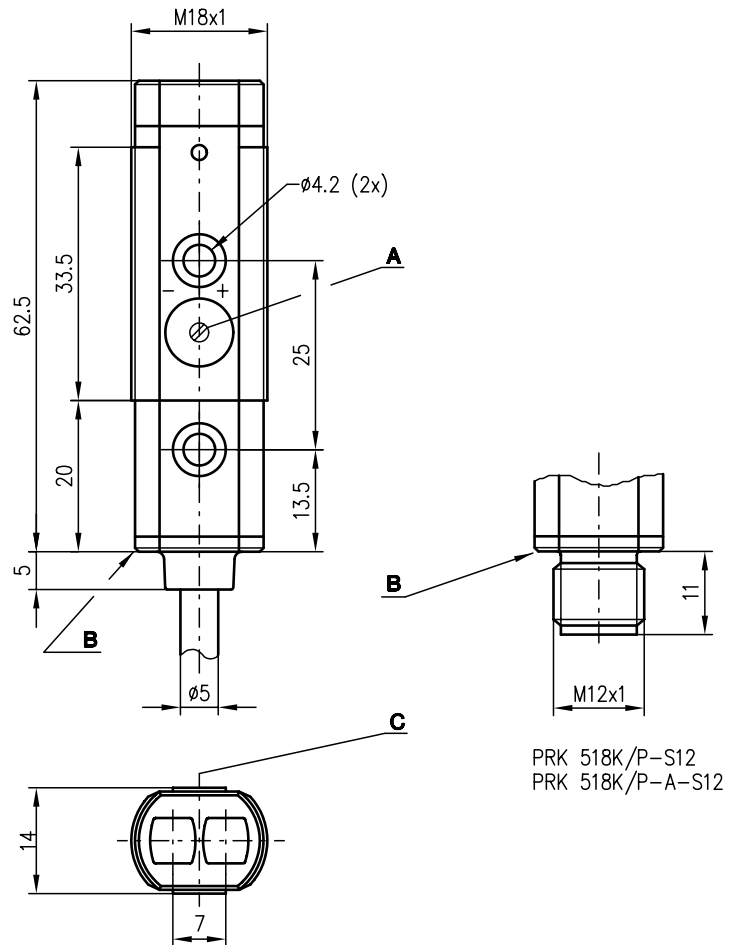


Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

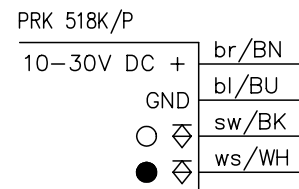
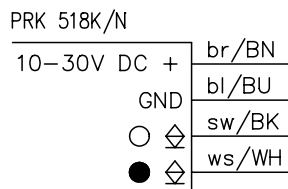
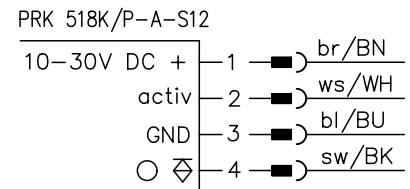
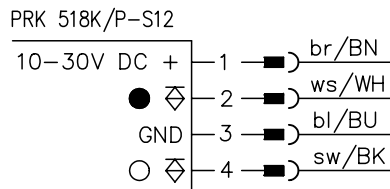
Dimensioned drawing



PRK 518K/P-S12
PRK 518K/P-A-S12

- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection



We reserve the right to make changes • 518_b03e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 3.5m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	95g (cable), 25g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

Options

Activation input activ ⁵⁾	
Transmitter active/not active	+ U_B or not connected / ≤ $U_B - 8V$

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250 VAC
- 5) only with PRK 518 K/P-A-S12

Order guide

	Designation	Part No.
with M12 connector, PNP switching output	PRK 518 K/P-S12	500 80579
with M12 connector, PNP switching output, activation input, light switching	PRK 518 K/P-A-S12	500 80581
with cable connection, PNP switching output	PRK 518 K/P	500 80583
with cable connection, NPN switching output	PRK 518 K/N	500 80585

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 2.5m
TK(S)	50x100	0.1 ... 2.1m
TK(S)	50x50	0.1 ... 1.6m
TK(S)	30x50	0.1 ... 1.2m
TK	82	0.1 ... 2.1m
TK	60	0.1 ... 1.2m
TK	45	0.1 ... 0.9m
TK	35	0.1 ... 0.7m
Tape 2	100x100	0.1 ... 0.8m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Remarks



PRK 518

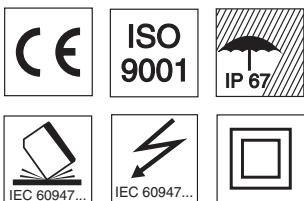
Retro-reflective photoelectric sensors with polarisation filter



0.1 ... 3.0m



- Polarised retro-reflective photoelectric sensors with angle optics using visible red light
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

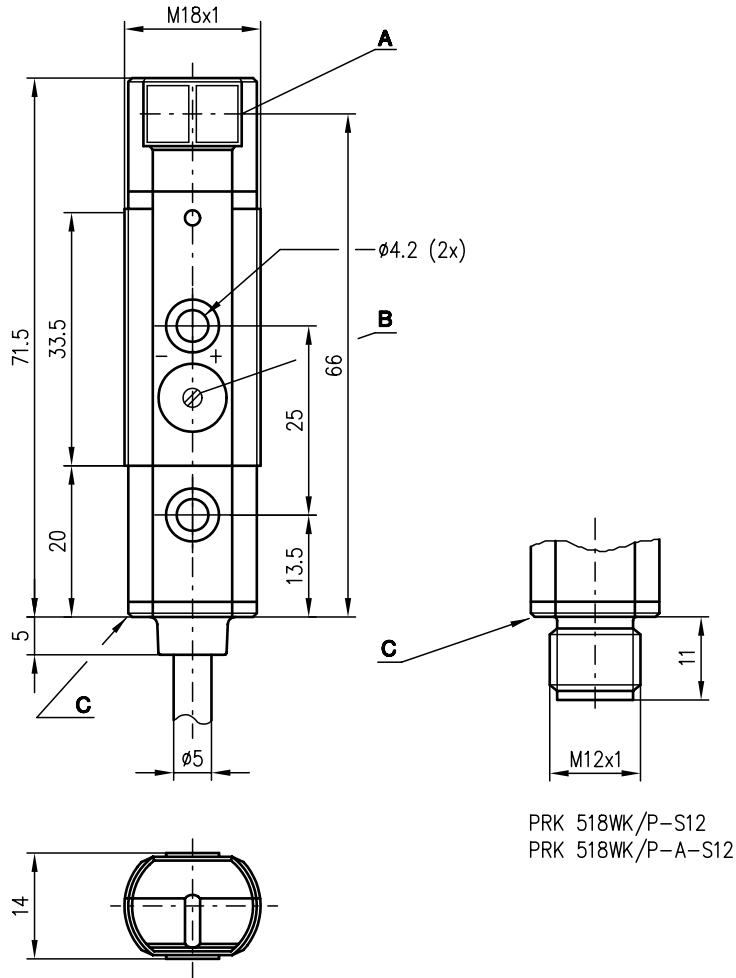


Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tape

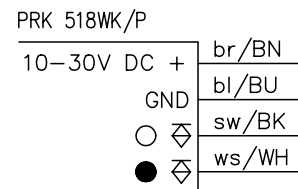
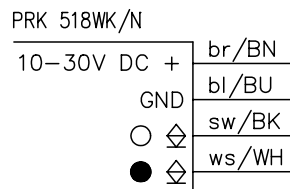
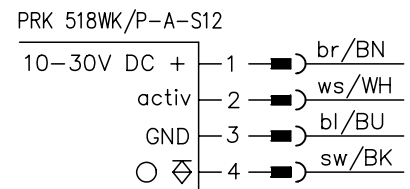
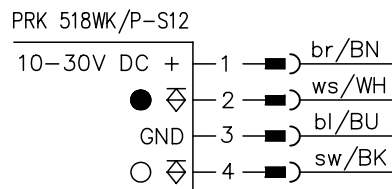
Dimensioned drawing



PRK 518WK/P-S12
PRK 518WK/P-A-S12

- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection



We reserve the right to make changes • 518_b04e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾	0.1 ... 3.0m
Operating range ²⁾	see table
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	light path free
LED red flashing	light path free, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	95g (cable), 25g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

Options

Activation input activ ⁵⁾	
Transmitter active/not active	+ U_B or not connected / ≤ $U_B - 8V$

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 VAC
 5) only with PRK 518 WK/P-A-S12

Tables

Reflectors		Operating range
TK(S)	100x100	0.1 ... 2.0m
TK(S)	50x100	0.1 ... 1.6m
TK(S)	50x50	0.1 ... 1.2m
TK(S)	30x50	0.1 ... 0.9m
TK	82	0.1 ... 1.6m
TK	60	0.1 ... 0.9m
TK	45	0.1 ... 0.6m
TK	35	0.1 ... 0.4m
Tape 2	100x100	0.1 ... 0.5m

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output	PRK 518 WK/P-S12	500 80580
with M12 connector, PNP switching output, activation input, light switching	PRK 518 WK/P-A-S12	500 80582
with cable connection, PNP switching output	PRK 518 WK/P	500 80584
with cable connection, NPN switching output	PRK 518 WK/N	500 80586

Remarks



RT 518

Energetic diffuse reflection light scanners

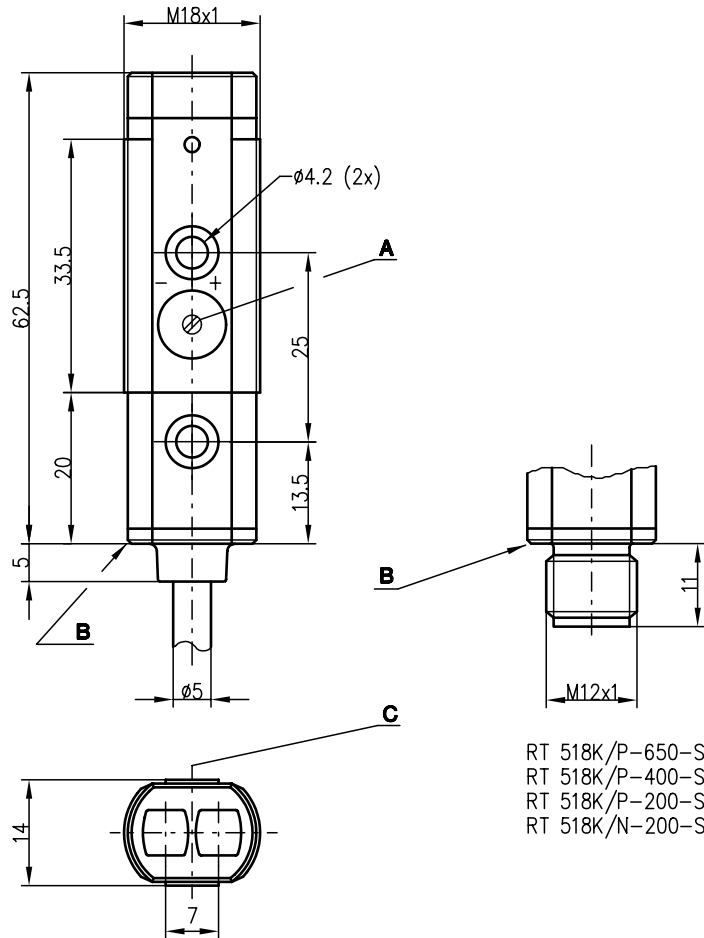


10 ... 250 mm
10 ... 500 mm
20 ... 800 mm



- Energetic diffuse reflection light scanner with infrared light and straight optics
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

Dimensioned drawing

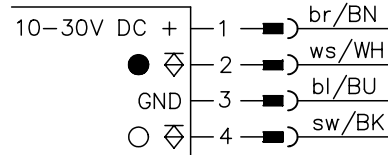


RT 518K/P-650-S12
RT 518K/P-400-S12
RT 518K/P-200-S12
RT 518K/N-200-S12

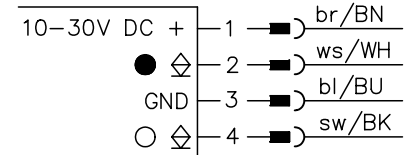
- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection

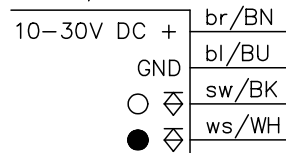
RT 518K/P-650-S12
RT 518K/P-400-S12
RT 518K/P-200-S12



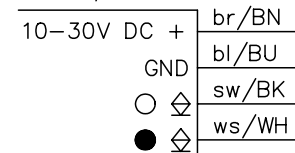
RT 518K/N-200-S12



RT 518K/P-650
RT 518K/P-400
RT 518K/P-200



RT 518K/N-400
RT 518K/N-200



Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 518_c01e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	10 ... 250mm, 10 ... 500mm, 20 ... 800mm
Scanning range ²⁾	20 ... 200mm, 20 ... 400mm, 20 ... 650mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	reflection
LED red flashing	reflection, no performance reserve

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	90g (cable), 20g (M12)
Connection type	M12 connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

1) Typ. scanning range limit: max. attainable range without performance reserve

2) Scanning range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Tables

Diagrams

Order guide

	Designation	Part No.
with M12 connector, PNP switching output	RT 518 K/P-650-S12	500 80589
	RT 518 K/P-400-S12	500 80588
	RT 518 K/P-200-S12	500 80587
with cable connection, PNP switching output	RT 518 K/P-650	500 80594
	RT 518 K/P-400	500 80593
	RT 518 K/P-200	500 80592
with M12 connector, NPN switching output	RT 518 K/N-200-S12	500 80597
with cable connection, NPN switching output	RT 518 K/N-400	500 80599
	RT 518 K/N-200	500 80598

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.



RT 518 W

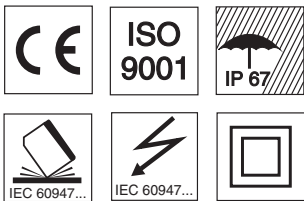
Energetic diffuse reflection light scanners



5 ... 130mm
10 ... 500mm



- Energetic diffuse reflection light scanner with infrared light and angle optics
- High switching frequency for detection of fast events
- Robust cylindrical plastic housing M18x1, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

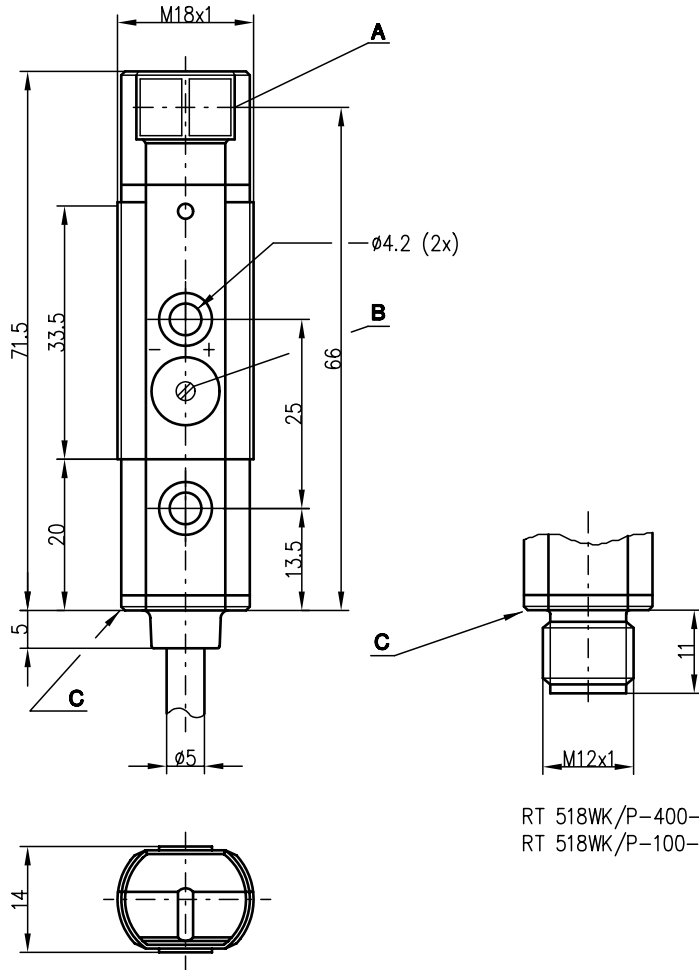


Accessories:

(available separately • see page 602)

- Mounting systems (BT 518.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

Dimensioned drawing

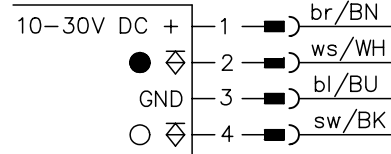


RT 518WK/P-400-S12
RT 518WK/P-100-S12

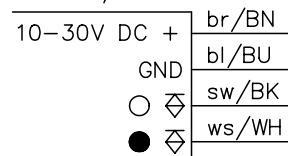
- A Optical axis
- B Sensitivity adjustment
- C Indicator diode

Electrical connection

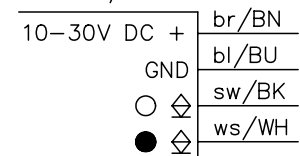
RT 518WK/P-400-S12
RT 518WK/P-100-S12



RT 518WK/P-400
RT 518WK/P-100



RT 518WK/N-400
RT 518WK/N-100



We reserve the right to make changes • 518_c02e.fm



Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	5 ... 130mm, 10 ... 500mm
Scanning range ²⁾	10 ... 100mm, 20 ... 400mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 30ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 15mA
Switching output	2 transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 1.6V$) / ≤ 1.6V
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED red	reflection
LED red flashing	reflection, no performance reserve

Mechanical data

Housing	plastic
Optics cover	glass
Weight	95g (cable), 25g (M12)
Connection type	M12connector, 4-pin cable 2m, 4x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -20°C ... +60°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67

1) Typ. scanning range limit: max. attainable range without performance reserve

2) Scanning range: recommended range with performance reserve

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC

Tables

Diagrams

Order guide

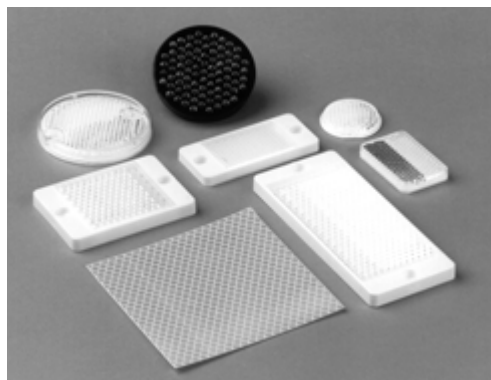
	Designation	Part No.
with M12 connector, PNP switching output	RT 518 WK/P-400-S12	500 80591
	RT 518 WK/P-100-S12	500 80590
with cable connection, PNP switching output	RT 518 WK/P-400	500 80596
	RT 518 WK/P-100	500 80595
with cable connection, NPN switching output	RT 518 WK/N-400	500 80601
	RT 518 WK/N-100	500 80600

Remarks

- With the set scanning range, a tolerance of the upper and lower scanning range limit is possible depending on the reflection properties of the material surface.



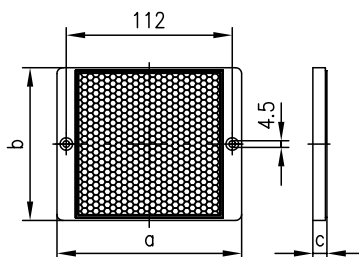
Reflectors



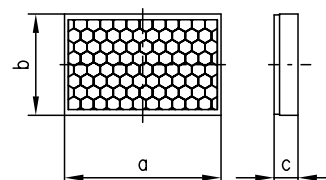
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tape No. 2 may be used.

Dimensioned drawings

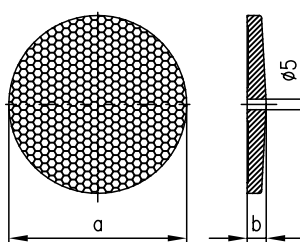
TKS 100 x 100



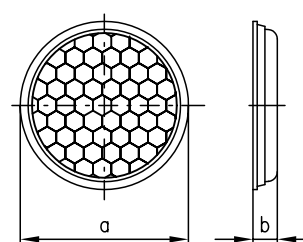
TK 30 x 50



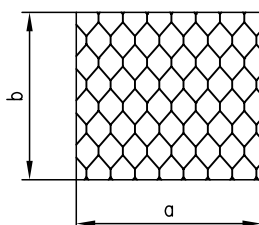
TK 82



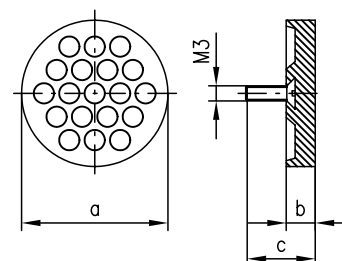
TK 35



Tape No. 2



TG 29



Order codes:

Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
TKS 50x50	500 22814
TKS 30x50	500 23525
TK 30x50	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
Tape 2	500 11523
TG 60	500 03179
TG 29	500 09374
TG 6	500 03176
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
BT 518.1	500 80534

Selection table

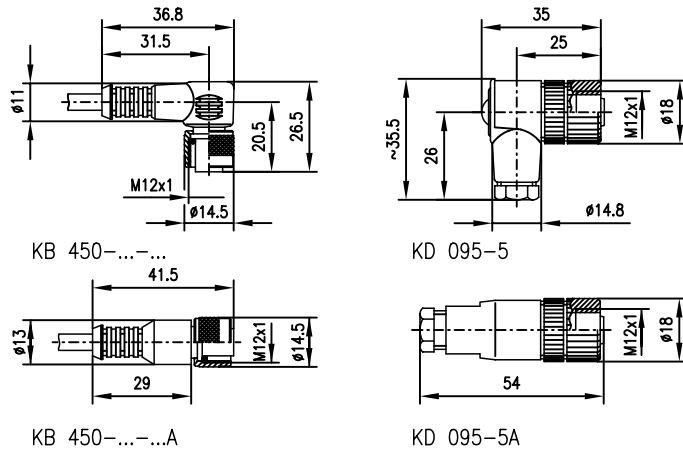
Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 2)	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 2)	-20°C/+60°C	99	49.5	9	○	●
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 2)	-20°C/+60°C	48	32	6.8	○	●
TK 82 1)	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8			●
TK 45	-20°C/+60°C	46	8			●
TK 35	-20°C/+60°C	35.5	5			●
Tape 2	-20°C/+60°C	100	100			●
TG 60	-20°C/+120°C	60	9	24	●	
TG 29	-20°C/+120°C	29	6.5	14.5	●	
TG 6	-20°C/+120°C	6	5			●

1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • 518_zu_e.fm

Dimensioned drawings

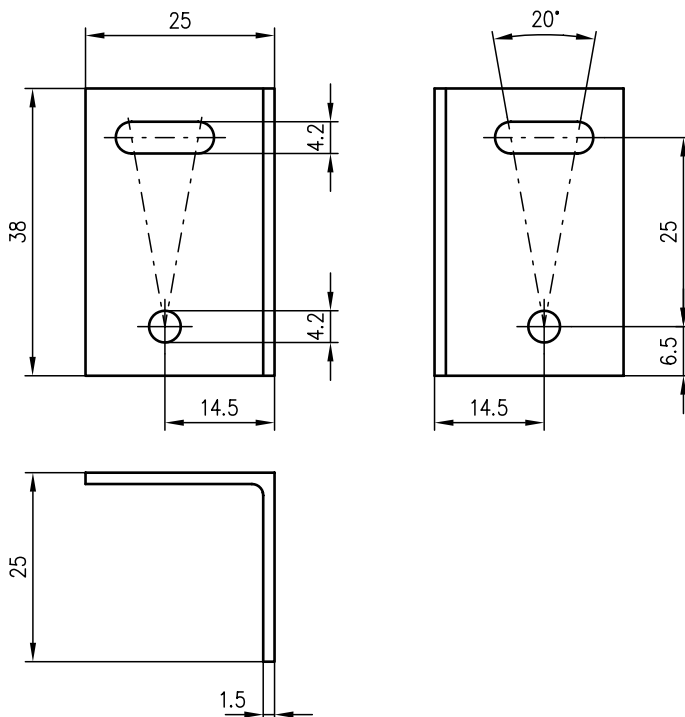


Selection table

M12 connectors			
 with 4-wire cable		 without cable	
2m cable length		KD 095-5	KD 095-5A
KB 450-2000-4	KB 450-2000-4A		
5m cable length			
KB 450-5000-4	KB 450-5000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings

BT 518.1



M12 connectors



For devices with M12 connectors, there are available: connectors with ready made cables and 2 conductor sockets with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Mounting systems

BT 518.1





618 Series

Overview and advantages



Cylindrical and short M18 metal housing



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Energetic diffuse reflection light scanners



The switching frequency of 500Hz enables the detection of fast events



10 ... 30VDC supply voltage and PNP transistor output with light or dark switching



M12 connector for fast installation





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage		Output			
			Metal	Stainless steel	Red light	Infrared	10 ... 30VDC	AS-i system	PNP transistor	NPN transistor	AS-interface	
	LS 618/4-S12	0 ... 12m	•			•		•		•		
	PRK 618/4-S12	0 ... 7.0m	•		•			•		•		
	RT 618/4-200-S12	0 ... 0.3m	•			•		•		•		



Switching frequency	Switching	Connection	Options							Page
	Light/dark	M12 connector	Warning output	Polarisation filter	Background suppression	Activation input	Sensitivity adjustment	Transparent media	Focused light beam	
500Hz	•	•					•			609
500Hz	•	•		•			•			611
500Hz	•	•					•			613



LS 618

Throughbeam photoelectric sensors



12m

10 - 30 V
DC

- Throughbeam photoelectric sensor with light/dark switching
- Robust cylindrical metal housing M18x1
- Sensitivity adjustment for optimal adaptation to the application
- Dual LED display for easy commissioning
- M12 connector for fast installation

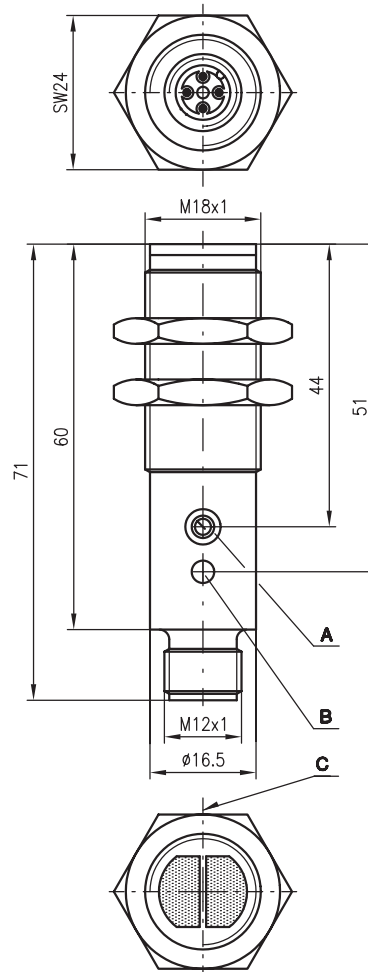


Accessories:

(available separately • see page 614)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- 90° deflection head

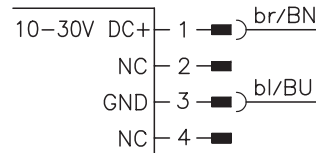
Dimensioned drawing



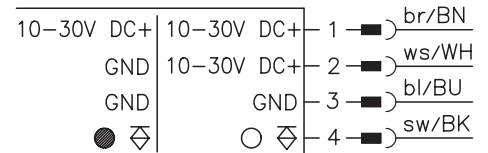
- A** Sensitivity adjustment
- B** Indicator diode
- C** Optical axis

Electrical connection

LSS 618-S12



LSE 618/4-S12



We reserve the right to make changes • 618_a01e.fm

Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 12m
Operating range ²⁾	0 ... 10m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	500Hz
Response time	1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 40mA
Switching output	PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	≥ ($U_B - 2.5V$) / ≤ 2.5V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED green (transmitter)	ready
Dual-LED (receiver)	
green	ready
yellow	light path free
yellow flashing	light path free, no performance reserve

Mechanical data

Housing	nickel-faced brass
Optics cover	plastic
Weight	40g
Connection type	M 12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -30°C ... +70°C
Protective circuit	Short circuit and overload protection
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) light switching for control line (ws/WH): not connected or connected to U_B
 dark switching for control line (ws/WH): connected to GND

Order guide

	Designation	Part No.
Transmitter and receiver	LS 618/4-S12	500 38451
Transmitter	LSS 618-S12	
Receiver	LSE 618/4-S12	

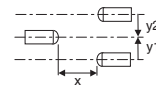
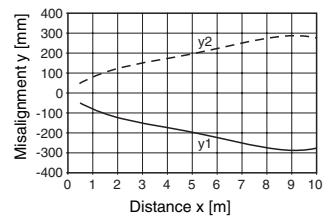
Tables

0	10	12
---	----	----

<input type="checkbox"/>	Operating range [m]
<input type="checkbox"/>	Typ. operating range limit [m]

Diagrams

Typ. response behaviour



Remarks

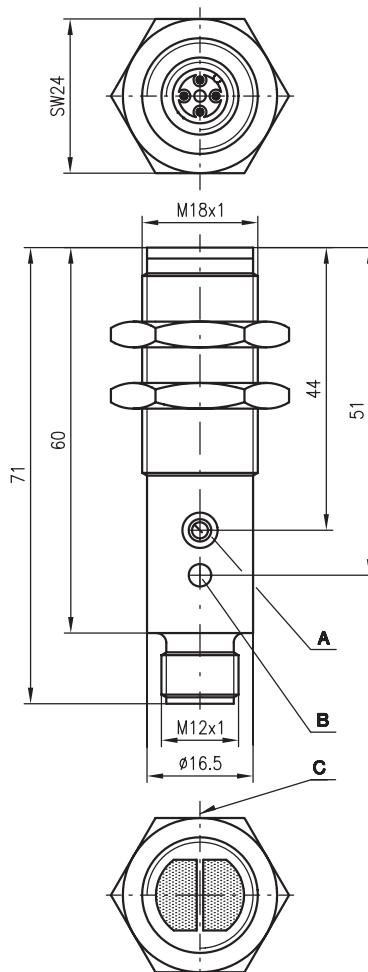


PRK 618

Retro-reflective photoelectric sensors



Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

Electrical connection

PRK 618/4-S12

10-30V DC+	10-30V DC+	1	br/BN
GND	10-30V DC+	2	ws/WH
GND	GND	3	bl/BU
● ▽	○ ▽	4	sw/BK



0 ... 7.0m



- Retro-reflective photoelectric sensor with light/dark switching
- With visible red light and polarisation filter
- Robust cylindrical metal housing M18x1
- Sensitivity adjustment for optimal adaptation to the application
- Dual LED display for easy commissioning
- M12 connector for fast installation



Accessories:

(available separately • see page 614)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes
- 90° deflection head

We reserve the right to make changes • 618_b01e.fm



Specifications

Optical data

Typ. operating range limit (TK(S) 100x100) ¹⁾ 0 ... 7.0m
 Operating range ²⁾ see table
 Light beam characteristic divergent
 Light source LED (modulated light)
 Wavelength 660nm (visible red light, polarised)

Timing

Switching frequency 500Hz
 Response time 1ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 10% of U_B
 Bias current ≤ 30mA
 Switching output PNP transistor output
 Function characteristics ³⁾ light/dark switching via control line
 Signal voltage high/low ≥ ($U_B - 2.5V$) / ≤ 2.5V
 Output current max. 100mA
 Sensitivity adjustable

Indicators

Dual LED green ready
 Dual LED yellow light path free
 Dual LED yellow flashing light path free, no performance reserve

Mechanical data

Housing nickel-faced brass
 Optics cover plastic
 Weight 40g
 Connection type M 12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage) -25°C ... +55°C / -30°C ... +70°C
 Protective circuit Short circuit and overload protection
 Protection class IP 67
 Standards applied IEC 60947-5-2

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) light switching for control line (ws/WH): not connected or connected to U_B
 dark switching for control line (ws/WH): connected to GND

Tables

Reflectors			Operating range	
1	TK(S)	100x100	0 ...	5.0m
2	MTK(S)	50x50	0 ...	2.3m
3	TK(S)	30x50	0.03 ...	2.1m
4	TK(S)	20x40	0 ...	1.7m
5	Tape 2	100x100	0.05 ...	2.0m

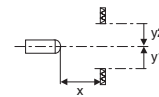
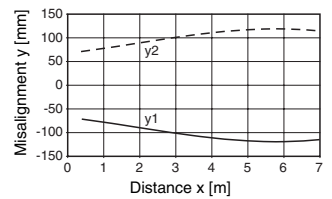
1	0		5.0	7.0
2	0	2.3	3.3	
3	0.03	2.1	3.0	
4	0	1.7	2.4	
5	0.05	2.0	2.8	

Operating range [m]
 Typ. operating range limit [m]

TK ... = adhesive
 TKS ... = screw type
 Tape 2 = adhesive

Diagrams

Typ. response behaviour (TK 100x100)



Order guide

Designation	Part No.
PRK 618/4-S12	500 38450

Remarks

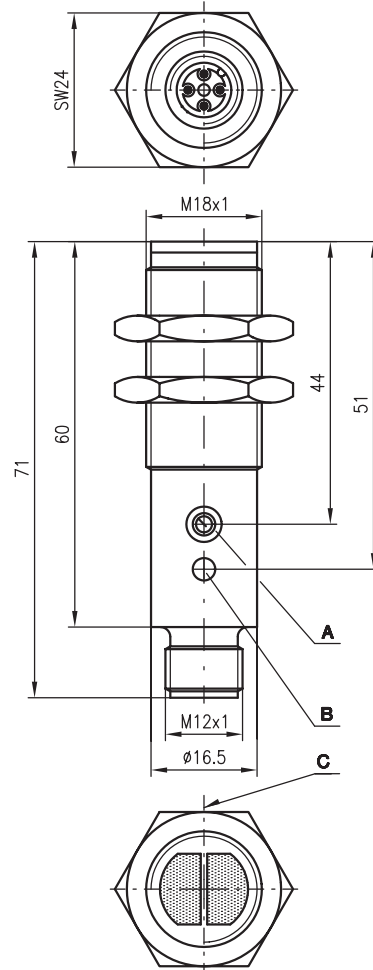


RT 618

Energetic diffuse reflection light scanner



Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Optical axis

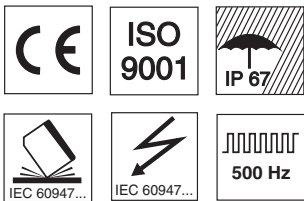
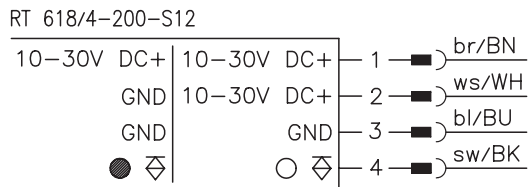


0 ... 300mm



- Energetic diffuse reflection light scanner with light/dark switching
- Robust cylindrical metal housing M18x1
- Sensitivity adjustment for optimal adaptation to the application
- Dual LED display for easy commissioning
- M12 connector for fast installation

Electrical connection



Accessories:

(available separately • see page 614)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- 90° deflection head

We reserve the right to make changes • 618_c01e.fm

Specifications

Optical data

Typ. scanning range limit (white 90%) ¹⁾	0 ... 300mm
Scanning range ²⁾	see table
Adjustment range	30 ... 300mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	500Hz
Response time	1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics ³⁾	light/dark switching via control line
Signal voltage high/low	≥ ($U_B - 2.5V$) / ≤ 2.5V
Output current	max. 100mA
Sensitivity	adjustable

Indicators

Dual LED green	ready
Dual LED yellow	reflection
Dual LED yellow flashing	reflection, no performance reserve

Mechanical data

Housing	nickel-faced brass
Optics cover	plastic
Weight	40g
Connection type	M12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +55°C / -30°C ... +70°C
Protective circuit	Short circuit and overload protection
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Typ. scanning range limit: max. attainable range without performance reserve

2) Scanning range: recommended range with performance reserve

3) light switching for control line (ws/WH): not connected or connected to U_B
 dark switching for control line (ws/WH): connected to GND

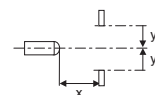
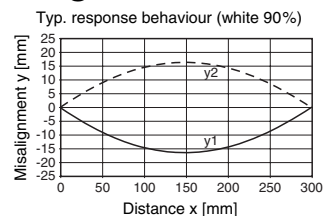
Tables

1	0	200	300
2	1	97	146
3	3	65	100

1	white 90%
2	grey 18%
3	black 6%

<input type="checkbox"/>	Scanning range [mm]
<input type="checkbox"/>	Typ. scanning range limit [mm]

Diagrams

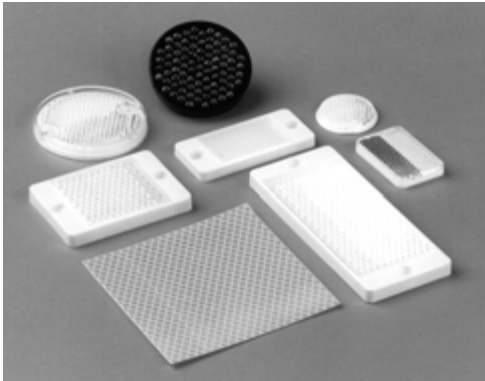


Order guide

Designation	Part No.
RT 618/4-200-S12	500 38449

Remarks

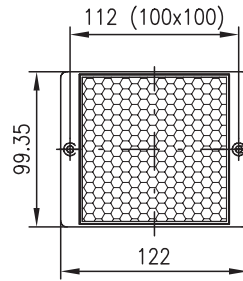
- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.

Reflectors


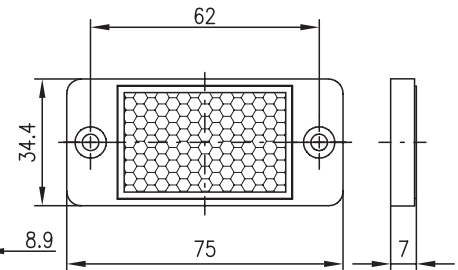
- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.

Dimensioned drawings

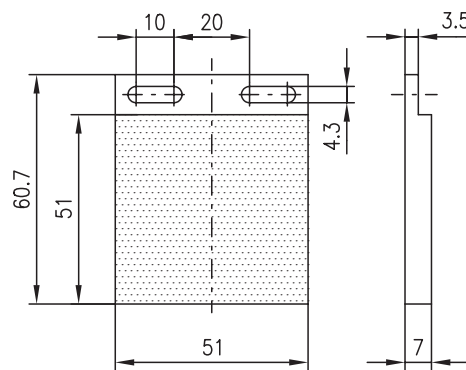
TKS 100 x 100



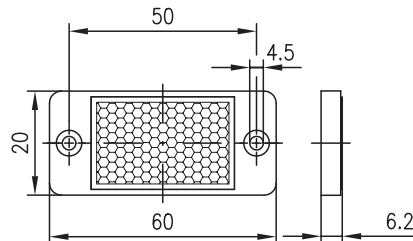
TKS 30 x 50



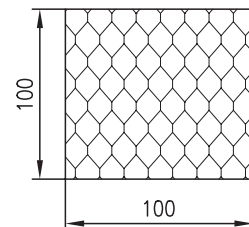
MTKS 50 x 50



TKS 20 x 40



Tape No. 2

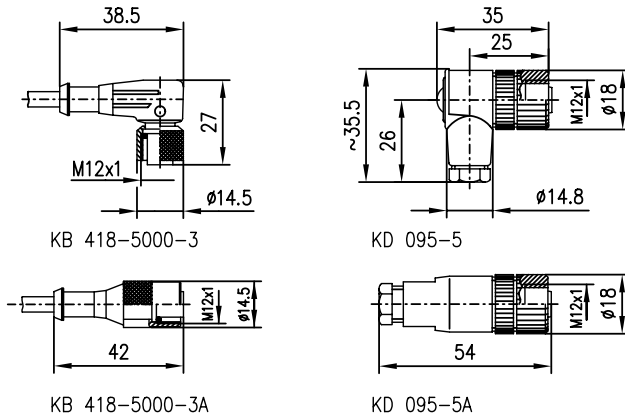


Additional information in section "Accessories" from page 925 onwards!

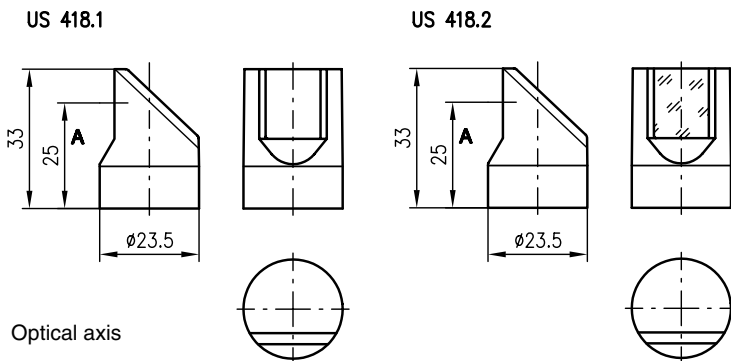
We reserve the right to make changes • 618_zu_e.fm

Order codes:

Designation	Part No.
TKS 100x100	500 22816
MTKS 50x50	500 36188
TKS 30x50	500 23525
TKS 20x40	500 81283
Tape 2	500 11523
KB 418-5000-3	500 23545
KB 418-5000-3A	500 23544
KB 450-2000-4	500 80838
KB 450-2000-4A	500 80841
KB 450-5000-4	500 80839
KB 450-5000-4A	500 80842
KB 450-10000-4	500 80840
KB 450-10000-4A	500 80843
KD 095-5	500 20502
KD 095-5A	500 20501
US 418.1	500 80130
US 418.2	500 80131

Dimensioned drawings

Selection table

M12 connectors			
with cable (5m cable length)		without cable	
KB 418-5000-3	KB 418-5000-3A	KD 095-5	KD 095-5A
KB 450-5000-4	KB 450-5000-4A		
2m cable length			
KB 450-2000-4	KB 450-2000-4A		
10m cable length			
KB 450-10000-4	KB 450-10000-4A		

Dimensioned drawings


A Optical axis

Selection table

Designation	US 418.1 operating range/ scanning range [mm]	US 418.2 operating range/ scanning range [mm]
LS 618/4-S12	7000	5000
PRK 618/4-S12 with TK(S) 100x100	2000	
RT 618/4-200-S12 relative to white 90%	150	
Versions	open	closed

Connectors and cables


For devices with M12 connectors, there are available: 2 connectors with ready-made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050)
plugged and screwed: IP 67

Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

Accessories

90° deflection head

All sensors of the 618 series can be equipped with a 90° deflection head.





mini Sensor Technology Overview and advantages



Miniature series in metal housing with glass cover



Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors
- Diffuse reflection light scanners



- Numerous housing types
- Different light beam characteristics



Connection option to extensive amplifier program

- In metal or plastic housing
- 10 ... 30VDC voltage with PNP or NPN transistor output
- Direct mains connection to 115/230VAC with relay output



General sensitivity adjustment for optimal adaptation to the application

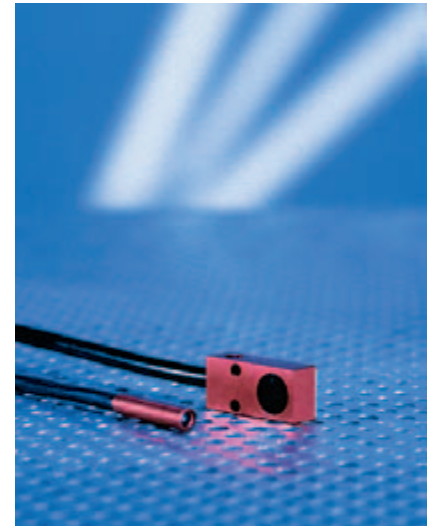


Switching frequency 1000Hz for detection of fast events



Options:

- Warning output
- Activation input
- Time modules
- Diaphragms





Operating principle	Designation	Operating range/ Scanning range	Photoelectric sensor connections	Housing			Operating voltage					Protection class		
				Metal	Stainless steel	Plastic	Miniature amplifier	10 ... 30VDC	18 ... 30VDC	24VDC	230VAC		115VAC	
	GS 70	5mm		•			•							IP 40
	LS 05 GA-G	150mm		•			•							IP 64
	LS 05.5	150mm			•		•							IP 64
	LS 29 L	35m			•		•							IP 67
	LS 31	500mm			•		•							IP 65
	LS 40	500mm		•			•							IP 65
	LS 66	12 m		•			•							IP 65
	LS 71	800mm		•			•							IP 64
	LS 72	800mm		•			•							IP 64
	LS 74	5m		•			•							IP 65
	LS 91	2m		•			•							IP 65
	LS 98	8m		•			•							IP 65
	LS 725	20m		•			•							IP 40
		RK 42	20 ... 400mm		•			•						
RK 713		0 ... 800mm		•			•							IP 65
	RK 41	1 ... 30mm		•			•							IP 65
	RK 715	0 ... 10mm		•			•							IP 64
	RK 44	15 ... 40mm		•			•							IP 65
	RK 83	0 ... 20mm		•			•							IP 65
	RK 70	1 ... 10mm		•			•							IP 65
	RK 716	0.5 ... 2.5mm		•			•							IP 65
	RK 70/4-50	1 ... 50mm				•				•				IP 65
	RT 707/4-2	0 ... 3.5mm		•						•				IP 65
	RT 709/4-4	1 ... 8mm		•						•				IP 65
		VS 3/71		1			•					•	•	
VS 9/1			1	•						•				IP 65
VS 9/4.1			1	•					•					IP 65
IVS 9/4.8			1	•				•						IP 65
VS 10/4			1			•				•				IP 40
VS 10/44			2			•				•				IP 40
VS 24/4			1			•			•					IP 65
VS 25/4 R			3			•				•				IP 20
VS 27/24			1			•			•					IP 40
IVS 28/44.8			1			•				•				IP 40
VS 29/44.8			1			•				•				IP 40
VS 100			1			•					•	•		IP 40
VS 100 Z			1			•					•	•		IP 40
VS 725/4			1			•				•				IP 40
VS 725			1			•					•			IP 40
		KK 05/2 S	0.2 ... 2mm		•						•			
	KK 05/4 S	0.2 ... 2mm		•						•				IP 40

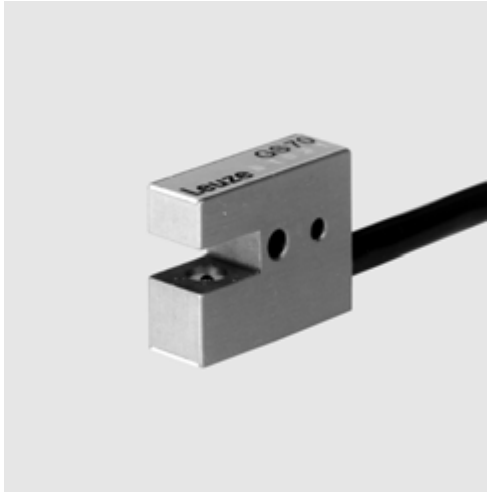


Output			Switching frequency	Switching			Connection			Options				Page
PNP transistor	NPN transistor	Relay		Light/dark	Light	Dynamic dark switching	Connector	Cable	Terminals	Warning output	Activation input	Time delay	Sensitivity adjustment	
								•						621
								•						623
								•						623
							•							625
								•						627
								•						627
								•						629
								•						633
								•						633
								•						635
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								•						647
•			1000Hz		•		•	•					•	649
•			3000Hz		•			•						651
			3000Hz		•			•						653
	•	•	200Hz	•						•			•	657
•	•		200Hz	•						•			•	659
•				•		•				•			•	661
•			100Hz	•					•	•	•		•	663
•			100Hz	•					•				•	665
•			100Hz	•					•				•	665
•			100Hz	•				•					•	667
•		•	45Hz	•					•	•			•	669
•	•		200Hz	•					•				•	675
•			1000Hz	•					•	•			•	677
•			200Hz	•					•	•			•	679
•		•	100Hz	•					•				•	681
•		•	70Hz	•					•		•		•	683
•						•			•				•	685
		•				•			•				•	685
	•						•							691
•							•							691



GS 70

Forked photoelectric sensor



5mm

mini

- Small construction volume enables application in small spaces
- Metal construction offers high firmness
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications



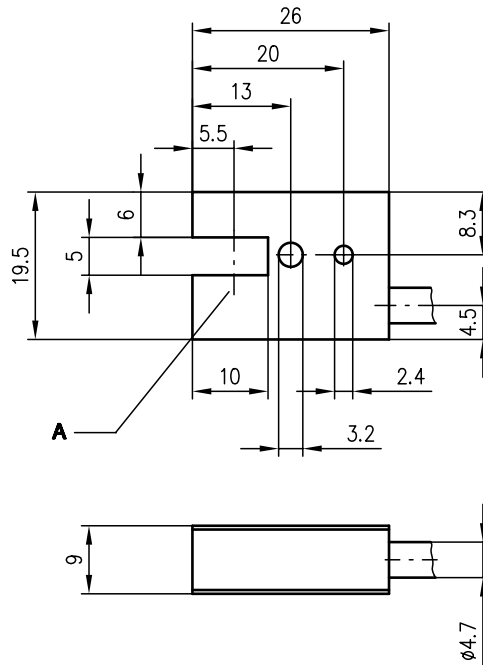
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Accessories:

(available separately)

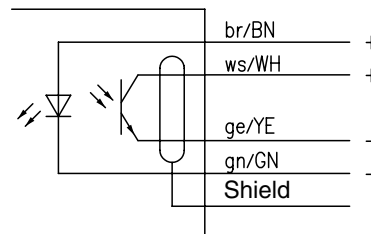
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Dimensioned drawing



A Optical axis

Electrical connection





Specifications

Optical data

Mouth width 5mm
Light source LED (modulated light)
Wavelength 880nm

Electrical data

Transmitter GaAs
Transmitting current max. 200mA at D=0.05
Receiver Si phototransistor
Inverse voltage U_{CEO} max. 35VDC

Mechanical data

Housing aluminium red anodised
Weight approx. 60g
Cable length 2000mm
Cable cross-section 4x0.14mm²+shield

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-30° ... +70°C
Protection class IP 40

Tables

Diagrams

Order guide

Designation	Part No.
GS 70	500 00067

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



LS 05

Throughbeam photoelectric sensors



150 mm



- Small construction volume enables application in small spaces
- Scratch resistant glass cover
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications
- Stainless steel version

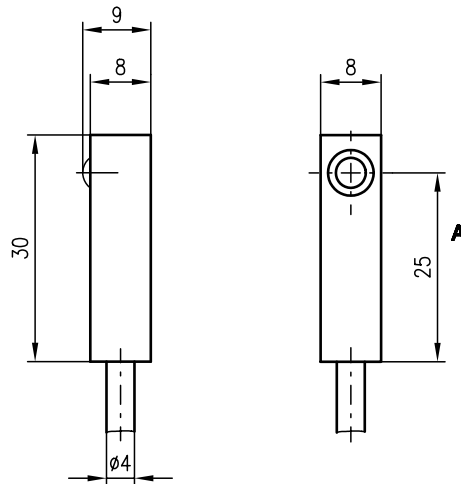


Accessories:

(available separately)

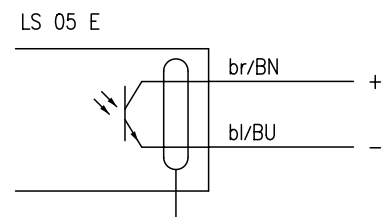
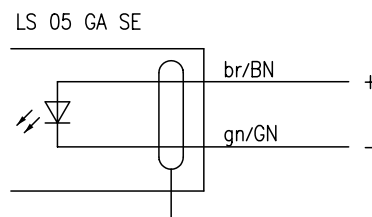
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Dimensioned drawing



A Optical axis

Electrical connection



Remark for receiver connection:
 brown(br/BN) $\hat{=}$ white(ws/WH)
 blue (bl/BU) $\hat{=}$ yellow(ge/YE)



Specifications

Optical data

Operating range ¹⁾	0 ... 150mm
Light source	LED (modulated light)
Wavelength	880nm

Electrical data

Transmitter	GaAs
Transmitting current	max. 200mA at D=0.05
Receiver	Si phototransistor
Inverse voltage U _{CEO}	max. 35VDC

Mechanical data

Housing	Transmitter aluminium anodised	Receiver natural colour anodised
Optics	glass	
Weight	approx. 70g	
Cable length	2000mm	
Cable cross-section	2x0.14mm ² +shield	

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protection class	IP 64

1) The operating range of the throughbeam photoelectric sensor LS 05 GA depends on the selected amplifier

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 05 GA-G	
Transmitter	LS 05 GA Se	500 00188
Receiver	LS 05 E	500 00184
Stainless steel version		
Transmitter and receiver	LS 05.5	
Transmitter	LS 05 Se.5	500 60871
Receiver	LS 05 E.5	500 60969

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



LS 29

Throughbeam photoelectric sensor



0 ... 35m

mini

- High performance throughbeam photoelectric sensor for connection to separate amplifier
- Round metal housing M12x1 with protection class IP 67
- 90° deflection via extension unit
- Alignment aid through LED indicator on the transmitter
- Penetration of multilayered coloured foils, in connection with VS 29/44.8

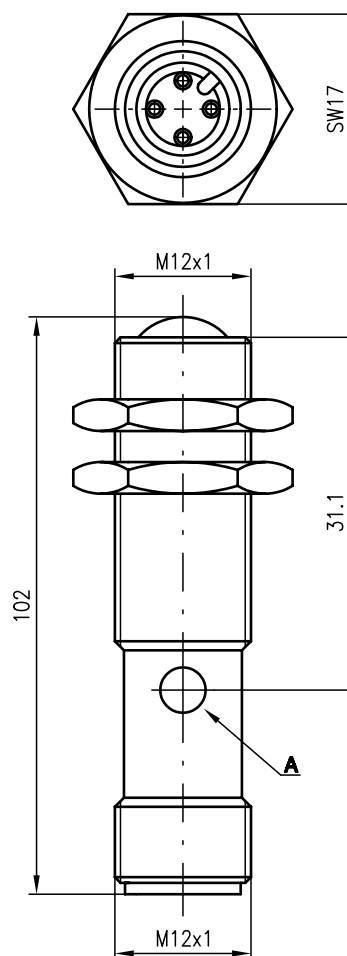


Accessories:

(available separately)

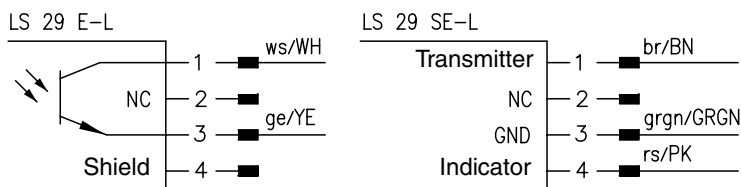
- Amplifier VS 29/44.8 (Part No. 500 80860, page 679)
- Diaphragm BL 29 hole Ø1 mm (Part No. 500 82260)
- Deflection mirror US 29 (Part No. 500 80863)
- Cable for transmitter:
 - BK7 KB-029-5000-3-SE (Part No. 500 80864)
 - BK7 KB-029-5000-3A-SE (Part No. 500 81156)
- Cable for receiver:
 - BK7 KB-029-5000-2-E (Part No. 500 81157)
 - BK7 KB-029-5000-2A-E (Part No. 500 81158)

Dimensioned drawing



A Indicator diode

Electrical connection





Specifications

Optical data

Operating range ¹⁾ see table
 Light source LED (modulated light)
 Wavelength 880nm

Timing

Switching frequency see amplifier
 Response time see amplifier
 Delay before start-up see amplifier

Electrical data

Pre-amplifier integrated in receiver
 Operating voltage only via separate amplifier

Indicators

LED yellow (on transmitter) light path free, alignment aid

Mechanical data

Housing M 12 stainless steel
 Optics glass
 Weight 12g each
 Connection type M 12 connector
 Cable see remarks

Environmental data

Ambient temp. (operation/storage) -25 °C ... +60 °C / -30 °C ... +70 °C
 Protection class IP 67
 Standards applied IEC 60947-5-2

1) Operating range: recommended range with performance reserve

Tables

Operating range with	
VS 29/44.8	35m

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 29 L	
Transmitter	LS 29 Se-L	500 80861
Receiver	LS 29 E-L	500 80862

Remarks

- Shielded cables KB 029... are recommended, others upon request.
- Mount receiver close to the amplifier.
- The performance reserve reduces itself about 20% when using the US 29.



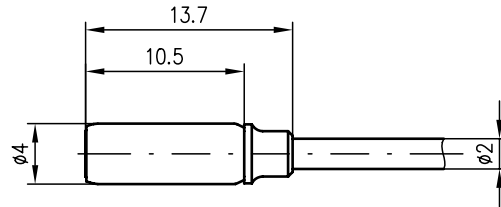
LS 31/LS 40

Throughbeam photoelectric sensor



Dimensioned drawing

LS 31



LS 40



500 mm



- Miniature construction enables application in limited spaces
- Metal construction offers high firmness
- Scratch resistant glass cover
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications



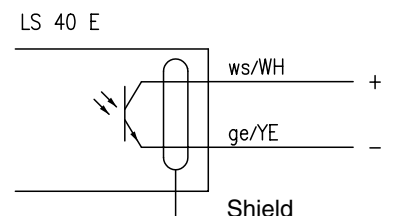
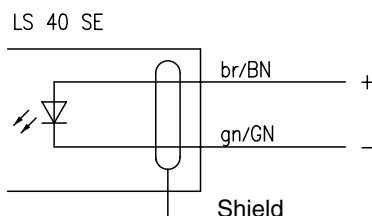
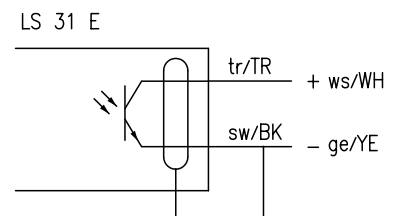
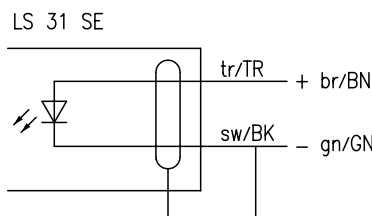
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Accessories:

(available separately)

- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Electrical connection





Specifications

	LS 31	LS 40
Optical data		
Operating range ¹⁾	0 ... 500mm	
Light source	LED (modulated light)	
Wavelength	880nm	
Electrical data		
Transmitter	GaAs	
Transmitting current	max. 200mA at D=0.05	
Receiver	Si phototransistor	
Inverse voltage U _{CEO}	max. 35VDC	
Mechanical data		
Housing	stainless steel V2A	aluminium red anodised
Optics	plastic	glass
Weight	approx. 40g	70g
Cable length	2000mm	
Cable cross-section	0.14mm ²	2x0.14mm ² +shield
Cable type	sheathing PVC internal conductor polyethylene	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C	
Protection class	IP 65	

1) The throughbeam photoelectric sensor operating range depends on the choice of the amplifier

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 31	
Transmitter	LS 31 Se	500 82029
Receiver	LS 31 E	500 82030
Transmitter and receiver	LS 40	
Transmitter	LS 40 Se	500 10157
Receiver	LS 40 E	500 10158

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.
- **LS 31**
Opening angle ± 12°



LS 66

Throughbeam photoelectric sensor



6m
12m

mini

- Small construction volume enables application in small spaces
- Metal construction offers high firmness
- Shockproof
- Through selection of appropriate amplifiers optimally adaptable to applications
- Various accessories



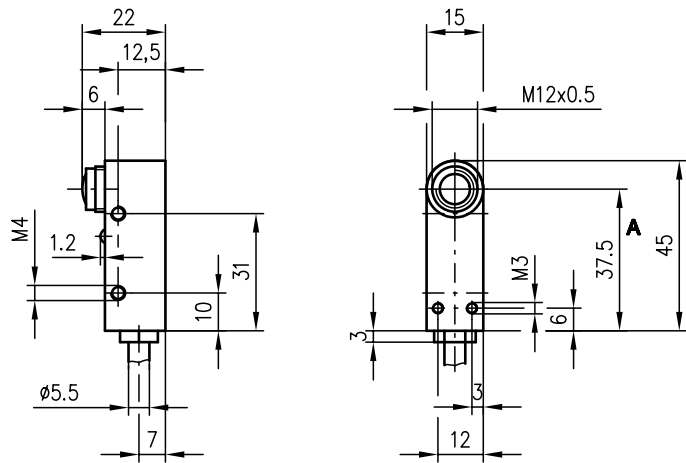
Accessories

(available separately • see from page 630 onwards)

- Adjusting and mounting device BT 66 (Part No. 500 16515)
- Compressed-air adapter DV 66 (Part No. 500 16516)
- Protection tube connection piece ET 316-01 (Part No. 500 11893)
- Pin diaphragm:
 - Diameter 2.0mm BL 66 (Part No. 500 15051)
- Slit diaphragm:
 - Slit width 1.5mm BL 66.1 (Part No. 500 15052)
- Pin diaphragm:
 - Diameter 2.0mm including compressed-air adapter BL 66.2 (Part No. 500 20003)
 - Mechanical alignment aid ARH 66 (Part No. 500 19029)

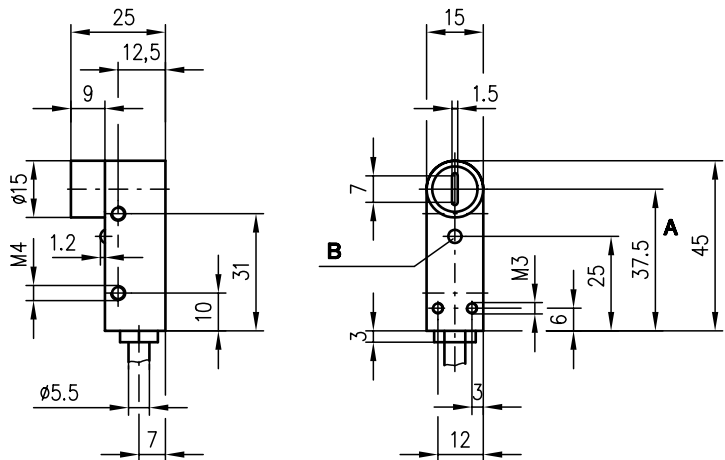
Dimensioned drawing

Transmitter



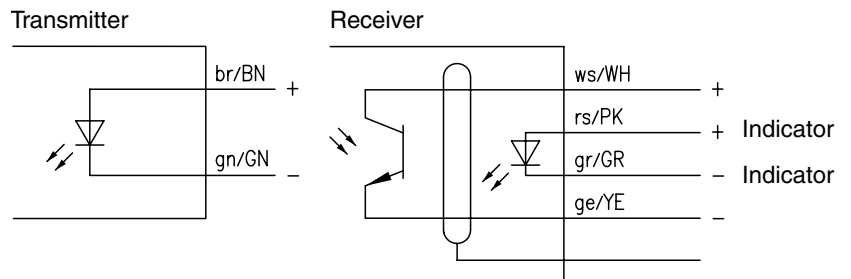
Receiver

with diaphragm BL 66.1



- A Optical axis
- B Indicator diode

Electrical connection



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Specifications

Optical data

Operating range ¹⁾ 0 ... 6m, 0 ... 12m
 Light source LED
 Wavelength 880nm

Electrical data

Transmitter GaAs
 Transmitting current max. 200mA at D=0.05
 Receiver Si phototransistor
 Inverse voltage max. 35VDC

Indicators

Receiver LED red light path free

Mechanical data

Housing	Transmitter	Receiver
Optics	aluminium red anodised	
Weight	glass	approx. 150g
Cable length	approx. 80g	
Cable cross-section	10000mm	4x0.25mm ² +shield
	2x0.25mm ²	

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-30°C ... +70°C
 Protection class IP 65

1) The operating range of the throughbeam photoelectric sensor LS 66 depends on the amplifier and diaphragm selections

Tables

Diaphragm \ VS	VS 25/4 R with EB 01
w/o diaphragm	0 ... 12m
BL 66	0 ... 2m
BL 66.1	0 ... 4m
BL 66.2	0 ... 3m

Diaphragm \ VS	IVS 28/44.8
w/o diaphragm	0 ... 6m
BL 66	0 ... 1m
BL 66.1	0 ... 2m
BL 66.2	0 ... 2m

Diaphragm \ VS	VS 3/71
w/o diaphragm	0 ... 6m
BL 66	0 ... 1m
BL 66.1	0 ... 2m
BL 66.2	0 ... 2m

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 66	
Transmitter	LS 66 Se	500 14689
Receiver	LS 66 E	500 14688

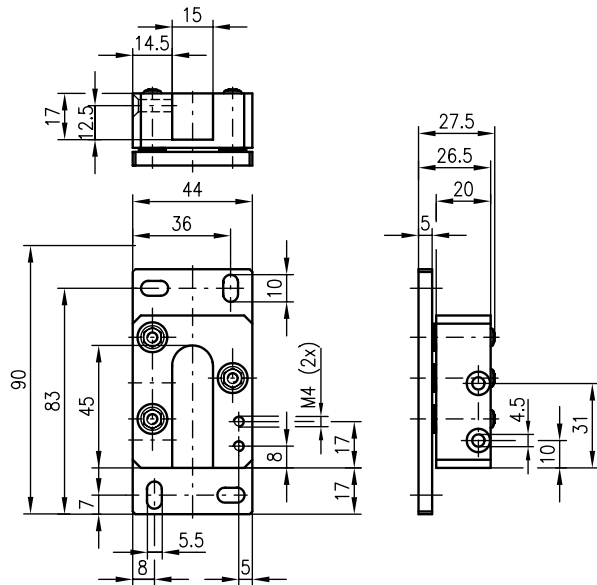
Remarks

- For secure control of e.g. tools with small diameters, the light beam can be optimally adjusted through pin or slit diaphragms.
- If a cable lengthening should be necessary, make sure that the shield is lead continuously.
- Combination of several photoelectric sensor systems in one cable, even if shielded, can cause interferences.
- The shielded photoelectric sensor conductors should not be lead in shared plug connections together with other conductors.

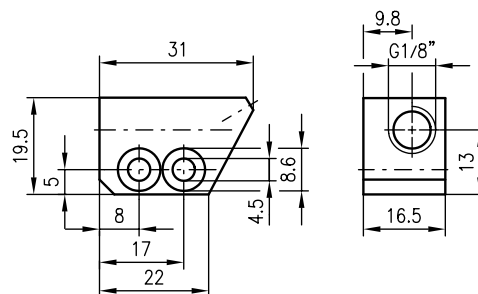

Dimensioned drawings

1. Alignment and mounting device BT 66
Part No. 500 16515
2. Compressed-air adapter DV 66
Part No. 500 16516
3. Slit or pin diaphragm BL 66, BL 66.1
Part No. (BL 66) 500 15051 and (BL 66.1) 500 15052
4. Diaphragm with integrated compressed-air adapter BL 66.2
Part No. 500 20003
5. Protection tube connection piece ET 316-01
Part No. 500 11893
6. Mechanical alignment aid ARH 66
Part No. 500 19029

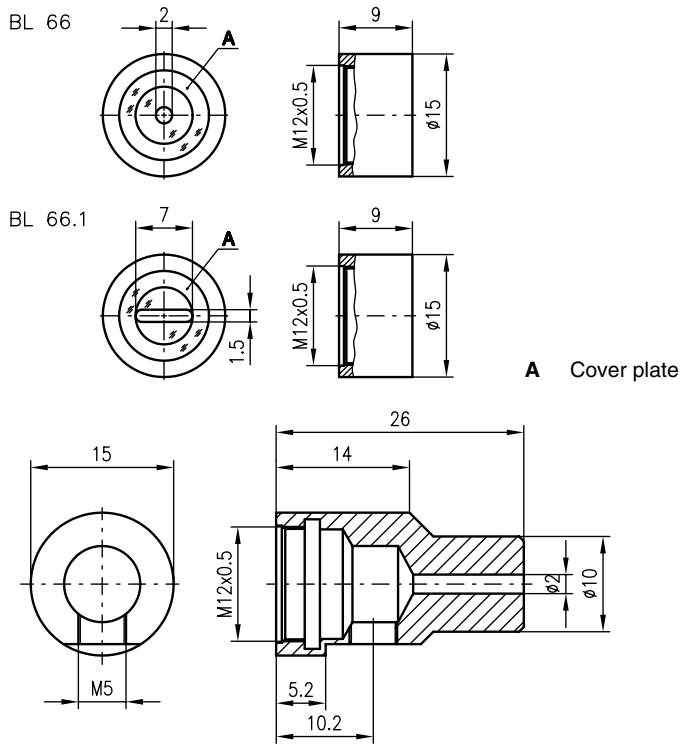
Adjusting and mounting device BT 66



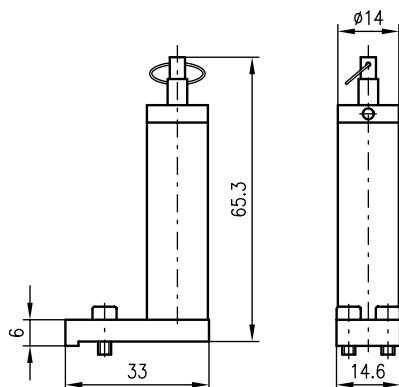
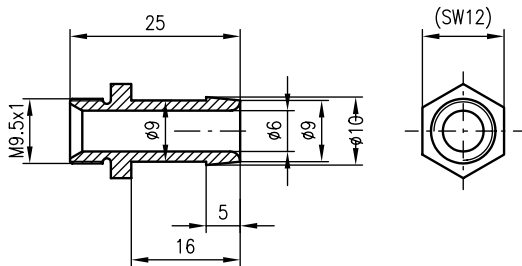
Compressed-air adapter DV 66



- Pressure:** 4 to 6bar, dep. on application
Air quality: Air filtered with 5µm average pore width, pulsed blow-off
Air connection: Fast screwing for hose inner dia. 3mm (not incl. in shipment)

Dimensioned drawings


Pressure: 4 to 6bar, dep. on application
Air quality: Air filtered with 5µm average pore width, pulsed blow-off
Air connection: Fast screwing for hose inner dia. 3mm (not incl. in shipment)



Pin diaphragm BL 66 $\varnothing=2.0\text{mm}$
 Slit diaphragm BL 66.1 $b=1.5\text{mm}$



Diaphragm BL 66.2
 with integrated compressed-air adapter



Protection tube connection piece
 ET 316-001



Mechanical alignment aid ARH 66





LS 71/LS 72

Throughbeam photoelectric sensors



800 mm



- Small construction volume enables application in small spaces
- Metal construction offers high firmness
- Scratch resistant glass cover
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications



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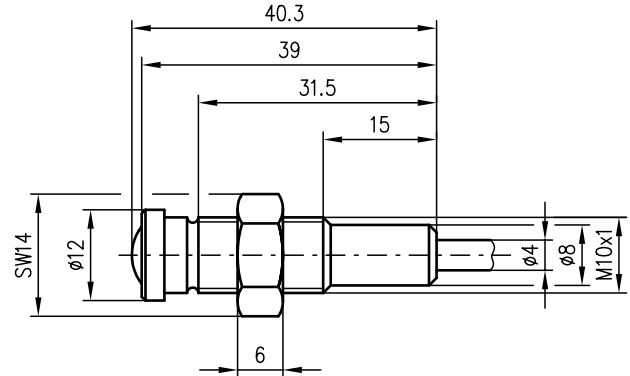
Accessories:

(available separately)

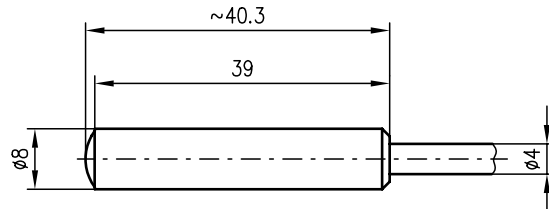
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Dimensioned drawing

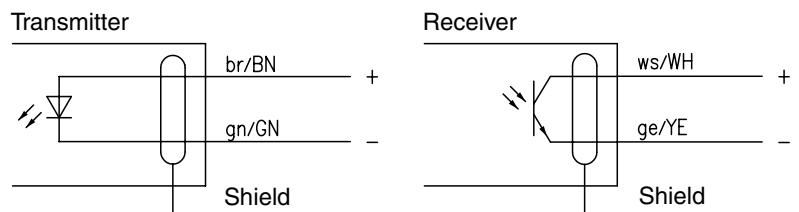
LS 71



LS 72



Electrical connection





Specifications

Optical data

Operating range ¹⁾	0 ... 800mm
Light source	LED (modulated light)
Wavelength	880nm

Electrical data

Transmitter	GaAs
Transmitting current	max. 200mA at D=0.05
Receiver	Si phototransistor
Inverse voltage U _{CEO}	max. 35VDC

Mechanical data

Housing	Transmitter	Receiver
Optics	aluminium red anodised	natural colour anodised
Weight	glass	
Cable length	approx. 70g	
Cable cross-section	2000mm	
	2x0.14mm ² +shield	

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protection class	IP 64

1) The operating range of the throughbeam photoelectric sensors LS 71 and 72 depends on the amplifier selections

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 71	
Transmitter	LS 71 Se	500 00215
Receiver	LS 71 E	500 00216
Transmitter and receiver	LS 72	
Transmitter	LS 72 Se,3000	500 00217
Receiver	LS 72 E,3000	500 00218

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



LS 74/LS 91

Throughbeam photoelectric sensors



5m
2m



- Scratch resistant glass cover
- High insensitivity towards soiling
- Convex optics
- Through selection of appropriate amplifiers optimally adaptable to applications
- Indicator diode as alignment aid and function indicator



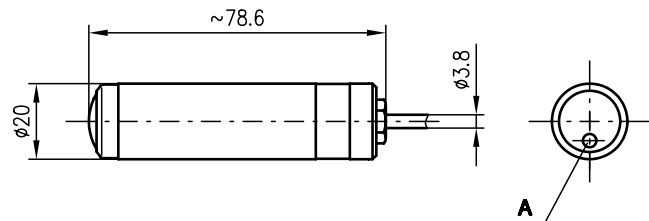
Accessories:

(available separately)

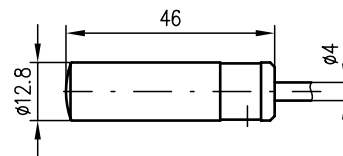
- Mounting systems
 - BT 01 (Part No. 500 03371)
 - BT 91 (Part No. 500 09420)
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Dimensioned drawing

LS 74

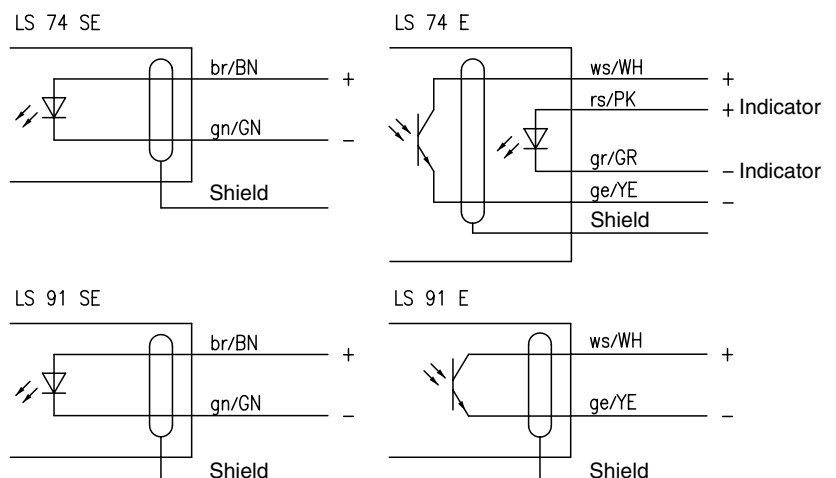


LS 91



A Indicator diode only at receiver

Electrical connection





Specifications

Optical data	LS 74	LS 91
Operating range ¹⁾	0 ... 5m	0 ... 2m
Light source	LED (modulated light)	
Wavelength	880nm	
Electrical data		
Transmitter	GaAs	
Transmitting current	max. 200mA at D=0.05	
Receiver	Si phototransistor	
Inverse voltage U _{CEO}	max. 35VDC	
Indicators		
LED red (receiver)	light path free	
Mechanical data		
Housing	aluminium red anodised	epoxy powder coating
Optics	glass	
Weight	approx. 180g	approx. 120g
Cable length	2000mm	
Cable cross-section	2x0.14mm ² +shield 4x0.14mm ² +shield (only for receiver LS 74)	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C	
Protection class	IP 65	

1) The operating range of the throughbeam photoelectric sensors depends on the amplifier and diaphragm selections

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 74	
Transmitter	LS 74 Se,6000	500 00224
Receiver	LS 74 E,6000	500 00225
Transmitter and receiver	LS 91	
Transmitter	LS 91 Se,4000	500 00262
Receiver	LS 91 E,4000	500 00263

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



LS 98

Throughbeam photoelectric sensor

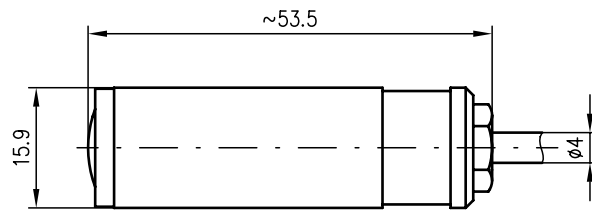


Dimensioned drawing



8m

mini



- Metal construction offers high firmness
- Scratch resistant glass optics
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications



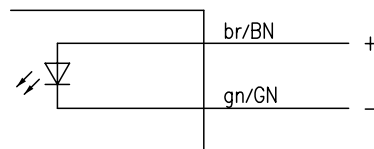
Electrical connection

Accessories:

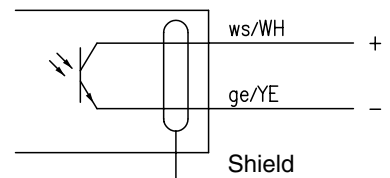
(available separately)

- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

LS 98 SE



LS 98 E



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Specifications

Optical data

Operating range ¹⁾	0 ... 8m
Light source	LED (modulated light)
Wavelength	880nm

Electrical data

Transmitter	GaAs
Transmitting current	max. 200mA at D=0.05
Receiver	Si phototransistor
Inverse voltage U _{CEO}	max. 35VDC

Mechanical data

Housing	Transmitter	Receiver
Optics	aluminium red anodised	
Weight	glass	
Cable length	approx. 200g	240g
Cable cross-section	8000mm	
	2x0.25mm ²	2x0.25mm ² +shield

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protection class	IP 65

1) The operating range of the throughbeam photoelectric sensor LS 98 depends on the selected amplifier

Tables

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 98	
Transmitter	LS 98 Se, 8000	500 10339
Receiver	LS 98 E, 8000	500 10340

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



LS 725

Throughbeam photoelectric sensor



20m



- Metal construction offers high firmness
- Indicator diode with analogue behaviour as alignment aid and function indicator
- In connection with the switching amplifier VS 725 especially suited for detection of dynamic events
- Scratch resistant glass optics
- Plug connection

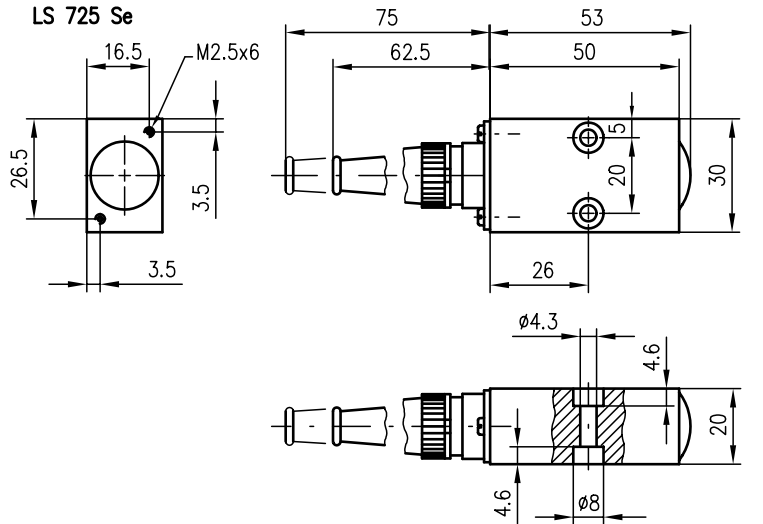


Accessories:

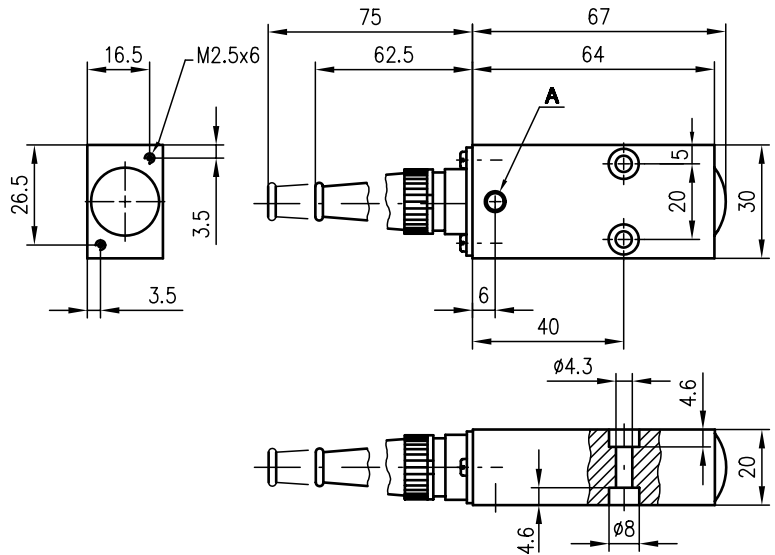
(available separately)

- Amplifier
 - VS 725 (Part No. 500 00647, page 685)
 - VS 725/4 (Part No. 500 16548, page 685)
- Slit diaphragm BL 01 (Part No. 500 00004)

Dimensioned drawing

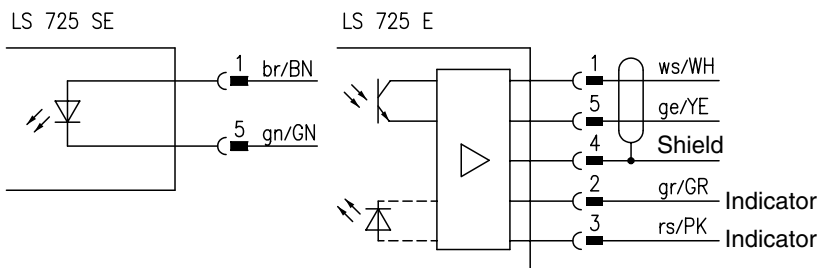


LS 725 E



A Indicator diode

Electrical connection



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Specifications

Optical data

Operating range ¹⁾	0 ... 20m
Light source	LED
Wavelength	880nm

Electrical data

Transmitter	GaAs
Transmitting current	max. 200mA at D=0.05
Receiver	Si phototransistor
Inverse voltage	max. 35VDC

Indicators

Receiver LED red	light path free
------------------	-----------------

Mechanical data

	Transmitter	Receiver
Housing	aluminium powder coated, red	
Optics	glass	
Weight	approx. 380g	approx. 600g
Cable length	20000mm	5000mm
Cable cross-section	2x0.25mm ²	4x0.14mm ² +shield

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protection class	IP 40

1) The operating range of the throughbeam photoelectric sensor LS 725 depends on the amplifier and diaphragm selections

Tables

Dia-phragm \ VS	VS 725 resp. VS 725/4	Smallest detectable object
without diaphragm	0 ... 20m	0.8mm Ø
BL 01	0 ... 10m	0.3mm Ø

Diagrams

Order guide

	Designation	Part No.
Transmitter and receiver	LS 725	
Transmitter	LS 725 Se, 20000	500 00270
Receiver	LS 725 E, 5000	500 00271
Slit diaphragm	BL 01	500 00004

Remarks

- For secure control of e.g. tools with small diameters, the light beam can be optimally adjusted through pin or slit diaphragms.
- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



RK 42/RK 713

Retro-reflective photoelectric sensors



**400 mm
800 mm**

mini

- Small construction volume enables application in small spaces
- Scratch resistant glass optics
- High insensitivity towards soiling and shocks
- Indicator diode as alignment aid and function indicator (only for RK 713)
- Through selection of appropriate amplifiers optimally adaptable to applications

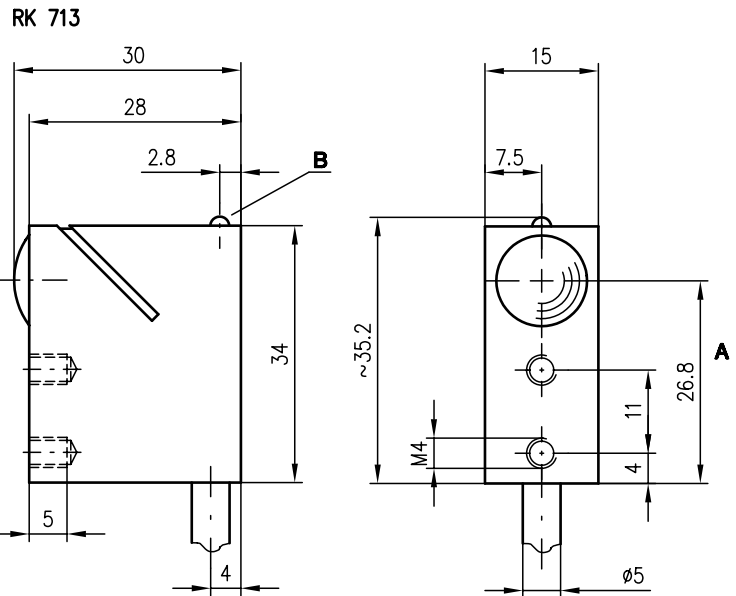
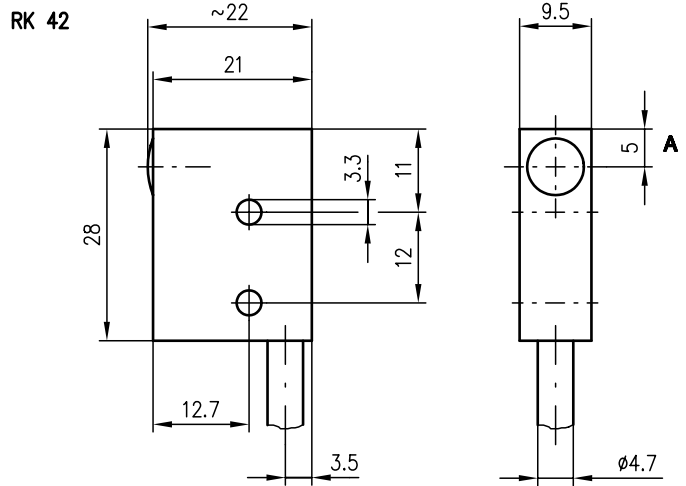


Accessories:

(available separately)

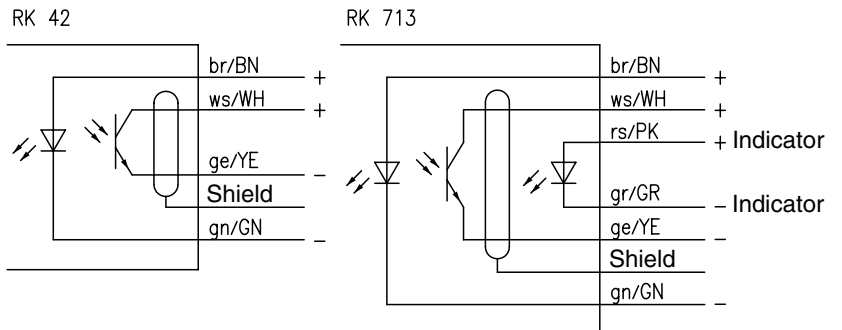
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)
- Reflectors
- Reflective tapes

Dimensioned drawing



A Optical axis
B Indicator diode

Electrical connection





Specifications

Optical data

Operating range ¹⁾
Light source
Wavelength

RK 42
20 ... 400mm
LED (modulated light)
880nm

RK 713
0 ... 800mm

Electrical data

Transmitter
Transmitting current
Receiver
Inverse voltage U_{CEO}

GaAs
max. 200mA at D=0.05
Si phototransistor
max. 35VDC

Indicators

LED red

reflection

Mechanical data

Housing
Optics cover
Weight
Cable
Cable cross-section

aluminium red anodised
glass
approx. 70g
2000mm
4x0.14mm²+shield

approx. 90g

6x0.14mm²+shield

Environmental data

Ambient temp. (operation/storage)
Protection class

-20°C ... +60°C/-30°C ... +70°C
IP 65

1) The operating range depends on the choice and on the sensitivity adjustment of the respective amplifier

Tables

RK 42

Reflectors		Operating range
TK	50x100	0.1 ... 0.4m
TK	30x50	0.02 ... 0.3m
TK	20x75	0.02 ... 0.2m
TK	45	0.02 ... 0.4m
TK	35	0.02 ... 0.2m
TG	20	0.02 ... 0.2m
Tape 2	100x100	0.02 ... 0.2m

RK 713

Reflectors		Operating range
TK	100x100	0 ... 0.8m
TK	50x50	0 ... 0.7m
TK	82	0 ... 0.8m
TK	60	0 ... 0.4m
TK	45	0 ... 0.6m
TG	60	0 ... 0.5m
Tape 2	100x100	0 ... 0.35m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Order guide

Designation	Part No.
RK 42	500 10398
RK 713	500 00568

Remarks

- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



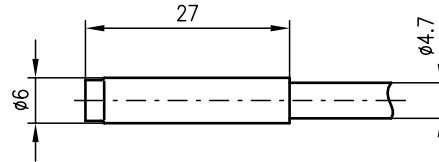
RK 41/RK 715

Energetic diffuse reflection light scanner

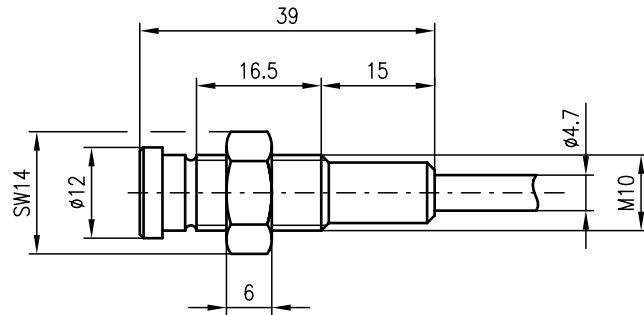


Dimensioned drawing

RK 41



RK 715

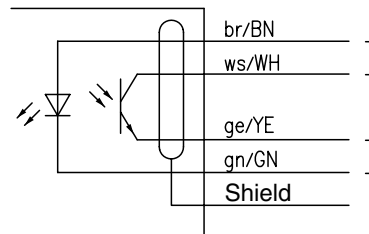


30mm
10mm



- Small construction volume enables application in small spaces
- Metal construction offers high firmness
- Scratch resistant glass cover
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications

Electrical connection



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Accessories:

(available separately)

- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)



Specifications

Optical data	RK 41	RK 715
Scanning range (white 90%) ¹⁾	1 ... 30mm	0 ... 10mm
Light source	LED (modulated light)	
Wavelength	880nm	
Electrical data		
Transmitter	GaAs	
Transmitting current	max. 200mA at D=0.05	
Receiver	Si phototransistor	
Inverse voltage U _{CEO}	max. 35VDC	
Mechanical data		
Housing	aluminium red anodised	
Optics	glass	
Weight	approx. 70g	
Cable length	2000mm	
Cable cross-section	4x0.14mm ² +shield	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C	
Protection class	IP 65	IP 64

1) The scanning range depends on the choice and on the sensitivity adjustment of the respective amplifier

Tables

Diagrams

Order guide

Designation	Part No.
RK 41	500 10395
RK 715	500 00574

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



RK 44/RK 83

Energetic diffuse reflection light scanner



40mm
20mm



- Small construction volume enables application in small spaces
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications
- Small light beam with RK 44
- Indicator diode as alignment aid for fast mounting (only for RK 83)

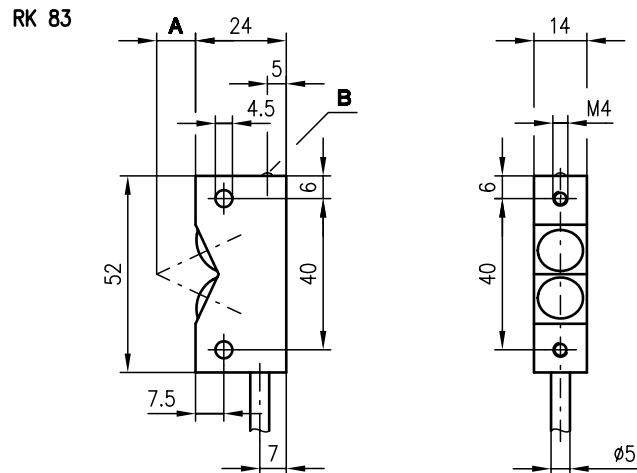
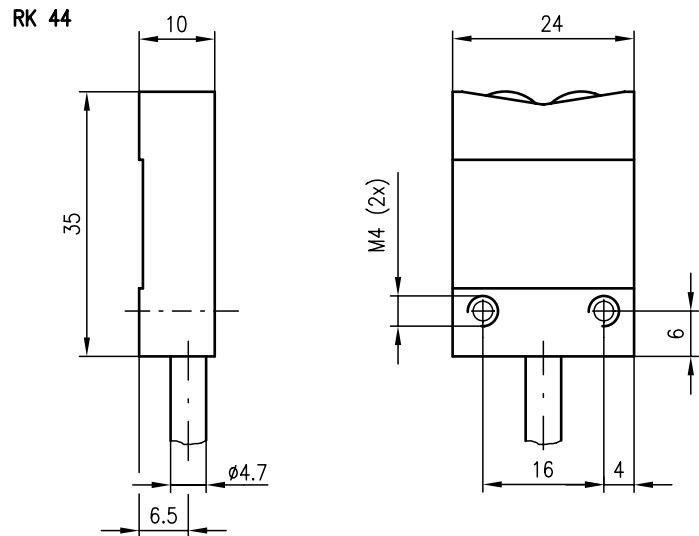


Accessories:

(available separately)

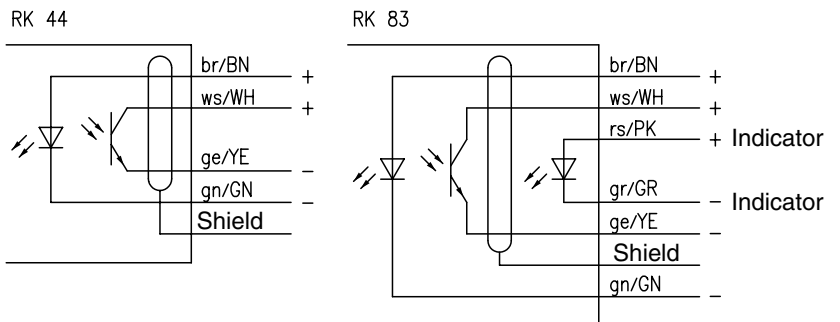
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Dimensioned drawing



A Focus
B Indicator diode

Electrical connection



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Specifications

	RK 44	RK 83
Optical data		
Scanning range (white 90%) ^{1) 2)}	15 ... 40mm	0 ... 20mm
Light source	LED (modulated light)	
Wavelength	880nm	
Electrical data		
Transmitter	GaAs	
Transmitting current	max. 200mA at D=0.05	
Receiver	Si phototransistor	
Inverse voltage U _{CEO}	max. 35VDC	
Indicators		
LED red		reflection
Mechanical data		
Housing	aluminium red anodised	
Optics	glass	
Weight	approx. 70g	approx. 130g
Cable length	2000mm	
Cable cross-section	4x0.14mm ² +shield	6x0.14mm ² +shield
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/30 °C ...+70°C	
Protection class	IP 65	

Tables

Diagrams

Order guide

Designation	Part No.
RK 44	500 19080
RK 83	500 00483

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- If a cable lengthening should be necessary, make sure that the shield is lead continuously.
- Based on its beam characteristics, the diffuse reflection light scanner RK 44 can detect objects through a slit with dia. ≥ 4.5 mm parallel to the flat housing and over the complete scanning range.



RK 70/RK 716

Energetic diffuse reflection light scanner



10mm
2.5mm



- Small construction volume enables application in small spaces
- Scratch resistant glass cover
- High insensitivity towards soiling and shocks
- Through selection of appropriate amplifiers optimally adaptable to applications

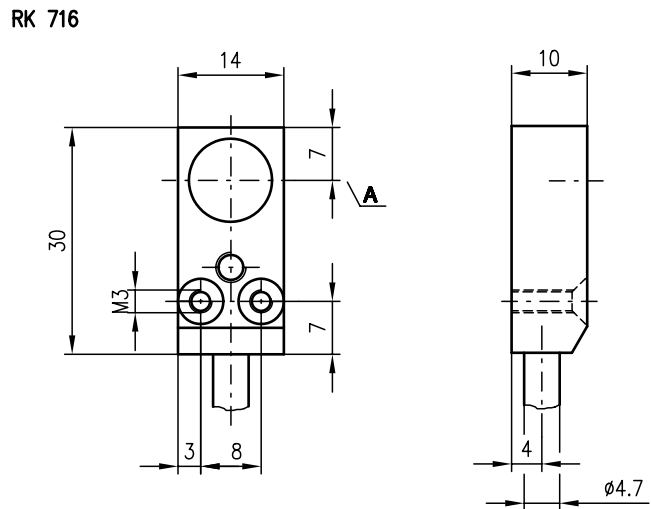
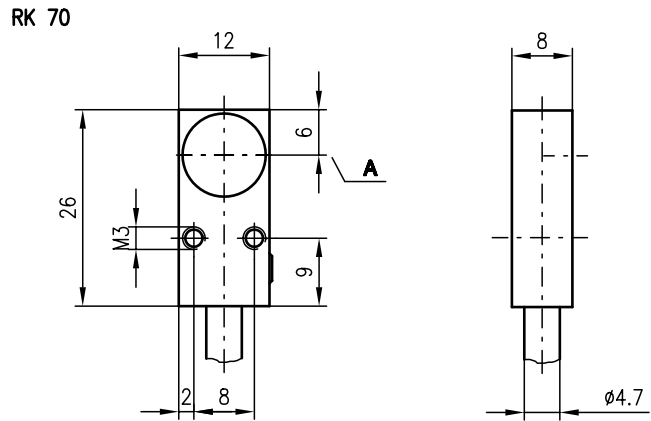


Accessories:

(available separately)

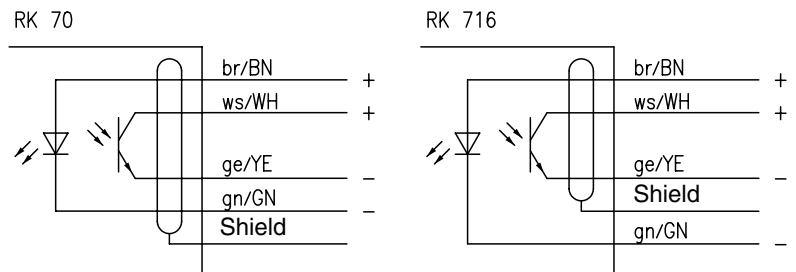
- Amplifier for mini photoelectric sensors, e.g.
 - VS 9/1 (Part No. 500 00632, page 659)
 - IVS 9/4.8 (Part No. 500 12303, page 663)
 - VS 27/24 (Part No. 500 82005, page 675)
 - IVS 28/44.8 (Part No. 500 19808, page 677)

Dimensioned drawing



A Optical axis

Electrical connection



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Specifications

	RK 70	RK 716
Optical data		
Scanning range (white 90%) ^{1) 2)}	1 ... 10mm	0.5 ... 2.5mm
Light source	LED (modulated light)	
Wavelength	880nm	
Electrical data		
Transmitter	GaAs	
Transmitting current	max. 200mA at D=0.05	
Receiver	Si phototransistor	
Inverse voltage U _{CEO}	max. 35VDC	
Mechanical data		
Housing	aluminium red anodised	
Optics	glass	
Weight	approx. 70g	approx. 90g
Cable	2000mm	
Cable cross-section	4x0.14mm ² +shield	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C	
Protection class	IP 65	

1) The scanning range depends on the choice and on the sensitivity adjustment of the respective amplifier
 2) With RK 716 objects are safely suppressed at distances starting at 9mm

Tables

Diagrams

Order guide

Designation	Part No.
RK 70	500 00390
RK 716	500 00575

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.
- If a cable lengthening should be necessary, make sure that the shield is lead continuously.



RK 70

Energetic diffuse reflection light scanner

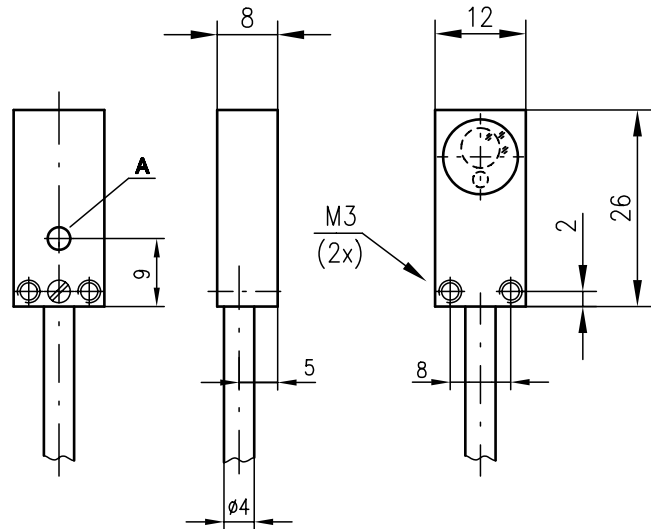


1 ... 50mm



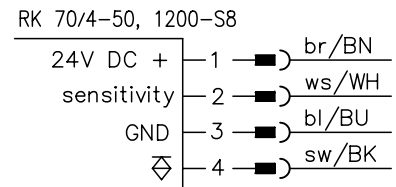
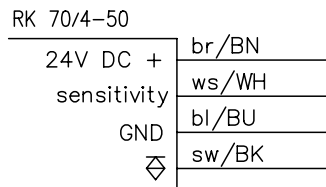
- Miniature construction with completely integrated electronics for 24V technology
- The PNP transistor output is short-circuit proof and polarity reversal protected
- Sensitivity adjustment via control line allows optimal adaptation to the applications
- Central sensitivity adjustment via multiturn potentiometer with use of the power supply unit NT 24 for up to 60 devices RK 70/4-50

Dimensioned drawing



A Indicator diode

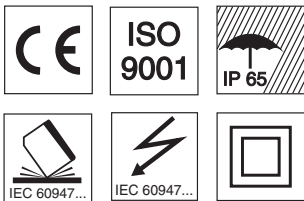
Electrical connection



Accessories:

(available separately)

- Power supply unit NT 24 (Part No. 500 24574, page 654)



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Specifications

Optical data

Scanning range (white 90%)	1 ... 50mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	24VDC filtered ± 20%
Residual ripple	≤ 10% of U_B
Bias current	≤ 10mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	100mA
Sensitivity	adjustable via control line (2V ... 24VDC)
	≤ 2V → min. sensitivity
	≥ 15V ... 24V → max. sensitivity

Indicators

LED yellow on	reflection
LED yellow off	no reflection

Mechanical data

Housing	plastic
Optics cover	glass
Weight	approx. 170g
Cable length	3000mm
Cable cross-section	4x0.14mm ² +shield
Cable material	PUR

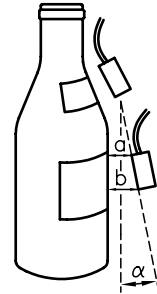
Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ¹⁾	2, 3
VDE safety class	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Typical application for bottle detection



$a \approx 10\text{mm}$
 $b = 12 - 15\text{mm}$
 $\alpha = 6 - 12^\circ$

Diagrams

Order guide

	Designation	Part No.
with 3m cable	RK 70/4-50	500 26536
with 1.2m cable and M8 connector, 4-pin	RK 70/4-50, 1200-S8	500 82038

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.

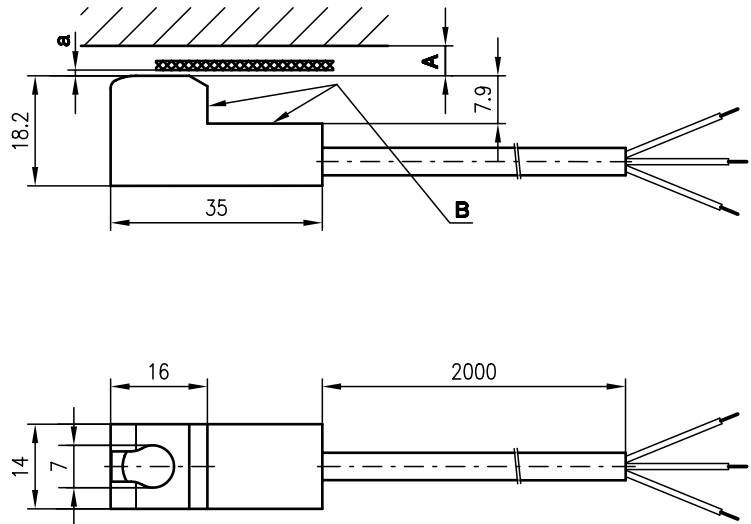


RT 707

Energetic diffuse reflection light scanner



Dimensioned drawing



0 ... 3.5 mm



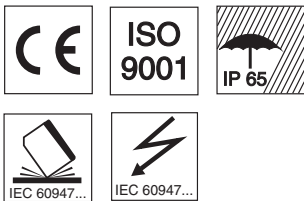
- Miniature construction with completely integrated electronics for 24V technology
- The PNP transistor output is short-circuit proof and polarity reversal protected
- Immersed optical cover for mechanical protection
- Pollution resistant through specially designed optics

- A** Free space
- B** Plain

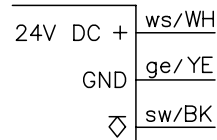
Distance a:
 optimum scanning distance 1.4 mm
 scanning range 0 ... 3.5 mm with white paper (90%)
 scanning range 0.1 ... 1.6 mm with black paper (6%)

Free space A:
 no reflection from 4.5 mm (background suppression)

Electrical connection



Accessories:



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Specifications

Optical data

Scanning range (white 90%)	0 ... 3.5mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	3000Hz
Response time	0.16ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	21.5V ... 25VDC
Residual ripple	≤ 10% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	50mA

Mechanical data

Housing	aluminium anodised, black
Optics cover	glass
Weight	approx. 15g
Cable length	2000mm
Cable cross-section	3x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	0°C ... +50°C / -30°C ... +60°C
Protective circuit ¹⁾	2, 3
VDE safety class	III
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Typical applications:
Paper edge detection in printing machines

Diagrams

Order guide

Designation	Part No.
RT 707/4-2	500 35072

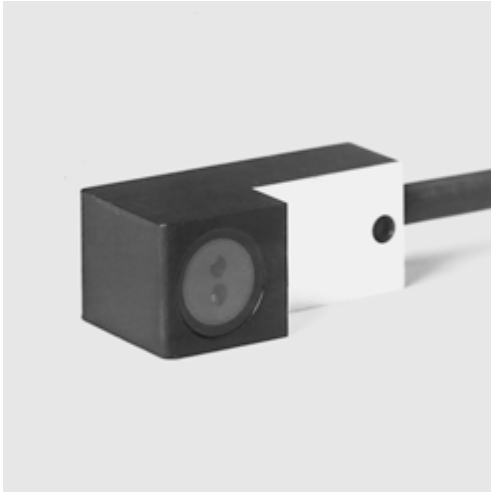
Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.

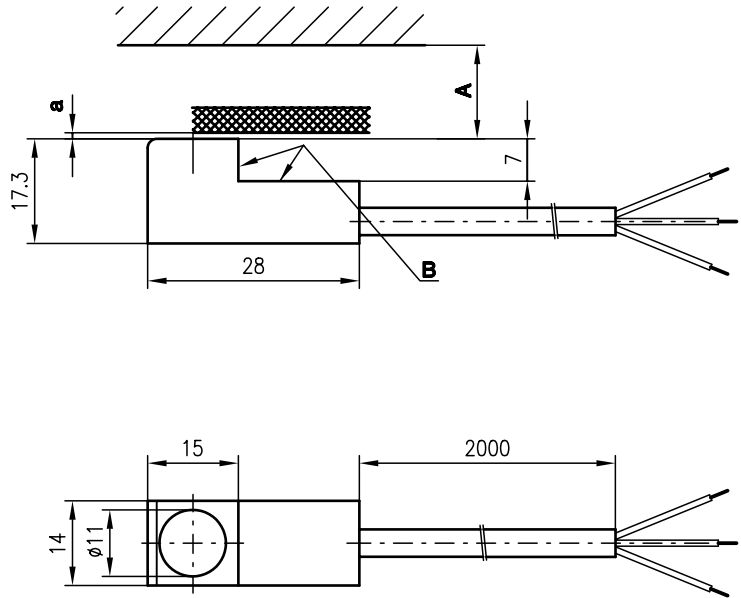


RT 709

Energetic diffuse reflection light scanner



Dimensioned drawing



- A** Free space
- B** Plain

Distance a:
 optimum scanning distance 3mm
 scanning range 1 ... 8mm with white paper (90%)
 scanning range 1 ... 4mm with black paper (6%)

Free space:
 no reflection from 14mm (background suppression)

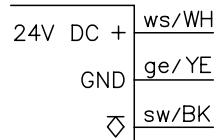


1 ... 8mm

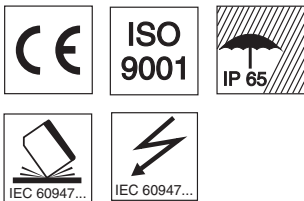


- Miniature construction with completely integrated electronics for 24V technology
- The PNP transistor output is short-circuit proof and polarity reversal protected
- Scratch resistant glass cover

Electrical connection



Accessories:



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Specifications

Optical data

Scanning range (white 90%)	1 ... 8mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	3000Hz
Response time	0.16ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	21.5V ... 25VDC
Residual ripple	≤ 10 % of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	50mA

Mechanical data

Housing	aluminium anodised, black
Optics cover	glass
Weight	approx. 15g
Cable length	2000mm
Cable cross-section	3x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	0°C ... +50°C / -30°C ... +60°C
Protective circuit ¹⁾	2, 3
VDE safety class	III
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Typical applications:

Paper edge detection in printing machines

Diagrams

Order guide

Designation	Part No.
RT 709/4-4	500 35074

Remarks

- The upper and lower scanning range limit varies depending on the reflection properties of the material surface.



NT 24

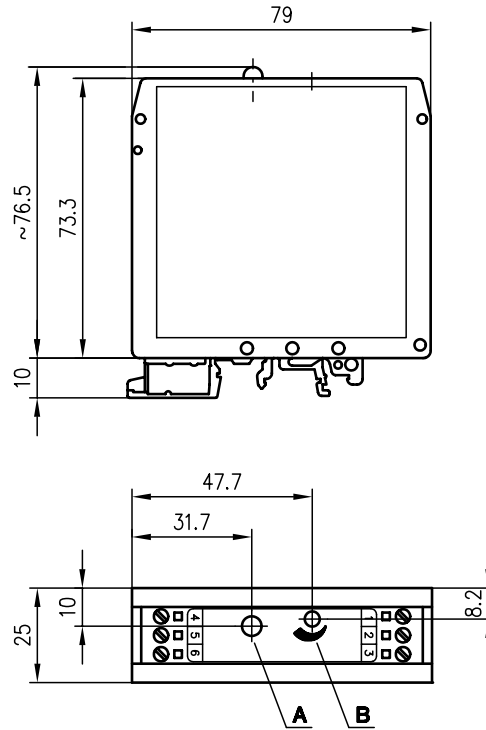
Power supply unit



24 V
DC

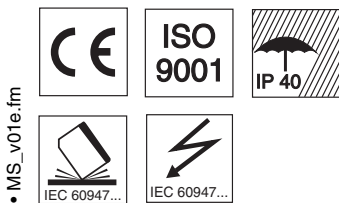
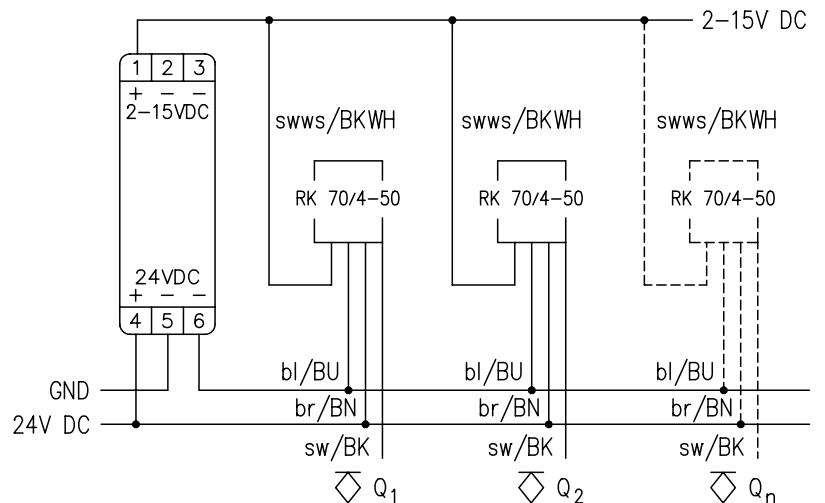
- Power supply unit with adjustable output voltage (2 ... 15V)
- Central voltage adjustment via multiturn potentiometer with use of the power supply unit NT 24 for up to 60 devices RK 70/4-50
- Plastic housing with snap-on mounting for standard rail

Dimensioned drawing



A Operation indicator
 B Output voltage

Electrical connection



Accessories:

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Specifications

Electrical data

Operating voltage U_B	24VDC filtered $\pm 20\%$
Residual ripple	$\leq 10\%$ of U_B
Output voltage	2 ... 15V (adjustable via 3-turn potentiometer)
Output current	max. 300mA

Indicators

LED green	ready (supply voltage connected)
-----------	----------------------------------

Mechanical data

Housing	plastic green
Weight	approx. 90g
Connection type	screw terminals (max. 0.75mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ¹⁾	3
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4 IEC 60947-5-2

Standards applied

1) 3=short circuit protection

Tables

Diagrams

Order guide

Designation	Part No.
NT 24	500 24574

Remarks

- The power supply unit NT 24 is suited for the supply voltage adjustment of up to 60 devices RK 70/4-50.



115/230 V AC

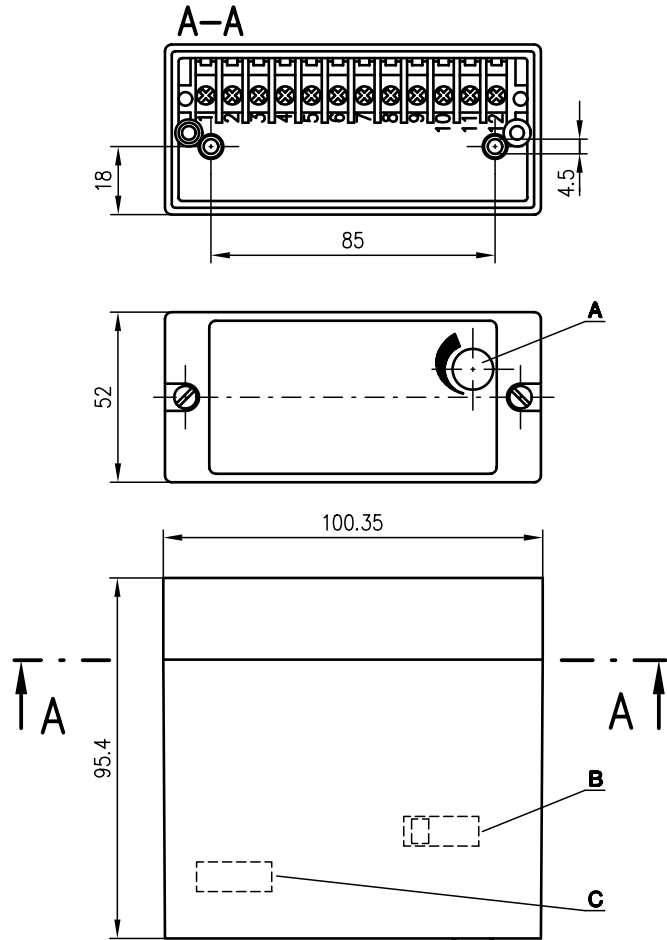
- Amplifier for connection of all miniature photoelectric sensors (GaAs)
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Through alternating light operation higher insensitivity of the connected mini photoelectric sensors towards ambient light
- Relay output or NPN transistor output
- Screw connection or on demand snap-on mounting for standard rail



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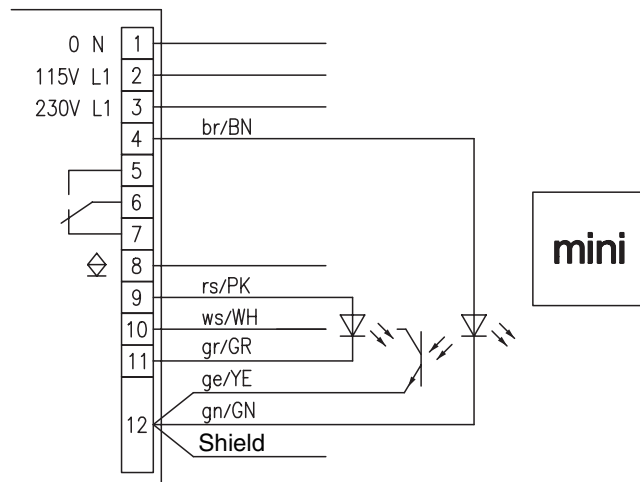
Accessories:

Dimensioned drawing



- A** Sensitivity adjustment below the protecting cap
- B** Internal: light/dark switching
- C** Internal: fuse

Electrical connection





Specifications

Timing

Switching frequency (relay)	20Hz
Switching frequency (transistor)	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	115/230VAC ± 10%, 50/60Hz
Power consumption	≤ 5.5VA
Insulation test voltage	input-output 4kVAC
	relay output 4kVAC
Switching output	NPN transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	≥ 22V/≤ 2V
Output current	max. 50mA
Switching output ¹⁾	relay, 1 change-over contact
Switching power, relay	50W/60VA
Switching voltage, relay	250VAC/DC
Sensitivity	adjustable

Mechanical data

Housing	plastic grey
Weight	490g
Connection type	screw connection

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30 °C ... +70°C
Protective circuit ²⁾	1, 3
Fuse	fine-wire fuse 0.25mA semi time-lag (5x20mm)
Protection class	IP 40
Standards applied	IEC 60947-5-2

1) Suitable spark extinction must be provided with inductive or capacitive loads
 2) 1=transient protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

Designation	Part No.
VS 3/71	500 00624

Remarks

- One gallium mini photo-electric sensor can be connected to the gallium amplifier VS 3/71.
- Housing with snap-on mounting to standard rail on demand.
- Special voltage on request.
- The slide switch for light/dark switching as well as the fine-wire fuse are located inside the housing.



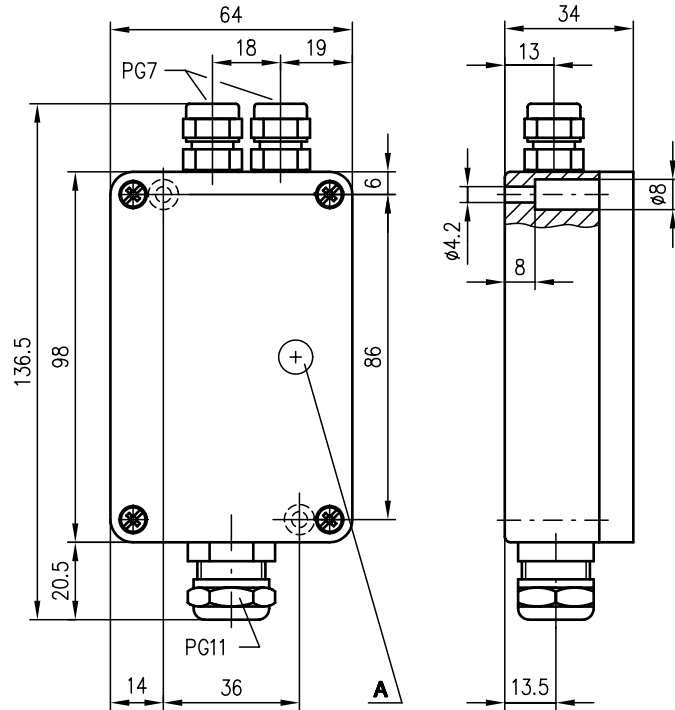
VS 9

Amplifier



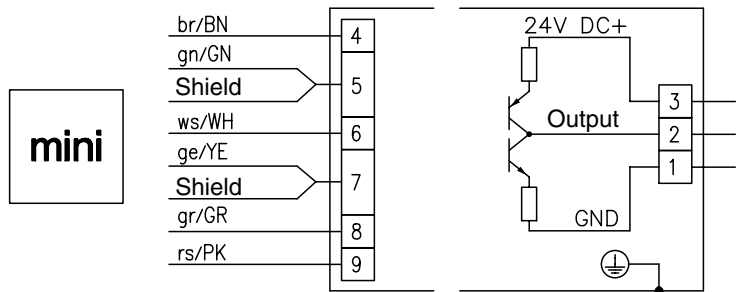
- Amplifier for connection of all mini photoelectric sensors(GaAs)
- Through alternating light operation higher insensitivity of the connected gallium mini photoelectric sensors towards extraneous light
- The NPN and PNP transistor outputs are short-circuit proof and polarity reversal protected as push-pull outputs
- Indicator diode used as alignment aid for simple mounting
- Metal housing for robust application

Dimensioned drawing

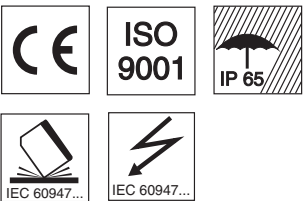


A Indicator diode
internal: sensitivity adjustment

Electrical connection



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Accessories:



Specifications

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	24VDC ± 10%
Residual ripple	≤ 15%
Bias current	≤ 90mA
Switching output	push-pull output, triggered NPN transistor output, light switching PNP transistor output, dark switching
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 500mA
Sensitivity	adjustable

Indicators

LED red	light path free/reflection (with performance reserve)
LED red flashing	light path free/reflection (without performance reserve)

Mechanical data

Housing	aluminium powder coated, red
Weight	approx. 330g
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ¹⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 1=transient protection, 2=polarity reversal protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

Designation	Part No.
VS 9/1	500 00632

Remarks

- One gallium mini photoelectric sensor can be connected to the gallium amplifier VS 9/1.



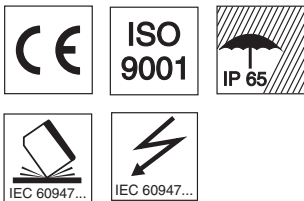
VS 9

Amplifier



18 - 30 V
DC

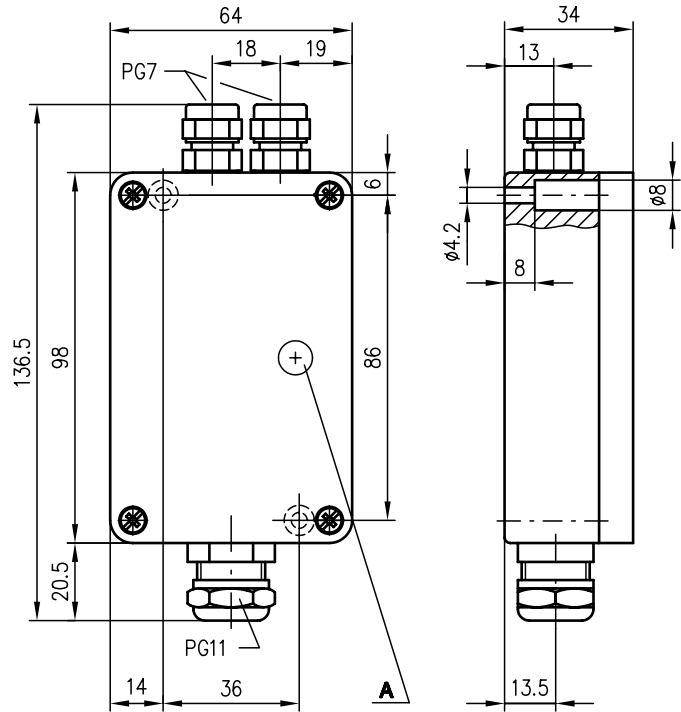
- Dynamic amplifier for connection of all mini photoelectric sensors (GaAs) for detection of fast events
- Through alternating light operation higher insensitivity of the connected mini photoelectric sensors towards ambient light
- The PNP transistor output is short-circuit proof and polarity reversal protected
- Metal housing for robust application



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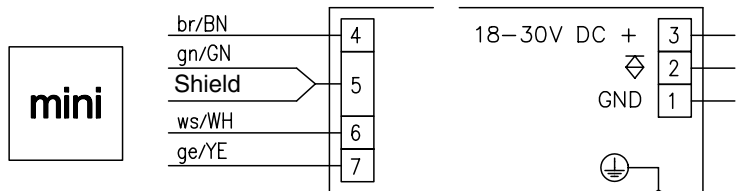
Accessories:

Dimensioned drawing



A Indicator diode
internal: sensitivity adjustment light/dark switching

Electrical connection





Specifications

Timing

Response time	0.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	18 ... 30VDC
Residual ripple	≤ 15%
Bias current	≤ 80mA
Switching output	PNP transistor output
Output pulse	approx. 50ms
Function characteristics	dynamic dark switching (transistor for approx. 50ms activated at change from light to dark)
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable

Mechanical data

Housing	aluminium powder coated, red
Weight	approx. 320g
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ¹⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 1=transient protection, 2=polarity reversal protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

Designation	Part No.
VS 9/4.1	500 10357

Remarks



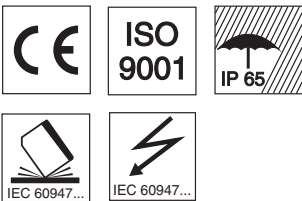
IVS 9

Amplifier



11 - 30 V
DC

- Amplifier for connection of all mini photoelectric sensors (GaAs)
- The PNP transistor output is short-circuit proof and polarity reversal protected
- Indicator diode used as alignment aid for simple mounting
- Plug-in time module provides optional functions
- Activation input allows function testing of the sensor and interlinking a number of sensors
- Warning output - for increased availability

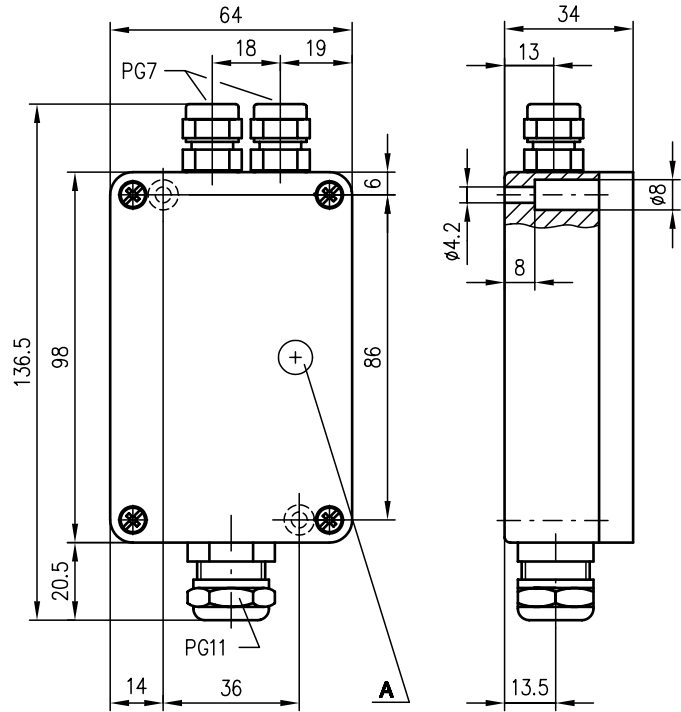


Accessories:

(available separately)

- Time modules
 - ZK 7810 (Part No. 500 00672)
 - ZK 7820 (Part No. 500 00673)

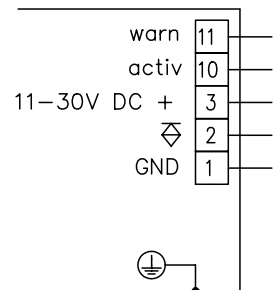
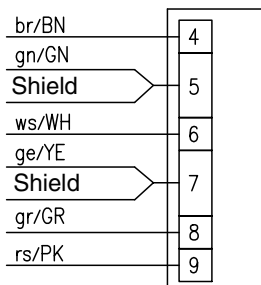
Dimensioned drawing



A Indicator diode
internal: sensitivity adjustment light/dark switching

Electrical connection

mini



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Specifications

Timing

Switching frequency	100Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	11 ... 30VDC
Residual ripple	≤ 15%
Bias current	≤ 80mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free/reflection
LED red flashing	light path free/reflection, without performance reserve

Mechanical data

Housing	aluminium powder coated, red
Weight	approx. 300g
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ¹⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	$\geq 8V / \leq 2V$ or not connected
Warning output autoControl warn	PNP transistor, counting principle
Signal voltage	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Time modules

- The standard device is expandable through add-on time modules (even at a later point)
- **Transient pulse** separately adjustable slow operation and pulse length, 100ms ... 5s (ZK 7810) respectively
 - **Slow operation and slow release** separately adjustable from 200ms ... 10sec (ZK 7820)

1) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for transistor output

Order guide

Designation	Part No.
IVS 9/4.8	500 12303

Tables

Diagrams

Remarks

- The activation input of the amplifier enables function control and logical connection of several systems through a special circuit. If this function is not needed, this connection (active) must be directly connected to $+U_B$.
- autoControl is a counting principle. The photoelectric sensor is counting switching cycles with reduced performance reserve. After three consecutive cycles with reduced performance reserve (LED flashing), the separate warning output is activated and remains active until corresponding measures (cleaning, alignment etc.) have provided optimum performance reserve.



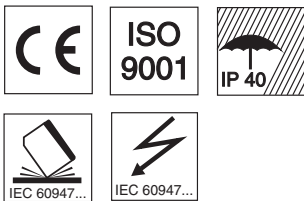
VS 10

Amplifier



24 V
DC

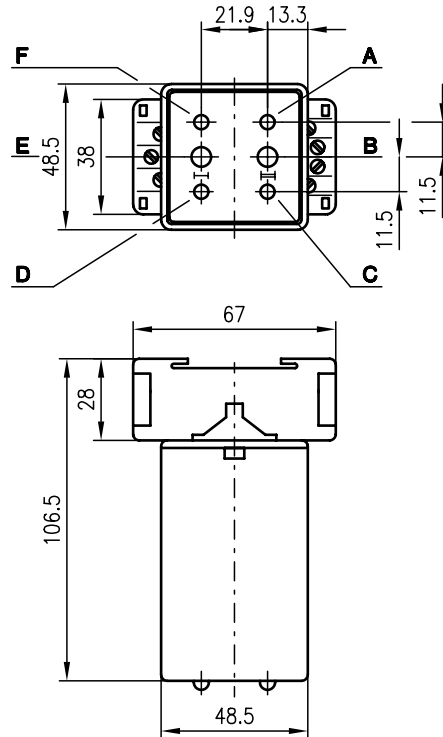
- Amplifier for connection of all mini photoelectric sensors (GaAs)
- The PNP transistor output is short-circuit proof and polarity reversal protected
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Indicator diode used as alignment aid for simple mounting
- Plastic housing with 11-pin connector, attachable to standard rail



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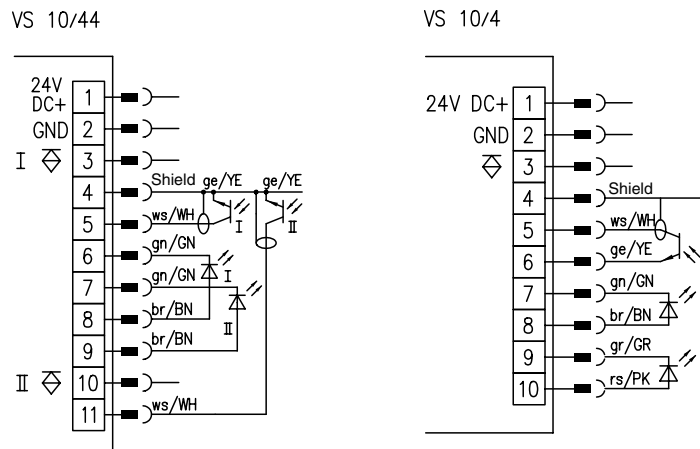
Accessories:

Dimensioned drawing



- A Light/dark switching
 - B Indicator diode
 - C Sensitivity adjustment
- only for VS 10/44
- D Light/dark switching
 - E Indicator diode
 - F Sensitivity adjustment

Electrical connection





Specifications

Timing

Switching frequency	VS 10/4	VS 10/44
Response time	100Hz	
Delay before start-up	5ms	
	≤ 100ms	

Electrical data

Operating voltage U_B	24VDC ± 10%	
Residual ripple	± 10%	
Power consumption	≤ 1.5W	3W
Switching output	1 PNP transistor	2 PNP transistors
Function characteristics	light or dark switching (reversible)	
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V	
Output current	max. 100mA	
Sensitivity	adjustable	

Indicators

LED yellow	light path free/reflection
LED yellow flashing	light path free/reflection, no performance reserve

Mechanical data

Housing	plastic standard housing
Weight	90g
Connection type	11-pin connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C / -30°C ... +70°C
Protective circuit ¹⁾	1, 3
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4 IEC 60947-5-2

Standards applied

1) 1=transient protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

	Designation	Part No.
for connection of one mini photoelectric sensor	VS 10/4	500 00633
for connection of two mini photoelectric sensors	VS 10/44	500 00634

Remarks

- VS 10/4 - single amplifier for connection of **one** mini photoelectric sensor.
- VS 10/44 - double amplifier for separate connection of **two** mini photoelectric sensors. Double amplifier with separate sensitivity adjustment, indicator diode, light/dark switching and transistor output.

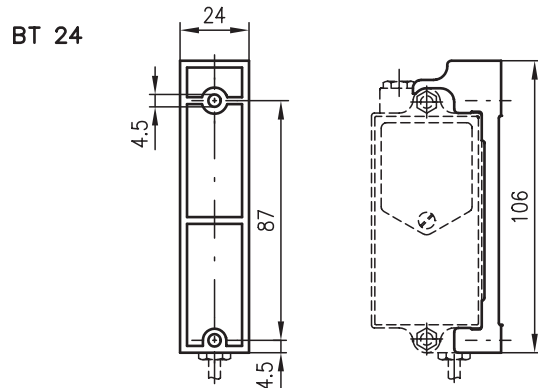
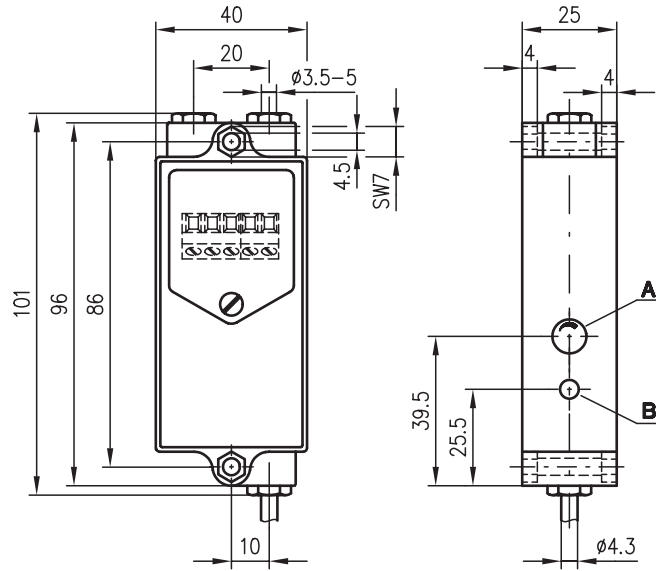


VS 24

Amplifier

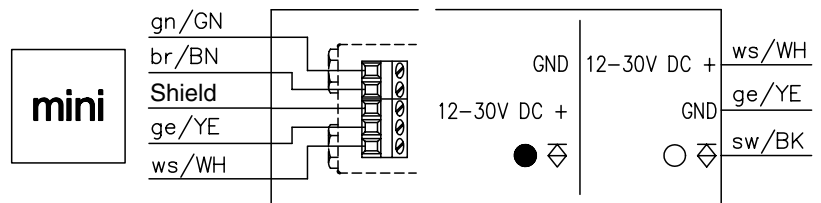


Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode

Electrical connection



12 - 30 V
DC

- Amplifier for connection of all mini photoelectric sensors (GaAs)
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Outputs are short-circuit proof and polarity reversal protected, thus guaranteeing riskless mounting
- Plastic housing with cable connection



Accessories:

(available separately)

- Mounting system BT 24 (Part No. 500 11791)

mini

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Specifications

Timing

Switching frequency	100Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	12 ... 30VDC
Residual ripple	≤ 15%
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light/dark switching (by reversing the polarity of U_B)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Sensitivity	adjustable

Indicators

LED red	light path free/reflection
LED red flashing	light path free/reflection, no performance reserve

Mechanical data

Housing	plastic, red
Weight	80g
Cable length	2000mm
Cable cross-section	3x0.25mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protective circuit ¹⁾	1, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 1=transient protection, 3= short-circuit protection for transistor output

Tables

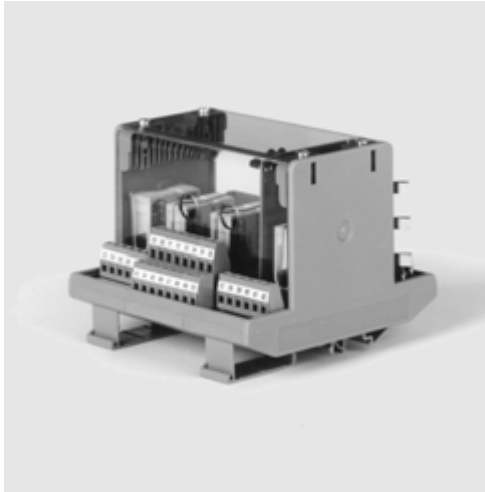
Diagrams

Order guide

Designation	Part No.
VS 24/4	500 11265

Remarks

- The screw terminals for connection of the photoelectric sensor are accessible through removal of the front cover.
- The cable entry of the photoelectric sensor to be connected is done via the cable gland (cable diameter 3.5 ... 5mm).

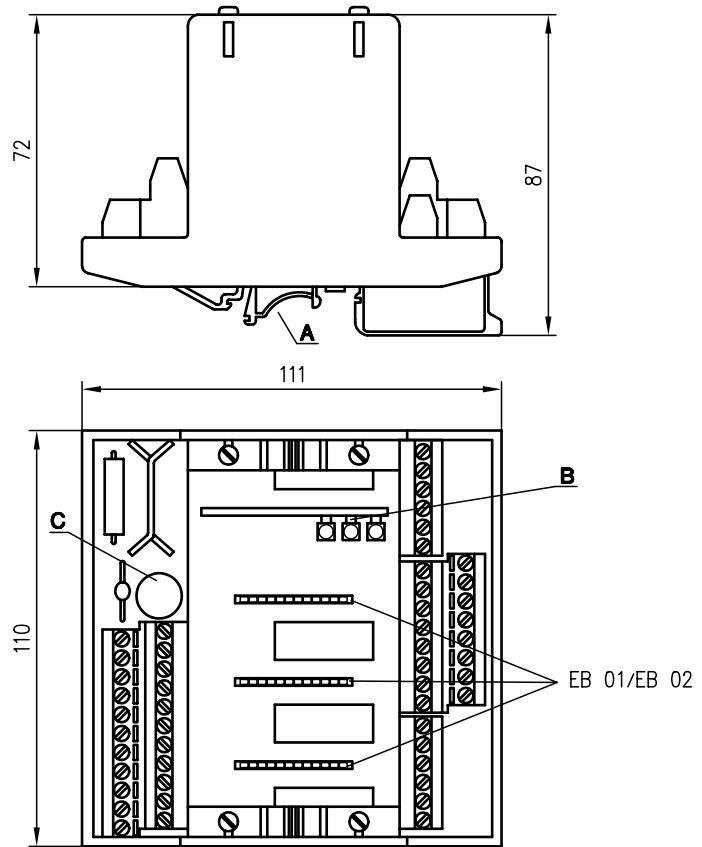


24 V
DC

- Multiplex amplifier for connection of a max. of 3 mini photoelectric sensors (GaAs)
- Through multiplex operation no mutual interference of the individual light axes
- Modular construction enables task-oriented equipment of the basic board
- Connection option for measurement instrument enables easy alignment of the photoelectric sensors
- Activation input allows function testing of the sensor and interlinking a number of sensors

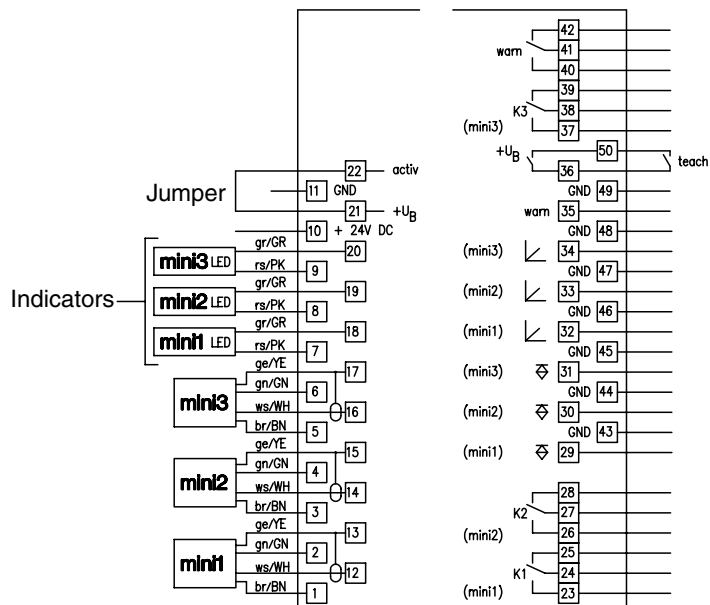


Dimensioned drawing



- A** Universal base for optional installation on all DIN EN mounting rails
- B** Indicator diode
- C** Fuse

Electrical connection



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Accessories:

(available separately)

- Amplifier modules
 - EB 01 (Part No. 500 10633, page 670)
 - EB 02 (Part No. 500 10634, page 671)



Specifications

Timing

Switching frequency	45 Hz
Response time	11 ms
Delay before start-up	≤ 100 ms

Electrical data

Operating voltage U_B	24 VDC ± 10%
Residual ripple	≤ 10%
Bias current	≤ 150 mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (reversible) EB 01 reversible through control knob EB 02 reversible through slide switch
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	transistor outputs: max. 100 mA
Analogue output	as adjustment and alignment aid
Switching output ¹⁾	relay, 1 change-over contact
Switching voltage, relay	250 VAC/DC
Switching power, relay	50 W/60 VA
Sensitivity	module EB 01: potentiometer adjustment module EB 02: automatic self-alignment

Indicators

LED red	end of the regulating range of EB 02 reached
---------	--

Mechanical data

Housing	plastic green
Weight	300 g
Connection type	screw terminals

Environmental data

Ambient temp. (operation/storage)	-20 °C ... +50 °C / -30 °C ... +70 °C
Protective circuit ²⁾	2, 3
Fuse	fine-wire fuse 2 Am (5x20 mm)
Protection class	IP 20 fulfils contact protection acc. to VBG 4
Standards applied	IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	≥ 8 V / ≤ 2 V or not connected

- 1) Suitable spark extinction must be provided with inductive or capacitive loads
2) 2=polarity reversal protection, 3= short-circuit protection for transistor output

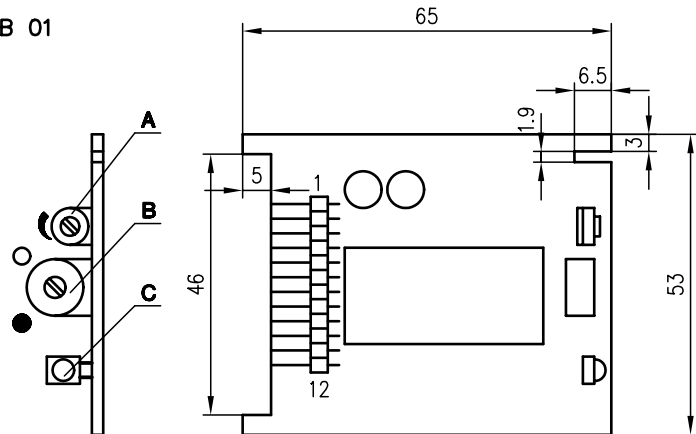
Remarks

- The device VS 25/4 R is designed for connection of max. 3 light axes. Type and number of amplifier modules EB 01 and EB 02 can be chosen independently.
- The corresponding modules have to be ordered separately.
- The photoelectric sensors can be optimally aligned via a connectable measuring instrument.
- The activation input active enables function control and logical connection of several systems. If this function is not needed, this connection active must be directly connected to $+U_B$.
- The terminals 21/22 are bridged in shipping state.
- The amplifier modules are designed as plug-in cards and may only be plugged in currentless state.
- **The shield of the receiver has to be connected to the terminals of the same light axis.**
mini 1 - terminal 13
mini 2 - terminal 15
mini 3 - terminal 17
- The shield detangling has to be short to ensure the greatest possible overlapping of the signal wires.

Order guide

Designation	Part No.
VS 25/4 R	500 13009

Amplifier module

Dimensioned drawings
EB 01


- A** Sensitivity adjustment
- B** Light/dark switching
- C** Indicator diode

Specifications
Transmitter

Pulse current
Frequency
Pulse-duty factor

max. 440mA
approx. 330Hz

$$T = \frac{T_1}{T_2} = \frac{0,25ms}{3,00ms} = \frac{Puls}{Pause}$$

Receiver

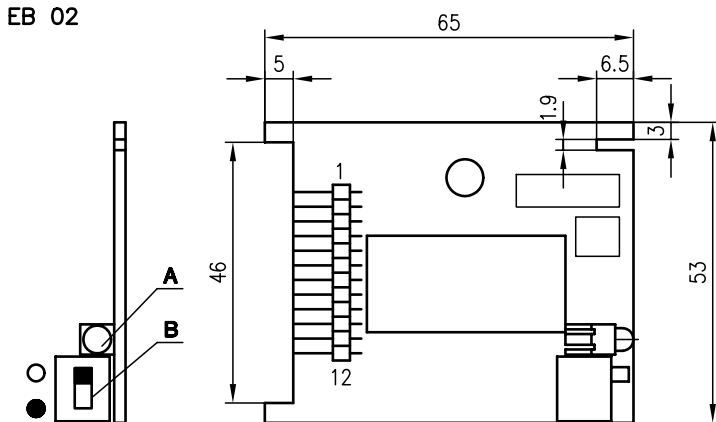
Minimal input pulse
Switching frequency
Output capability
Output

approx. 11 ms
approx. 45Hz
max. 100mA
short-circuit proof

Order guide

Designation	Part No.
EB 01	500 10633

Dimensioned drawings



- A** Indicator diode
B Light/dark switching

Specifications

Transmitter

Pulse current

approx. 10mA to approx. 230mA
 automatically adjustable
 approx. 330Hz

Frequency

Scanning relation

$$T = \frac{T_1}{T_2} = \frac{0,25ms}{3,00ms} = \frac{\text{Puls}}{\text{Pause}}$$

Receiver

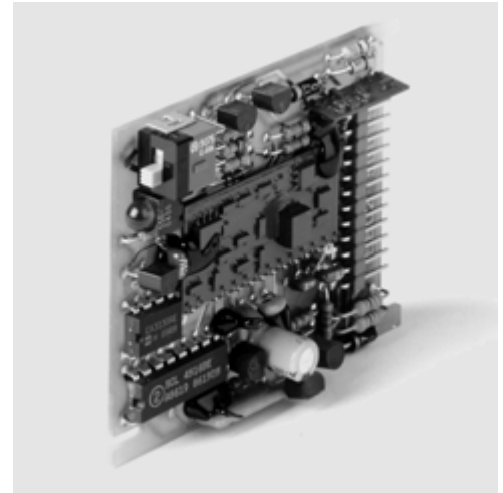
Minimal input pulse
 Switching frequency
 Output capability
 Output

approx. 11ms
 approx. 45Hz
 max. 100mA
 short-circuit proof

Order guide

Designation	Part No.
EB 02	500 10634

Amplifier module



- Plug-in module for amplifier VS 25/4 R
- Connection of all GaAS mini photoelectric sensors
- Sensitivity calibration through external circuit
- Light/dark switching through sliding switch
- LED indicator (illuminates during free light path/reflection)



Description of functions

General Information

The **VS 25/4 R** is the basic component for building a modular **3 fold multiplexed amplifier**.

By using the clock generator of the control component **SB 01**, the single amplifier components are controlled through a multiplexed process. Therefore, no mutual interference of the single light axes is possible. A maximum of **three plug-in ports for amplifier components EB 01 or EB 02** are available. These can be equipped depending on the application.

The possibility to connect a measurement instrument to each amplifier module enables optimum alignment of each light axis.

The amplifier modules **EB 02** are equipped with an **automatic calibration possibility** and a **warning signal output**. Through this, photoelectric sensors operated with this module are able to detect **minor shadowing** and to **compensate increasing contamination**. If the amplifier reaches the limit of its control range through **increasing soiling** a separate warning output issues an error message. This **warning output** is only erased, after having returned to optimum conditions and another impulse for automatic calibration.

Note

- The free plug-in ports for the amplifier modules EB 01 and EB 02 can be equipped according to each application.
- With amplifier modules EB 02, an automatic calibration for compensation of soiling, misalignment etc. is induced through an external polling pulse (connection terminals 36/50).
If the limit of the control range should be reached during this process, a common warning output is activated and the LED corresponding to this module on the SB 01 activated.
- A measurement instrument can be connected to the terminals 32/33/34 and 46/47/48. Through this an optimum mechanical basic adjustment is possible.



Description of functions

The control component SB01 includes a clock generator with a clock frequency of approx. 2 kHz. This pulse succession is assigned to the connected amplifier modules in multiplex process.

Through this, at a given time only one of the amplifiers is active and a mutual interference can not happen.

When connecting the operating voltage, an automatic self-calibration is performed for about 1 sec on all amplifier modules EB 02. Through this, the transmitter current of these modules is adjusted to enable detection of objects with little shadowing with sufficient performance reserve. This adjustment can be cyclically repeated through an external PNP signal transmitter or a "positive" switching contact. During this process, a device internal pulse of 1 sec duration is generated. The transmitter current is regulated accordingly if it is apparent that since the last automatic calibration, the effective signal on the receiver has become smaller. In case the limit of the control range should be reached during readjustment, the warning output is activated (PNP transistor and relay contact); in addition to that, the corresponding LED on the SB 01 is activated. To avoid unwanted switching processes during automatic calibration function, the switching outputs of the EB 02 modules are bridged.

Apart from this special automatic calibration function, the amplifier module EB 02 is a photoelectric sensor-alternating light amplifier with PNP transistor and relay output with light/dark switching for all gallium mini photoelectric sensors of the Leuze shipping program.

The amplifier module EB 01 is also an alternating light amplifier with PNP transistor and relay output, sensitivity adjustment, and light/dark switching.

Order guide

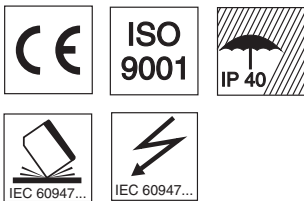
	Designation	Part No.
Amplifier	VS 25/4 R	500 13009
	VS 25/4 R including SB 01	500 10635
Amplifier module 1	EB 01	500 10633
Amplifier module 2	EB 02	500 10634

The amplifier modules EB 01 and EB 02 have to be ordered separately.



10 - 30 V
DC

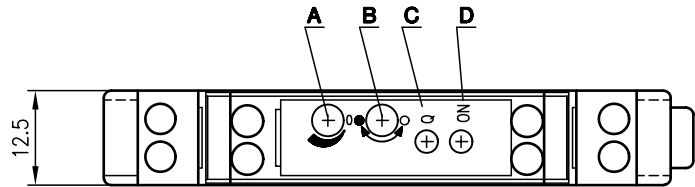
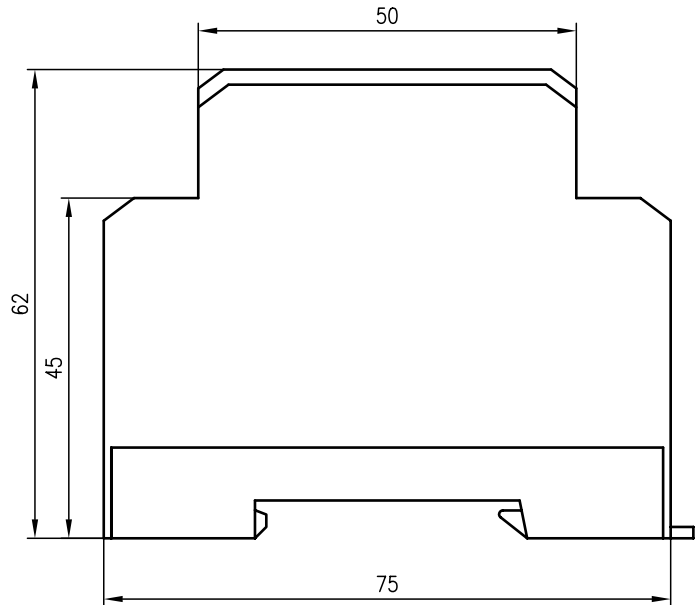
- Amplifier for connection of all mini photoelectric sensors (GaAs)
- Wide voltage range 10 ... 30V with PNP and NPN switching output
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Outputs are short-circuit proof and polarity reversal protected, this guaranteeing riskless mounting
- Plastic housing with snap-on mounting for standard rail



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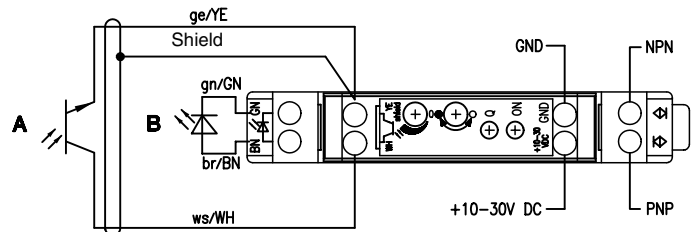
Accessories:

Dimensioned drawing



- A Sensitivity adjustment
- B Light/dark switching
- C Switching indicator
- D Operation indicator

Electrical connection



- A Receiver
- B Transmitter



Specifications

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC ± 10%
Bias current	≤ 30mA
Switching output	PNP and NPN transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 200mA
Sensitivity	adjustable

Indicators

LED green	ready, transmitter operating
LED yellow	light path free/reflection (with performance reserve)
LED yellow flashing	light path free/reflection (without performance reserve)

Mechanical data

Housing	plastic
Weight	80g
Connection type	screw terminals
Cable cross-section	0.25mm ² ... 1.5mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/30°C ... +70°C
Protective circuit ¹⁾	1, 3
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4 IEC 60947-5-2

Standards applied

1) 1=transient protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

Designation	Part No.
VS 27/24	500 82005

Remarks

- One gallium mini photoelectric sensor can be connected to the gallium amplifier VS 27/24.
- The device can be snapped on a standard rail.



IVS 28

Amplifier



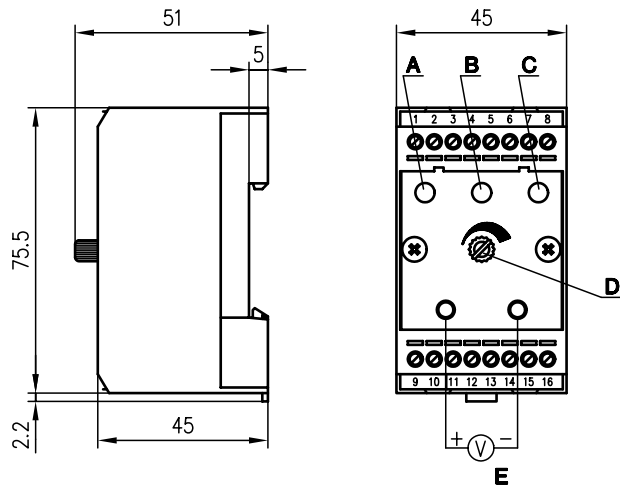
18 - 30 V
DC

- Cascading of up to 10 amplifiers
- Amplifier for connection of all mini photoelectric sensors
- Outputs are short-circuit proof and polarity reversal protected
- Easy alignment of the connected photoelectric sensors through analogue output (0 ... 10V)
- Warning output - for increased availability
- Activation input allows function testing of the sensor and interlinking a number of sensors



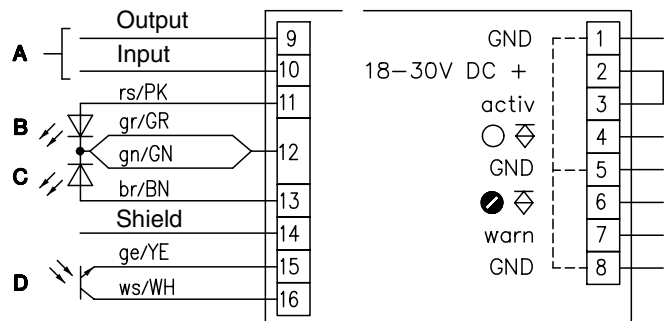
Accessories:

Dimensioned drawing



- A Indicator diode: in operation
- B Indicator diode: output Q, \bar{Q}
- C Indicator diode: warning
- D Sensitivity adjustment
- E Measuring output

Electrical connection



- A Synchronisation
- B Display
- C Transmitter
- D Receiver

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Specifications

Timing

Switching frequency	1000Hz
Response time	0.5ms
Delay before start-up	≤ 50ms
Transmitter and synchronous pulse length	20ms (pulse-duty factor 1:16)

Electrical data

Operating voltage U_B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 10% of U_B
Bias current	≤ 80mA
Switching output	2 PNP switching outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 200mA respectively
Sensitivity	adjustable

Indicators

LED green	ready (supply voltage connected)
LED yellow continuous light	free light path/reflection (with performance reserve)
LED yellow flashing	free light path/reflection (without performance reserve)
LED red	warning output active

Mechanical data

Housing	plastic green
Weight	approx. 120g
Connection type	screw terminals (max. 2.5mm ²)

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ¹⁾	1, 2, 3
VDE safety class	III, protective extra-low voltage
Protection class	housing IP 40
Standards applied	terminals IP 20, fulfils contact protection acc. to VBG 4 IEC 60947-5-2

Options

Activation input active	
Transmitter active/not active	$\geq 10V / \leq 2V$ or not connected
Activation/disable delay	≤ 1ms
Warning output autoControl warn	PNP transistor, counting principle
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 200mA
Cascading	maximal 10 devices
Analogue output	0 ... 10V, max. 10mA

1) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for transistor output

Remarks

- A maximum of 10 amplifiers is cascadable. Device 1 works as master (sync input open), controls device 2 on the device's sync input by using its own sync output. The sync output of device 2 controls the sync input of device 3 etc. Connect + U_B and GND of the devices with each other.
- The activation input of the amplifier enables function control and logical connection of several systems through a special circuit. If this function is not needed, this connection (active) must be directly connected to + U_B .
- autoControl is a counting principle. The photoelectric sensor is counting switching cycles with reduced performance reserve. After three consecutive cycles with reduced performance reserve (LED flashing), the separate warning output is activated and remains active until corresponding measures (cleaning, alignment etc.) have provided optimum performance reserve.
- The device can be snapped on a standard rail.

Order guide

Designation	Part No.
IVS 28/44.8	500 19808



VS 29

Amplifier



18 - 30 V
DC

- Cascadable high-power amplifier for up to 8 mini light axes
- Penetration of multilayered coloured foils, in connection with LS 29 L
- Indicator LED for process monitoring
- Complementary outputs
- Plastic housing with snap-on mounting for standard rail

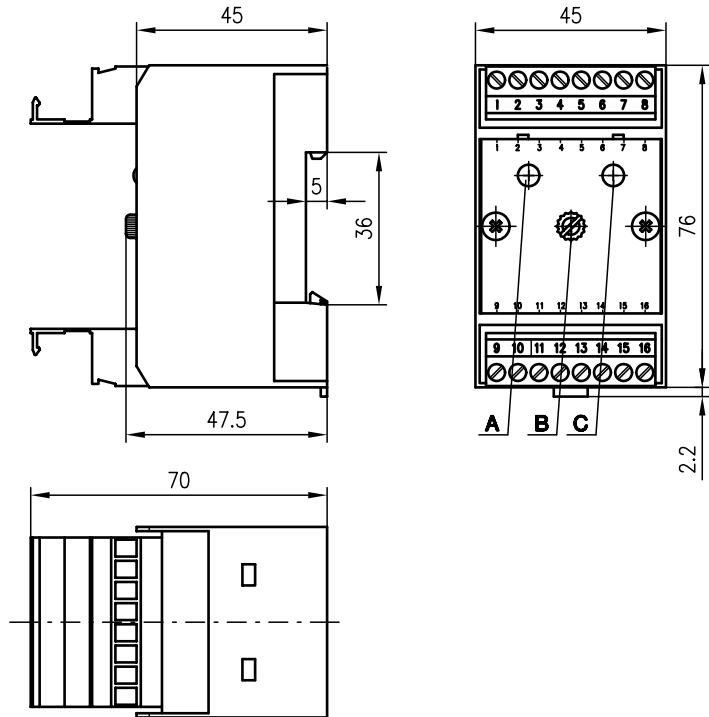


Accessories:

(available separately)

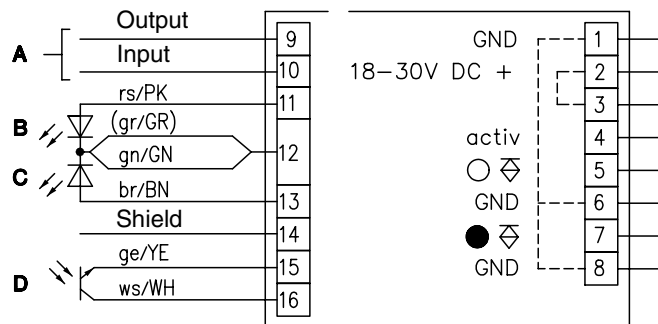
- Mini photoelectric sensor LS 29 L (see page 624)

Dimensioned drawing



- A Operation indicator
- B Sensitivity adjustment
- C Switching indicator

Electrical connection



- A Synchronisation
- B Display
- C Transmitter
- D Receiver

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Specifications

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	55mA with LS 29 L, light path free
Switching output	2 PNP switching outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 200mA respectively
Test or activation input (active)	high active: High signal $\geq 10V$ Low signal $\leq 2V$
Sensitivity	adjustable

Indicators

LED yellow	light path free
LED green	ready (supply voltage connected)

Mechanical data

Housing	plastic green
Weight	approx. 120g
Connection type	Combicon with screw terminals (max. 2.5mm ²)
Environmental data	
Ambient temp. (operation/storage)	-25°C ... +55°C / -40°C ... +70°C
Protective circuit ¹⁾	1, 2, 3
VDE safety class	III, protective extra-low voltage
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4 IEC 60947-5-2
Standards applied	

Options

Cascading	maximum 8 devices
-----------	-------------------

1) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for transistor output

Tables

Operating range with	
LS 29 L	35m

Diagrams

Order guide

Designation	Part No.
VS 29/44.8	500 80860

Remarks

- Max. 8 amplifiers cascable.
- If testing input not used, connect active to + U_B (bridge 3-4).
- A maximum of 8 amplifiers is cascable. Device 1 works as master (sync input open), controls device 2 on the device's sync input by using its own sync output. The sync output of device 2 controls the sync input of device 3 etc. Connect + U_B and GND of the devices with each other.



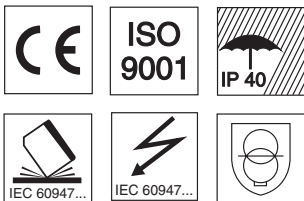
VS 100

Amplifier



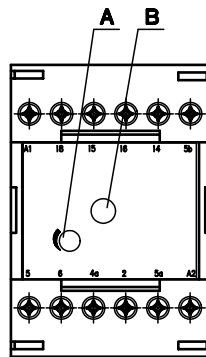
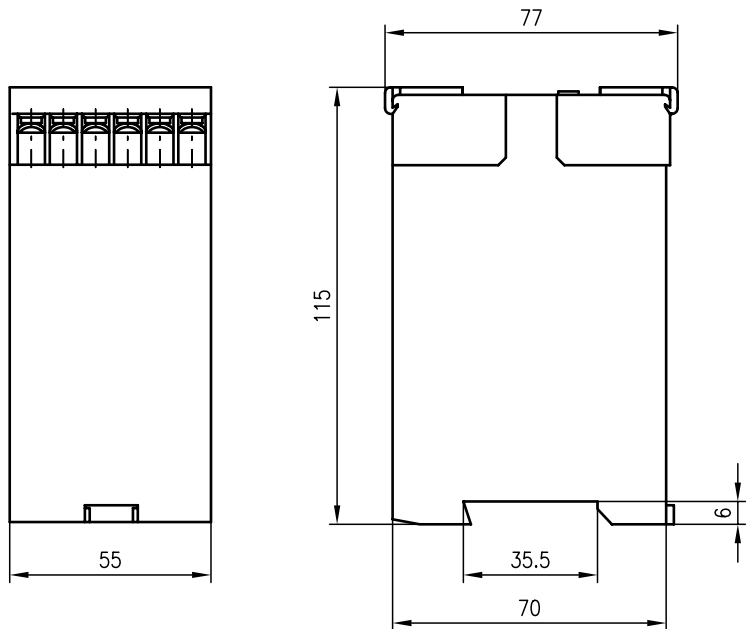
115/230 V AC

- Amplifier for connection of all mini photoelectric sensors (GaAs)
- Relay or PNP transistor output
- Multicolour display for detailed information about the switching and operating status, allows for preventive maintenance
- Plastic housing with snap-on mounting for standard rail
- Secure galvanic isolation between input/output



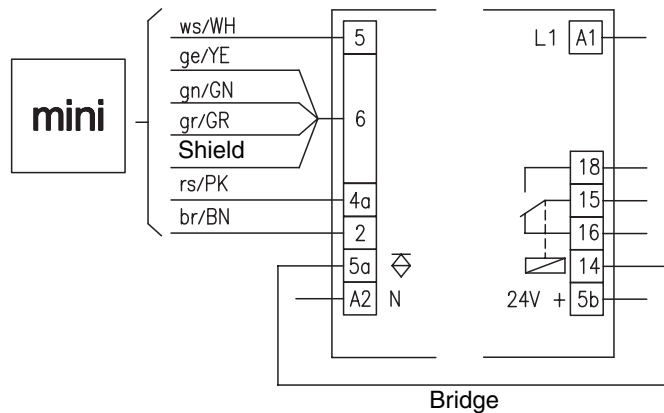
Accessories:

Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode

Electrical connection



We reserve the right to make changes • MS_v13e.fm



Specifications

Timing

Switching frequency	100Hz
Response time	5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	230 VAC ± 10%, 50/60Hz 115 VAC ± 10%, 50/60Hz through soldering of a bridge inside the device
Power consumption	≤ 4.5VA
Insulation test voltage	input - output 4kVAC relay - output 4kVAC
Switching output	PNP transistor output
Function characteristics	light/dark switching (reversible inside the device)
Signal voltage high/low	≥ 22V/≤ 2V
Output current	max. 100mA
Switching output ¹⁾	relay, 1 change-over contact
Switching voltage, relay	250 VAC/DC
Switching power, relay	50W/60VA
Sensitivity	adjustable

Indicators

LED green	light path free/reflection
LED yellow	light path free/reflection, no performance reserve
LED red	light path interrupted, or no reflection

Mechanical data

Housing	plastic standard housing
Weight	350g
Connection type	terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ²⁾	1, 3
VDE safety class	II
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4
Standards applied	IEC 60947-5-2

1) Suitable spark extinction must be provided with inductive or capacitive loads
2) 1=transient protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

Designation	Part No.
VS 100	500 00644

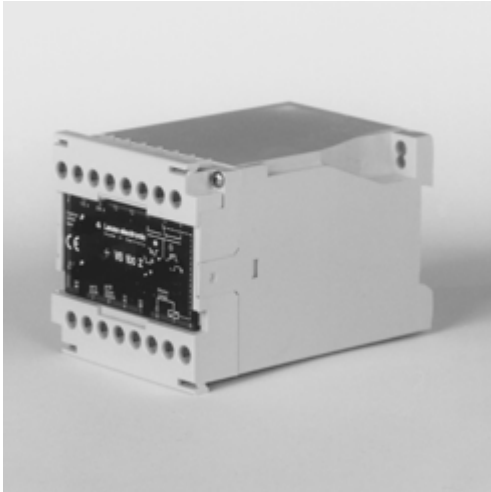
Remarks

- The output relay can be activated through a bridge between 5a and 14.
- +24VDC are present on terminal 5b.



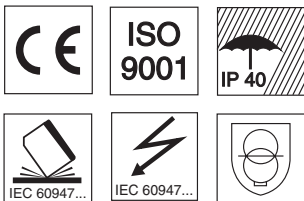
VS 100

Amplifier



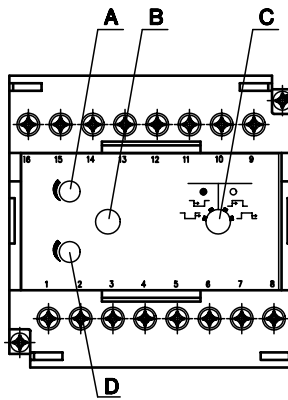
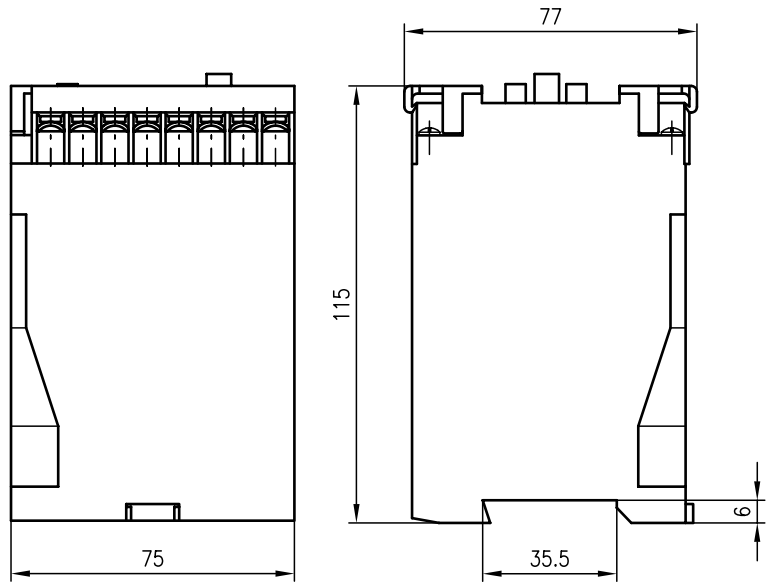
115/230 V AC

- Amplifier for connection of all mini photoelectric sensors (GaAs)
- Relay or PNP transistor output
- Adjustable time delay, light/dark switching and sensitivity adjustment
- Multicolour display for detailed information about the switching and operating status, allows for preventive maintenance
- Plastic housing with snap-on mounting for standard rail



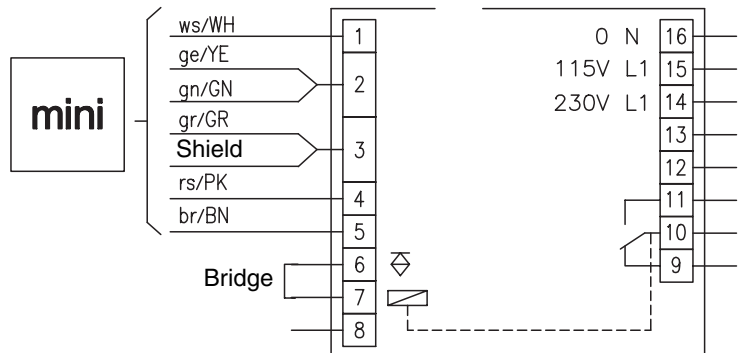
Accessories:

Dimensioned drawing



- A Sensitivity adjustment
- B Indicator diode
- C Light/dark switching slow oper./release
- D Time delay

Electrical connection



We reserve the right to make changes • MS_v14e.fm



Specifications

Timing

Switching frequency	70Hz
Response time	8ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	115/230VAC ± 10%, 50/60Hz
Power consumption	≤ 4.5VA
Insulation test voltage	input - output 4kVAC relay - output 4kVAC
Switching output	PNP transistor output
Function characteristics	light or dark switching (reversible)
Signal voltage high/low	≥ 22V/≤ 2V
Output current	max. 100mA
Switching output ¹⁾	relay, 1 change-over contact
Switching voltage, relay	250VAC/DC
Switching power, relay	50W/60VA
Sensitivity	adjustable

Indicators

LED green	light path free/reflection
LED yellow	light path free/reflection, no performance reserve
LED red	light path interrupted, or no reflection

Mechanical data

Housing	plastic standard housing
Weight	450g
Connection type	terminals

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ²⁾	1, 3
VDE safety class	II
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4 IEC 60947-5-2

Standards applied

Options

Switching delay (slow oper./release)	0 ... 10s
--------------------------------------	-----------

1) Suitable spark extinction must be provided with inductive or capacitive loads
2) 1=transient protection, 3= short-circuit protection for transistor output

Tables

Diagrams

Order guide

Designation	Part No.
VS 100 Z	500 00645

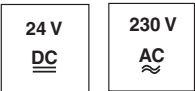
Remarks

- The output relay can be activated through a bridge between 6 and 7.

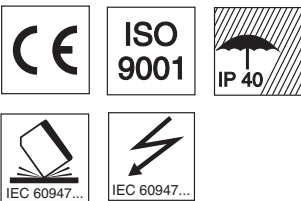


VS 725

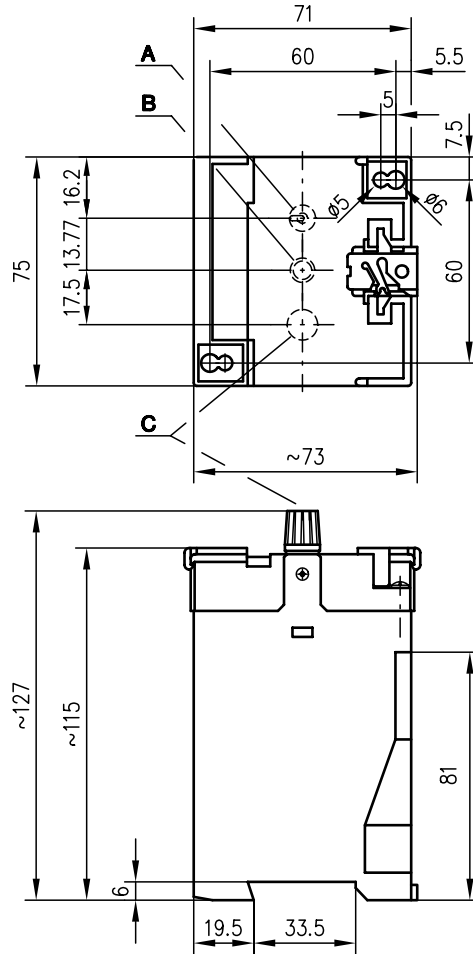
Amplifier



- Dynamic amplifier for connection of all mini photoelectric sensors (GaAs) for detection of fast events
- Sensitivity adjustment for optimum adaptation to the optical or mechanical situation
- Automatic contamination compensation
- Outputs are short-circuit proof and polarity reversal protected, thus guaranteeing riskless mounting
- Easy alignment of the photoelectric sensors through connectable alignment mode and additional LED indicator

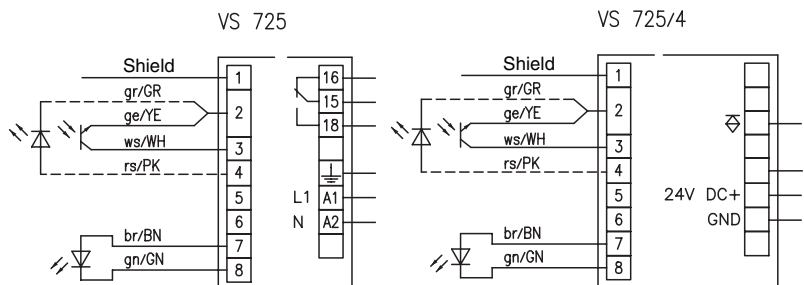


Dimensioned drawing



- A Operating mode
- B Indicator diode
- C Sensitivity adjustment

Electrical connection



We reserve the right to make changes • MS_v15e.fm

Accessories:

(available separately)

- Mini photoelectric sensor (see page 638)
 - LS 725 SE, 20000 (Part No. 500 00270)
 - LS 725 E, 5000 (Part No. 500 00271)



Specifications

	VS 725/4	VS 725
Timing		
Response time	4ms	
Delay before start-up	≤ 100ms	
Electrical data		
Operating voltage U_B	24VDC ± 10%	230VAC ± 10%, 50/60Hz
Residual ripple	≤ 15%	
Bias current	≤ 200mA	
Switching output	PNP transistor output	relay, 1 change-over contact
Output pulse	approx. 200ms	
Function characteristics	dynamic dark switching (output for approx. 200ms activated at change from light to dark)	
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$	
Output current	max. 100mA	
Switching voltage, relay		250VAC/DC
Switching power, relay		50W/60VA
Sensitivity	adjustable	
Indicators		
LED green	light path free	
Mechanical data		
Housing	plastic	
Weight	260g	460g
Connection type	terminals	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C	
Protective circuit ^{1) 2)}	1, 2, 3	
Protection class	housing IP 40 terminals IP 20, fulfils contact protection acc. to VBG 4	
Standards applied	IEC 60947-5-2	

- 1) 1=transient protection, 2=polarity reversal protection, 3= short-circuit protection for transistor output
 2) Suitable spark extinction must be provided with relay output and inductive or capacitive loads

Tables

Diagrams

Order guide

	Designation	Part No.
Relay output 230 V AC	VS 725	500 00647
Transistor output 24 V DC	VS 725/4	500 16548

Remarks

- The amplifier is especially suitable for operation in connection with the LS 725.
- During insufficient performance reserve or light interference ≥ 1 sec, the output of the VS 725/4 pulses with a frequency of approx. 3Hz. In the alignment mode, this function is switched off.
- The device can be snapped on a standard rail.

Description of functions and application notes for functional units LS 725 and VS 725/(4)

Description of functions

The photoelectric sensor amplifiers VS 725 and VS 725/4 are dynamic switching amplifiers.

All Leuze infrared mini photoelectric sensors can be operated with these amplifiers, which provide special advantages for the use with throughbeam and retro-reflective photoelectric sensors.

Very fast minor changes in light conditions, as well as significant light/dark transitions are detected through the dynamic switching behaviour. It is therefore possible to detect objects which are significantly smaller than the lens area (=active light channel) of the used photoelectric sensors.

A darkening which remains for at least 4ms causes an output pulse of 200ms in length.

By using the sensitivity potentiometer, the system is adjusted to the conditions given by the application.

Fast, small area darkening - high sensitivity.

Slow, large area darkening - low sensitivity.

Commissioning

First, mechanically align the photoelectric sensor, transmitter and receiver to each other.

Connect wired unit to voltage and switch the amplifier to "Alignment".

The indicator LED on the receiver then works in analogue mode. Conduct the alignment between transmitter and receiver in such a way that the indicator LED illuminates with maximum brightness.

In switch position: "Operation" the unit is switched to the operating state.

Application examples

1. Application area of textile machines

For detection of falling rovings, threads, yarns etc.

e.g. on flyer, finisseur, drawing frames etc.

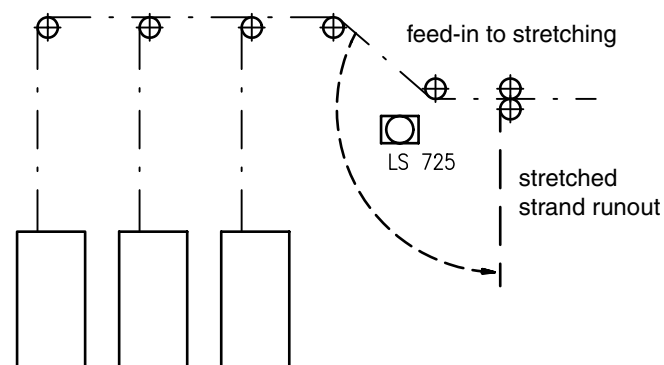
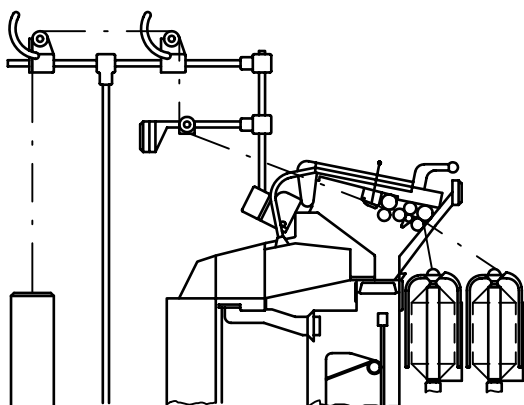
The light beam is lead alongside the warp in such a way that a breaking thread or thread end falls or swings through the light beam.

With the flyer, the following mounting positions are possible

Photoelectric sensor allocation:

Lead-in control

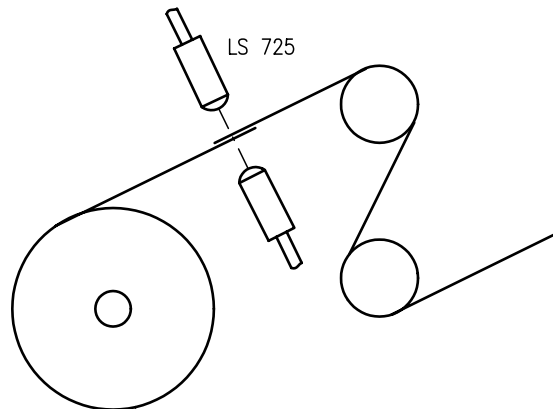
The axis of the light beam is to be positioned in such a way that a broken strand crosses the light beam.



With emptying canisters, the remaining stretched strand run-out swings through the photoelectric sensor range and causes a machine standstill.

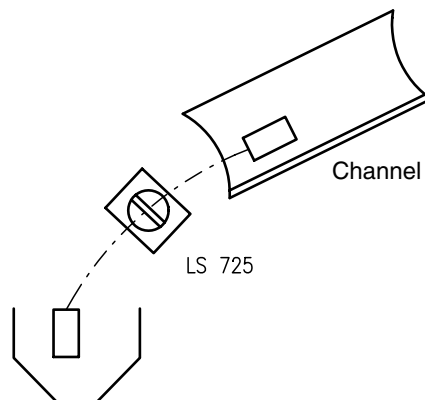
2. Adhesive joint detection

On detection of the adhesive joint, the machine is regulated back to initial speed.



3. Counting of small parts

Application of LS 725 at the end of channels etc.. Free falling or sliding parts with defined flight path can be detected and counted by the LS 725. Application on punching machines, feeding units, in the packaging industry for counting and dosage procedures.

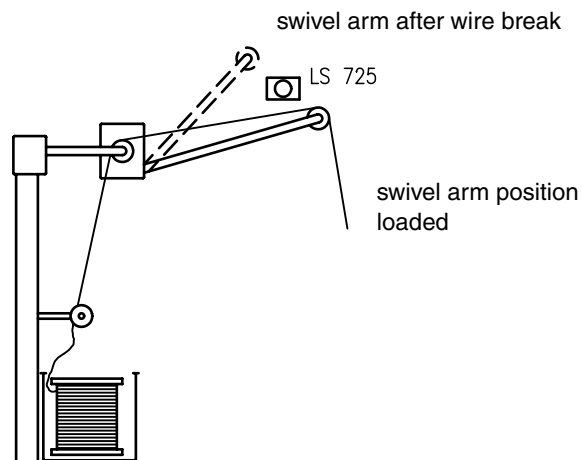


4. Laboratory technology and chemical area

Application of the LS 725 e.g. for drop counting. A significant advantage of the LS 725, is here that as described under 2, the object to be detected, small part or drop, may move through the complete range of the optics (15mm) and will still be securely detected.

5. Wire wrapping machines

Especially multi wrapping units signal a wire break through mechanical spring arm allocation. Every spring arm has an assigned micro switch. After a wire break, one or more swivel arm can be monitored by an LS 725.



Information sheet
Circuit dimensioning for gallium mini devices in constant light operation

The Leuze mini photoelectric sensors can be used as pulse transmitter with DC voltage and are therefore suitable for control of digital systems.

Technical Data

Switching frequency	max. 10000Hz (pulse-duty factor 1:1)
For operating voltages	with max. 24VDC filtered
Residual ripple	≤ 5%
Receiver	silicon phototransistor
Collector current I_C	min. possible collector current 100µA. Thermally max. allowable collector current 30mA under observation of P_V max. 100mW
Switching point on/off (hysteresis)	the voltage on R_A changes proportionally to the covering of the light sensitive area
Voltage drop	depending on load resistance and the resulting DC voltage
Transmitter	GaAs indicator
Operating current	see data sheet

For current limitation resp. current control, the transmitter diode is only to be operated with load resistance (protective resistor) or through a constant current source. The max. value may not be exceeded even for a short period. The nominal value of the transmitting current serves as output value for the calculation of the required load resistance.

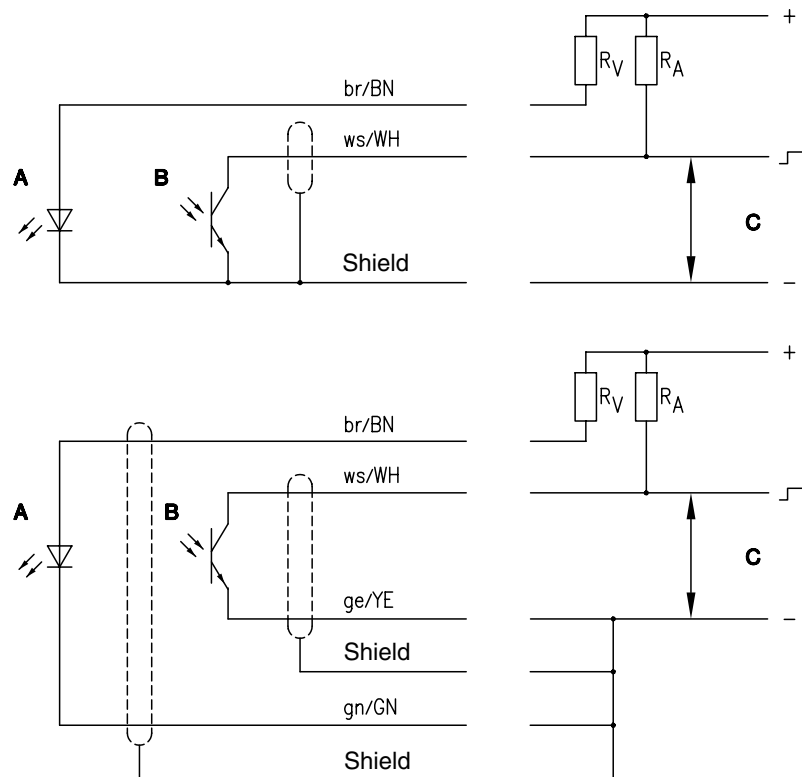
Example: $U_B = 24\text{VDC}$ $I_{\text{Transmitter}} = 35\text{mA}$
 $R_V = 24\text{VDC} / 0.035\text{A} = 680\Omega$

Connection

There are no load resistors pre-installed in the transmitter and receiver.

Note!

Only throughbeam photoelectric sensors are suitable for this operating mode, because of the magnitude of the effective signal.



- A** Transmitter
- B** Receiver
- C** Output-Signal

Cable lengthening on mini photoelectric sensors

All gallium mini devices of Leuze photoelectric sensor program are mainly used in connection with amplifiers. In these amplifier power supply units, the current pulses for the transmitter supply are generated. Simultaneously, the receiver signals for relay operation respectively the transistor output are amplified.

The electrical signal between the receiver and the transmitter is not yet amplified, i.e. of high-impedance and therefore exposed for possible capacitive or inductive interferences.

For that reason the receiver cables of the mini sensor are shielded.

This shield is important for interference free function!

The original device cable may not be lengthened or replaced by common installation cables NYA or NYAF.

Combination of several photoelectric sensor systems in one cable, even if shielded, can cause interferences.

In addition to that, the shielded photoelectric sensor cables should not be lead together with other lines in one common plug connection.

Our recommendations are:

1. Allocation in a way that the length of the sensor standard cables suffices to reach the amplifier.

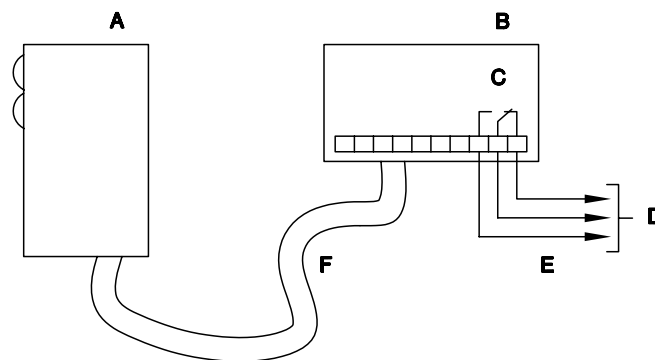
Amplifier close to the scanning place.

From the amplifier output, the contact signal can be transmitted via cables of any length.

2. If an allocation as described under 1. is impossible, we recommend a cable lengthening by using an original cable (order code: e.g. "4m cable for RK 72").

The transition has to be performed in a way that the shield is continued without interruption.

We recommend not to exceed 10m as maximum distance between gallium mini device and amplifier.



- A Mini sensor
- B Amplifier VS ...
- C Relay contact
- D To the machine control system
- E Any cable length
- F Original cable without join



KK 05

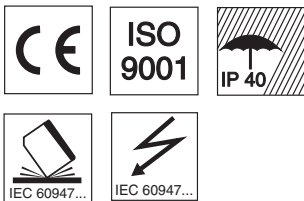
Capacitive sensor



0.2 ... 2.0mm



- Capacitive sensor for mass detection
- Connection via M8 connector for fast installation
- NPN/ PNP output
- Switching state display

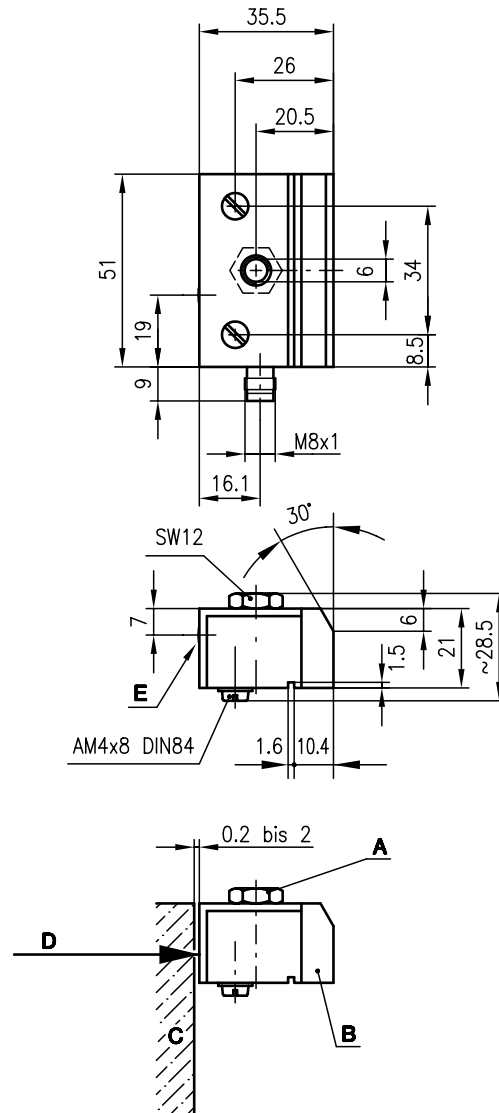


Accessories:

(available separately)

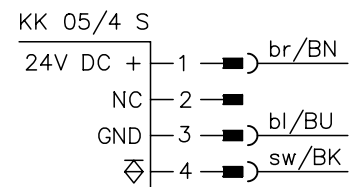
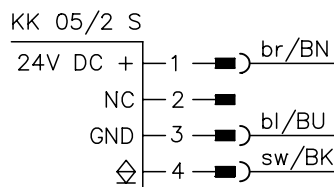
- Ready-made cables (KB ...)

Dimensioned drawing



- A** Use only plastic screws with this mounting option!
- B Plastic part:** the mounting parts have to keep a distance of min. 3mm from the plastic part in all directions!
- C** Measurement part
- D** Approaching plane
- E** Indicator diode

Electrical connection





Specifications

	KK 05/4 S	KK 05/2 S
Sensor data		
Scanning range (relative to paper)	min. 0.2 ... 2.0mm	
Installation width	51 mm	
Installation height	≈ 28.5mm	
Installation depth	36mm	
Timing		
Switching frequency	100Hz	
Input pulse	min. 5ms	
Delay before start-up	≤ 100ms	
Electrical data		
Operating voltage U_B	24VDC (incl. residual ripple) functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)	
Residual ripple	≤ 15% the lowest voltage may not be below $U_B - 20%$	
Power consumption	max. 250mW	
Switching output	PNP transistor	NPN transistor
Function characteristics	dark switching if object present: high-impedance output	
Output current	max. 100mA	
Indicators		
LED yellow	switching state display	
LED yellow off	object present	
LED yellow on	no object	
Mechanical data		
Housing	aluminium	
Surface	anodised	
Weight	approx. 60g	
Connection type	M8 connector, 4-pin	
Environmental data		
Ambient temp. (operation/storage)	0°C ... +50°C/-30°C ... +70°C	
Protective circuit ¹⁾	2, 3	
Protection class	IP 40	
Standards applied	IEC 60947-5-2	

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

	Designation	Part No.
PNP output	KK 05/4 S	500 29234
NPN output	KK 05/2 S	500 29228

Remarks

- The sensor only detects condensed stacks, single sheets are not detected.
- Mounting parts have to be away from the plastic at least 3mm in all directions.



Fiber optic cable control devices

Overview and advantages

Wide range of models and accessories:

- Fiber optic cable control devices in robust metal housing
- Fiber optic cable control devices in solid plastic housing
- Glass and plastic fibre optic cables with various cross sections, lengths and head pieces

Operating principles:

- Throughbeam operation
- Scanner operation

- Visible red light for easy alignment.
- Infrared light for increased indifference to ambient light

- 10 ... 30VDC voltage with PNP or NPN transistor output
- Direct mains connection to 230VAC with relay output

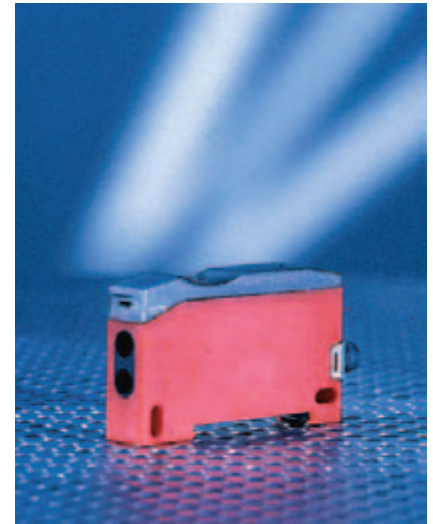
High switching frequency up to 5000Hz for detection of fast events

General sensitivity adjustment for optimal adaptation to the application or adjustment via teach-in

Connection via M12 and M8 connectors, cable or terminal compartment

Options:

- Warning output
- Activation input
- Time modules
- Software parameterisation





Operating principle	Designation	Operating range/ Scanning range	Housing		Light source		Operating voltage		Output		
			Metal	Plastic	Red light	Infrared	10 ... 30VDC	220V	PNP transistor	NPN transistor	Relay
	ILVS 9/4.8	1000mm/80mm	•			•	•		•		
	LVS 9/7	1000mm/80mm	•			•		•	•		•
	LVS 19/4	1000mm/80mm	•			•			•		
	LVS 19/2	1000mm/80mm	•			•			•	•	
	LVS 19/4 L8	1000mm/80mm	•			•			•		
	ILVS 19/4	1000mm/80mm	•			•			•		
	LVS 19/4T L8	1000mm/80mm	•			•			•		
	LVS 420/P	100mm/30mm		•	•		•		•		
	LVS 420/N	100mm/30mm		•	•		•		•	•	
	LVS 420/P-S8	100mm/30mm		•	•		•		•		
	LVS 325K/P-401	300mm/80mm		•	•		•		•		
	LVS 325K/P-402-S8	300mm/80mm		•	•		•		•		
LVS 325K/P-201	200mm/80mm		•	•		•		•			
LVS 325K/P-202-S8	200mm/80mm		•	•		•		•			
LVS 325K/N-202-S8	200mm/80mm		•	•		•		•	•		
LVS 8/24-GF	600mm/80mm		•		•		•		•	•	
LVS 8/24-GF-S12	600mm/80mm		•		•		•		•	•	
LVS 8/24-KF	200mm/60mm		•		•		•		•	•	
LVS 8/24-KF-S12	200mm/60mm		•		•		•		•	•	



Switching frequency	Switching	Connection				Options					Page
		Light/dark	M8 connector	M12 connector	Cable	Terminals	Warning output	Activation input	Sensitivity adjustment	Teach-in	
1000Hz	•					•	•	•			697
20Hz	•					•		•			699
1000Hz	•			•				•			701
1000Hz	•			•				•			701
1000Hz	•	•						•			701
1000Hz	•			•		•		•			701
1000Hz	•	•							•		703
1000Hz	•			•				•			707
1000Hz	•			•				•			707
1000Hz	•	•						•			707
1500 Hz	•			•		•	•	•	•	•	709
1500 Hz	•	•				•	•	•	•	•	709
1500 Hz	•			•		•	•	•	•	•	709
1500 Hz	•	•				•	•	•	•	•	709
1500 Hz	•	•				•	•	•	•	•	709
5000Hz	•			•					•		711
5000Hz	•		•						•		711
5000Hz	•			•					•		711
5000Hz	•		•						•		711

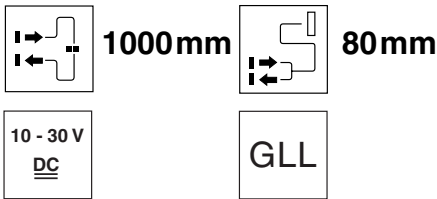


ILVS

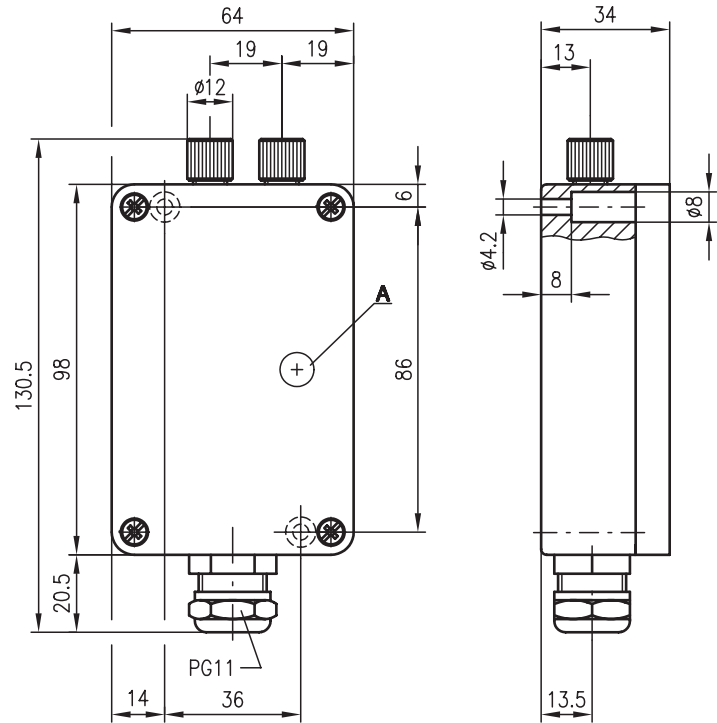
Fibre optic cable control devices



Dimensioned drawing

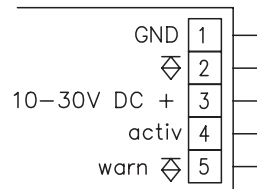


- High switching frequency for detection of fast events
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Warning output autoControl for increased availability
- Activation input allows function testing of the sensor and interlinking a number of sensors
- Plug-in time module provides optional functions



A Indicator diode
 Internal: sensitivity adjustment
 light/dark switching

Electrical connection



We reserve the right to make changes • LSG_e01e.fm



Accessories

(available separately • see from page 714 onwards)

- Glass fibre optic cable



Specifications

Optical data

Operating range/scanning range ¹⁾
Light source
Wavelength

Timing

Switching frequency ²⁾
Response time

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current
Sensitivity

Multicolour display

LED red

LED red flashing

Mechanical data

Housing
Weight
Cable connection
Fibre optic cable connection

Environmental data

Ambient temp. (operation/storage)
Protective circuit ³⁾
Protection class

Options

Activation input activ
Transmitter active/not active
Activation/disable delay
Input resistance

Warning output autoControl warn
Signal voltage high/low
Output current

Throughbeam operation Scanning operation

1000mm
LED (modulated light)
880nm (infrared)

1000Hz
0.5ms

10 ... 30VDC (incl. residual ripple)
 $\leq 10\%$ of U_B
 ≤ 50 mA
PNP transistor output
light/dark switching via selector switch
 $\geq (U_B - 2V) \leq 2V$
max. 100mA
adjustable through potentiometer

light path free/reflection
(with performance reserve)
light path free/reflection
(without performance reserve)

aluminium
320g
screw terminals
screw connection

-20°C ... +60°C/-30°C ...+70°C
2, 3
IP 65

$\geq 8V/\leq 2V$ or not connected
 ≤ 0.5 ms
47kOhm $\pm 10\%$
PNP transistor, counting principle
 $\geq (U_B - 2V) \leq 2V$
max. 100mA

Tables

Throughbeam operation

Type	Operating range
GF 500/1 LS-...	200mm
GF 500/4 LS-...	600mm
GF 1000/1 LS-...	200mm
GF 1000/4 LS-...	1000mm

Scanning operation

Type	Scanning range ¹⁾
GF 500/1 RT-...	0 ... 50mm
GF 500/4 RT-...	0 ... 80mm
GF 1000/4 RT-...	0 ... 80mm
GF 500/1 RT-MS.1	0 ... 10mm

1) Relative to white 90%

Diagrams

Remarks

- The activation input of the transmitter allows function control and logical linking of several systems using the appropriate switching. If this function is not used, this terminal must be connected directly with $+U_B$.
- autoControl is a counting principle. The photoelectric sensor is counting switching cycles with reduced performance reserve. After three consecutive cycles with reduced performance reserve (LED flashing), the separate warning output is activated and remains active until corresponding measures (cleaning, alignment etc.) have provided optimum performance reserve.

Order guide

Designation	Part No.
ILVS 9/4.8	500 14601

The standard device is expandable through add-on time modules (even at a later point).

- **Transient pulses** (blue module order code ZK 7810)
slow operation and pulse length separately adjustable (each 100ms ... 5s)
- **Slow release** (green module order code ZK 7820)
separately adjustable from 200ms ... 10sec.

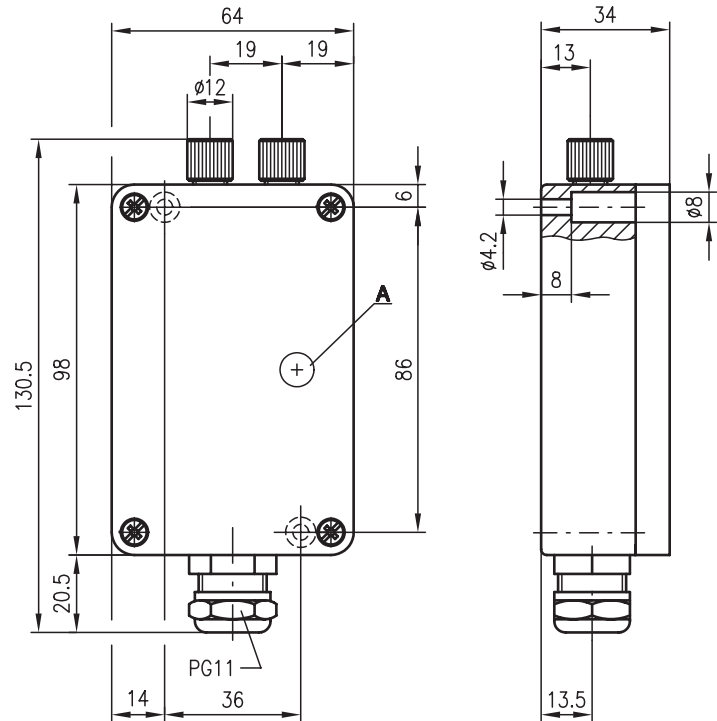
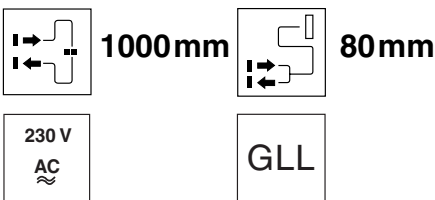


LVS

Fibre optic cable control devices



Dimensioned drawing



- Version for direct mains connection to 230VAC and with relay output
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Multicolour display for detailed information about the switching and operating status allows for preventive maintenance
- Plug-in time module provides optional functions

A Indicator diode
 Internal: sensitivity adjustment
 light/dark switching

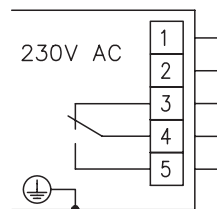
Electrical connection



Accessories

(available separately • see from page 714 onwards)

- Glass fibre optic cable



We reserve the right to make changes • LSG_e02e.fm



Specifications

Optical data

Operating range/scanning range ¹⁾
Light source
Wavelength

Timing

Switching frequency ²⁾
Response time

Electrical data

Operating voltage U_B
Switching output
Function characteristics
Switching voltage, relay
Switching power
Sensitivity

Multicolour display

LED green

LED yellow

LED red

Mechanical data

Housing
Weight
Cable connection
Fibre optic cable connection

Environmental data

Ambient temp. (operation/storage)
Protection class

1) Scanning range relative to white 90%
2) With a duty cycle of 1:1

Throughbeam operation

1000mm
LED (modulated light)
880nm (infrared)

Scanning operation

80mm

20Hz
25ms

230VAC ± 10% 50/60Hz
relay, 1 change-over contact
light/dark switching via selector switch
250VAC/DC
60VA/250VAC
adjustable through potentiometer

light path free/reflection
(with performance reserve)
light path free/reflection
(without performance reserve)
operating voltage connected

aluminium
350g
screw terminals
screw connection

-20°C ... +60°C/-30°C ... +70°C
IP 65

Tables

Throughbeam operation

Type	Operating range
GF 500/1 LS-...	200mm
GF 500/4 LS-...	600mm
GF 1000/1 LS-...	200mm
GF 1000/4 LS-...	1000mm

Scanning operation

Type	Scanning range ¹⁾
GF 500/1 RT-...	0 ... 50mm
GF 500/4 RT-...	0 ... 80mm
GF 1000/4 RT-...	0 ... 80mm
GF 500/1 RT-MS.1	0 ... 10mm

1) Relative to white 90%

Diagrams

Order guide

Designation	Part No.
LVS 9/7	500 00280

The standard device is expandable through add-on time modules (even at a later point).

- **Transient pulses** (blue module order code ZK 7810)
slow operation and pulse length separately adjustable (each 100ms ... 5s)
- **Slow release** (green module order code ZK 7820)
separately adjustable from 200ms ... 10sec.

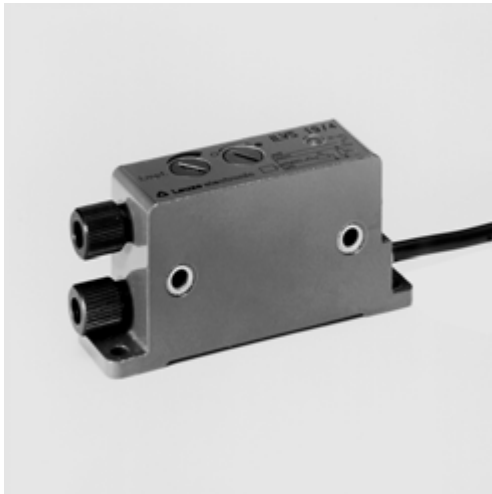
Remarks

- The housing cover must be removed in order to set the sensitivity adjustment and light/dark switching.

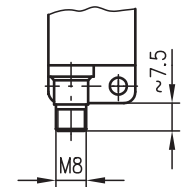
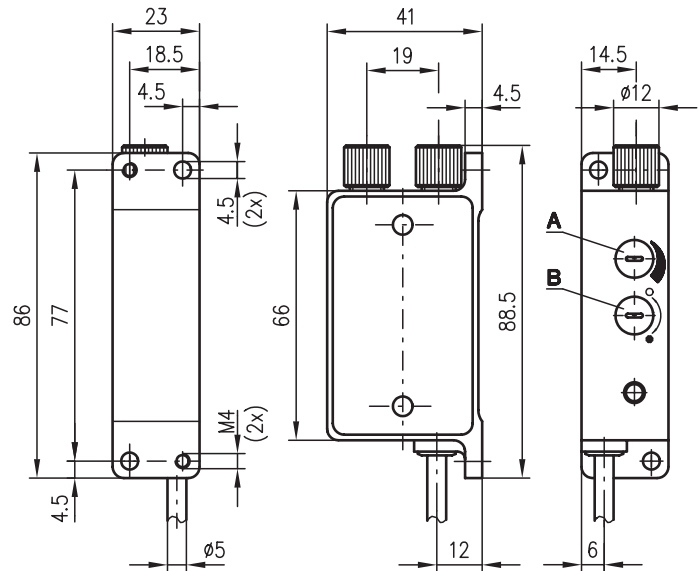


LVS

Fibre optic cable control devices

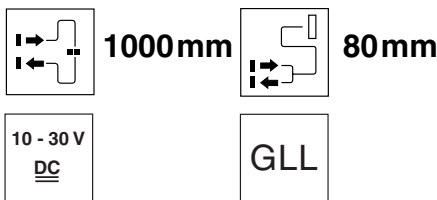


Dimensioned drawing



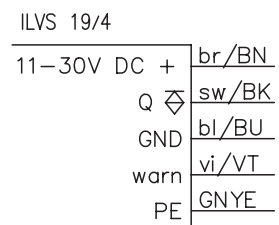
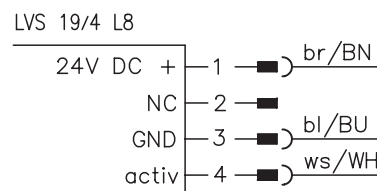
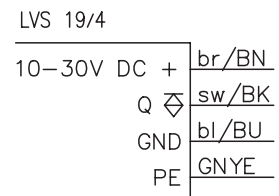
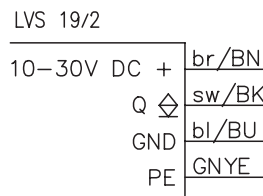
LVS 19/4 L8

- A Sensitivity adjustment
- B Light/dark switching



- High switching frequency for detection of fast events
- Light/dark switching and sensitivity adjustment for optimal adaptation to the application
- Extensive selection of fibre optic cables for throughbeam and scanner operation with various lengths and end pieces
- Output is short-circuit proof and polarity reversal protected, thus guaranteeing riskless commissioning
- Separate switching output allows preventive maintenance

Electrical connection



Accessories

(available separately • see from page 714 onwards)

- Glass fibre optic cable
- M8 connectors (KD ...)
- Ready-made cables (KB ...)



We reserve the right to make changes • LSG_e03e.fm



Specifications

Optical data

Operating range/scanning range ¹⁾
Light source
Wavelength

Throughbeam operation

1000mm
LED (modulated light)
880nm (infrared)

Scanning operation

80mm

Timing

Switching frequency ²⁾
Response time

1000Hz
0.5ms

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current
Sensitivity

10 ... 30VDC (incl. residual ripple)
 $\leq 10\%$ of U_B
 ≤ 50 mA
PNP or NPN transistor output
light/dark switching via selector switch
 $\geq (U_B - 2V) / \leq 2V$
max. 100mA
adjustable through potentiometer

Multicolour display

LED red

LED red flashing

light path free/reflection
(with performance reserve)
light path free/reflection
(without performance reserve)

Mechanical data

Housing
Weight
Connection

aluminium
200g
M8 connector, 3-pin (LVS 19/4 L8)
cable 2m, 4x0.25mm² (LVS 19/4 and LVS 19/2)
cable 2m, 5x0.25mm² (ILVS 19/4)
screw connection

Fibre optic cable connection

Environmental data

Ambient temp. (operation/storage)
Protective circuit ³⁾
Protection class

-20°C ... +60°C / -30°C ... +70°C
2, 3
IP 65

Options

Warning output autoControl warn
Signal voltage high/low
Output current

PNP transistor, counting principle
 $\geq (U_B - 2V) / \leq 2V$
max. 100mA

1) Scanning range relative to white 90%

2) With a duty cycle of 1:1

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with 2m cable, NPN switching output	LVS 19/2	500 08318
with 2m cable, PNP switching output	LVS 19/4	500 08319
with 2m cable, NPN switching output and warning output	ILVS 19/4	500 15635
with M8 connector, PNP switching output	LVS 19/4 L8	500 17772

Tables

Throughbeam operation

Type	Operating range
GF 500/1 LS-...	200mm
GF 500/4 LS-...	600mm
GF 1000/1 LS-...	200mm
GF 1000/4 LS-...	1000mm

Scanning operation

Type	Scanning range ¹⁾
GF 500/1 RT-...	0 ... 50mm
GF 500/4 RT-...	0 ... 80mm
GF 1000/1 RT-...	0 ... 50mm
GF 1000/4 RT-...	0 ... 80mm
GF 500/1 RT-MS.1	0 ... 10mm

1) Relative to white 90%

Diagrams

Remarks

- The corresponding protective cover must be removed in order to set the sensitivity adjustment and light/dark switching.
- autoControl is a counting principle. The photoelectric sensor is counting switching cycles with reduced performance reserve. After three consecutive cycles with reduced performance reserve (LED flashing), the separate warning output is activated and remains active until corresponding measures (cleaning, alignment etc.) have provided optimum performance reserve.

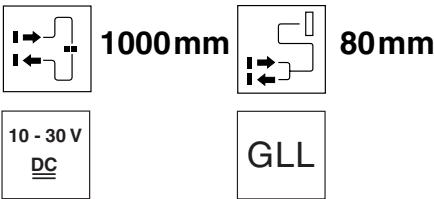


LVS

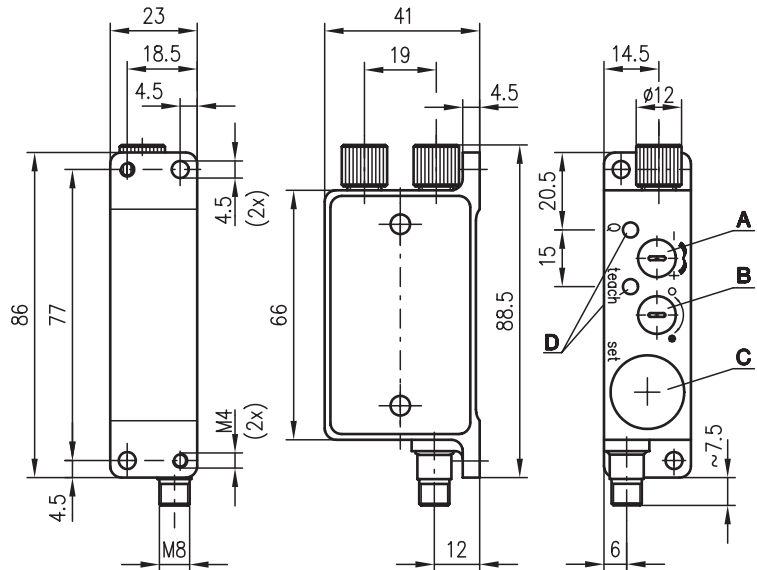
Fibre optic cable control devices



Dimensioned drawing

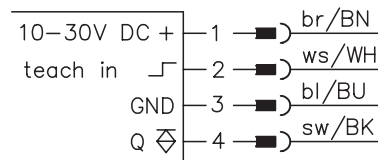


- Easy calibration with calibration button for optimum sensitivity adjustment (teach-in)
- The adjusted sensitivity value is preserved even with the operating voltage switched off
- External calibration input for remote control
- High switching frequency for detection of fast events



- A Sensitivity adjustment
- B Light/dark switching
- C Calibration button
- D Indicator diodes

Electrical connection



We reserve the right to make changes • LSG_e04e.fm



Accessories

(available separately • see from page 714 onwards)

- Glass fibre optic cable
- M8 connectors (KD ...)
- Ready-made cables (KB ...)



Specifications

Optical data

Operating range/scanning range ¹⁾
Light source
Wavelength

Timing

Switching frequency ²⁾
Response time

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current

Sensitivity

Display

LED yellow
LED red

Mechanical data

Housing
Weight
Connection
Fibre optic cable connection

Environmental data

Ambient temp. (operation/storage)
Protective circuit ³⁾
Protection class

Options

External calibration input

Teach-in, active/not active
Pulse length

Throughbeam operation

1000mm
LED (modulated light)
880nm (infrared)

Scanning operation

80mm

10 ... 30VDC (incl. residual ripple)
 $\leq 10\%$ of U_B

≤ 35 mA

PNP transistor output

light/dark switching via selector switch

$\geq (U_B - 2V) / \leq 2V$

max. 200mA

adjustment by pressing the calibration button
correctable through potentiometer (\pm)

light path free/reflection
failure during teach-in event
remains on if light path is not free,
or working distance is to big

aluminium

200g

M8 connector, 4-pin

screw connection

$-20^\circ\text{C} \dots +60^\circ\text{C} / -30^\circ\text{C} \dots +70^\circ\text{C}$

2, 3

IP 65

$\geq 6V/L \leq 2V$ or not connected

≥ 200 ms

Tables

Throughbeam operation

Type	Operating range
GF 500/1 LS-...	200mm
GF 500/4 LS-...	600mm
GF 1000/1 LS-...	200mm
GF 1000/4 LS-...	1000mm

Scanning operation

Type	Scanning range ¹⁾
GF 500/1 RT-...	0 ... 50mm
GF 500/4 RT-...	0 ... 80mm
GF 1000/1 RT-...	0 ... 50mm
GF 1000/4 RT-...	0 ... 80mm

1) Relative to white 90%

Diagrams

Remarks

- The corresponding protective cover must be removed when manually setting the sensitivity for light/dark switching.
- Sensitivity adjustment
In scanner operation:
position object and shortly press calibration button.
In throughbeam operation:
shortly press calibration button without object.
Event successful,
if red LED extinguishes.
- Using the potentiometer
Pos. 1, a sensitivity correction of approx. $\pm 2\%$ can be performed.
Example in scanner operation: Levelling of ranges with different diffuse reflection e.g. printing.
Example in throughbeam operation: for detection of half transparent media e.g. foils, glass etc. Before the teach-in event, the potentiometer is set to "+". After the teach-in event it is set into direction "-" until the object causes a switching procedure.

Order guide

Designation	Part No.
LVS 19/4 T L8	500 80664

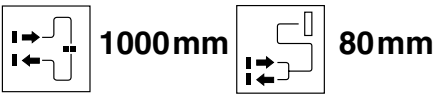
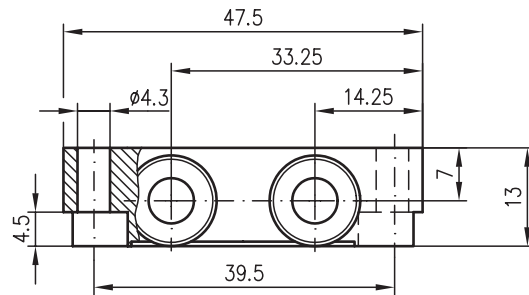
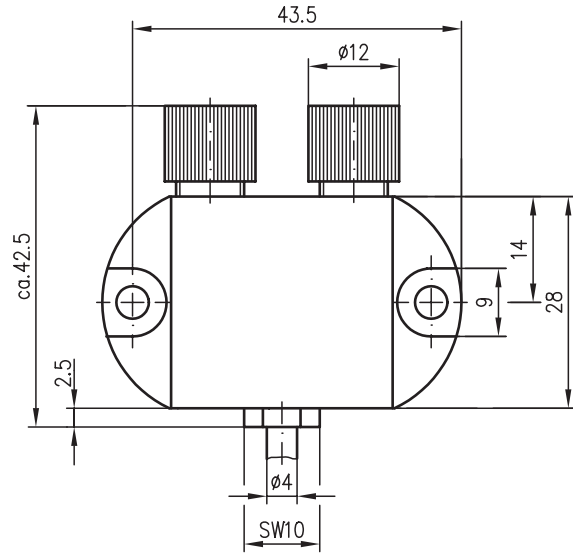


GF-A1

Fibre optic cable adapter



Dimensioned drawing



GLL

- Fibre optic cable adapter for glass fibre optic cable with infrared light
- Extensive selection of fibre optic cables for throughbeam and scanner operation with various lengths and end pieces
- Small construction with robust metal housing, protection class IP 65 for industrial application
- Electrical connection is suitable for all GaAs alternating light amplifiers

Electrical connection

Transmitter	br / BN
	gn / GN
Receiver	(ge / YE)
	(ws / WH)



Accessories:

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Specifications

Mechanical data

Housing	aluminium
Weight	110g
Cable type	cable black, LIY-CY
Cable length	approx. 2100mm
Cable cross-section	4x0.14mm ²
Cable diameter	approx. 4.7mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +20°C/-30°C ... +70°C
Protection class	IP 65

Tables

Diagrams

Order guide

Designation	Part No.
GF-A1	500 17479

Remarks

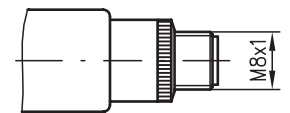
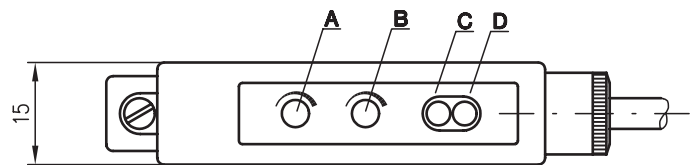
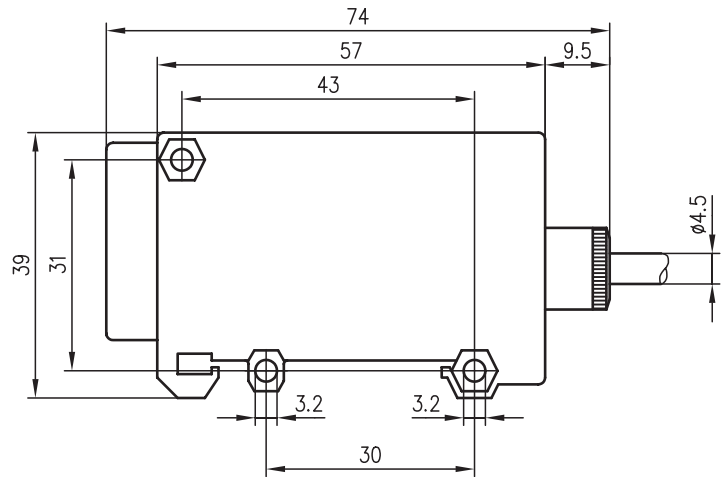


LVS

Fibre optic cable control devices

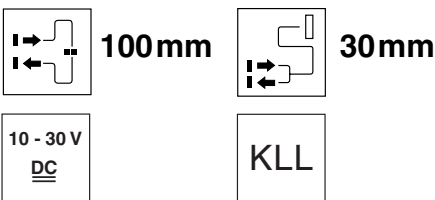


Dimensioned drawing



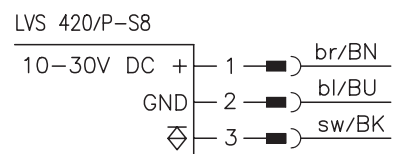
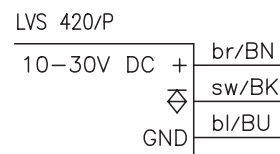
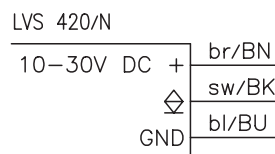
LVS 420/P-S8

- A Sensitivity adjustment
- B Light/dark switching
- C Indicator diode red
- D Indicator diode yellow



- Wide voltage range 10 ... 30V with PNP or NPN switching output for PLC applications
- High switching frequency for detection of fast events
- Light/dark switching, sensitivity adjustment and delay before start-up for optimal adaptation to the application
- Mounting holes or top hat rail mounting for fast installation
- Connection via cable or M8 connector

Electrical connection



Accessories

(available separately • see from page 714 onwards)

- Plastic fibre optic cable
- M8 connectors (KD ...)
- Ready-made cables (KB ...)

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Specifications

Optical data

Operating range/scanning range ¹⁾
Light source
Wavelength

Throughbeam operation Scanning operation

100mm 30mm
LED (modulated light)
660nm (visible red light)

Timing

Switching frequency ²⁾
Response time
Delay before start-up

1000Hz
0.5ms
≤ 100ms

Electrical data

Operating voltage U_B
Residual ripple
Bias current
Switching output
Function characteristics
Signal voltage high/low
Output current
Sensitivity

10 ... 30VDC (incl. residual ripple)
≤ 10% of U_B
≤ 25mA
PNP or NPN transistor output
light/dark switching via selector switch
≥ (U_B-2.5V) ≤ 2.5V
max. 300mA
adjustable through potentiometer

Indicators

LED red
LED yellow

no performance reserve
light path free reflection

Mechanical data

Housing
Weight
Connection type

PBTP (Polybutyleneterphthalate)
35g without cable
M8 connector, 3-pin
or cable 2m, 3x0.34mm²
screw connection

Fibre optic cable connection

Environmental data

Ambient temp. (operation/storage)
Protective circuit ³⁾
Protection class
Standards applied

-25°C ... +55°C/-40°C ... +70°C
2, 3
IP 65
IEC 60947-5-2

1) Scanning range relative to white 90%
2) With a duty cycle of 1:1
3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Throughbeam operation

Type	Operating range
KF 2000/2 LS.5-01	80mm
KF 2000/2 LS.4-02	100mm
KF 2000/2 LS.5-03	100mm

Scanning operation

Type	Scanning range ¹⁾
KF 2000/2 RT.4-04	25mm
KF 2000/2 RT.4-05	30mm
KF 2000/1 RT.4-06	6mm
KF 2000/2 RT.5-07	25mm

1) Relative to white 90%

Diagrams

Order guide

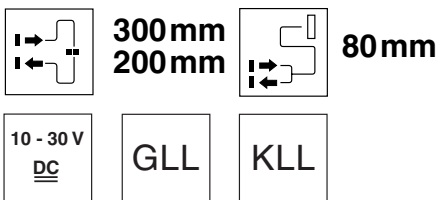
	Designation	Part No.
with cable connection, PNP switching output	LVS 420/P	500 27192
with cable connection, NPN switching output	LVS 420/N	500 80500
with M8 connector, PNP switching output	LVS 420/P-S8	500 82032

Remarks



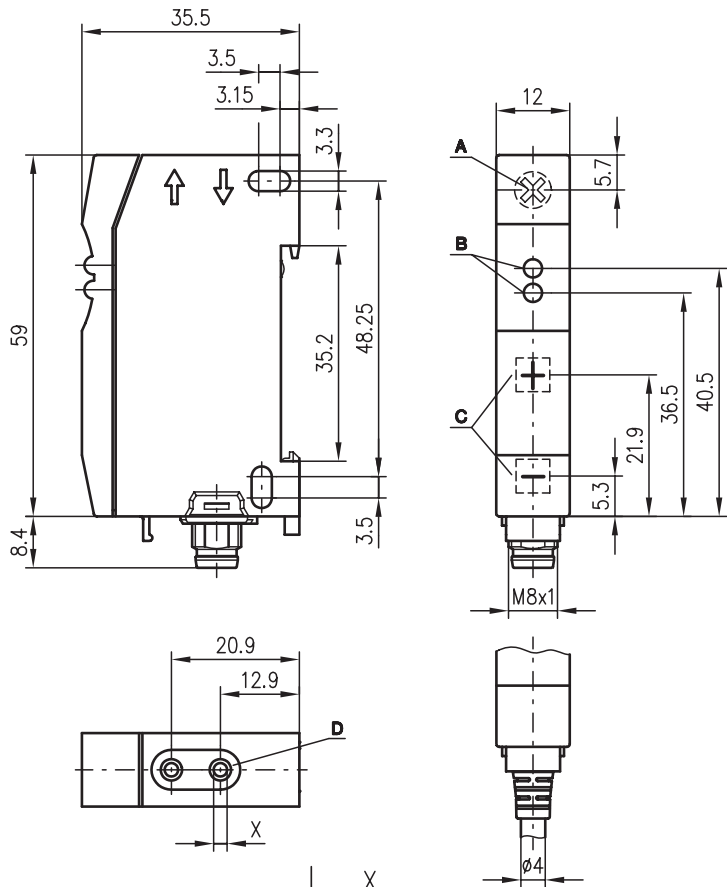
LVSR 325

Fibre optic cable control devices



- Easy calibration with "Teach-in" for optimum sensitivity adjustment
- Warning output autoControl for increased availability
- Control input for activation or for remote calibration
- Parameterisation via optical interface with PC or handheld (e.g. time delay)
- Indicator diode for switching state, performance reserve and readiness
- High switching frequency for detection of fast events
- Mounting holes or top hat rail mounting for universal and fast installation

Dimensioned drawing

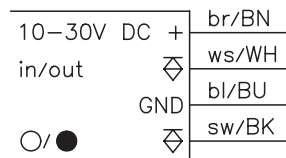


	X
LVSR 325K/P-201	∅ 2,2
LVSR 325K/P-202-S8	∅ 2,2
LVSR 325K/N-202-S8	∅ 2,2
LVSR 325K/P-401	∅ 4
LVSR 325K/P-402-S8	∅ 4

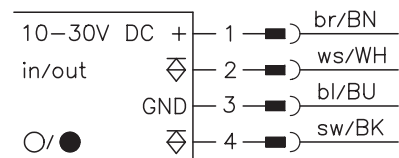
- A** Fibre optic cable fixing screw
- B** Indicator diodes
- C** Sensitivity adjustment
- D** Fibre optic cable input

Electrical connection

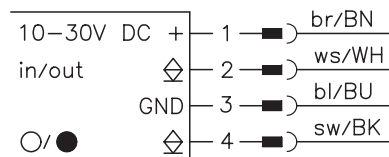
LVSR 325K/P-201
LVSR 325K/P-401



LVSR 325K/P-202-S8
LVSR 325K/P-402-S8



LVSR 325K/N-202-S8



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Accessories

(available separately • see from page 714 onwards)

- Glass fibre optic cable
- Plastic fibre optic cable
- M8 connectors (KD ...)
- Programming cable
- Handheld programming device
- Mounting device
- Programming software



Specifications

Optical data	Throughbeam operation	Scanning operation
Operating range/scanning range ¹⁾	300mm (glass FOC) 200mm (plastic FOC) LED (modulated light) 660nm (red light)	80mm (glass FOC) 80mm (plastic FOC)
Light source		
Wavelength		
Timing		
Switching frequency	1500Hz	
Response time	0.33ms	
Delay before start-up	≤ 300ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 10% of U _B	
Bias current	≤ 25mA	
Inputs/Outputs	adjustable: 2 switching output, complementary ²⁾ switching output and warning output switching output and control input	
Signal voltage high/low	≥ (U _B - 2V) / ≤ 2V	
Output current	together max. 200mA	
Control input ³⁾	not active ≤ 2V / active ≥ 7V	
Sensitivity	adjustable via 2 buttons automatically per "Teach-in" (simultaneously depress both buttons) step wise per button "+" and "-"	
Display		
LED yellow	switching state	
LED red	failure display in learning mode 1.5s remote indication at recognised key depression 65ms	
LED red flashing	no performance reserve	
LED green	ready	
LED green flashing	display in learning mode	
Mechanical data		
Housing	plastic	
Weight	30g	
Connection	M8 connector, 4-pin cable 2m, 4x0.2mm ² screw connection for: plastic fibre optic cable Ø2.2mm glass fibre optic cable Ø4mm	
Fibre optic cable connection		
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +70°C / -40°C ... +75°C	
Protective circuit ⁴⁾	2, 3	
Protection class	IP 65	

1) Operating range/scanning range: recommended range/scanning range with performance reserve

2) Factory setting

3) Internal resistance 20kOhm, delay before start-up/turn-off ≤ 3ms

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
glass fibre optic cable Ø4mm and PNP output		
M8 connector	LVSR 325K/P-402-S8	500 81301
cable	LVSR 325K/P-401	500 81300
plastic fibre optic cable Ø2.2mm and PNP output		
M8 connector	LVSR 325K/P-202-S8	500 81298
cable	LVSR 325K/P-201	500 81297
plastic fibre optic cable Ø2.2mm and NPN output		
M8 connector	LVSR 325K/N-202-S8	500 33579

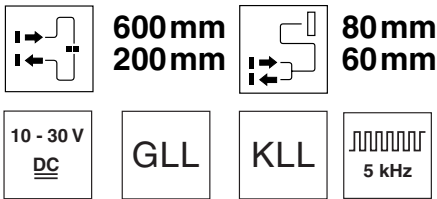
Remarks

- **Unlock keyboard**
The "automatic keyboard lock" is active in the default settings. Press both buttons for 5s to unlock it (until green LED flashes once). 4min. after the last button action, the keyboard locks itself.
- **Manual adjustment**
Bring the object to be detected in the desired distance into the detection range. Using the buttons "+" and "-" the sensitivity of the sensor can be adjusted (red LED flashes any time a button is pressed, yellow LED displays switching state). Buttons are equipped with a repeat-function (depressing of button repeats itself automatically).
Note:
The limit of the keyboard potentiometer is reached if the red LED does not flash while pressing a button.
- **Teach-in event**
Press both buttons "+" and "-" simultaneously (approx. 1s) until the lit red LED goes off. The sensor is now in "learning mode" and displays this through flashing (2Hz) of the green LED. Bring the object to be detected at the desired distance into the detection range or move the object through the detection range at the desired distance. The green LED shortly flashes at a higher frequency (4Hz). As soon as the LED flashes with the initial frequency, the learning mode is finished. To finish the teach-in press one of the two buttons "+" or "-". The sensor switches the green LED to permanent light and displays the detection state with the yellow LED.

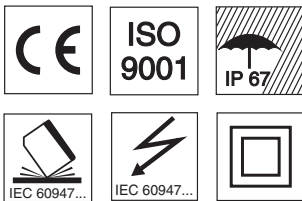


LVSr 8

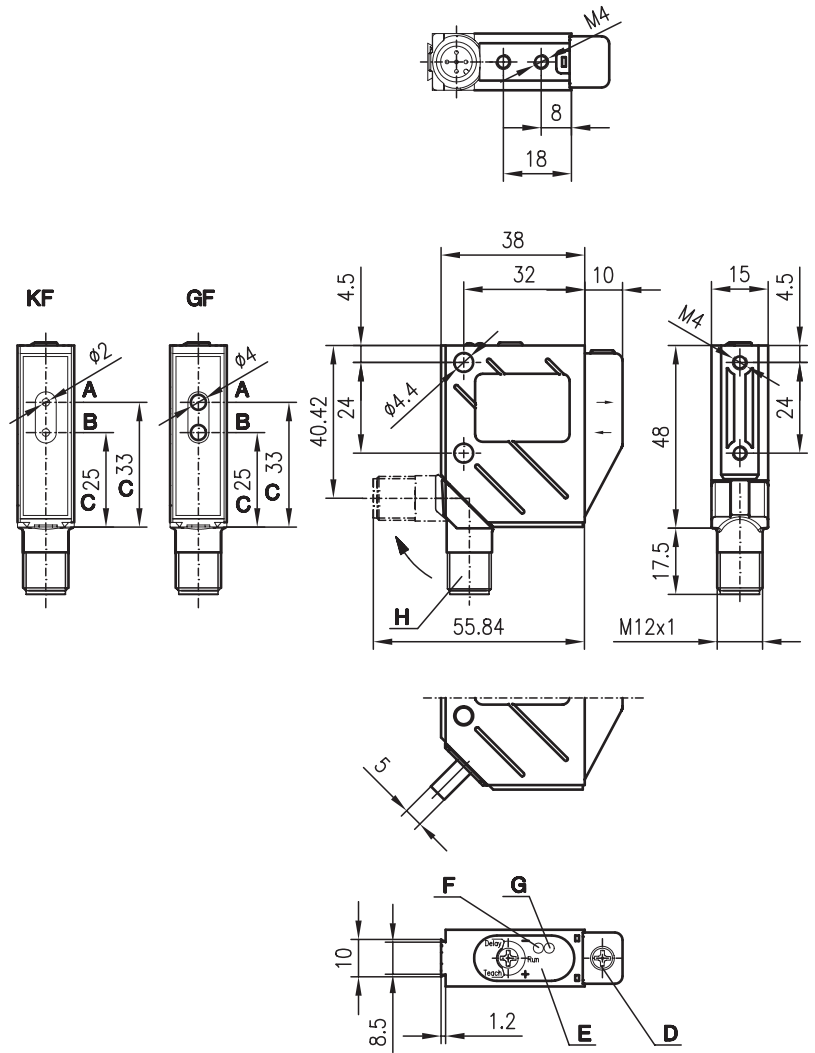
Fiber optic cable control devices



- Fiber optic cables made of plastic and glass
- Light/dark switching
- M12 turning connector or cable connection
- Adjustment via teach-in
- Adjustable sensitivity



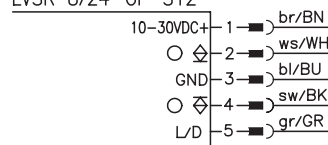
Dimensioned drawing



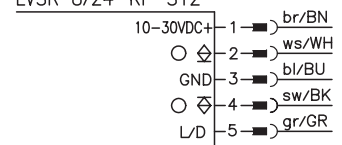
- A Receiver
- B Transmitter
- C Optical axis
- D Straining screw
- E Operational control
- F LED green
- G LED yellow
- H 90° turning connector

Electrical connection

LVSr 8/24-GF
LVSr 8/24-GF-S12



LVSr 8/24-KF
LVSr 8/24-KF-S12



We reserve the right to make changes • 8_e01e.fm

Accessories:

(available separately)

- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems
- Fiber optic cable accessories
 - Glass fibre optic cable
 - Plastic fibre optic cable



Specifications

Optical data	Throughbeam operation	Scanning operation
Operating range/scanning range ¹⁾	600mm (glass FOC) 200mm (plastic FOC)	80mm (glass FOC) 60mm (plastic FOC)
Light source	LED (modulated light)	
Wavelength	660nm (visible red light)	
Timing		
Switching frequency	5000Hz	
Response time	100µs	
Delay before start-up	≤ 650ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 35mA	
Switching output	1 PNP and 1 NPN switching output	
Function characteristics	light/dark reversible	
Signal voltage high/low	≥ (U _B -2V)/≤ 2V	
Output current	max. 100mA	
Indicators		
LED green	ready	
LED green flashing	teaching in progress	
LED yellow	object detected	
LED yellow flashing	device or teach error	
Mechanical data		
Housing	metal	
Optics cover	glass	
Weight (plug/cable)	70g/140g	
Connection type	M12 connector, 5-pin or cable: 2000mm, 5x0.25mm ²	
Environmental data		
Ambient temp. (operation/storage)	-40°C ... +60°C/-40°C ... +70°C	
Protective circuit ²⁾	2, 3	
VDE safety class ³⁾	II, all-insulated	
Protection class ⁴⁾	IP 67	
Standards applied	IEC 60947-5-2	
Options		
L/D input ⁵⁾		
Dark switching/light switching	U _B /0V or not connected	
L/D delay	< 0.5ms	
Pulse delay	10ms, can be activated via step switch	

1) Operating range/scanning range: recommended range/scanning range with performance reserve

2) 2=polarity reversal protection, 3=short-circuit protection for all outputs

3) Rating voltage 250VDC

4) In stop position of the turning connector (turning connector locked)

5) L/D switching is activated after "teach-in" or "power on"

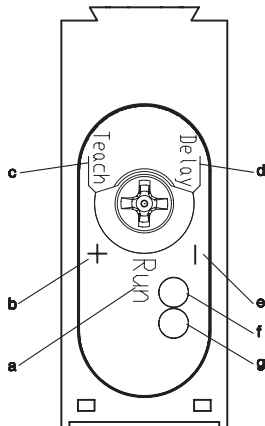
Order guide

	Designation	Part No.
	Plastic fibre optic cable	
with M12 connector	LVSR 8/24-KF-S12	500 36378
with 2m cable	LVSR 8/24-KF	500 36379
	Glass fibre optic cable	
with M12 connector	LVSR 8/24-GF-S12	500 36380
with 2m cable	LVSR 8/24-GF	500 36381

Tables

Diagrams

Remarks

LSVR 8
Controls and indicators


- a Switch position **Run**
- b Switch position **+**
- c Switch position **Teach**
- d Switch position **Delay**
- e Switch position **-**
- f Operation and teach indicator (LED green)
- g Object/light path (LED yellow)

Step switch		Function
	Run	Operating position
	Teach	Sensor detects background and object
	+	Switching threshold is increased by 5%
	-	Switching threshold is reduced by 5%
	Delay	Activate/deactivate 10ms pulse stretching



Teach-in

	Step switch	Scanner operation	Throughbeam operation	LED green	LED yellow
Normal operation	Run	Operating position	Operating position	ON	Q
Activated	Run -> Teach	Immediately	Immediately	OFF	OFF
Time lock	Teach	> 2s	> 2s	3Hz	OFF
Teaching phase 1	Teach	Accept value 1 (background)	Accept value 1 (free light path)	3Hz	OFF
Teaching phase 2	Teach -> Run	Accept value 2 (object)	Accept value 2 (object)	3Hz	OFF
Normal operation	Run	Operating position	Operating position	ON	Q

The step switch must be set to >500ms to allow the individual functions to be activated.

Changing the switching threshold

	Step switch	Scanner operation	Throughbeam operation	LED green	LED yellow
Normal operation	Run	Operating position	Operating position	ON	Q
Activated	Run -> (+/-)	Immediately	Immediately	OFF	OFF
Time lock	(+/-)	> 2s	> 2s	1Hz	Q
Change	(+/-)	Switching threshold (increase/decrease)	Switching threshold (increase/decrease)	1Hz	Q
Normal operation	(+/-) -> Run	Operating position	Operating position	ON	Q

At switch position (+/-), the switching threshold is increased by 5% every second.

Maximum value LED green = ON

Minimum value LED green = OFF

Pulse stretching on/off

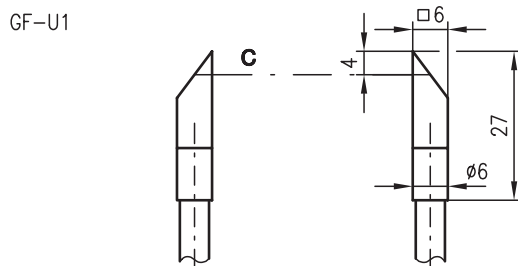
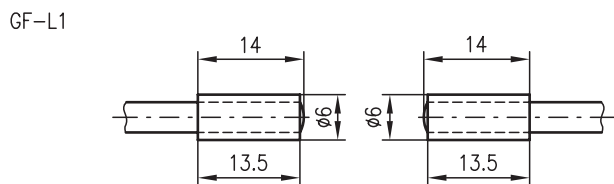
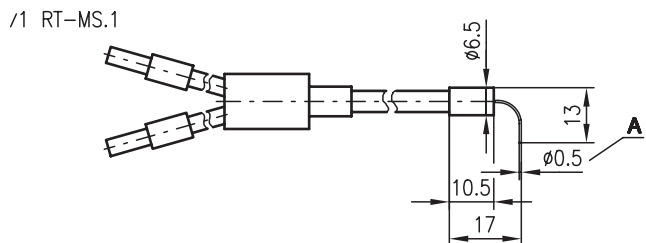
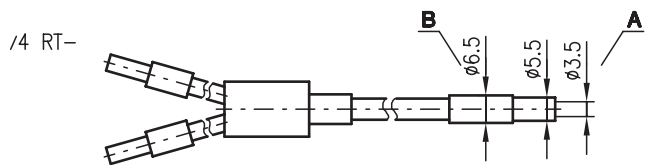
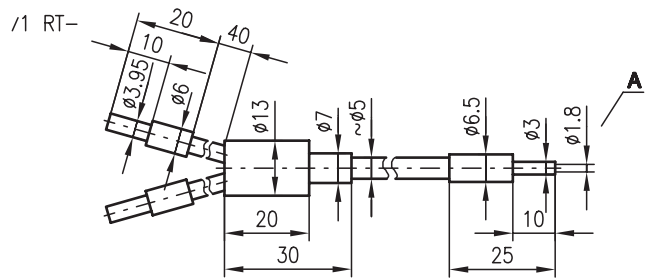
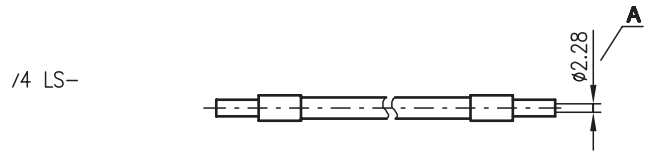
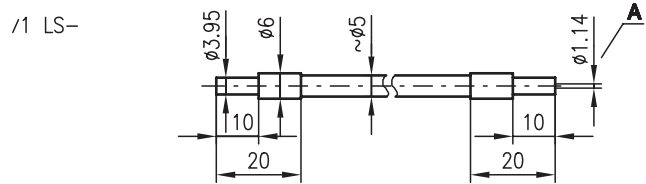
	Step switch	Scanner operation	Throughbeam operation	LED green	LED yellow
Normal operation	Run	Operating position	Operating position	ON	Q
Activated	Run -> Delay	Immediately	Immediately	OFF	OFF
Time lock	Delay	> 2s	> 2s	10Hz	Status
Change	Delay	> 10s pulse stretching on <-> off	Pulse stretching On <-> Off	10Hz	New
Normal operation	Delay -> Run	Operating position	Operating position	ON	Q



GLL

- Glass fibre optic cables in throughbeam or scanner operation
- Fibre optic cables with various cross sections and end pieces
- Connection pieces suitable for all control devices of the series (I)LVS 19, (I)LVS 9, LVSR 8 and LVSR 325
- Metal sheathing allows use at high temperatures and offers the maximum mechanical fibre protection
- Silicone coated metal sheathing results in a high protection class (IP 65) and allows use in the food industry

Dimensioned drawing



- A Active diameter
- B At VA sheathing $\varnothing 8\text{mm}$
- C Waveguide

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Accessories:

(available separately)

- Angles and optics attachments
- GF-L1 (Part No. 500 14649)
- GF-U1 (Part No. 500 09382)



Specifications

Optical data

Standard length approx. 500mm and approx. 1000mm (special lengths on request)
 Fibre optic cable outer diameter approx. 5mm
 Minimum bending radius 40mm

Materials of sheathing and end piece

...-MS brass/aluminium anodised or V2A
 ...-SI silicone/V2A
 ...-VA V2A/V2A

Operation and storage temperature

...-MS -30°C ... +140°C
 ...-SI -30°C ... +160°C
 ...-VA -30°C ... +300°C (transient)

Order guide

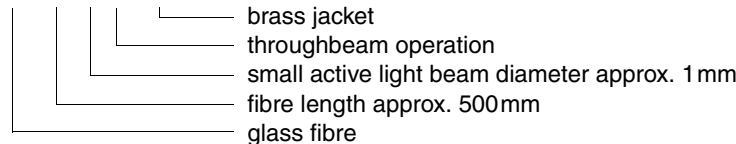
Glass fibre optic cable in throughbeam operation

Designation	GF 500/1 LS-... GF 1000/1 LS-...	GF 500/4 LS-...	GF 1000/4 LS-...
Operating range ¹⁾	200mm	600mm	1000mm
Operating range ²⁾	250mm	300mm	300mm
Operating range ³⁾	250mm	600mm	600mm
With GF-L1 ¹⁾	400mm	300mm	300mm
With GF-U1 ¹⁾	700mm	500mm	700mm
Active light beam diameter [mm]	1.1 mm	2.3mm	2.3mm

1) Operating range in connection with (I)LVS 9/... and (I)LVS 19/...
 2) Operating range in connection with LVSR 325
 3) Operating range in connection with LVSR 8

Example code:

GF 500/1 LS-MS



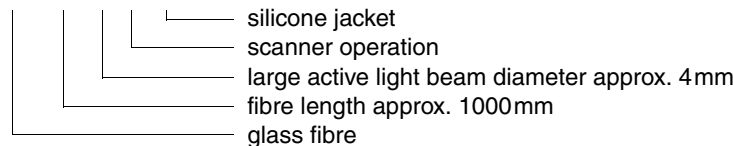
Glass fibre optic cables in scanner operation

Designation	GF 500/1 RT-... GF 1000/1 RT-...	GF 500/4 RT-... GF 1000/4 RT-...	GF 1000/1 RT-MS.1
Scanning range ¹⁾	50mm	80mm	10mm
Scanning range ²⁾	50mm	80mm	-
Scanning range ³⁾	50mm	80mm	10mm
Active light beam diameter [mm]	1.8mm	3.5mm	0.5mm

1) Scanning range in connection with (I)LVS 9/... and (I)LVS 19/... relative to white 90%
 2) Scanning range in connection with LVSR 325 relative to white 90%
 3) Scanning range in connection with LVSR 8 relative to white 90%

Example code:

GF 1000/4 RT-SI



Remarks

- **Mounting**
When mounting the fibre optic cable, a minimum bending radius of 40mm must be guaranteed for reliable function.
- **Connection**
The fibre optic cables must be inserted securely into the corresponding openings in the control device. The fibre optic cable is fixed in place using the set screw.
- **Optical attachments**
For larger operating ranges using .../1 type cable (beam exit approx. 1mm), or changes in cable direction, optical attachments are available.
Attention:
When mounting attachments, ensure that the optics are not contaminated by adhesive substances. The adhesive must fulfil the temperature requirements.
- Shipment is done in pairs for throughbeam (LS) applications.
- Fibre optic cables with other lengths, head pieces and cross sections on request.



Special types

Glass fibre optic cables



1000mm



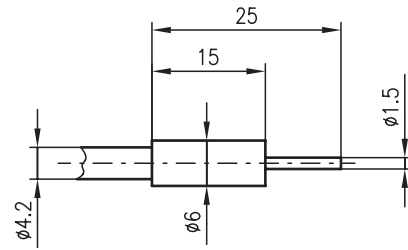
80mm



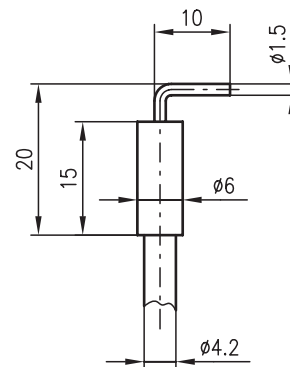
- Glass fibre optic cables in throughbeam or scanner operation
- Fibre optic cables with various cross sections and end pieces
- Connection pieces suitable for all control devices of the series (I)LVS 19, (I)LVS 9, LVSR 8 and LVSR 325
- Silicone coated metal sheathing results in a high protection class (IP 65) and allows use in the food industry

Dimensioned drawing

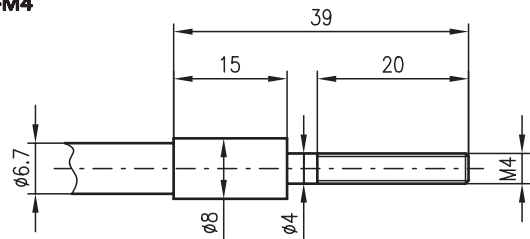
GF 600/1-RT-SI-1,5
GF 600/1-LS-SI-1,5



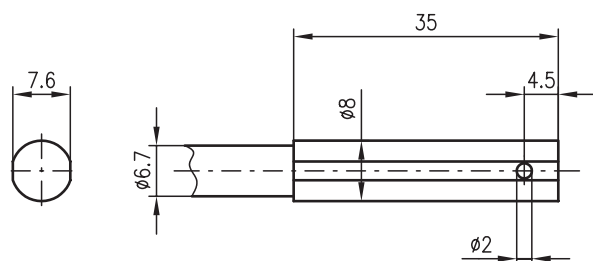
GF 600/1-RT-SI-W-1,5
GF 600/1-LS-SI-W-1,5



GF 600/4-RT-SI-M4
GF 600/4-LS-SI-M4



GF 600/4-RT-SI-W
GF 600/4-LS-SI-W



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Accessories:
(available separately)



Glass fibre optic cables

Order guide

Glass fibre optic cables in throughbeam operation

Selection table		Order code →	GF 500/1 LS-MS Part No. 500 01030	GF 500/1 LS-SI Part No. 500 06779	GF 1000/1 LS-MS Part No. 500 01032	GF 1000/1 LS-SI Part No. 500 00036	GF 500/4 LS-MS Part No. 500 01031	GF 500/4 LS-VA Part No. 500 00043	GF 1000/4 LS-MS Part No. 500 01033	GF 1000/4 LS-SI Part No. 500 00037	GF 1000/4 LS-VA Part No. 500 00045
Equipment ↓	Sheathing/end piece	brass/aluminium	●		●		●		●		
		silicone/V2A		●		●				●	
		V2A/V2A						●			●
Length	500mm		●	●			●	●			
	1000mm				●	●			●	●	●
Light beam diameter	approx. 1 mm		●	●	●	●			●	●	
	approx. 4mm						●	●	●	●	●

Glass fibre optic cables in scanner operation

Selection table		Order code →	GF 500/1 RT-MS Part No. 500 01034	GF 500/1 RT-SI Part No. 500 00038	GF 500/1 RT-VA Part No. 500 00046	GF 1000/1 RT-MS Part No. 500 01036	GF 500/4 RT-MS Part No. 500 01035	GF 500/4 RT-VA Part No. 500 00047	GF 1000/4 RT-MS Part No. 500 01037	GF 1000/4 RT-SI Part No. 500 00041	GF 1000/4 RT-MS.1 Part No. 500 11508
Equipment ↓	Sheathing/end piece	brass/aluminium	●			●	●		●		●
		silicone/V2A		●						●	
		V2A/V2A			●			●			
Length	500mm		●	●	●		●	●			
	1000mm					●			●	●	●
Light beam diameter	approx. 1 mm		●	●	●	●			●	●	
	approx. 4mm						●	●	●	●	●

Special types - Glass fibre optic cables in throughbeam or scanner operation

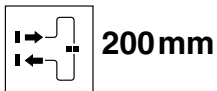
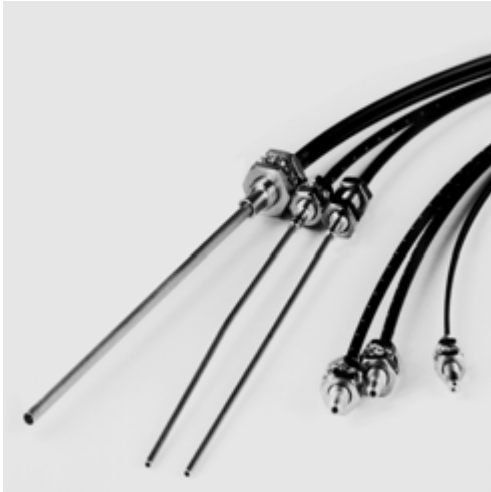
Selection table		Order code →	GF 600/1-LS-SI-1,5 Part No. 500 34365	GF 600/1-RT-SI-1,5 Part No. 500 34352	GF 600/1-LS-SI-W-1,5 Part No. 500 34363	GF 600/1-RT-SI-W-1,5 Part No. 500 34368	GF 600/4-LS-SI-M4 Part No. 500 34361	GF 600/4-RT-SI-M4 Part No. 500 34356	GF 600/4-LS-SI-W Part No. 500 34359	GF 600/4-RT-SI-W Part No. 500 34367
Operating mode	throughbeam operation		●		●		●		●	
	scanner operation			●		●		●		●
Sheathing/end piece	brass/aluminium									
	silicone/V2A		●	●	●	●	●	●	●	●
	V2A/V2A									
Length	600mm		●	●	●	●	●	●	●	●
Light beam diameter	approx. 1 mm		●	●	●	●				
	approx. 4mm						●	●	●	●

Remarks

- Fibre optic cables with other lengths, head pieces and cross sections on request.

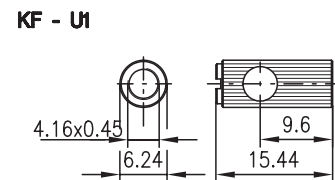
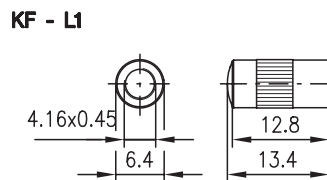
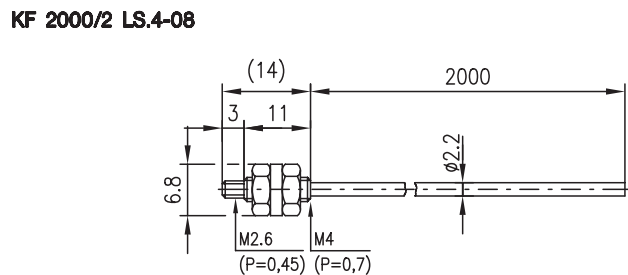
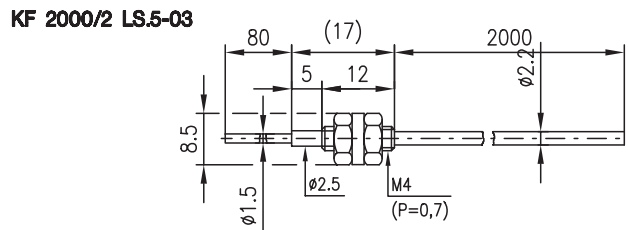
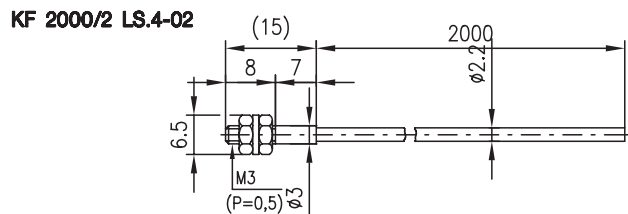
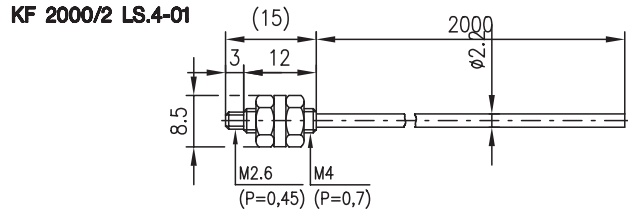


Plastic fibre optic cables in throughbeam operation



- Plastic fibre optic cables in throughbeam operation
- Fibre optic cables with various cross sections and end pieces
- Length can be cut by the user
- Connection pieces suitable for fibre optic cable amplifiers LVS 420/P, LVSR 8 and LVSR 325
- With ".5" versions, the end piece is bendable and can be adjusted to every mounting position

Dimensioned drawing



We reserve the right to make changes • LSG_e09e.fm

Accessories:

(available separately)

- Angles and optics attachments
 - KF-L1 (Part No. 500 34065)
 - KF-U1 (Part No. 500 34064)

(part of the delivery contents)

- Fibre optic cable cutting device (except for KF 2000/2 LS.4-08)
- Adapter (for fibre optic cables with Ø 1 mm)



Plastic fibre optic cables in throughbeam operation

Specifications

Optical data

Standard length	2000mm
Reinforcement	PVC
Operating temperature	-25 °C ... +80 °C
Minimum bending radius	15mm

Remarks

- **Mounting**
When mounting the fibre optic cable, a minimum bending radius of 15mm must be guaranteed for reliable function. Moreover, the fibre optic cable must not be bent within 15mm of the sensor and cable head. The minimum bending radius of the stainless steel sleeve on the cable head is 10mm.
- **Connection**
The fibre optic cables must be inserted securely into the corresponding openings in the control device (connection length approx. 15mm). The fastening screw is used for fixation of the fibre optic cables.
- **Cutting**
The plastic fibre optic cable can be cut to the desired length using the fibre optic cable cutting device. Each cut opening may only be used once.
- **Adapter**
The included adapter must be used with fibre optic cables having a fibre diameter of 1mm. The fibre optic cable must extend more than 0.5mm beyond the adapter.
- **First installation**
Before using the fibre optic cable for the first time, the fibre must be cut at the end to provide a smooth surface.
- **Optical attachments**
Screw-on type for KF 2000/2 LS.4-01 (throughbeam operation). With optical attachment KF-L1 for longer operating ranges. With optical attachment KF-U1 for 90° deflection. Operating range see table.
- Shipment is done in pairs for throughbeam (LS) applications.

Order guide

Plastic fibre optic cables in throughbeam operation

Order code	KF 2000/2 LS.4-01 Part No. 500 22775 KF 2000/2 LS.4-08 Part No. 500 35309			KF 2000/2 LS.4-02 Part No. 500 27780	KF 2000/2 LS.5-03 Part No. 500 27781
		KF-L1	KF-U1		
Operating range ¹⁾	80mm	800mm	100mm	100mm	100mm
Operating range ²⁾	200mm	2500mm	250mm	200mm	200mm
Operating range ³⁾	200mm	2000mm	200mm	200mm	200mm
Fibre optic cable outer diameter	2mm			2mm	2mm

1) Operating range in connection with LVS 420/P
 2) Operating range in connection with LVSR 325
 3) Operating range in connection with LVSR 8



Plastic fibre optic cables in scanner operation

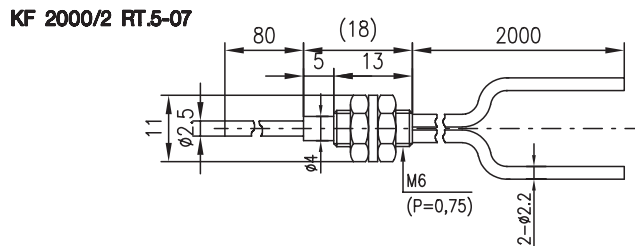
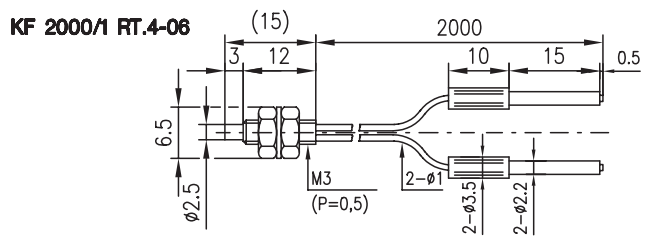
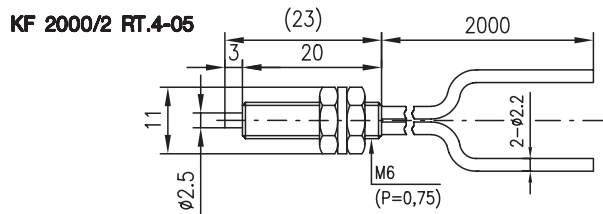
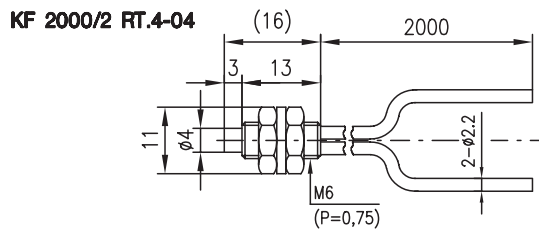
Dimensioned drawing



80 mm



- Plastic fibre optic cables in scanner operation
- Fibre optic cables with various cross sections and end pieces
- Length can be cut by the user
- Connection pieces suitable for fibre optic cable amplifiers LVS 420/P, LVSR and LVSR 325
- With ".5" versions, the end piece is bendable and can be adjusted to every mounting position



We reserve the right to make changes • LSG_e09e.fm

Accessories:

(part of the delivery contents)

- Fibre optic cable cutting device
- Adapter (for fibre optic cables with Ø 1 mm)



Plastic fibre optic cables in scanner operation

Specifications

Optical data

Standard length	2000mm
Reinforcement	PVC
Operating temperature	-25 °C ... +80 °C
Minimum bending radius	15mm

Remarks

- **Mounting**
When mounting the fibre optic cable, a minimum bending radius of 15mm must be guaranteed for reliable function. Moreover, the fibre optic cable must not be bent within 15mm of the sensor and cable head. The minimum bending radius of the stainless steel sleeve on the cable head is 10mm.
- **Connection**
The fibre optic cables must be inserted securely into the corresponding openings in the control device (connection length approx. 15mm). The fastening screw is used for fixation of the fibre optic cables.
- **Cutting**
The plastic fibre optic cable can be cut to the desired length using the fibre optic cable cutting device. Each cut opening may only be used once.
- **Adapter**
The included adapter must be used with fibre optic cables having a fibre diameter of 1mm. The fibre optic cable must extend more than 0.5mm beyond the adapter.
- **First installation**
Before using the fibre optic cable for the first time, the fibre must be cut at the end to provide a smooth surface.
- Shipment is done in pairs for throughbeam (LS) applications.

Order guide

Plastic fibre optic cable in scanner operation

Order code	KF 2000/2 RT.4-04 Part No. 500 27782	KF 2000/2 RT.4-05 Part No. 500 27783	KF 2000/1 RT.4-06 Part No. 500 27784	KF 2000/2 RT.5-07 Part No. 500 27785
Scanning range ¹⁾	25mm	30mm	6mm	30mm
Scanning range ²⁾	65mm	80mm	15mm	65mm
Scanning range ³⁾	50mm	60mm	10mm	50mm
Fibre optic cable outer diameter	2mm	2mm	1mm	2mm

1) Scanning range in connection with LVS 420/P relative to white 90%
 2) Scanning range in connection with LVSR 325 relative to white 90%
 3) Scanning range in connection with LVSR 8 relative to white 90%





Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index



Forked photoelectric sensors

Overview and advantages



Wide range of models with robust metal housing and glass cover



10 ... 30VDC voltage with PNP and NPN transistor output



High switching frequency up to 5000Hz for detection of fast events



- Measurement range of 25mm
- Resolution of 14µm



Mouth width of 29mm or 100mm



Connection via M8 respectively M12 connectors or cable

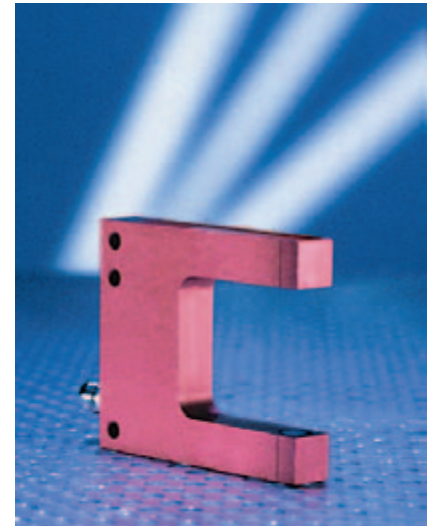


Easy adjustment for optimal adaptation to the application



Applications:

- Detection of labels
- Detection of transparent labels
- Counting function
- Detection of small parts
- Edge detection
- Diameter detection
- Detection of multiple objects





Operating principle	Designation	Mouth width [mm]	Mouth depth [mm]	Operating voltage		Output		Switching frequency	Switching		
				10 ... 30VDC	24VDC	PNP transistor	NPN transistor		Light	Dark	
	GK 14/24 L	1		•		•	•	5000Hz	•		
	GS 04M/P-30/35-01-S8	30	35	•		•		2500Hz	•		
	GS 04M/P-30/35-02-S8	30	35	•		•		2500Hz		•	
	GS 04M/P-50/55-01-S8	50	55	•		•		2500Hz	•		
	GS 04M/P-50/55-02-S8	50	55	•		•		2500Hz		•	
	GS 04M/P-80/55-01-S8	80	55	•		•		2500Hz	•		
	GS 04M/P-80/55-02-S8	80	55	•		•		2500Hz		•	
	GS 04M/P-120/55-01-S8	120	55	•		•		2500Hz	•		
	GS 04M/P-120/55-02-S8	120	55	•		•		2500Hz		•	
	GS 04M/P-220/55-01-S8	220	55	•		•		2500Hz	•		
	GS 04M/P-220/55-02-S8	220	55	•		•		2500Hz		•	
	GS 04M/P-30/35-03-S8	30	35	•		•		2500Hz	•		
	GS 04M/P-30/35-04-S8	30	35	•		•		2500Hz		•	
	GS 04M/P-50/55-03-S8	50	55	•		•		2500Hz	•		
	GS 04M/P-50/55-04-S8	50	55	•		•		2500Hz		•	
	GS 04M/P-80/55-03-S8	80	55	•		•		2500Hz	•		
	GS 04M/P-80/55-04-S8	80	55	•		•		2500Hz		•	
	GS 04M/P-120/55-03-S8	120	55	•		•		2500Hz	•		
	GS 04M/P-120/55-04-S8	120	55	•		•		2500Hz		•	
	GS 04M/P-220/55-03-S8	220	55	•		•		2500Hz	•		
	GS 04M/P-220/55-04-S8	220	55	•		•		2500Hz		•	
	GS 04M/P-50/55-06-S8	50	55	•		•		2500Hz		•	
	GS 04M/P-80/55-06-S8	80	55	•		•		2500Hz		•	
	GS 04M/P-120/55-06-S8	120	55	•		•		2500Hz		•	
	GS 04M/P-220/55-06-S8	220	55	•		•		2500Hz		•	
	GS 04M/P-20/25-07-S8	20	25	•		•		2500Hz	•	•	
	GS 04M/P-30/35-07-S8	30	35	•		•		2500Hz	•	•	
	GS 04M/P-50/55-07-S8	50	55	•		•		2500Hz	•	•	
	GS 04M/P-80/55-07-S8	80	55	•		•		2500Hz	•	•	
	GS 04M/P-120/55-07-S8	120	55	•		•		2500Hz	•	•	
	GS 04M/P-220/55-07-S8	220	55	•		•		2500Hz	•	•	
	GS 04M/P-50/25-10-S8	50	25	•		•		2500Hz		•	
	GS 05/24 G, 150 L	2			•		•	•	5000Hz	•	
	GS 05/24 G	2			•		•	•	5000Hz	•	
	GS 05/24 G.1	5			•		•	•	5000Hz	•	
	GS 05/24 GD	2			•		•	•	5000Hz		•
	GS 05/24 GD.1	5			•		•	•	5000Hz		•
	GS 05/24 GD.2	2			•		•	•	5000Hz		•
	GS 10/22 G	2			•			•	1000Hz	•	•
	GS 10/4 G	2			•		•		1000Hz	•	
	GS 10/4 GL8	2			•		•		1000Hz	•	
	GS 12/24 GL	5			•		•	•	5000Hz	•	
	GS 21/4 G	8				•	•		1000Hz	•	
	GSU 14/24 L	4	67		•		•	•		•	
	GSU 14/24 DL	4	67		•		•	•			•



Operating principle	Designation	Mouth width [mm]	Mouth depth [mm]	Operating voltage		Output											
				10 ... 30VDC	18 ... 30VDC	1xOutput Analogue Voltage	1xOutput Analogue Current	2xOutput Analogue Voltage	2xOutput Analogue Current	1xRS 232	1xRS 422	1xOutput PNP	2xOutput PNP	1xInput			
	GS 754M/D-29/42-101-S12	29	42		•						•			•			
	GS 754M/D-29/42-102-S12	29	42		•						•			•			
	GS 754M/D-29/42-201-S12	29	42		•							•					
	GS 754M/D-29/42-202-S12	29	42		•							•					
	GS 754M/V-29/42-501-S12	29	42		•	•								•			
	GS 754M/V-29/42-502-S12	29	42		•	•								•			
	GS 754M/V-29/42-601-S12	29	42		•		•							•			
	GS 754M/V-29/42-602-S12	29	42		•		•							•			
	GS 754M/V-29/42-511-S12	29	42		•	•											•
	GS 754M/V-29/42-512-S12	29	42		•	•											•
	GS 754M/V-29/42-611-S12	29	42		•		•										•
	GS 754M/V-29/42-612-S12	29	42		•		•										•
	GS 754M/D-100/42-102-S12	100	42		•							•	•	•			
	GS 754M/V-100/42-502-S12	100	42		•			•								•	•
	GS 754M/V-100/42-602-S12	100	42		•				•						•	•	•



Switching frequency	Connection				Detection of			Options	Page
	M12 connector (5-pin)	M12 connector (8-pin)	Rear connector	Lateral connector	Edge	Diameter	Transparent objects (> 25%)		
50Hz	•			•	•	•		•	757
50Hz	•		•		•	•		•	757
50Hz	•			•	•	•		•	757
50Hz	•		•		•	•		•	757
50Hz	•			•	•	•		•	757
50Hz	•		•		•	•		•	757
50Hz	•			•	•	•		•	757
50Hz	•		•		•	•		•	757
50Hz	•			•	•	•		•	757
50Hz	•		•		•	•		•	757
50Hz	•			•	•	•		•	757
50Hz	•		•		•	•		•	757
50Hz		•	•		•	•	•	•	759
50Hz		•	•		•	•	•	•	759
50Hz		•	•		•	•	•	•	759

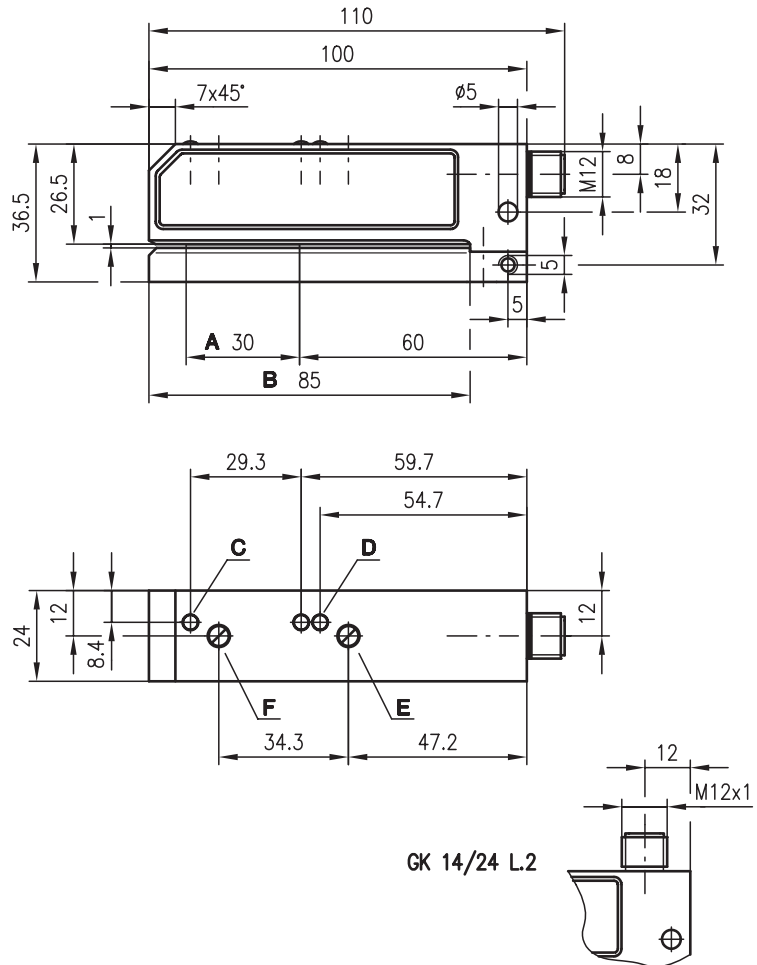


GK 14

Capacitive forked sensor



Dimensioned drawing



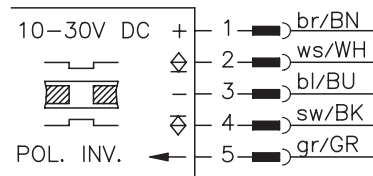
1 mm



- Forked sensor for reliable detection of transparent and opaque labels
- PNP and NPN transistor output for optimum adaptation to the controller
- Robust metal housing with bevelled inlet edges
- Inverting input for easy adaptation of the output signal level

- A** Sensor
- B** Mouth depth
- C** Display switching output
- D** Display base adjustment
- E** Base adjustment
- F** Sensitivity adjustment:
Clockwise rotation = increase sensitivity

Electrical connection



We reserve the right to make changes • GS_a04e.fm



Accessories:

(available separately • see page 762)

- M12 connectors (KD ...)



Specifications

Optical data

Mouth width	0.9mm ± 0.1mm
Mouth depth	85mm

Timing

Switching frequency ¹⁾	5000Hz
Response time	0.1ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 35mA
Switching output	1 PNP transistor output 1 NPN transistor output
Function characteristics	direction dependent, reversible
Signal voltage high/low	≥ (U _B - 2V) / ≤ 2V
Output current	200mA
Sensitivity	adjustable with multiturn potentiometer
Base adjustment	adjustable with multiturn potentiometer

Indicators

LED yellow	label/gap
LED yellow (2x)	base adjustment

Mechanical data

Housing	aluminium, anodised
Weight	175g
Connection type	M12 connector, 5-pin

Environmental data

Ambient temp. (operation/storage)	0°C ... +60°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

Options

Inverting input high/low	≥ 8V / ≤ 2V
Input resistance	10kΩ

1) max. label speed 10m/s, min. label spacing 2mm

2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Designation	Part No.
GK 14/24 L	500 26371

Remarks

- **Base setting**
 - Set sensitivity to max. (turn potentiometer to the right), then turn back 1/2 turn to the left.
 - Base adjustment without labels such that both LEDs are equally bright.
 - If necessary, reduce the sensitivity setting (in steps of 1/4 turn to the left).
- **Base adjustment**

Perform after new mounting, cleaning, sensitivity increase.
- **Switching behaviour**

A signal change on the switching output occurs when a label enters at the minimum velocity. The output signal remains constant until the next edge of an existing or entering label is detected.



GS 04

Forked photoelectric sensors



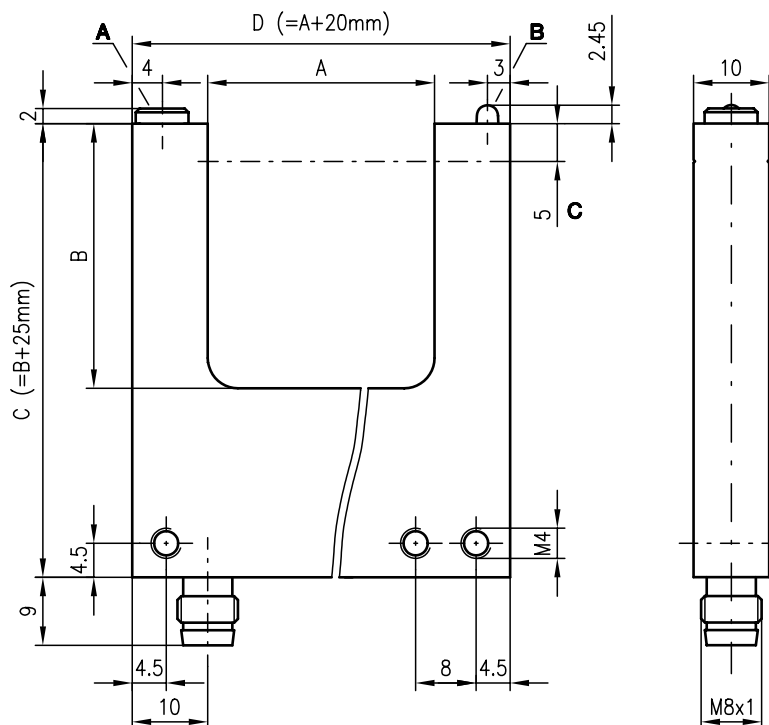
30/50/80/120/220 mm



10 - 30 V
DC

- Sensitivity adjustment for optimal adaptation to the application
- Sensitivity adjustment and indicator LED on the leg front
- Robust metal housing and glass optics for protection against environmental influences
- Transmitter and receiver are installed in the same housing, therefore easy and fast mounting (excessive mounting brackets and extensive alignment not necessary)

Dimensioned drawing



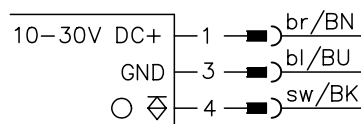
- A** Sensitivity adjustment
- B** Indicator diode
- C** Optical axis

	A mouth width	B mouth depth	C	D
GS 04M/P-30/35-...	30	35	60	50
GS 04M/P-50/55-...	50	55	80	70
GS 04M/P-80/55-...	80	55	80	100
GS 04M/P-120/55-...	120	55	80	140
GS 04M/P-220/55-...	220	55	80	240

Electrical connection

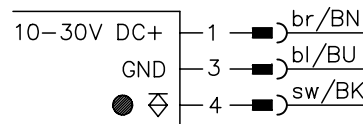
Light switching types

GS 04M/P-...01...



Dark switching types

GS 04M/P-...02...

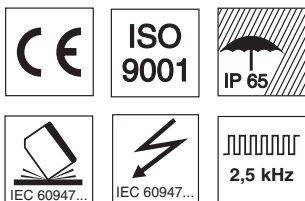


Accessories:

(available separately • see page 762)

- M8 connectors (KD ...)

We reserve the right to make changes • GS_a05e.fm





Specifications

Optical data

Mouth width	30/50/80/120/220mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	2500Hz
Response time	0.2ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	200mA
Sensitivity	adjustable

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	aluminium, anodised
Weight	see order guide
Optics cover	glass
Connection type	M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

- 1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Resolution (smallest object)

Mouth width [mm]	Resolution [mm]
30	1
50	1
80	1.5
120	1.5
220	2

Diagrams

Order guide

Selection table		Order code →									
Equipment ↓		GS 04M/P-30/35-01-S8 Part No. 500 81206	GS 04M/P-30/35-02-S8 Part No. 500 81207	GS 04M/P-50/55-01-S8 Part No. 500 81210	GS 04M/P-50/55-02-S8 Part No. 500 81211	GS 04M/P-80/55-01-S8 Part No. 500 81216	GS 04M/P-80/55-02-S8 Part No. 500 81217	GS 04M/P-120/55-01-S8 Part No. 500 81220	GS 04M/P-120/55-02-S8 Part No. 500 81221	GS 04M/P-220/55-01-S8 Part No. 500 81224	GS 04M/P-220/55-02-S8 Part No. 500 81225
Switching	light switching	●		●		●		●		●	
	dark switching		●		●		●		●		●
Mouth width	30mm	●	●								
	50mm			●	●						
	80mm					●	●				
	120mm							●	●		
	220mm									●	●
Weight in g		40	40	60	60	80	80	100	100	160	160

Remarks

- Versions with NPN switching output or other mouth width and depth on request.

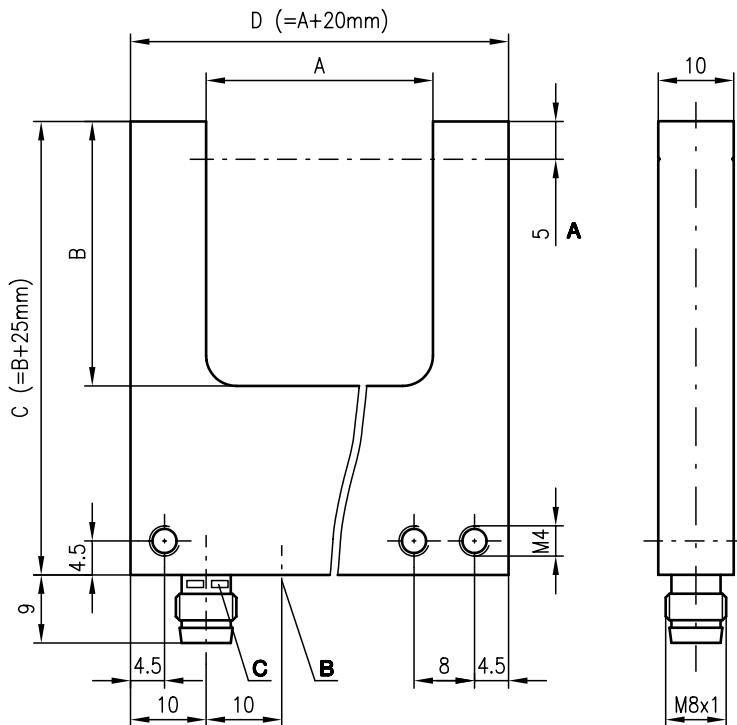


GS 04

Forked photoelectric sensors



Dimensioned drawing



- A** Optical axis
- B** Sensitivity adjustment
- C** Indicator diode

	A Mouth width	B Mouth depth	C	D
GS 04M/P-30/35-...	30	35	60	50
GS 04M/P-50/55-...	50	55	80	70
GS 04M/P-80/55-...	80	55	80	100
GS 04M/P-120/55-...	120	55	80	140
GS 04M/P-220/55-...	220	55	80	240

30/50/80/120/220 mm



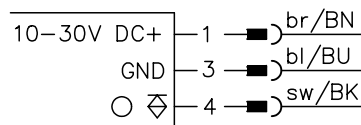
10 - 30 V
DC

- Sensitivity adjustment for optimal adaptation to the application
- Sensitivity adjustment on the back of the fork
- Robust metal housing and glass optics for protection against environmental influences
- Transmitter and receiver are installed in the same housing, therefore easy and fast mounting (excessive mounting brackets and extensive alignment not necessary)

Electrical connection

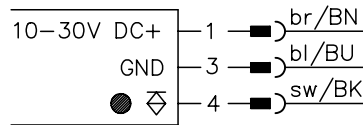
Light switching types

GS 04M/P-...03...



Dark switching types

GS 04M/P-...04...

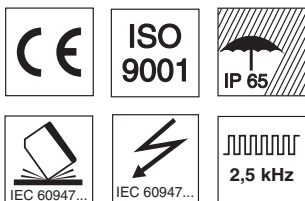


Accessories:

(available separately • see page 762)

- M8 connectors (KD ...)

We reserve the right to make changes • GS_a06e.fm





Specifications

Optical data

Mouth width	30/50/80/120/220mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	2500Hz
Response time	0.2ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	200mA
Sensitivity	adjustable

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	aluminium, anodised
Weight	see order guide
Optics cover	glass
Connection type	M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

- 1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Resolution (smallest object)

Mouth width [mm]	Resolution [mm]
30	1
50	1
80	1.5
120	1.5
220	2

Diagrams

Order guide

Selection table		Order code →									
Equipment ↓		GS 04M/P-30/35-03-S8 Part No. 500 81208	GS 04M/P-30/35-04-S8 Part No. 500 81209	GS 04M/P-50/55-03-S8 Part No. 500 81212	GS 04M/P-50/55-04-S8 Part No. 500 81213	GS 04M/P-80/55-03-S8 Part No. 500 81218	GS 04M/P-80/55-04-S8 Part No. 500 81219	GS 04M/P-120/55-03-S8 Part No. 500 81222	GS 04M/P-120/55-04-S8 Part No. 500 81223	GS 04M/P-220/55-03-S8 Part No. 500 81226	GS 04M/P-220/55-04-S8 Part No. 500 81227
Switching	light switching	●		●		●		●		●	
	dark switching		●		●		●		●		
Mouth width	30mm	●	●								
	50mm			●	●						
	80mm					●	●				
	120mm							●	●		
	220mm									●	●
Weight in g		40	40	60	60	80	80	100	100	160	160

Remarks

- Version with NPN switching output or other mouth width and depth on request.



GS 04

Forked photoelectric sensors

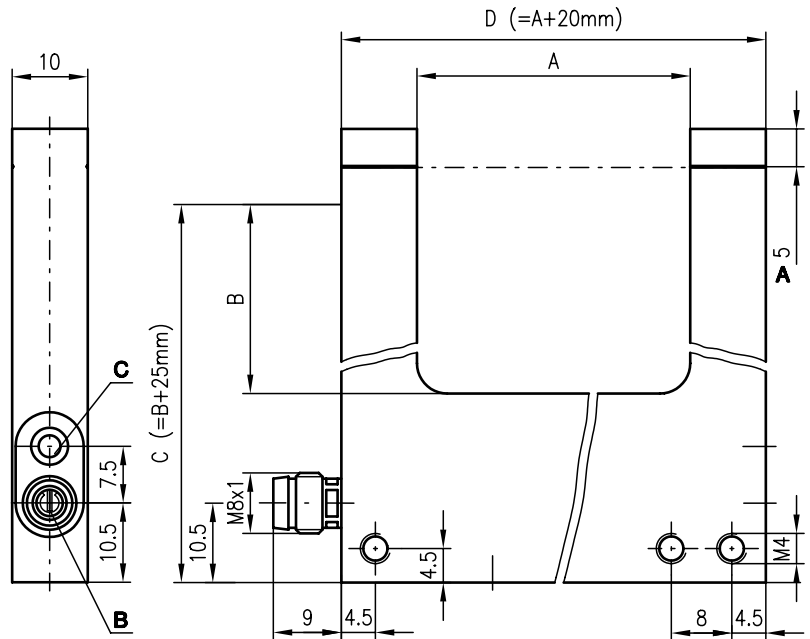


50/80/120/220 mm



- Sensitivity adjustment for optimal adaptation to the application
- Robust metal housing and glass optics for protection against environmental influences
- Transmitter and receiver are installed in the same housing, therefore easy and fast mounting (excessive mounting brackets and extensive alignment not necessary)

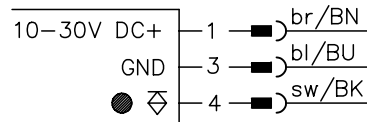
Dimensioned drawing



- A** Optical axes
- B** Sensitivity adjustment
- C** Indicator diode

	A Mouth width	B Mouth depth	C	D
GS 04M/P-50/55-...	50	55	80	70
GS 04M/P-80/55-...	80	55	80	100
GS 04M/P-120/55-...	120	55	80	140
GS 04M/P-220/55-...	220	55	80	240

Electrical connection



Accessories:

(available separately • see page 762)

- M8 connectors (KD ...)

We reserve the right to make changes • GS_a17e.fm



Specifications

Optical data

Mouth width 50/80/120/220mm
 Light source LED (modulated light)
 Wavelength 880nm

Timing

Switching frequency 2500Hz
 Response time 0.2ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B ¹⁾ 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output PNP transistor output
 Function characteristics dark switching
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current 200mA
 Sensitivity adjustable

Indicators

LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing aluminium, anodised
 Weight see order guide
 Optics cover glass
 Connection type M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -30°C ... +70°C
 Protective circuit ²⁾ 1, 2
 VDE safety class III
 Protection class IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Resolution (smallest object)

Mouth width [mm]	Resolution [mm]
20	1
80	1.5
120	1.5
220	2

Diagrams

Order guide

Selection table		Order code →						
Equipment ↓		GS 04M/P-50/55-06-S8 Part No. 500 814 71	GS 04M/P-80/55-06-S8 Part No. 500 307 31	GS 04M/P-120/55-06-S8 Part No. 500 307 32	GS 04M/P-220/55-06-S8 Part No. 500 307 33			
Switching	dark switching	●	●	●	●			
Mouth width	50mm	●						
	80mm		●					
	120mm			●				
	220mm				●			
Weight in g		60	80	100	160			

Remarks

- Versions with NPN switching output or other mouth width and depth on request.



GS 04

Forked photoelectric sensors

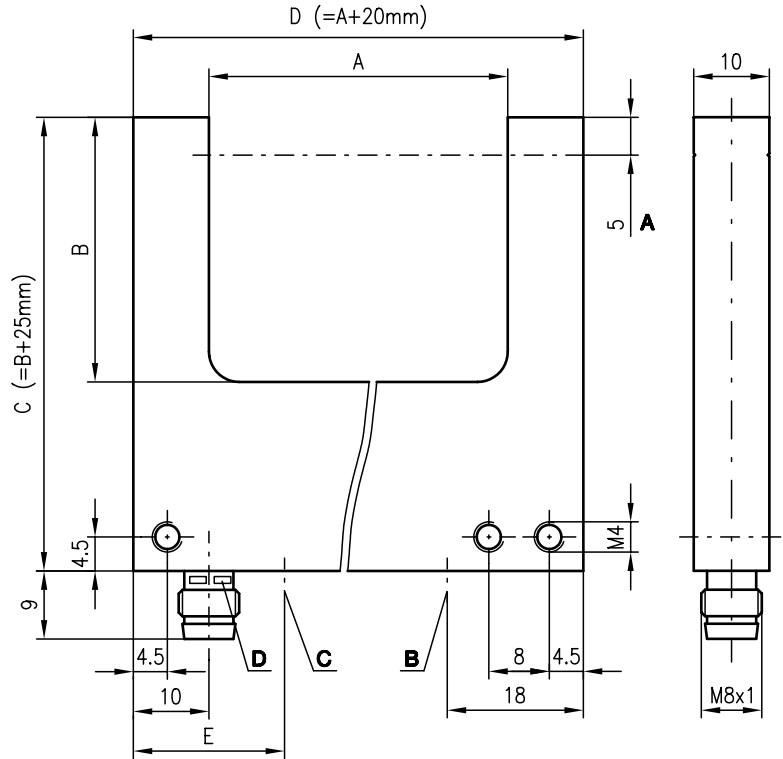


20mm

10 - 30 V
DC

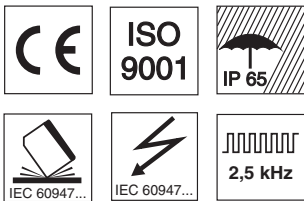
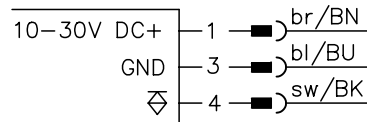
- Sensitivity adjustment and light/dark switching for optimal adaptation to the application
- Sensitivity adjustment on the back of the fork
- Robust metal housing and glass optics for protection against environmental influences
- Transmitter and receiver are installed in the same housing, therefore easy and fast mounting (excessive mounting brackets and extensive alignment not necessary)

Dimensioned drawing



- A** Optical axes
- B** Light/dark switching
- C** Sensitivity adjustment
- D** Indicator diode

Electrical connection



Accessories:

(available separately • see page 762)

- M8 connectors (KD ...)

We reserve the right to make changes • GS_a16e.fm



Specifications

Optical data

Mouth width	20mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	2500Hz
Response time	0.2ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	light/dark switching reversible
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	200mA
Sensitivity	adjustable

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	aluminium, anodised
Weight	35g
Optics cover	glass
Connection type	M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)

2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Resolution (smallest object)

Mouth width [mm]	Resolution [mm]
20	1

Diagrams

Order guide

Designation	Part No.
GS 04M/P-20/25-07-S8	500 33722

Remarks

- Versions with NPN switching output or other mouth width and depth on request.

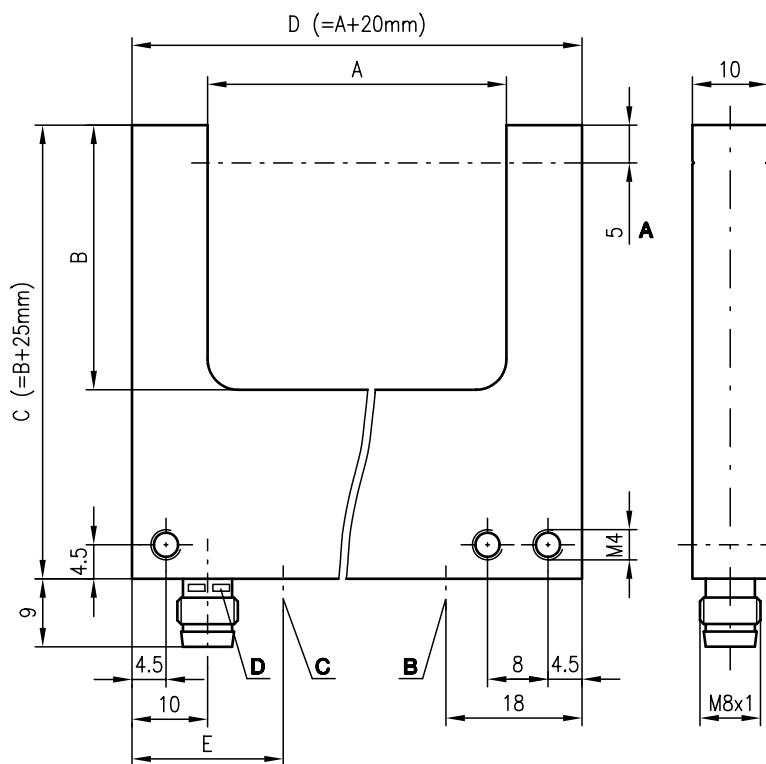


GS 04

Forked photoelectric sensors



Dimensioned drawing



- A Optical axis
- B Light/dark switching
- C Sensitivity adjustment
- D Indicator diode

	A Mouth width	B Mouth depth	C	D	E
GS 04M/P-30/35-...	30	35	60	50	18
GS 04M/P-50/55-...	50	55	80	70	20
GS 04M/P-80/55-...	80	55	80	100	20
GS 04M/P-120/55-...	120	55	80	140	20
GS 04M/P-220/55-...	220	55	80	240	20

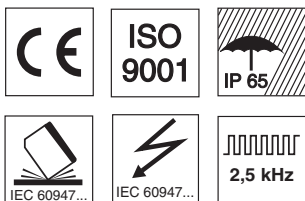
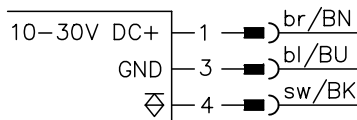


30/50/80/120/220 mm



- Sensitivity adjustment and light/dark switching for optimal adaptation to the application
- Sensitivity adjustment on the back of the fork
- Robust metal housing and glass optics for protection against environmental influences
- Transmitter and receiver are installed in the same housing, therefore easy and fast mounting (excessive mounting brackets and extensive alignment not necessary)

Electrical connection



Accessories:

(available separately • see page 762)

- M8 connectors (KD ...)

We reserve the right to make changes • GS_a07e.fm



Specifications

Optical data

Mouth width 30/50/80/120/220mm
 Light source LED (modulated light)
 Wavelength 880nm

Timing

Switching frequency 2500Hz
 Response time 0.2ms
 Delay before start-up ≤ 100ms

Electrical data

Operating voltage U_B ¹⁾ 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 30mA
 Switching output PNP transistor output
 Function characteristics light/dark switching reversible
 Signal voltage high/low ≥ ($U_B - 2V$) / ≤ 2V
 Output current 200mA
 Sensitivity adjustable

Indicators

LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Mechanical data

Housing aluminium, anodised
 Weight see order guide
 Optics cover glass
 Connection type M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -30°C ... +70°C
 Protective circuit ²⁾ 1, 2
 VDE safety class III
 Protection class IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Resolution (smallest object)

Mouth width [mm]	Resolution [mm]
30	1
50	1
80	1.5
120	1.5
220	2

Diagrams

Order guide

Selection table		Order code →						
Equipment ↓		GS 04M/P-30/35-07-S8 Part No. 500 81426	GS 04M/P-50/55-07-S8 Part No. 500 81427	GS 04M/P-80/55-07-S8 Part No. 500 81428	GS 04M/P-120/55-07-S8 Part No. 500 30892	GS 04M/P-220/55-07-S8 Part No. 500 30893		
Mouth width [mm]		30	50	80	120	220		
Weight in g		40	60	80	100	160		

Remarks

- Versions with NPN switching output or other mouth width and depth on request.



GS 04

Forked photoelectric sensors

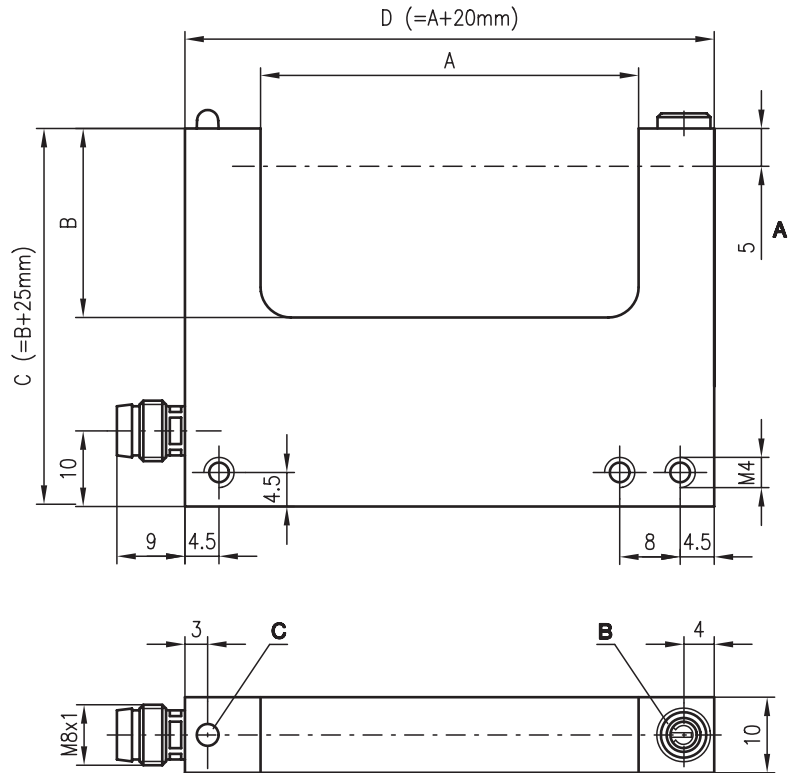


50mm

10 - 30 V
DC

- Sensitivity adjustment for optimal adaptation to the application
- Perfectly visible indicator LED for switching and operating status
- Robust metal housing and glass optics for protection against environmental influences
- Transmitter and receiver are installed in the same housing, therefore easy and fast mounting (excessive mounting brackets and extensive alignment not necessary)

Dimensioned drawing

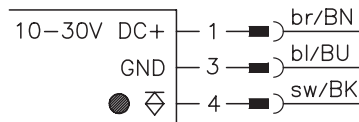


- A** Optical axis
- B** Sensitivity adjustment
- C** Indicator diode

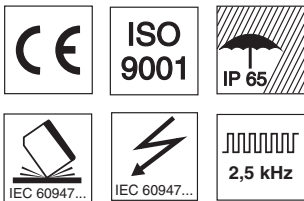
	A Mouth width	B Mouth depth	C	D
GS 04M/P-50/25-...	50	25	50	70

Electrical connection

GS 04M/P-...10...



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Accessories:

(available separately • see page 762)

- M8 connectors (KD ...)



Specifications

Optical data

Mouth width	50mm
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	2500Hz
Response time	0.2ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor output
Function characteristics	dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	200mA
Sensitivity	adjustable

Indicators

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	aluminium, anodised
Weight	60g
Optics cover	glass
Connection type	M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)

2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Resolution (smallest object)

Mouth width [mm]	Resolution [mm]
50	1

Diagrams

Order guide

Designation	Part No.
GS 04M/P-50/25-10-S8	500 81215

Remarks

- Versions with NPN switching output or other mouth width and depth on request.

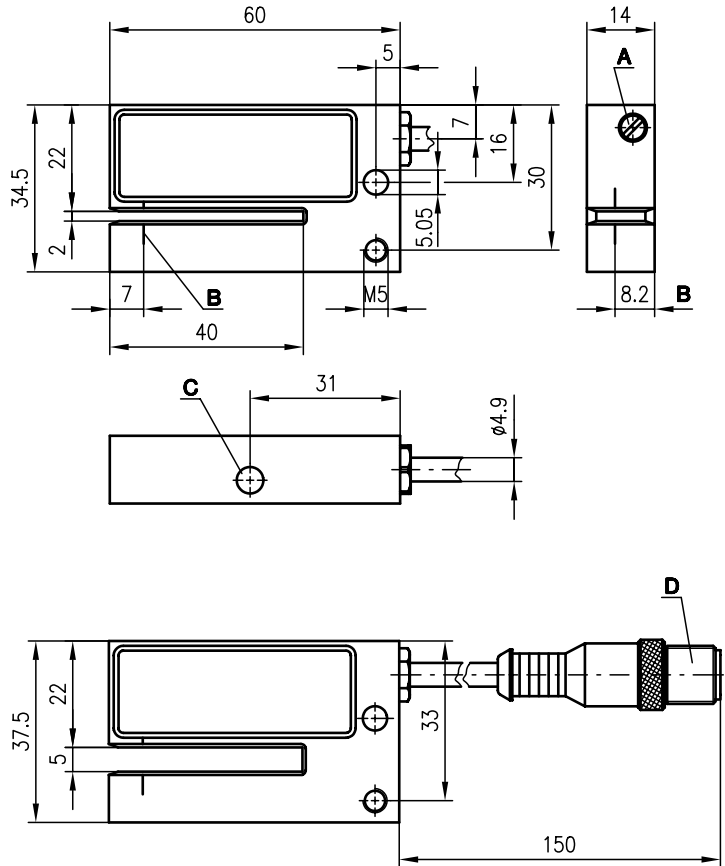


GS 05

Forked photoelectric sensors



Dimensioned drawing



- A Sensitivity adjustment
- B Optical axis
- C Indicator diode
- D Connector M12x1

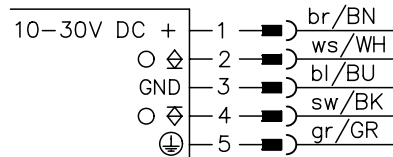


2mm

10 - 30 V
DC

- Fast amplifier with high switching frequency for detection of short events (e.g. gaps between labels)
- Universal application due to short circuit and polarity reversal protected PNP and NPN switching output
- Multiturn potentiometer for easy and exact sensitivity adjustment
- Robust aluminium housing with bevelled inlet edges, protection class IP 65
- Mounting holes and M12 connector for fast installation

Electrical connection



Accessories:



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Specifications

Optical data	
Mouth width	2mm
Timing	
Switching frequency	5000Hz
Response time	0.1ms
Delay before start-up	≤ 100ms
Electrical data	
Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	1 PNP transistor output 1 NPN transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	250mA
Sensitivity	adjustable with multiturn potentiometer
Indicators	
LED yellow	light path free
Mechanical data	
Housing	aluminium, anodised
Weight	125g
Connection type	cablE tail 150mm with M12 connector
Environmental data	
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Designation	Part No.
GS 05/24 G, 150 L	500 80846

Remarks



GS 05

Forked photoelectric sensors

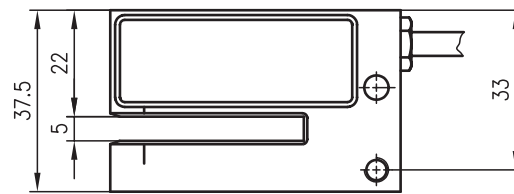
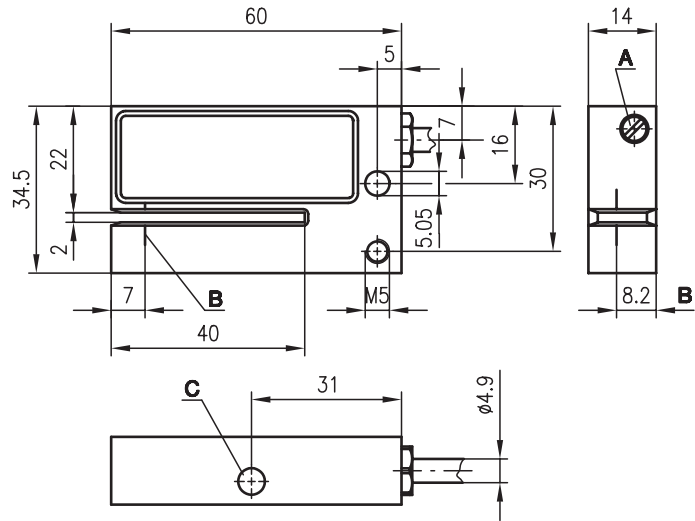


2mm
5mm

10 - 30 V
DC

- Fast amplifier with high switching frequency for detection of short events (e.g. gaps between labels)
- Universal application due to short circuit and polarity reversal protected PNP and NPN switching output
- Multiturn potentiometer for easy and exact sensitivity adjustment
- Robust aluminium housing with bevelled inlet edges, protection class IP 65
- Indicator diode displays the switching state

Dimensioned drawing

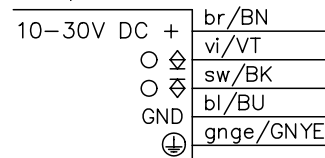


GS 05/24 G.1
GS 05/24 GD.1

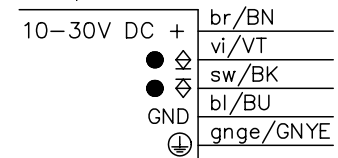
- A** Sensitivity adjustment
- B** Optical axis
- C** Indicator diode

Electrical connection

GS 05/24 G
GS 05/24 G.1



GS 05/24 GD
GS 05/24 GD.1



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Accessories:



Specifications

Optical data	
Mouth width	2mm or 5mm
Timing	
Switching frequency	5000Hz
Response time	0.1ms
Delay before start-up	≤ 100ms
Electrical data	
Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	1 PNP transistor output 1 NPN transistor output
Function characteristics	light/dark switching
Signal voltage high/low	$\geq (U_B - 2V) \leq 2V$
Output current	250mA
Sensitivity	adjustable with multitrans potentiometer
Indicators	
LED yellow	light path free
Mechanical data	
Housing	aluminium, anodised
Weight	120g
Connection type	cabl 2000mm (cross section 5x0.25mm ²)
Environmental data	
Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Selection table		Order code →						
Equipment ↓		GS 05/24 G Part No. 500 21435	GS 05/24 GD Part No. 500 21436	GS 05/24 G.1 Part No. 500 23112	GS 05/24 GD.1 Part No. 500 23114			
Switching	light switching	●		●				
	dark switching		●		●			
Mouth width	2mm	●	●					
	5mm			●	●			

Remarks



GS 05

Forked photoelectric sensors

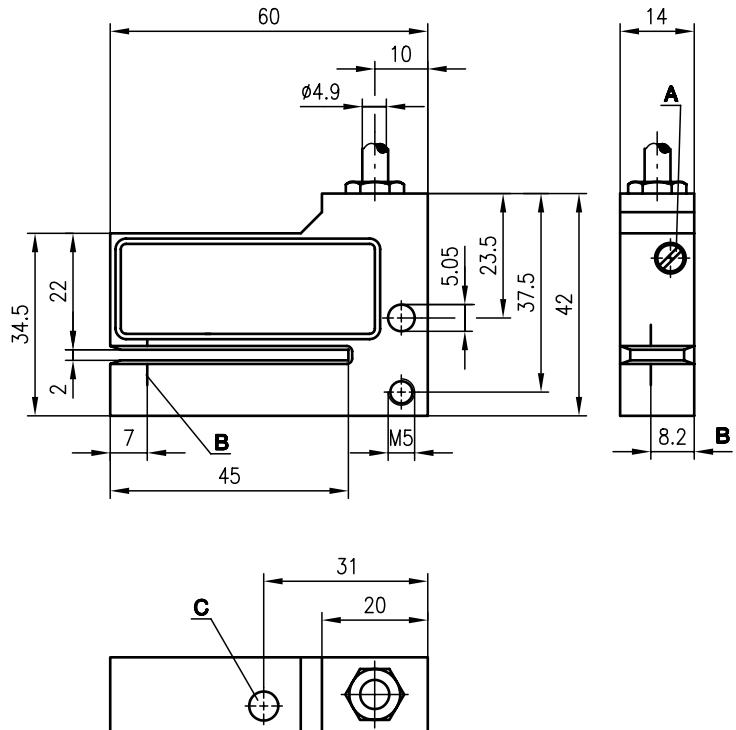


2mm

10 - 30 V
DC

- Fast amplifier with high switching frequency for detection of short events (e.g. gaps between labels)
- Universal application due to short circuit and polarity reversal protected PNP and NPN switching output
- Multiturn potentiometer for easy and exact sensitivity adjustment
- Robust aluminium housing with bevelled inlet edges, protection class IP 65
- Indicator diode displays the switching state

Dimensioned drawing



- A** Sensitivity adjustment
- B** Optical axis
- C** Indicator diode

Electrical connection

10-30V DC +	br/BN
●	vi/VT
●	sw/BK
●	bl/BU
GND	gnge/GNYE

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Accessories:



Specifications

Optical data	
Mouth width	2mm
Timing	
Switching frequency	5000Hz
Response time	0.1ms
Delay before start-up	≤ 100ms
Electrical data	
Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	1 PNP transistor output 1 NPN transistor output
Function characteristics	dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	250mA
Sensitivity	adjustable with multiturn potentiometer
Indicators	
LED yellow	light path free
Mechanical data	
Housing	aluminium, anodised
Weight	125g
Connection type	cabl 2000mm (cross section 5x0.25mm ²)
Environmental data	
Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Designation	Part No.
GS 05/24 GD.2	500 80003

Remarks



GS 10

Forked photoelectric sensors

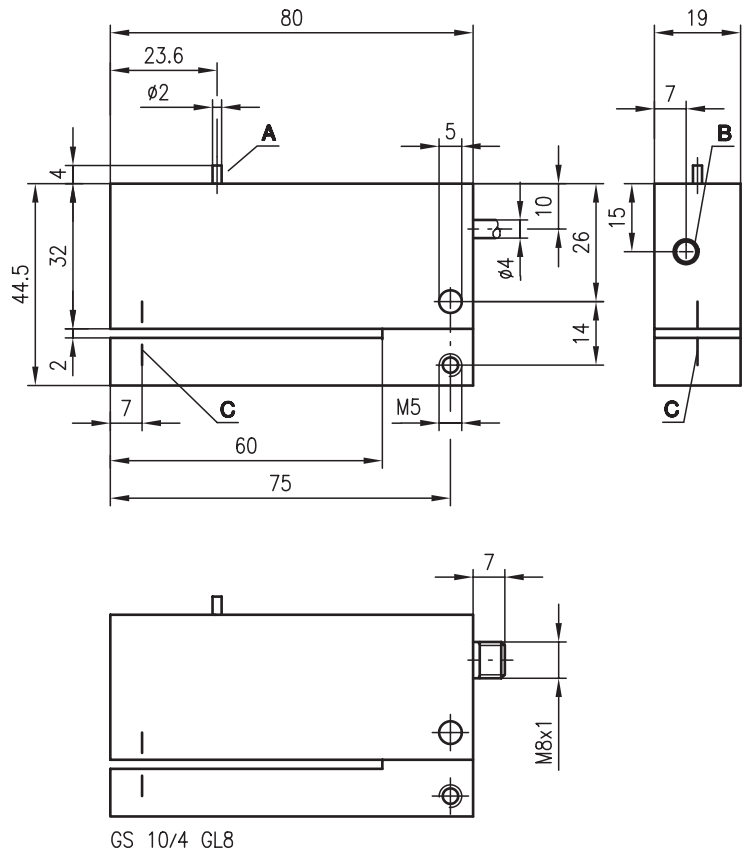


2mm

10 - 30 V
DC

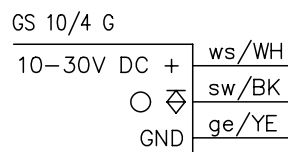
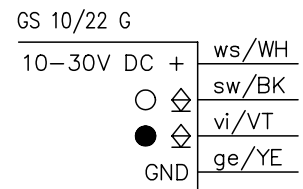
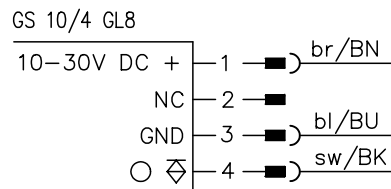
- Fast amplifier with high switching frequency for detection of short events (e.g. gaps between labels)
- Universal application due to short circuit and polarity reversal protected PNP or NPN switching output
- Robust aluminium housing with bevelled inlet edges
- Indicator diode with large viewing area displays the switching state
- Easy calibration with calibration button for optimum sensitivity adjustment

Dimensioned drawing



- A Calibration button
- B Indicator diode
- C Optical axis

Electrical connection



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Accessories:

(available separately • see page 762)

- Ready-made cables (KB ...)
- M8 connectors (KD ...)



Specifications

Optical data

Mouth width 2mm

Timing

Switching frequency 1000Hz
Response time 0.5ms

Electrical data

Operating voltage U_B ¹⁾ 10 ... 30VDC (incl. residual ripple)
Residual ripple $\leq 15\%$ of U_B
Bias current ≤ 50 mA
Switching output 1 PNP transistor output, light switching or
2 NPN transistor outputs, light/dark switching
Signal voltage high/low $\geq (U_B - 2V) \leq 2V$
Output current 100mA
Sensitivity adjustable by pressing the calibration button

Indicators

LED red light path free

Mechanical data

Housing aluminium, anodised
Weight 120g connector version
170g cable version
Connection type cable 2000mm (cross section 4x0.25mm²)
cable 2000mm (cross section 3x0.25mm²) or
M8 connector, 3-pin

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C / -30°C ... +70°C
Protective circuit ²⁾ 1, 2
VDE safety class III
Protection class IP 40

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)

2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Selection table		Order code →						
Equipment ↓		GS 10/22 G Part No. 500 17880	GS 10/4 G Part No. 500 13637	GS 10/4 GL8 Part No. 500 21319				
Switching output	1 PNP		●	●				
	2 NPN	●						
Connection	M8 connector			●				
	3-wire cable		●					
	4-wire cable	●						
Switching	light switching		●	●				
	light/dark switching	●						

Remarks

- The sensitivity of the device is set by placing the material with the attached labels in the light beam and pressing the calibration button.
- Setup by untrained personnel possible when changing labels.
- The set value of the sensitivity is retained when the operating voltage is switched off.

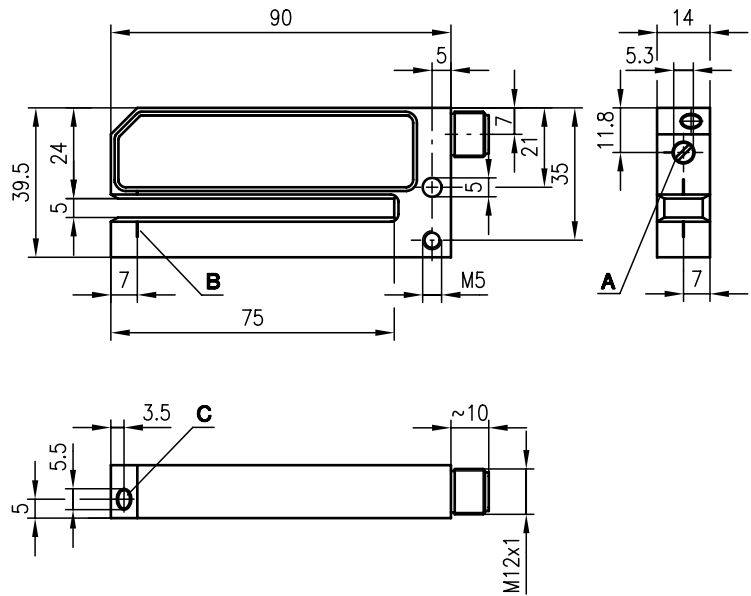


GS 12

Forked photoelectric sensors



Dimensioned drawing



- A Sensitivity adjustment
- B Optical axis
- C Indicator diode

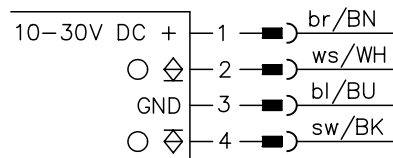


5mm



- Fast amplifier with high switching frequency for detection of short events (e.g. gaps between labels)
- Universal application due to short-circuit and polarity reversal protected PNP and NPN switching output, with M12 connector
- Robust aluminium housing with bevelled inlet edges, protection class IP 65
- Indicator diode with large viewing area displays the switching state

Electrical connection



Accessories:

(available separately • see page 762)

- M12 connectors (KD ...)



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Specifications

Optical data	
Mouth width	5mm
Timing	
Switching frequency	5000Hz
Response time	0.1ms
Delay before start-up	≤ 200ms
Electrical data	
Operating voltage U_B ¹⁾	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	1 PNP transistor output 1 NPN transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	250mA
Sensitivity	range selection using 3-turn potentiometer
Indicators	
LED yellow	light path free
Mechanical data	
Housing	aluminium, anodised
Weight	120g
Connection type	M12 connector
Environmental data	
Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

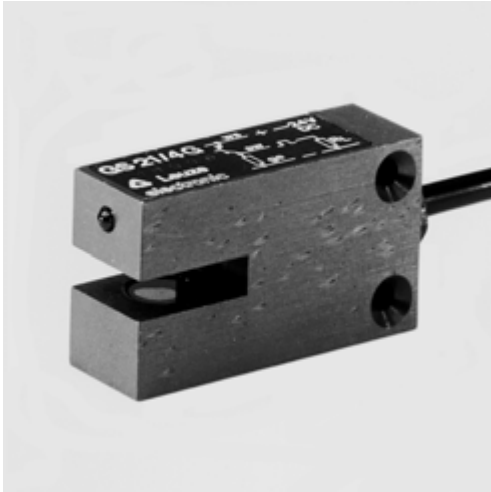
Designation	Part No.
GS 12/24 GL	500 22724

Remarks



GS 21

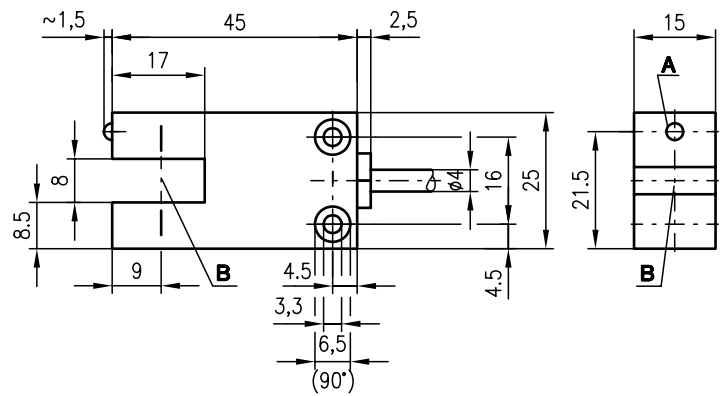
Forked photoelectric sensors



Dimensioned drawing



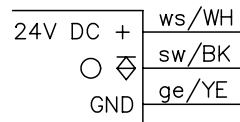
8mm



- A Indicator diode
- B Optical axis

- GaAs top photoelectric sensor in constant light operation with gallium arsenide transmitter diode ensures a long lifetime
- Fast amplifier with high switching frequency for detection of short events (e.g. gaps between labels)
- Transistor output - separate switching amplifier not required
- Insensitive to interference due to low impedance output
- Indicator diode displays the switching state

Electrical connection



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Accessories:



Specifications

Optical data	
Mouth width	8mm
Timing	
Switching frequency	1000Hz
Response time	0.5ms
Electrical data	
Operating voltage U_B ¹⁾	24VDC, filtered $\pm 10\%$
Residual ripple	$\leq 15\%$ of U_B
Bias current	$\leq 90\text{mA}$
Switching output	1 PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2\text{V}) / \leq 2\text{V}$
Output current	100mA
Indicators	
LED red	light path free
Mechanical data	
Housing	aluminium, anodised
Weight	120g
Connection type	cable 5000mm (cross section 3x0.25mm ²)
Environmental data	
Ambient temp. (operation/storage)	-20°C ... +60°C / -30°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65

1) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Designation	Part No.
GS 21/4 G	500 13967

Remarks

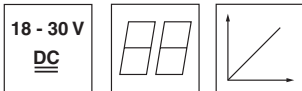


GS 754

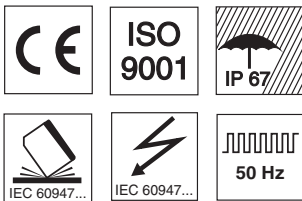
Forked photoelectric CCD sensors



29mm



- CCD line array sensor with 25mm measurement range
- Analogue, digital or serial interfaces
- Measurement range and mode adjustable
- Teach-in function
- Detection of multiple objects

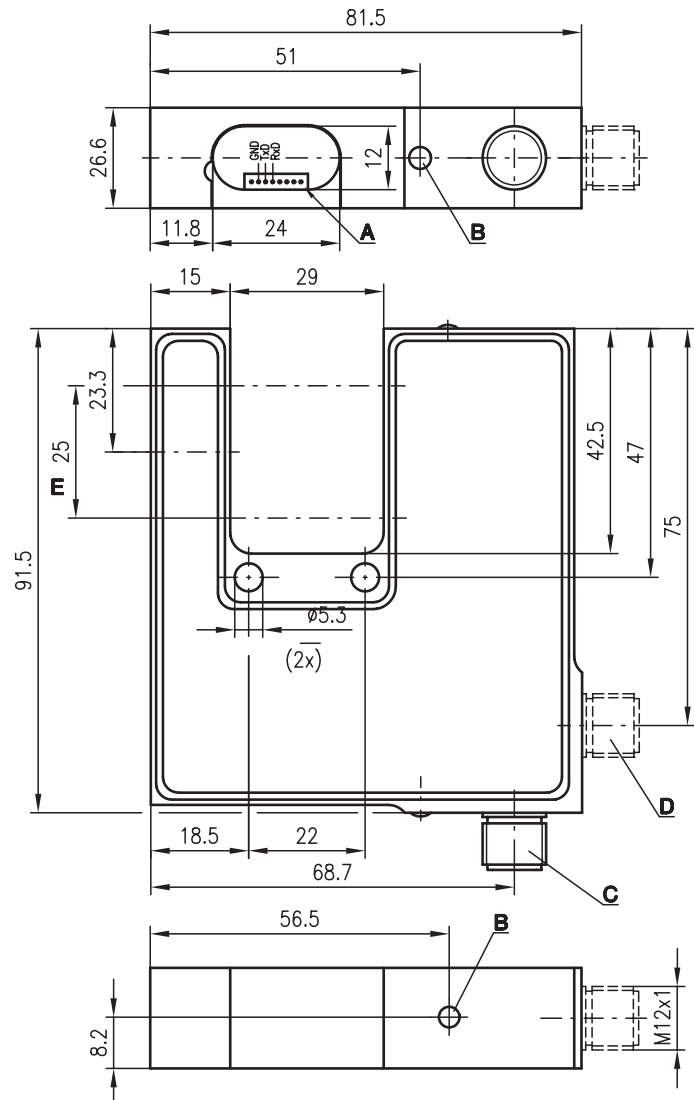


Accessories:

(available separately • see page 762)

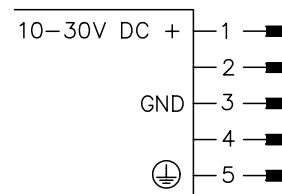
- M12 connectors (KD ...)
- Programming cable for PC (KB-ODS 96-1500, Part No. 500 82007)

Dimensioned drawing



- A Interface
- B Indicator diode
- C Lateral connector
- D Rear connector
- E Optical detection area

Electrical connection



	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5
RS 232	+	I/O	GND	TxD	Earth
RS 422	+	Tx-	GND	Tx+	Earth
Bus	+	Bus L	GND	Bus H	Earth
analogue voltage	+	I/O	GND	analogue	Earth
analogue current	+	I/O	GND	analogue	Earth

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Specifications

Optical data

Mouth width	29mm
Mouth depth	42mm
Measurement field (M)	25mm
Minimum object diameter	0.5mm
Object position	random (see remarks)
Resolution ¹⁾	a: 0.1mm (mode 1 ... 5) b: 0.014mm (mode 7)
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	max. 50Hz
Response time	min. 10ms
Output cycle	0.02 ... 3.00sec
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U_B ²⁾	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 150mA

Output versions

Active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7kΩ ± 10%
Output current	max. 100mA per transistor output
Analogue output current	1 output 0 ... 20mA (R_L ≤ 500Ω)
Analogue output voltage	1 output 0 ... 10V (R_L ≥ 2kΩ)
Serial interface	RS 232/RS 422/RS 485
Teaching input	max. 1 input reversible
Warning output	max. 1 output reversible

Indicators

LED green continuous light	ready
LED green flashing	fault

Mechanical data

Housing	aluminium, anodised
Weight	260g
Optics cover	plexiglass
Connection type	M 12 connector, 5-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) System resolution, i.e. smallest practical value for the last digit of the display

2) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)

3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Selection table		GS 754MD-29/42-101-S12 Part No. 500 82106	GS 754MD-29/42-102-S12 Part No. 500 33063	GS 754MD-29/42-201-S12 Part No. 500 31588	GS 754MD-29/42-202-S12 Part No. 500 33067	GS 754MV-29/42-501-S12 Part No. 500 61397	GS 754MV-29/42-502-S12 Part No. 500 61398	GS 754MV-29/42-601-S12 Part No. 500 60892	GS 754MV-29/42-602-S12 Part No. 500 61399	GS 754MV-29/42-511-S12 Part No. 500 33068	GS 754MV-29/42-512-S12 Part No. 500 33069	GS 754MV-29/42-611-S12 Part No. 500 33070	GS 754MV-29/42-612-S12 Part No. 500 33071
Order code →													
Equipment ↓													
Connector location	lateral	●		●		●		●		●		●	
	at the back		●		●		●		●		●		●
Output versions	RS 232	●	●										
	RS 422/RS 485			●	●								
	analogue voltage					●	●			●	●		
	analogue current							●	●			●	●
Assignment Pin #2	teaching input									●	●	●	●
	PNP output	●	●			●	●	●	●				

Remarks

- Functional earth must be connected.
- Sources of extraneous light must not radiate on the receiver from the front.
- Objects ≤ 1mm should be scanned in front of the receiver.

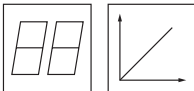


GS 754

Forked photoelectric CCD sensors



100mm



- CCD line array sensor with 25mm measurement range
- Analogue, digital or serial interfaces
- Measurement range and measurement mode adjustable
- Teach-in function
- Detection of multiple objects

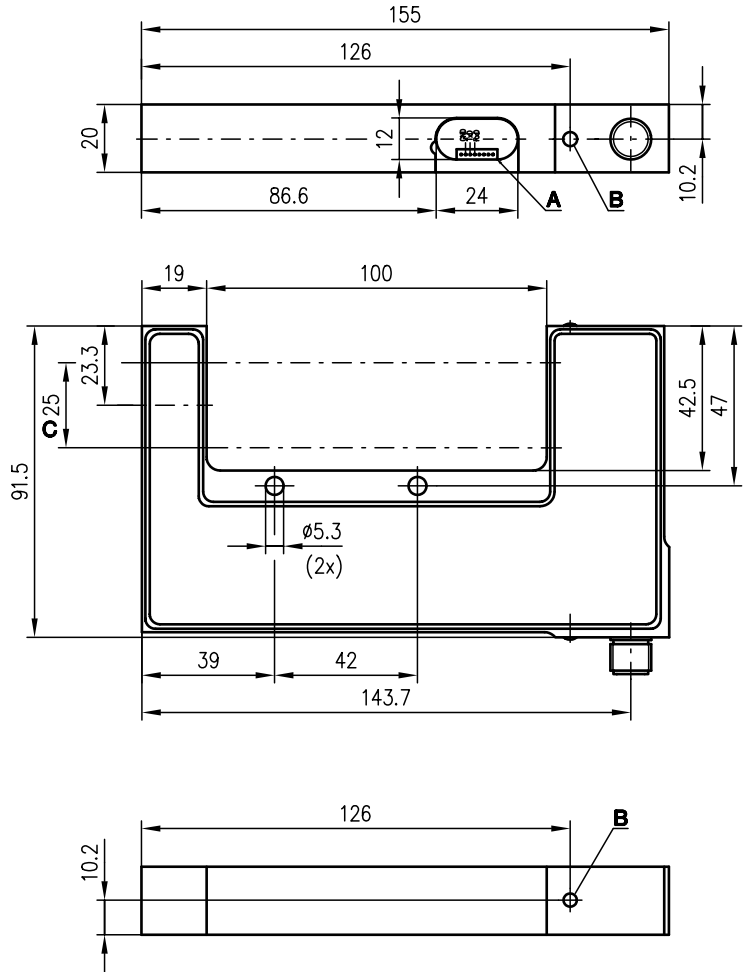


Accessories:

(available separately • see page 762)

- M12 connectors (KD ...)
- Programming cable for PC (KB-ODS 96-1500, Part No. 500 82007)

Dimensioned drawing



- A Interface
- B Indicator diode
- C Optical detection area

Electrical connection

GS 754M/D-100/42-102-S12

18-30V DC +	1	ws/WH
O1: fault	2	br/BN
GND	3	gn/GN
Tx +	4	ge/YE
Tx -	5	gr/GR
Tx D	6	rs/PK
Rx D	7	bl/BU
	8	rt/RD

GS 754M/V-100/42-502-S12

GS 754M/V-100/42-602-S12

18-30V DC +	1	ws/WH
I1: teach in	2	br/BN
GND	3	gn/GN
A2: diameter	4	ge/YE
A1: edge	5	gr/GR
O3: fault	6	rs/PK
O2: fault	7	bl/BU
	8	rt/RD

We reserve the right to make changes • GS_a03e.fm



Specifications

Optical data

Mouth width	100mm
Mouth depth	42mm
Measurement field (M)	25mm
Minimum object diameter	0.5mm
Object position	random (see remarks)
Resolution ¹⁾	a: 0.1mm (mode 1 ... 5) b: 0.014mm (mode 7)
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	max. 50Hz
Response time	min. 10ms
Output cycle	0.02 ... 3.00sec
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U_B ²⁾	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 150mA

Output versions

active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7kΩ ± 10%
Output current	max. 100mA per transistor output
Analogue output current	2 output 0 ... 20mA ($R_L \leq 500\Omega$)
Analogue output voltage	2 outputs 0 ... 10V ($R_L \leq 2k\Omega$)
Serial interface	RS 232/RS 422/RS 485
Inputs	max. 3 inputs
Outputs	max. 3 outputs

Indicators

LED green continuous light	ready
LED green flashing	fault

Mechanical data

Housing	aluminium, anodised
Weight	260g
Optics cover	plexiglass
Connection type	M 12 connector, 8-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class	III
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) System resolution, i.e. smallest practical value for the last digit of the display

2) Functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)

3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

Selection table		GS 754M/D-100/42-102-S12 Part No. 500 35947	GS 754M/V-100/42-502-S12 Part No. 500 35474	GS 754M/V-100/42-602-S12 Part No. 500 35948				
Order code →								
Equipment ↓								
Connector location	at the back	●	●	●				
Output versions	RS 232	●						
	RS 422/RS 485	●						
	1xAnalogue voltage							
	2xAnalogue voltage		●					
Assignment Pin #2	2xanalogue current			●				
	1xInput		●	●				
	1xOutput	●						
	2xOutput		●	●				
	3xOutput							

Remarks

- Functional earth must be connected.
- Sources of extraneous light must not radiate on the receiver from the front.
- Objects ≤ 1mm should be scanned in front of the receiver.



GSU 14/24

Ultrasonic Label Fork

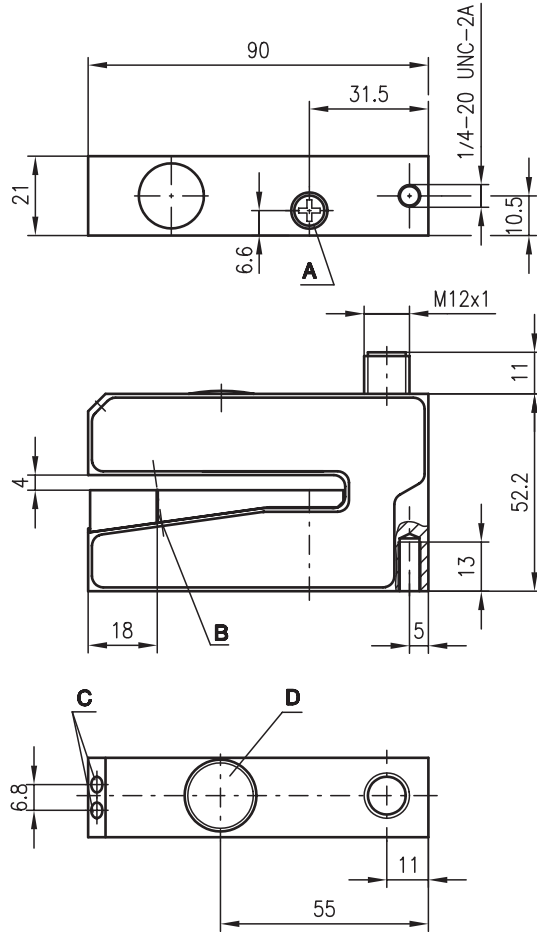


4mm



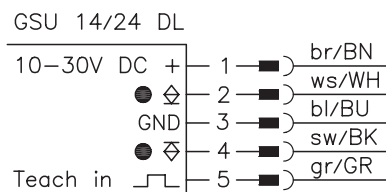
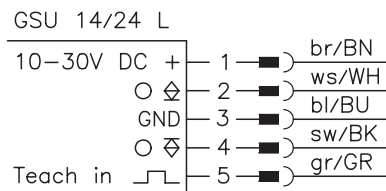
- Forked sensor for reliable detection of:
 - foil labels on foil carrier
 - foil labels on paper carrier
 - paper labels on paper carrier
 - metallised foil labels
 - thin metal foils
- Simple adjustment via teach-in by pressing a button or remote calibration
- Static PNP and NPN transistor outputs for optimum adaptation to the controller
- Robust metal housing with bevelled inlet edges and M12 connector

Dimensioned drawing



- A The support table can be removed and cleaned after loosening the screw
- B Sensor marker
- C Indicator diode
- D Teach-in button

Electrical connection



We reserve the right to make changes • GS_a01e.fm



Accessories:

(available separately • see page 762)

- M12 connectors (KD ...)



Specifications

Physical data

Mouth width	4mm
Mouth depth	67mm
Label length	≥ 2mm
Label spacing	≥ 2mm
Band speed	≤ 2m/s (120m/min)
Repeatability ¹⁾	± 0.2mm
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 60mA
Switching outputs	PNP and NPN transistor output
Function characteristics	light or dark switching
Signal voltage high/low	≥ (U _B -2V) ≤ 2V
Output current	200mA

Indicators

LED green	ready
LED green flashing	teach-in activated
LED yellow	switching point in the label gap

Mechanical data

Housing	aluminium, anodised
Colour	red/black
Weight	300g
Connection type	M12 connector, 5-pin

Environmental data

Ambient temp. (operation/storage)	0°C ... +60°C/-40°C ... +70°C
Protective circuit ²⁾	1, 2
VDE safety class	III
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Teach-in input	
active/not active	≥ 8V/≤ 2V
Activation/disable delay	≤ 0.2ms
Input resistance	10kΩ

1) material dependent

2) 1=polarity reversal protection, 2=short-circuit protection for all outputs

Order guide

	Designation	Part No.
light switching (signal in the label gap)	GSU 14/24 L	500 61406
dark switching (signal on the label)	GSU 14/24 DL	500 37974

Remarks

Function

Manual teach-in

1. Insert label band at the correct position (band's center at sensor's marker).
2. The button on the device is pressed to teach - green LED flashes.
3. Label band advances so that 2 - 3 label gaps pass through the measuring zone.
4. The button is then pressed again. The green LED illuminates continuously. The teaching process is concluded.

Function

Remote teach-in

1. Insert label band at the correct position (band's center at sensor's marker).
2. Apply voltage at "Teach in" control input. Teach-in is activated.
3. Advance 2 - 3 label gaps through the sensor.
4. Disconnect voltage.

Measurement values are stored. Teach-in ends after 100ms.

- To achieve high repeatability, the label band must be slightly under tension.
- The label band's center should be positioned above the sensor's marker (see also there).

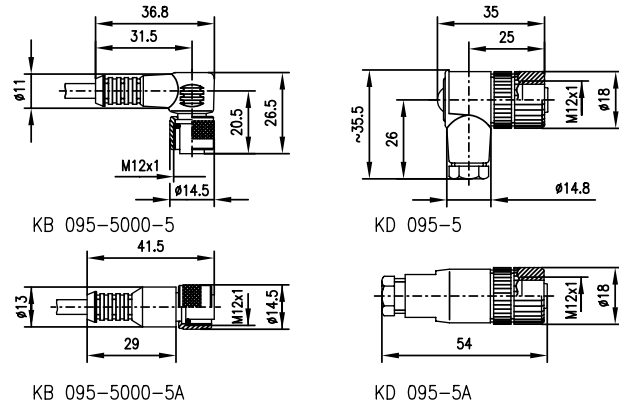
M12 connectors



For devices with M12 connectors, there are available: connectors with ready-made cable and connectors with screw connection.

Protection class (DIN 40050) plugged and screwed: IP 67

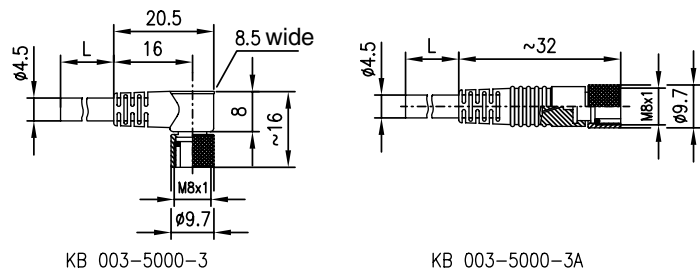
Dimensioned drawings



Selection table

M12 connectors			
 with 3-pin cable (5m)		 without cable 5-pin	
KB 418-5000-3 Part No. 500 23545	KB 418-5000-3A Part No. 500 23544	KD 095-5 Part No. 500 20502	KD 095-5A Part No. 500 20501
with 5-pin cable (5m)			
KB 095-5000-5 Part No. 500 20500	KB 095-5000-5A Part No. 500 20499		
with 8-pin cable (2m)			
KB 448-2000-5A Part No. 500 32411			
with 8-pin cable (5m)			
KB 448-5000-8A Part No. 500 33061			

Dimensioned drawings



Selection table

M8 connectors	
 with 3-pin cable (5m)	
KB 003-5000-3 Part No. 500 81179	KB 003-5000-3A Part No. 500 81180

M8 connectors



For devices with M8 connectors, 2 connectors with ready-made 5m cable are available.

Protection class (DIN 40050) plugged and screwed: IP 67

Additional information in section "Accessories" from page 925 onwards!

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Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index



USDS - Ultrasonic distance sensors

Overview and advantages

- Distance measurement using the ultrasonic principle
- Measurement ranges from 50mm to 6000mm

Distance information nearly independent of surface properties

- Outputs:
- 2 switching outputs
 - Analogue current output

- Operating principles:
- HRTU models with background suppression
 - VRTU models with foreground suppression and background suppression

HRTU 418M/V... and VRTU 430M/V... models can be configured via PC-software and programming terminal

M18 or M30 housings





Operating principle	Designation	Operating range	Housing	Measurement principle	Operating voltage	Switching		Output	
						Analogue output 4 ... 20mA	2nd switching output	PNP transistor	NPN transistor
	HRTU 418M/P-5010-300-S12	50 ... 300mm	• Metal	• Ultrasonics	• 20 ... 30VDC			•	
	HRTU 418M/P-3010-1000-S12	150 ... 1000mm	•	•	•			•	
	HRTU 418M/V-5010-300-S12	50 ... 300mm	•	•	•	•			
	HRTU 418M/V-3010-1000-S12	150 ... 1000mm	•	•	•	•			
	VRTU 430M/P-5110-300-S12	60 ... 300mm	•	•	•		•		•
	VRTU 430M/P-3110-1300-S12	200 ... 1300mm	•	•	•		•		•
	VRTU 430M/V-5710-300-S12	60 ... 300mm	•	•	•	•			•
	VRTU 430M/V-3710-1300-S12	200 ... 1300mm	•	•	•	•			•
	VRTU 430M/P-2110-3000-S12	400 ... 3000mm	•	•	•		•		•
	VRTU 430M/V-2710-3000-S12	400 ... 3000mm	•	•	•	•			•
	VRTU 430M/P-1110-6000-S12	600 ... 6000mm	•	•	•		•		•
	VRTU 430M/V-1710-6000-S12	600 ... 6000mm	•	•	•	•	•		•



Connection		Switching frequency	Options							Page
Cable	M12 connector		Teachable switching outputs	Parameterisation possible	Synchronisation input	Background suppression	Foreground suppression	Operating range adjustment	Transparent media	
	•	5Hz		•	•	•		•	•	769
	•	4Hz		•	•	•		•	•	769
	•	5Hz		•	•	•		•	•	771
	•	4Hz		•	•	•		•	•	771
	•	8Hz		•	•	•	•	•	•	773
	•	4Hz		•	•	•	•	•	•	773
	•	8Hz		•	•	•	•	•	•	775
	•	4Hz		•	•	•	•	•	•	775
	•	2Hz		•	•	•	•	•	•	777
	•	2Hz		•	•	•	•	•	•	779
	•	1Hz		•	•	•	•	•	•	781
	•	1Hz		•	•	•	•	•	•	783

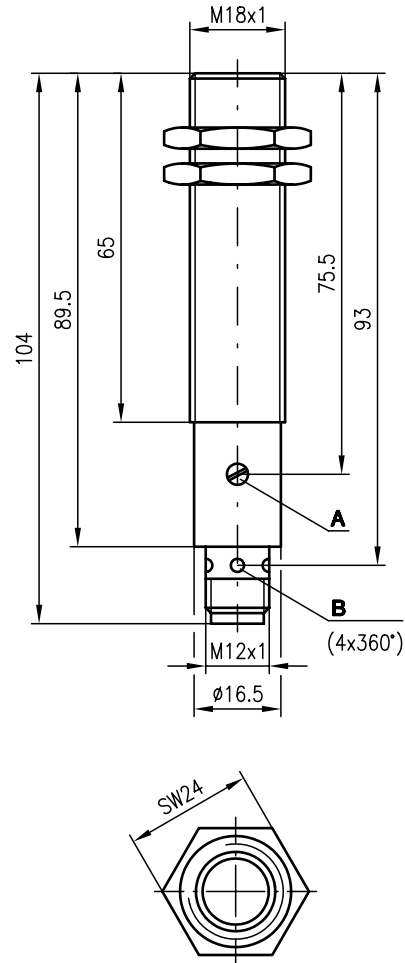


HRTU 418

Ultrasonic distance sensors



Dimensioned drawing



- A End of switching range (only for ... 418M/P ...)
- B Indicator diodes Q1

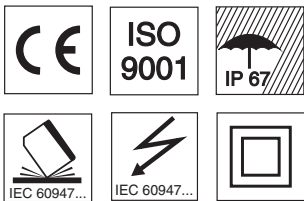
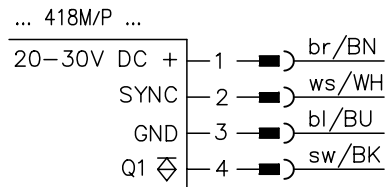


50 ... 300mm
150 ... 1000mm



- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

We reserve the right to make changes • USDS_01e.fm



Specifications

	HRTU...-5010-300...	HRTU...-3010-1000...
Ultrasonic specifications		
Operating range ¹⁾	50 ... 300mm	150 ... 1000mm
Ultrasonic frequency	400kHz	200kHz
Opening angle	6°	
Resolution	1 mm	
Absolute measurement accuracy	± 2.5% of the measurement range	
Reproducibility	± 1mm	± 2mm
Timing		
Switching frequency	5Hz	4Hz
Response time	100ms	120ms
Delay before start-up	280ms	280ms
Switching hysteresis	10mm	10mm
Electrical data		
Operating voltage U _B	20 ... 30V DC (incl. ± 10% residual ripple)	
Residual ripple	± 10% of U _B	
Bias current	≤ 60mA	
Switching output	PNP transistor	
Function characteristics	switching in case of object recognition	
Output current	150mA	
Switching range adjustment	potentiometer 270°	
Indicators		
LED yellow	output activated	
Mechanical data		
Housing	metal/CuZn	
Weight	50g	
Connection type	M12 connector, plastic, 4-pin	
Environmental data		
Ambient temp. (operation/storage)	-25°C ... +70°C/-40°C ... +85°C	
Protective circuit ²⁾	1, 2, 3	
VDE safety class ³⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	
Fitting position	any	
Explosion protection	ex zone 2/zone 11/temperature class T5	

- 1) For the complete temperature range, measured object ≥ 10x10mm²
 2) 1=short-circuit and overload protection, 2=polarity reversal protection (not for analogue inputs),
 3=wire break and inductive protection
 3) Rating voltage 250VAC

Tables

Diagrams

Order guide

Designation	Part No.
HRTU 418M/P-5010-300-S12	500 36257
HRTU 418M/P-3010-1000-S12	500 36258

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

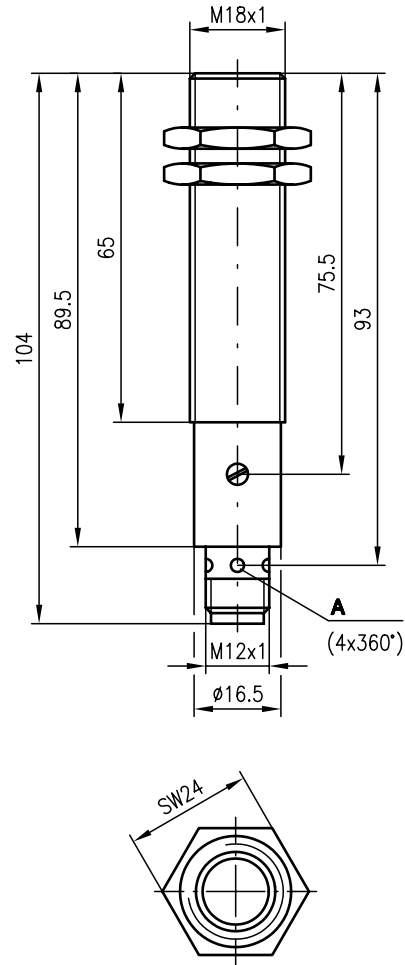


HRTU 418

Ultrasonic distance sensors



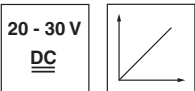
Dimensioned drawing



A Indicator diodes Q1

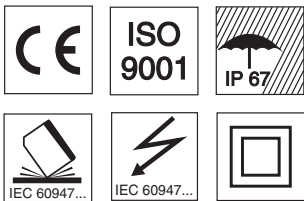


50 ... 300 mm
150 ... 1000 mm



- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

... 418M/V ...	
20-30V DC +	1 —■) br/BN
SYNC	2 —■) ws/WH
GND	3 —■) bl/BU
4-20mA	4 —■) sw/BK

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Specifications

Ultrasonic specifications

	HRTU...-5010-300...	HRTU...-3010-1000...
Operating range ¹⁾	50 ... 300mm	150 ... 1000mm
Ultrasonic frequency	400kHz	200kHz
Opening angle	6°	
Resolution	1 mm	
Absolute measurement accuracy	± 2.5% of the measurement range	
Reproducibility	± 1mm	± 2mm

Timing

	HRTU...-5010-300...	HRTU...-3010-1000...
Switching frequency	5Hz	4Hz
Response time	100ms	120ms
Delay before start-up	280ms	280ms
Switching hysteresis	10mm	10mm

Electrical data

Operating voltage U_B	20 ... 30VDC (incl. ± 10% residual ripple)
Residual ripple	± 10% of U_B
Bias current	≤ 60mA
Switching output	analogue
Output current	4 ... 20 mA
Analogue output	R_{L0} ... 300Ω
Characteristic curve	ascending

Indicators

LED yellow	output activated
------------	------------------

Mechanical data

Housing	metal/CuZn
Weight	50g
Connection type	M12 connector, plastic, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +70°C/-40°C ... +85°C
Protective circuit ²⁾	1, 2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2
Fitting position	any
Explosion protection	ex zone 2/zone 11/temperature class T5

1) For the complete temperature range, measured object $\geq 10 \times 10 \text{mm}^2$

2) 1=short-circuit and overload protection, 2=no polarity reversal protection, 3=wire break and inductive protection

3) Rating voltage 250 VAC

Order guide

Designation	Part No.
HRTU 418M/V-5010-300-S12	500 36259
HRTU 418M/V-3010-1000-S12	500 36260

Tables

Diagrams

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

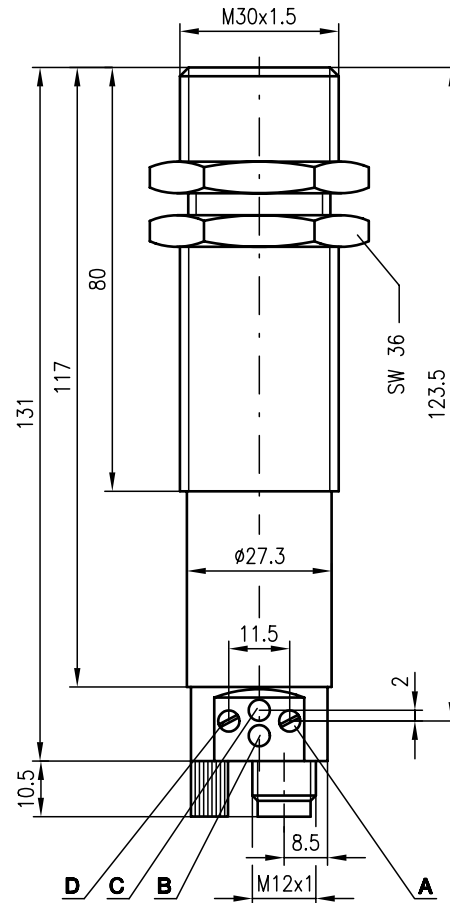


VRTU 430

Ultrasonic distance sensors



Dimensioned drawing



- A End of switching range
- B Indicator diode Q2 only for ... 430M/P ...
- C Indicator diode Q1
- D Start of switching range

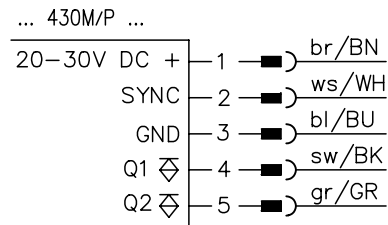


60 ... 300 mm
200 ... 1300 mm



- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

We reserve the right to make changes • USDS_05e.fm



Specifications

Ultrasonic specifications

	VRTU...-5110-300...	VRTU...-3110-1300...
Operating range ¹⁾	60 ... 300mm	200 ... 1300mm
Ultrasonic frequency	400kHz	200kHz
Opening angle	6°	
Resolution	≤ 1mm	≥ 1mm
Absolute measurement accuracy	± 1.5% of the measurement range	
Reproducibility	± 0.45mm	± 2mm

Timing

	VRTU...-5110-300...	VRTU...-3110-1300...
Switching frequency	8Hz	4Hz
Response time	80ms	110ms
Delay before start-up	280ms	280ms
Switching hysteresis	10mm	10mm

Electrical data

Operating voltage U_B	20 ... 30VDC (incl. ± 10% residual ripple)
Residual ripple	± 10% of U_B
Bias current	≤ 50mA (without load)
Switching output	2 PNP transistors
Function characteristics	switching in case of object recognition
Output current	300mA
Switching range adjustment	potentiometer 270°

Indicators

LED yellow	output activated
LED yellow flashing	programming error

Mechanical data

Housing	metal/CuZn
Weight	210g
Connection type	M12 connector, plastic, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +70°C/-40°C ... +85°C
Protective circuit ²⁾	1, 2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2
Fitting position	any
Explosion protection	ex zone 2/zone 11/temperature class T5

1) For the complete temperature range, measured object $\geq 10 \times 10 \text{mm}^2$

2) 1=short-circuit and overload protection, 2=polarity reversal protection, 3=wire break and inductive protection

3) Rating voltage 250 VAC

Tables

Diagrams

Order guide

Designation	Part No.
VRTU 430M/P-5110-300-S12	500 36261
VRTU 430M/P-3110-1300-S12	500 36262

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

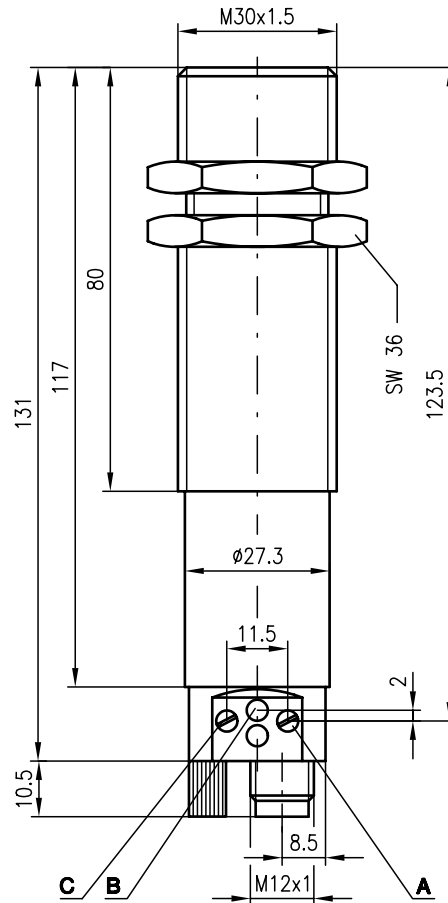


VRTU 430

Ultrasonic distance sensors



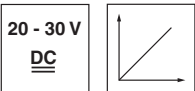
Dimensioned drawing



- A End of switching range
- B Indicator diode Q1
- C Start of switching range

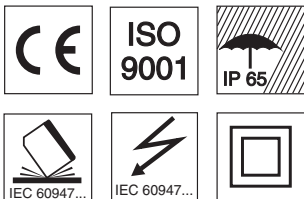
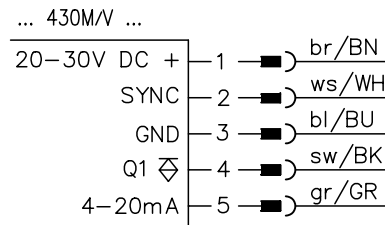


60 ... 300 mm
200 ... 1300 mm



- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- Analogue current output, 1 switching output
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

We reserve the right to make changes • USDS_03e.fm



Specifications

Ultrasonic specifications

	VRTU...-5710-300...	VRTU...-3710-1300...
Operating range ¹⁾	60 ... 300mm	200 ... 1300mm
Ultrasonic frequency	400kHz	200kHz
Opening angle	6°	
Resolution	≤ 1mm	≥ 1mm
Absolute measurement accuracy	± 1.5% of the measurement range	
Reproducibility	± 0.45mm	± 2mm

Timing

	VRTU...-5710-300...	VRTU...-3710-1300...
Switching frequency	8Hz	4Hz
Response time	80ms	110ms
Delay before start-up	280ms	280ms
Switching hysteresis	10mm	10mm

Electrical data

	VRTU...-5710-300...	VRTU...-3710-1300...
Operating voltage U_B	20 ... 30VDC (incl. ± 10% residual ripple)	
Residual ripple	± 10% of U_B	
Bias current	≤ 50mA (without load)	
Outputs	1 PNP transistor, 1 analogue output	
Function characteristics	switching in case of object recognition	
Output current (PNP/analogue)	300 mA/4 ... 20 mA	
Analogue output	R_L 0 ... 300Ω	
Characteristic curve	ascending	
Sensitivity	potentiometer 270°	

Indicators

	VRTU...-5710-300...	VRTU...-3710-1300...
LED yellow	output activated	
LED yellow flashing	programming error	

Mechanical data

	VRTU...-5710-300...	VRTU...-3710-1300...
Housing	metal/CuZn	
Weight	210g	
Connection type	M12 connector, plastic, 5-pin	

Environmental data

	VRTU...-5710-300...	VRTU...-3710-1300...
Ambient temp. (operation/storage)	-25°C ... +70°C/-40°C ... +85°C	
Protective circuit ²⁾	1, 2, 3	
VDE safety class ³⁾	II, all-insulated	
Protection class	IP 65	
Standards applied	IEC 60947-5-2	
Fitting position	any	
Explosion protection	ex zone 2/zone 11/temperature class T5	

1) For the complete temperature range, measured object $\geq 10 \times 10 \text{mm}^2$

2) 1=short-circuit and overload protection, 2=polarity reversal protection, 3=wire break and inductive protection

3) Rating voltage 250 VAC

Tables

Diagrams

Order guide

Designation	Part No.
VRTU 430M/V-5710-300-S12	500 36266
VRTU 430M/V-3710-1300-S12	500 36267

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

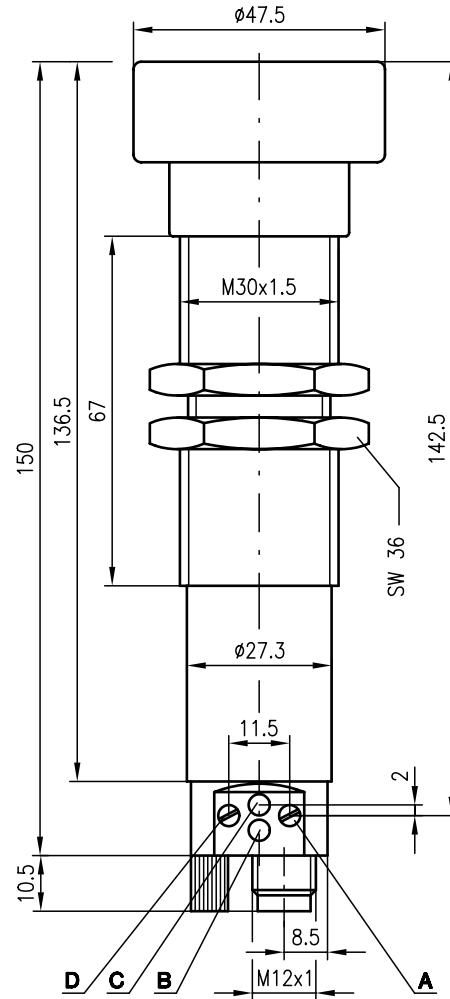


VRTU 430

Ultrasonic distance sensors



Dimensioned drawing



400 ... 3000mm



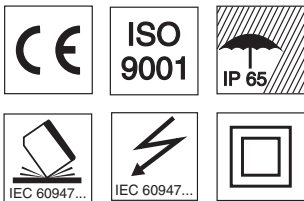
- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

- A End of switching range
- B Indicator diode Q2 ((only for ... 430M/P ...))
- C Indicator diode Q1
- D Start of switching range

Electrical connection

... 430M/P ...

20-30V DC +	1	br/BN
SYNC	2	ws/WH
GND	3	bl/BU
Q1	4	sw/BK
Q2	5	gr/GR



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

We reserve the right to make changes • USDS_04e.fm



Specifications

Ultrasonic specifications

Operating range ¹⁾	400 ... 3000mm
Ultrasonic frequency	120kHz
Opening angle	6°
Resolution	≥ 1mm
Absolute measurement accuracy	± 1.5% of the measurement range
Reproducibility	± 5mm

Timing

Switching frequency	2Hz
Response time	200ms
Delay before start-up	280ms
Switching hysteresis	20mm

Electrical data

Operating voltage U _B	20 ... 30VDC (incl. ± 10% residual ripple)
Residual ripple	± 10% of U _B
Bias current	≤ 50mA (without load)
Switching output	2 PNP transistors
Function characteristics	switching in case of object recognition
Output current	300mA
Switching range adjustment	potentiometer 270°

Indicators

LED yellow	output activated
LED yellow flashing	programming error

Mechanical data

Housing	metal/CuZn
Weight	340g
Connection type	M 12 connector, plastic, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +70°C/-40°C ... +85°C
Protective circuit ²⁾	1, 2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2
Fitting position	any
Explosion protection	ex zone 2/zone 11/temperature class T5

- 1) For the complete temperature range, measured object ≥ 50x50mm²
 2) 1=short-circuit and overload protection, 2=polarity reversal protection, 3=wire break and inductive protection
 3) Rating voltage 250 VAC

Tables

Diagrams

Order guide

Designation	Part No.
VRTU 430M/P-2110-3000-S12	500 36263

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

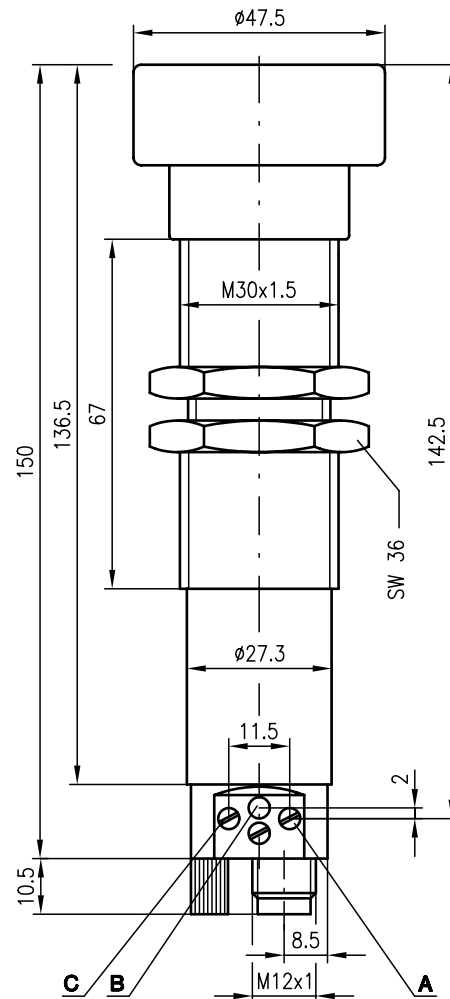


VRTU 430

Ultrasonic distance sensors



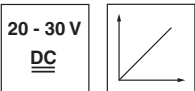
Dimensioned drawing



- A End of switching range
- B Indicator diode Q1
- C Start of switching range



400 ... 3000mm

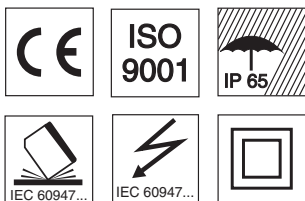


- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- Analogue current output, 1 switching output
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection

... 430M/V ...

20-30V DC +	1	br/BN
SYNC	2	ws/WH
GND	3	bl/BU
Q1	4	sw/BK
4-20mA	5	gr/GR



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

We reserve the right to make changes • USDS_06e.fm



Specifications

Ultrasonic specifications	VRTU...-2710-3000...
Operating range ¹⁾	400 ... 3000mm
Ultrasonic frequency	120kHz
Opening angle	6°
Resolution	≥ 1mm
Absolute measurement accuracy	± 1.5% of the measurement range
Reproducibility	± 5mm
Timing	
Switching frequency	2Hz
Response time	200ms
Delay before start-up	280ms
Switching hysteresis	20mm
Electrical data	
Operating voltage U _B	20 ... 30VDC (incl. ± 10% residual ripple)
Residual ripple	± 10% of U _B
Bias current	< 60mA
Outputs	1 PNP transistor, 1 analogue output
Function characteristics	switching in case of object recognition
Output current (PNP/analogue)	300 mA/4 ... 20 mA
Analogue output	R _L 0 ... 300Ω
Characteristic curve	ascending
Switching range adjustment	potentiometer 270°
Indicators	
LED yellow	output activated
LED yellow flashing	programming error
Mechanical data	
Housing	metal/CuZn
Weight	340g
Connection type	M 12 connector, plastic, 5-pin
Environmental data	
Ambient temp. (operation/storage)	-25 °C ... +70 °C/-40 °C ... +85 °C
Protective circuit ²⁾	1, 2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2
Fitting position	any
Explosion protection	ex zone 2/zone 11/temperature class T5

Tables

Diagrams

Order guide

Designation	Part No.
VRTU 430M/V-2710-3000-S12	500 36268

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

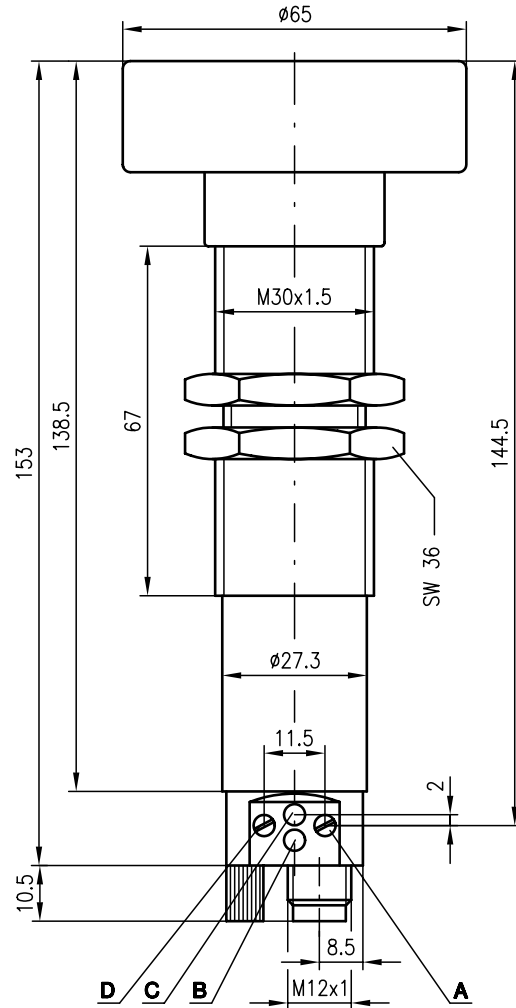


VRTU 430

Ultrasonic distance sensors



Dimensioned drawing



- A End of switching range
- B Indicator diode Q2 only for ... 430M/P ...
- C Indicator diode Q1
- D Start of switching range

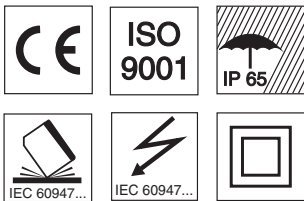
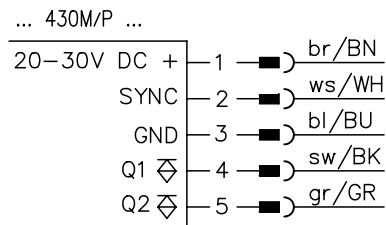


600 ... 6000mm



- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 (programming device)

We reserve the right to make changes • USDS_08e.fm



Specifications

Ultrasonic specifications

Operating range ¹⁾	600 ... 6000mm
Ultrasonic frequency	80kHz
Opening angle	6°
Resolution	≥ 1mm
Absolute measurement accuracy	± 1.5% of the measurement range
Reproducibility	± 9mm

Timing

Switching frequency	1 Hz
Response time	400ms
Delay before start-up	280ms
Switching hysteresis	60mm

Electrical data

Operating voltage U _B	20 ... 30VDC (incl. ± 10% residual ripple)
Residual ripple	±10% of U _B
Bias current	≤ 50mA (without load)
Switching output	2 PNP transistors
Function characteristics	switching in case of object recognition
Output current	300mA
Switching range adjustment	potentiometer 270°

Indicators

LED yellow	output activated
LED yellow flashing	programming error

Mechanical data

Housing	metal/CuZn
Weight	380g
Connection type	M 12 connector, plastic, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +70°C/-40°C ... +85°C
Protective circuit ²⁾	1, 2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2
Fitting position	any
Explosion protection	ex zone 2/zone 11/temperature class T5

- 1) For the complete temperature range, measured object ≥ 100x100 mm²
 2) 1=short-circuit and overload protection, 2=polarity reversal protection, 3=wire break and inductive protection
 3) Rating voltage 250 VAC

Tables

Diagrams

Order guide

Designation	Part No.
VRTU 430M/P-1110-6000-S12	500 36264

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.

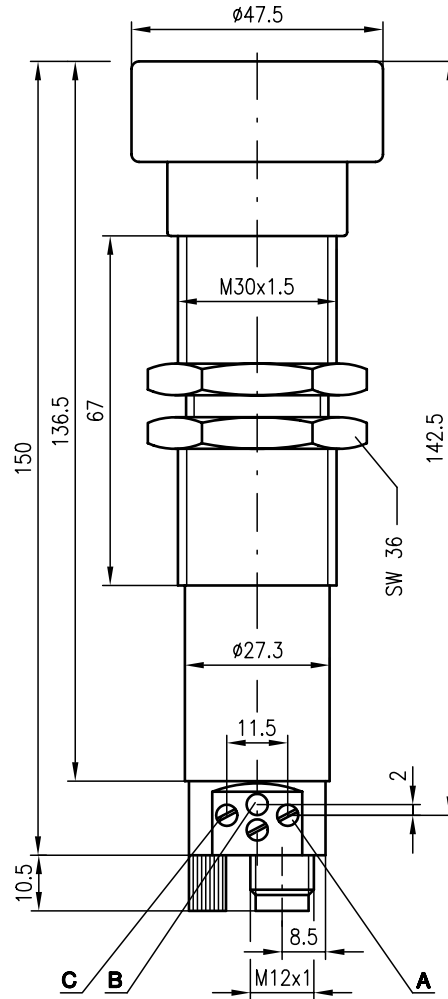


VRTU 430

Ultrasonic distance sensors



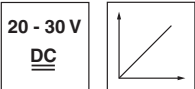
Dimensioned drawing



- A End of switching range
- B Indicator diode Q1
- C Start of switching range

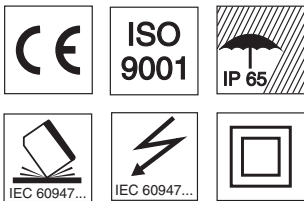
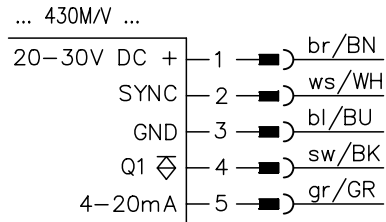


600 ... 6000mm



- Ideal for detection of levels of liquids, bulk materials, transparent media, ...
- Distance information does not depend on the surface properties
- Analogue current output, 1 switching output
- All settings are adjustable
- Up to 10 devices can be synchronised via the SYNC input
- Start and end of switching range adjustable separately

Electrical connection



Accessories:

(available separately • see page 784)

- Programming software "USDS-Config"
- PGU 01 ((programming device)

We reserve the right to make changes • USDS_07e.fm



Specifications

Ultrasonic specifications

Operating range ¹⁾	600 ... 6000mm
Ultrasonic frequency	80kHz
Opening angle	6°
Resolution	≥ 1mm
Absolute measurement accuracy	± 1.5% of the measurement range
Reproducibility	± 9mm

Timing

Switching frequency	1 Hz
Response time	400ms
Delay before start-up	280ms
Switching hysteresis	60mm

Electrical data

Operating voltage U _B	20 ... 30VDC (incl. ± 10% residual ripple)
Residual ripple	± 10% of U _B
Bias current	< 60 mA
Outputs	1 PNP transistor, 1 analogue output
Function characteristics	switching in case of object recognition
Output current (PNP/analogue)	300 mA/4 ... 20 mA
Analogue output	R _L 0 ... 300Ω
Characteristic curve	ascending
Switching range adjustment	potentiometer 270°

Indicators

LED yellow	output activated
LED yellow flashing	programming error

Mechanical data

Housing	metal/CuZn
Weight	380g
Connection type	M 12 connector, plastic, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +70°C / -40°C ... +85°C
Protective circuit ²⁾	1, 2, 3
VDE safety class ³⁾	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2
Fitting position	any
Explosion protection	ex zone 2/zone 11/temperature class T5

1) For the complete temperature range, measured object ≥ 100x100 mm²
 2) 1=short-circuit and overload protection, 2=polarity reversal protection, 3=wire break and inductive protection
 3) Rating voltage 250 VAC

Tables

Diagrams

Order guide

Designation	Part No.
VRTU 430M/V-1710-6000-S12	500 36269

Remarks

- Synchronisation: mutual interference is excluded by connecting the sensors with the SYNC input.
- Multiplex: Achieved by parameterisation of the sensors using the "USDS-Config" software.



Accessories

Ultrasonics distance sensors

M12 connectors

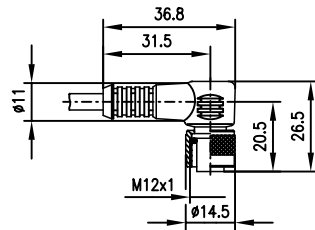


Leuze electronic offers connectors with ready-made cables in various lengths suited for the connector-type devices.

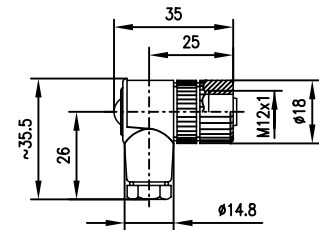
Select the appropriate cable for the device with the desired cable length from the following tables.

For devices with M12 connectors, there are available: 2 connectors with ready-made 2m, 5m and 10m cable and 2 connectors with screw connection.

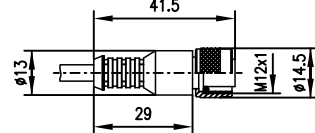
Dimensioned drawings



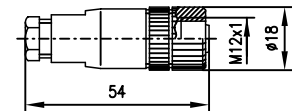
KB 450-...-...



KD 095-...



KB 450-...-...A



KD 095-...A

Selection table

M12 connectors				
with cable			without cable	
		5m		
KB 095-5000-5 Part No. 500 20500	KB 095-5000-5A Part No. 500 20499		KD 095-5 Part No. 500 20502	KD 095-5A Part No. 500 20501
		2m		
KB 450-2000-4 Part No. 500 80833	KB 450-2000-4A Part No. 500 80841		KD 095-4 Part No. 500 31324	KD 095-4A Part No. 500 31323
		5m		
KB 450-5000-4 Part No. 500 80834	KB 450-5000-4A Part No. 500 80842			
		10m		
KB 450-10000-4 Part No. 500 80840	KB 450-10000-4A Part No. 500 80843			

Programming device

PGU 01 (Part No. 500 36559)



The "USDS-Config" software is supplied with the PGU 01 programming device

Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes • USDS_zu_e.fm

ODS 78 / ODS 96 / ROD 4

Overview and advantages

Optical distance sensor with new CCD technology

- Microcontroller and programmable parameters result in higher flexibility
- Infrared light, measurement range from 100 ... 600mm
- Laser with visible red light, measurement range from 50 ... 5000mm
- Reflection-independent distance information

- Analogue output with current (4 ... 20mA) or voltage (1 ... 10V)
- Serial output via RS 232 or RS 485
- Two teachable switching outputs

- 18 ... 30VDC voltage with analogue output
- 10 ... 30VDC voltage with serial output or two switching outputs

M12 connector or comfortable terminal compartment for individual electrical connection

- Robust metal housing with glass optics
- Protection class IP 67

Innovative mounting system for rod mounting or mounting holes for screw connection

Accessories:

- PC software for parameter setting
- Parameterisation cable
- Mounting systems



The rotoScan ROD-4 is an area scanning distance sensor for the detection of objects. The light beam is reflected by a rotating mirror and directed over a semicircular area (190°) with a radius of max. 50m.



Operating principle	Designation	Measurement range	Housing	Light source			Operating voltage			
				Metal	Red light	Infrared	Laser	10 ... 30VDC	18 ... 30VDC	22 ... 28VDC
	ODS 78-800 S	300 ... 800mm	•		•				•	
	ODS 78-800 S.1	300 ... 800mm	•		•				•	
	ODS 96M/V-5000-600-220	100 ... 600mm	•		•			•		
	ODS 96M/V-5000-600-420	100 ... 600mm	•		•			•		
	ODS 96M/V-5010-600-221	100 ... 600mm	•		•			•		
	ODS 96M/V-5010-600-421	100 ... 600mm	•		•			•		
	ODS 96M/V-5110-420	50 ... 2000mm	•	•				•		
	ODS 96M/V-5120-421	50 ... 2000mm	•	•				•		
	ODS 96M/V-5060-220	200 ... 2000mm	•	•		•		•		
	ODS 96M/V-5060-420	200 ... 2000mm	•	•		•		•		
	ODS 96M/V-5070-221	200 ... 2000mm	•	•		•		•		
	ODS 96M/V-5070-421	200 ... 2000mm	•	•		•		•		
	ODS 96M/V-5510-420	200 ... 5000mm	•	•		•		•		
	ODS 96M/V-5480-421	200 ... 5000mm	•	•		•		•		
	ODS 96M/D-5020-600-222	100 ... 600mm	•		•		•			
	ODS 96M/D-5020-600-422	100 ... 600mm	•		•		•			
	ODS 96M/D-5030-600-223	100 ... 600mm	•		•		•			
	ODS 96M/D-5030-600-423	100 ... 600mm	•		•		•			
	ODS 96M/S-5040-600-224	100 ... 600mm	•		•		•			
	ODS 96M/S-5040-600-424	100 ... 600mm	•		•		•			
	ODS 96M/D-5080-222	200 ... 2000mm	•	•		•	•			
	ODS 96M/D-5080-422	200 ... 2000mm	•	•		•	•			
	ODS 96M/D-5090-223	200 ... 2000mm	•	•		•	•			
	ODS 96M/D-5090-423	200 ... 2000mm	•	•		•	•			
	ODS 96M/S-5100-224	200 ... 2000mm	•	•		•	•			
	ODS 96M/S-5100-424	200 ... 2000mm	•	•		•	•			
	ROD-4	0 ... 15m	•		•	•				•
	ROD-4-06	0 ... 15m	•		•	•				•



PNP transistor	NPN transistor	Output				Switching frequency	Switching	Connection			Options			Page
		Serial		Analogue				Light/dark	M12 connector	Terminals	Connector	Teachable switching outputs	Parameterisation possible	
RS 232	RS 485	Current	Voltage											
					•	100Hz				•				789
				•		100Hz				•				789
•				•		20 ... 100Hz	•		•		•	•		791
•				•		20 ... 100Hz	•	•			•	•		791
•					•	20 ... 100Hz	•		•		•	•		791
•					•	20 ... 100Hz	•	•			•	•		791
•				•	•	10 ... 100Hz	•	•			•	•		793
•				•	•	10 ... 100Hz	•	•			•	•		793
•				•		10 ... 100Hz	•		•		•	•		795
•				•		10 ... 100Hz	•	•			•	•		795
•					•	10 ... 100Hz	•		•		•	•		795
•				•	•	10 ... 100Hz	•	•			•	•		795
•					•	10 ... 100Hz	•	•			•	•		797
•					•	10 ... 100Hz	•	•			•	•		797
•		•				20 ... 100Hz	•		•		•	•		799
•		•				20 ... 100Hz	•	•			•	•		799
•			•			20 ... 100Hz	•		•		•	•		799
•			•			20 ... 100Hz	•	•			•	•		799
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•						20 ... 100Hz	•	•			•	•		801
•		•				10 ... 100Hz	•		•		•	•		803
•		•				10 ... 100Hz	•	•			•	•		803
•			•			10 ... 100Hz	•		•		•	•		803
•			•			10 ... 100Hz	•	•			•	•		803
•						10 ... 100Hz	•		•		•	•		805
•						10 ... 100Hz	•	•			•	•		805
•		•	•			25Hz				•		•		807
•		•	•			25Hz				•		•	•	807

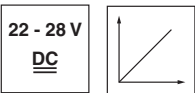


ODS 78

Optical distance sensors

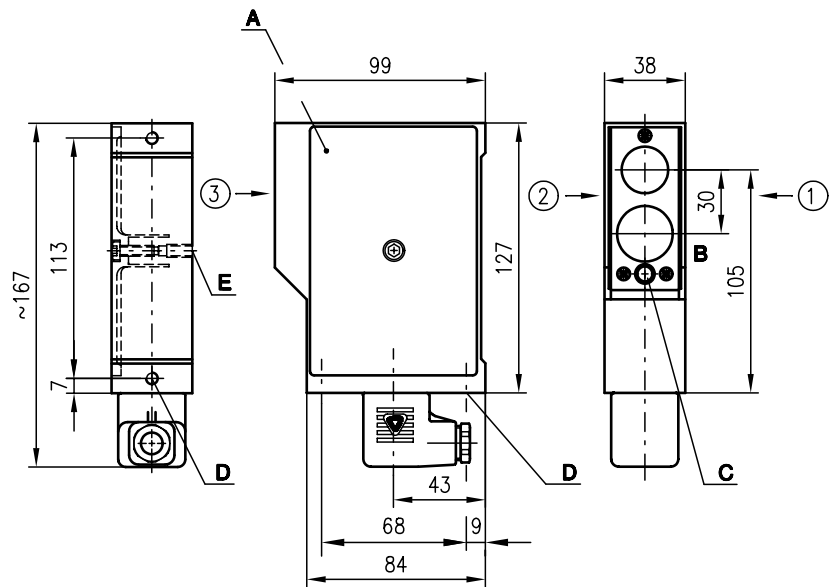


300 ... 800mm



- Analogue current or voltage output
- Robust metal housing with glass optics, protection class IP 65
- Triangulation principle provides for almost reflectance independent distance information
- LED transmitting element for long working life

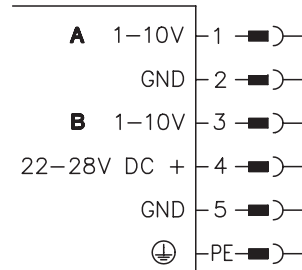
Dimensioned drawing



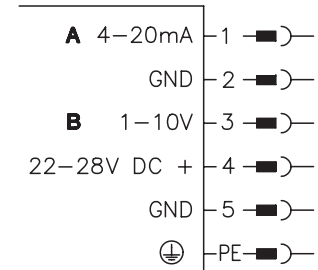
- A** Removable lid with cheese head screw DIN 6912 M5x16 (machined)
 - B** Optical axis
 - C** Indicator diodes
 - D** Device fixture M6x9
 - E** Device fixture M6x12
- Preferred entry direction for objects ① + ② + ③

Electrical connection

ODS 78-800 S



ODS 78-800 S.1



- A** Analogue output
- B** Monitoring output

We reserve the right to make changes • ods_01e.fm



Accessories:

(available separately • see page 808)

- Mounting systems

Specifications

Optical data

Measurement range	300 ... 800mm
Resolution ¹⁾	0.3% relative to the measurement range
Light source	LED (modulated light)
Wavelength	880nm (infrared)
Light spot diameter	approx. 20mm (over entire measurement range)

Error limits

Absolute measurement accuracy ²⁾	± 3% rel. to the measurement range ($T_U = 15 \dots 30^\circ\text{C}$) ± 5% rel. to the measurement range ($T_U = 5 \dots 50^\circ\text{C}$)
Repeatability ¹⁾	approx. 0.6% rel. to the same measurement distance
Linearity failure ¹⁾	± 1% relative to the measurement range

Timing

Switching frequency	100Hz
Running-in period ³⁾	≥ 15min until error limit is reached

Electrical data

Operating voltage U_B	22 ... 28VDC filtered
Residual ripple	≤ 5% of U_B
Analogue output	$R_L \geq 2\text{k}\Omega$ (voltage) $R_L \leq 500\Omega$ (current)
Monitoring output	1 ... 10VDC $R_L \geq 2\text{k}\Omega$ 1V equals a very dark measured object 10V equals a very light measured object

Indicators

LED green	object in measurement range, safe operating status
LED red	object out of measurement range, reflection not sufficient

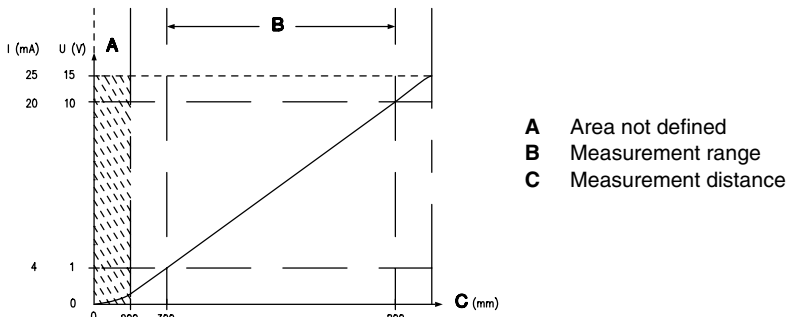
Mechanical data

Housing	diecast aluminium
Optics cover	glass
Weight	530g
Connection type	standard plug with screw connection

Environmental data

Ambient temp. (operation/storage)	+5°C ... +50°C/-20°C ... +70°C
Protection class	IP 65
Standards applied	IEC 60947-5-2

- 1) Luminosity coefficient 18% ... 90%, measured object 100x100mm² (smaller objects can be detected)
 2) Included are changes in reflectance, linearity fields, temperature drift
 3) Device is fully functional during running-in period



Order guide

Designation	Part No.
ODS 78-800 S	500 14599
ODS 78-800 S.1	500 25584

Remarks

- The reference edge for the distance to the measured object is the lower front housing edge.
- The monitoring output can be used for contamination control (preventive maintenance).

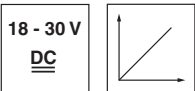


ODS 96

Optical distance sensors

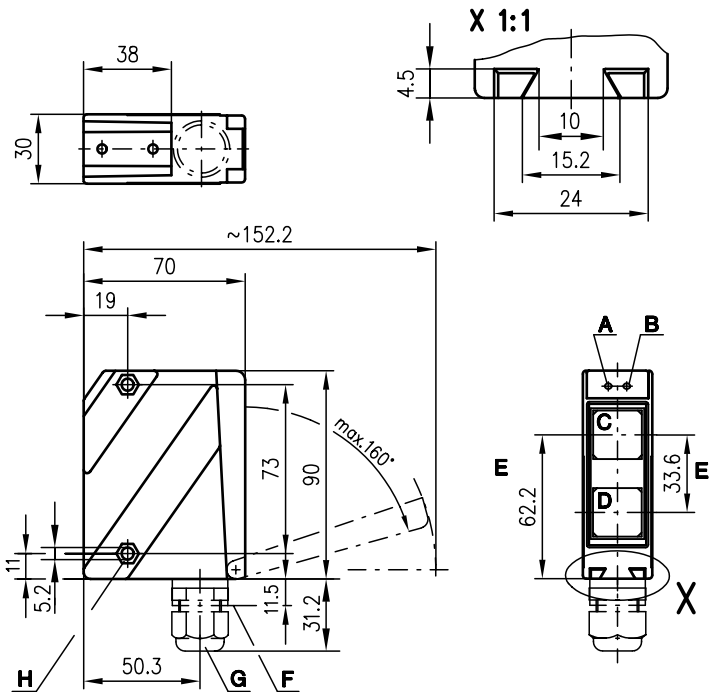


100 ... 600mm

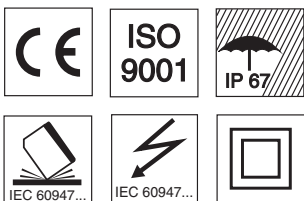
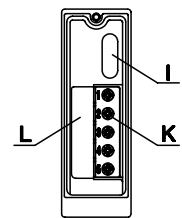


- Reflection-independent distance information
- Highly insensitive to extraneous light
- Analogue current or voltage output
- Measurement range and mode adjustable
- Teachable switching output

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry

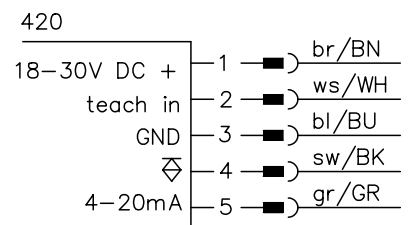
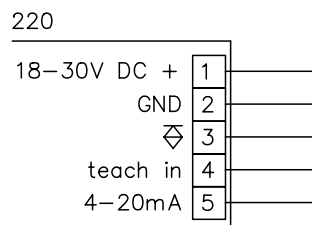
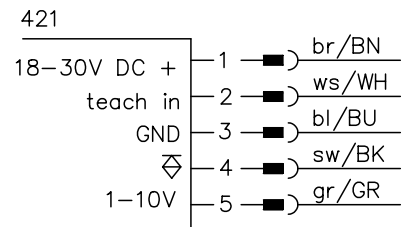
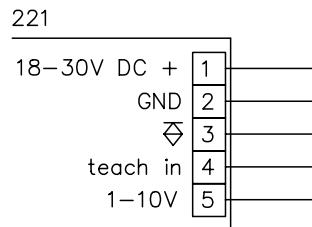


Accessories:

(available separately • see page 808)

- Mounting systems
- Programming software

Electrical connection



We reserve the right to make changes • ods_06e.fm



Specifications

Optical data

Measurement range ¹⁾	100 ... 600mm
Resolution	≤ 0.5mm
Light source	LED (modulated light)
Wavelength	880nm (infrared)
Light spot diameter	approx. 10mm (over entire measurement range)

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	± 0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	20 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U _B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 150mA
Switching output	PNP transistor, high-active
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Analogue output	R _L ≥ 2kΩ (voltage) R _L ≤ 500Ω (current)

Indicators

LED green	continuous light	teach-in on GND	teach-in on +U_B		
	flashing			ready	
	off			error	teaching procedure
LED yellow	continuous light	no voltage			
	flashing	object inside teach-in			
	off	measurement distance	teaching procedure		
		object outside teach-in			
		measurement distance			

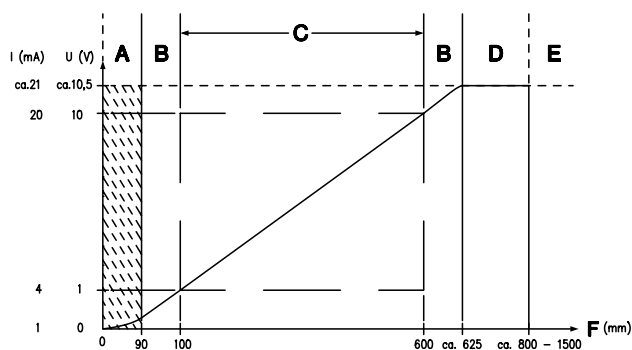
Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²
- 2) Same object, measured object ≥ 50x50mm²
- 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC



- A Area not defined
- B Linearity not defined
- C Measurement range
- D Object present
- E No object detected
- F Measurement distance

Order guide

	Designation	Part No.
Terminals		
Current output	ODS 96M/V-5000-600-220	500 81127
Voltage output	ODS 96M/V-5010-600-221	500 81128
M12 connector		
Current output	ODS 96M/V-5000-600-420	500 81129
Voltage output	ODS 96M/V-5010-600-421	500 81130

ODS 96M/V... - 04

Tables

Diagrams

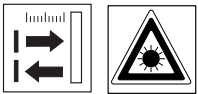
Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- **Teaching procedure:** Position measured object at desired measurement distance. Connect teach input to +U_B for ≥ 2s. Reconnect teach input to GND, switching output is programmed.

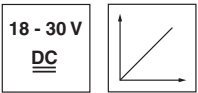


ODS 96

Optical laser distance sensors

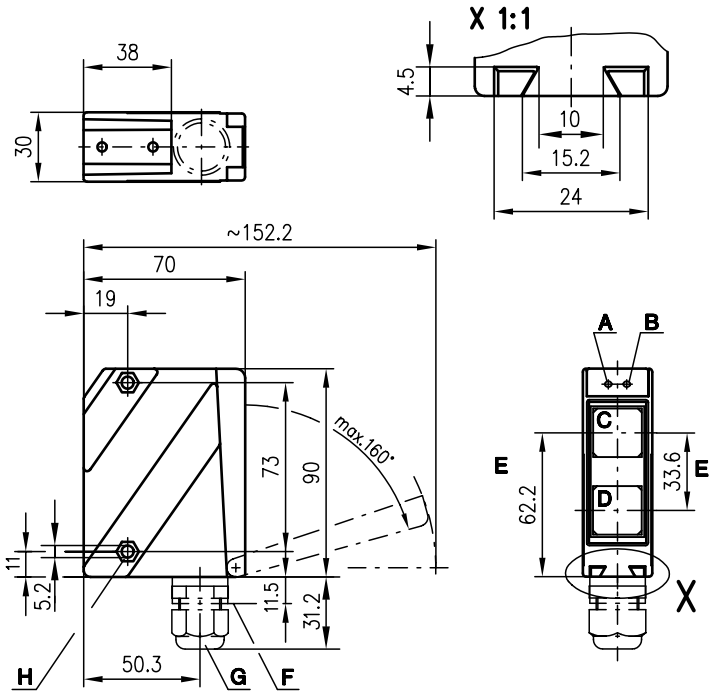


50 ... 2000mm

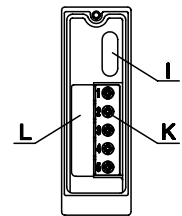


- Reflection-independent distance information
- Highly insensitive to extraneous light
- Analogue current or voltage output
- Measurement range and mode adjustable
- Teachable switching output
- Easy alignment through visible red light

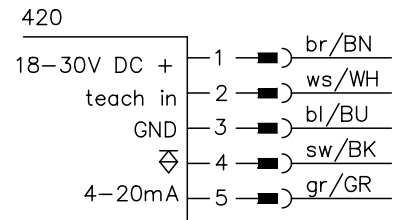
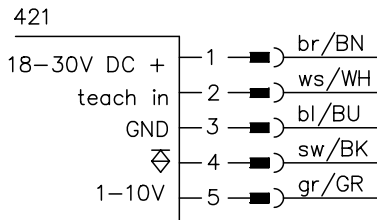
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



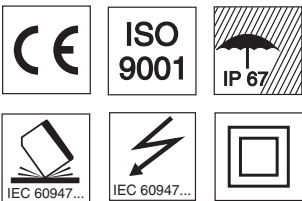
Electrical connection



Accessories:

(available separately • see page 808)

- Mounting systems
- Programming software



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Specifications

Optical data

Measurement range ¹⁾	50 ... 2000mm
Resolution	≤ 5mm
Light source	laser and LED (modulated light)
Wavelength	660nm (visible red light)
Light spot diameter	divergent, 3x8mm ² at 1200mm (laser) square 4mm at 200mm (LED)
Laser warning notice	see remarks

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	± 0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	10 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U_B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 150mA
Switching output	PNP transistor, high-active
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Analogue output	$R_L \geq 2 \text{ k}\Omega$ (voltage) $R_L \leq 500\Omega$ (current)

Indicators

LED green	continuous light	teach-in on GND	ready	teach-in on + U_B
	flashing		error	
LED yellow	off	no voltage	teaching procedure	
	continuous light	object inside teach-in		
	flashing	measurement distance	teaching procedure	
	off	object outside teach-in		
		measurement distance		

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	M12 connector

Environmental data

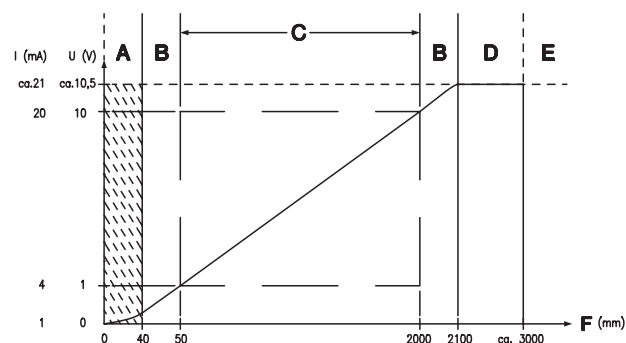
Ambient temp. (operation/storage)	-20°C ... +50°C / -30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²

2) Same object, measured object ≥ 50x50mm²

3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC



- A** Area not defined
- B** Linearity not defined
- C** Measurement range
- D** Object present
- E** No object detected
- F** Measurement distance

Order guide

M12 connector

Current output	ODS 96M/V-5110-420	500 35611
Voltage output	ODS 96M/V-5120-421	500 35124

Tables

Diagrams

Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- **Teaching procedure:** Position measured object at desired measurement distance. Connect teach input to + U_B for ≥ 2s. Reconnect teach input to GND, switching output is programmed.

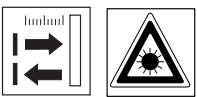
LASERSTRAHLUNG / LASER LIGHT
NICHT IN DEN STRAHL BLICKEN
DO NOT STARE INTO BEAM
LASERKLASSE 2
CLASS 2 LASER PRODUCT
IEC 60825-1-am2 (2001-01)

ODS 96
Pulse duration < 32ms
Quiescent period > 5ms
 $P_{max} \leq 1mW$
 $\lambda = 670nm$

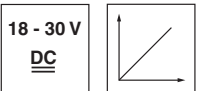


ODS 96

Optical laser distance sensors

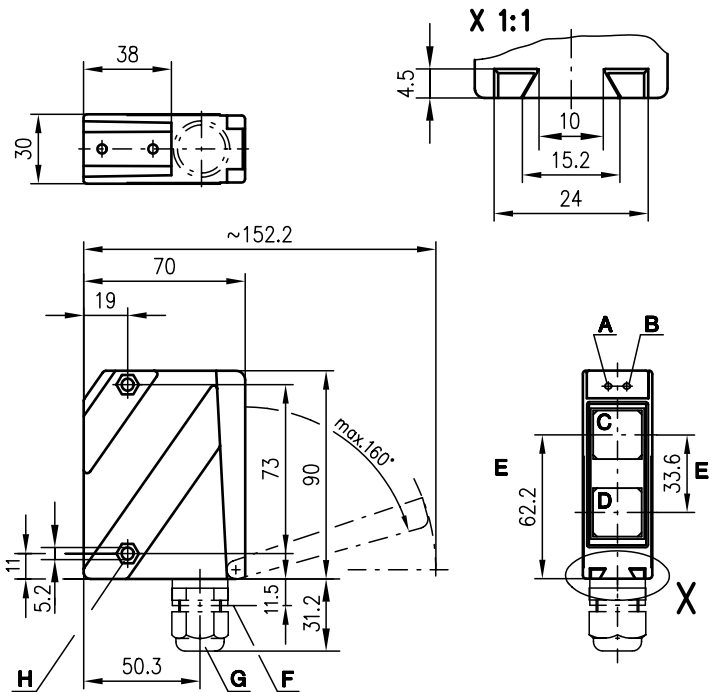


200 ... 2000mm

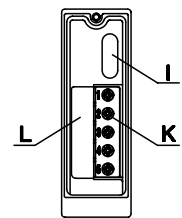


- Reflection-independent distance information
- Highly insensitive to extraneous light
- Analogue current and voltage output
- Measurement range and mode adjustable
- Teachable switching output

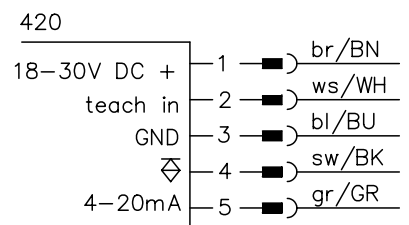
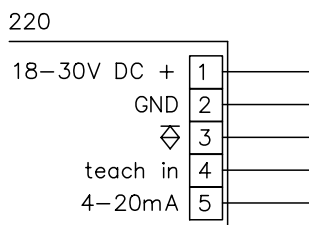
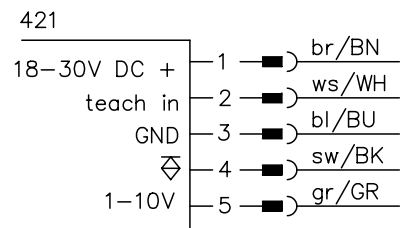
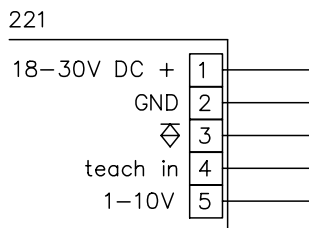
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



Electrical connection



Accessories:

(available separately • see page 808)

- Mounting systems
- Programming software

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Specifications

Optical data

Measurement range ¹⁾	200 ... 2000mm
Resolution	≤ 5mm
Light source	laser (modulated light)
Wavelength	660nm (visible red light)
Light spot diameter	divergent, 3x12mm ² at 2m
Laser warning notice	see remarks

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	± 0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	10 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U_B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 150mA
Switching output	PNP transistor, high-active
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Analogue output	$R_L \geq 2k\Omega$ (voltage) $R_L \leq 500\Omega$ (current)

Indicators

LED green	continuous light	teach-in on GND	teach-in on $+U_B$
	flashing		
	off		
LED yellow	continuous light	ready	teaching procedure
	flashing		
	off		
	flashing	object inside teach-in measurement distance	teaching procedure
	off		
	flashing	object outside teach-in measurement distance	
	off		

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

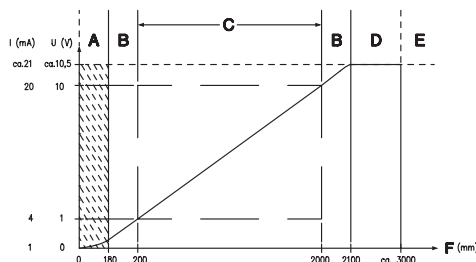
Ambient temp. (operation/storage)	-20°C ... +50°C / -30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object $\geq 50 \times 50 \text{mm}^2$

2) Same object, measured object $\geq 50 \times 50 \text{mm}^2$

3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs

4) Rating voltage 250VAC



- A** Area not defined
- B** Linearity not defined
- C** Measurement range
- D** Object present
- E** No object detected
- F** Measurement distance

Order guide

Terminals

Current output	ODS 96M/V-5060-220	500 30595
Voltage output	ODS 96M/V-5070-221	500 30596

M12 connector

Current output	ODS 96M/V-5060-420	500 30597
Voltage output	ODS 96M/V-5070-421	500 30598

ODS 96M/V... Laser - 03

Tables

Diagrams

Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- **Teaching procedure:** Position measured object at desired measurement distance. Connect teach input to $+U_B$ for $\geq 2s$. Reconnect teach input to GND, switching output is programmed.

LASERSTRAHLUNG / LASER LIGHT
NICHT IN DEN STRAHL BLICKEN
DO NOT STARE INTO BEAM
LASERKLASSE 2
CLASS 2 LASER PRODUCT
IEC 60825-1-am2 (2001-01)

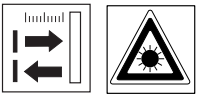
ODS 96
Pulse duration $\leq 32ms$
Quiescent period $\geq 5ms$
 $P_{max} \leq 1mW$
 $\lambda = 670nm$

0202

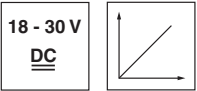


ODS 96

Optical laser distance sensors

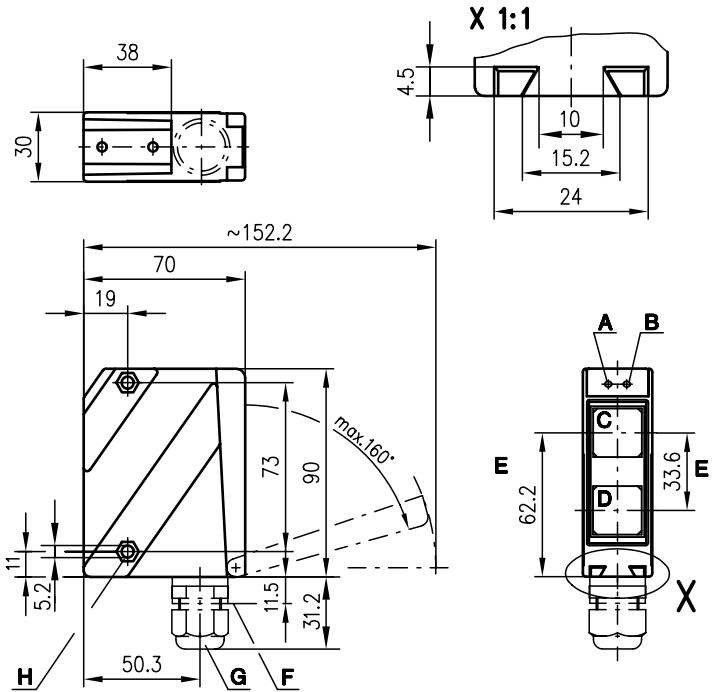


200 ... 5000mm

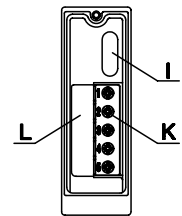


- Reflection-independent distance information
- Highly insensitive to extraneous light
- Analogue current or voltage output
- Measurement range and mode adjustable
- Teachable switching output
- Easy alignment through visible red light

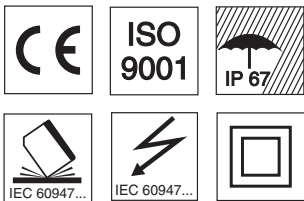
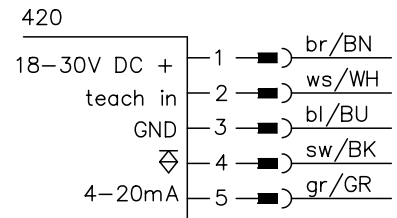
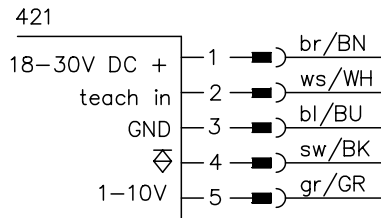
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



Electrical connection



Accessories:

(available separately • see page 808)

- Mounting systems
- Programming software

We reserve the right to make changes • ods_09e.fm

Specifications

Optical data

Measurement range ¹⁾	200 ... 5000mm
Resolution	≤ 5mm at a distance of 2000mm ≤ 10mm at a distance of 3000mm ≤ 30mm at a distance of 5000mm
Light source	laser (modulated light)
Wavelength	660nm (visible red light)
Light spot diameter	divergent, 3x8mm ² at 1200mm (Laser)
Laser warning notice	see remarks

Error limits

Absolute measurement accuracy ¹⁾	at 5m ± 10% (relative to the measurement distance)
Repeatability ²⁾	at 5m ± 5%
b/w detection thresholds (6% up to 3m/90% at 5m)	at 5m < 5%
Absolute measurement accuracy ¹⁾	at 3m ± 5% (relative to the measurement distance)
Repeatability ²⁾	at 3m ± 2.5%
b/w detection thresholds	at 3m < 2.5%
(6 ... 90% to 3m/10 ... 90% at 5m)	

Timing

Switching frequency	10 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U _B	18 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 150mA
Switching output	PNP transist., high-act.
Signal voltage high/low	≥ (U _B -2V) ≤ 2V
Analogue output	R _L ≥ 2kΩ (voltage) R _L ≤ 500Ω (current)

Indicators

LED green	continuous light	teach-in on GND	teach-in on +U_B	
	flashing			ready
	off			error
LED yellow	continuous light		teaching procedure	
	flashing	no voltage		
	off	object inside teach-in measurement distance	teaching procedure	
		object outside teach-in measurement distance		

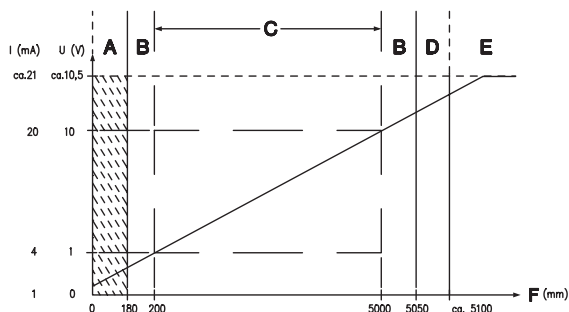
Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +40°C/-30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Luminosity coefficient from 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²
 2) Same object, measured object ≥ 5x50mm²
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC



- A** Area not defined
B Linearity not defined
C Measurement range
D Object present
E No object detected
F Measurement distance

Order guide

	Designation	Part No.
M12 connector		
Current output	ODS 96M/V-5510-420	500 35216
Voltage output	ODS 96M/V-5480-421	500 36255

Tables

Diagrams

Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- Teaching procedure:** Position measured object at desired measurement distance. Connect teach input to +U_B for ≥ 2s. Reconnect teach input to GND, switching output is programmed.

LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

ODS 96
 Pulse duration ≤ 32ms
 Quiescent period ≥ 5ms
 P_{max} ≤ 1mW
 λ = 670nm

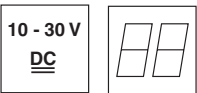


ODS 96

Optical distance sensors

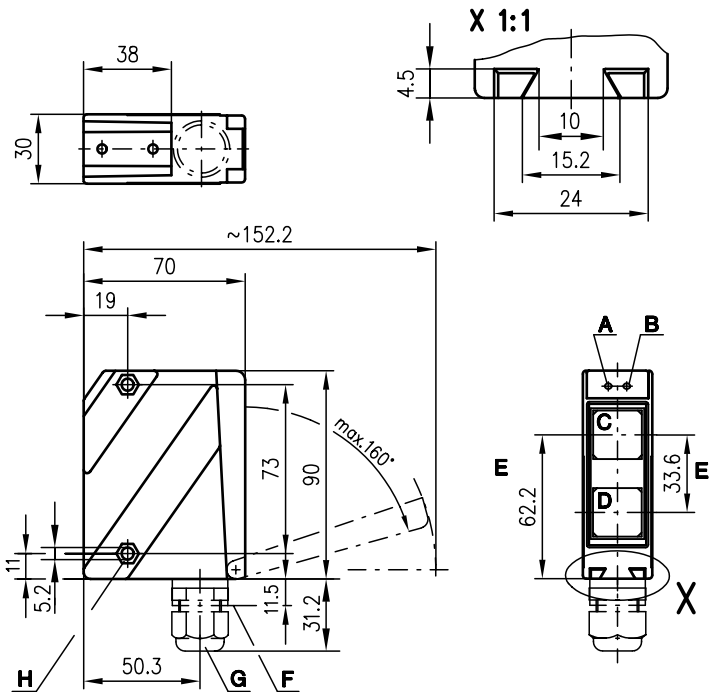


100 ... 600mm

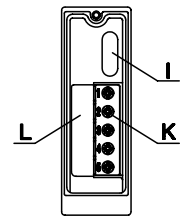


- Reflection-independent distance information
- Highly insensitive to extraneous light
- RS 232 or RS 485 interface
- Measurement range and mode adjustable
- Switching output (teachable with RS 232, adjustable with RS 485)

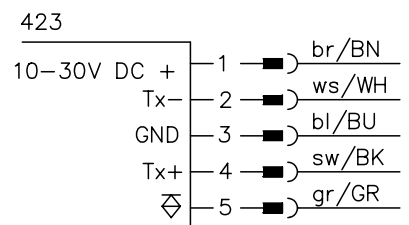
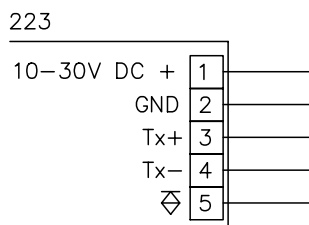
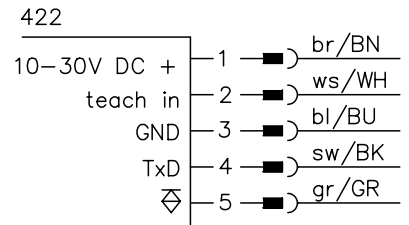
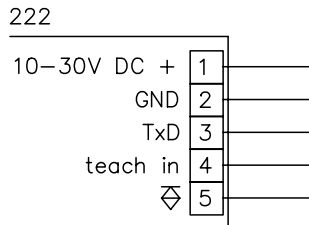
Dimensioned drawing



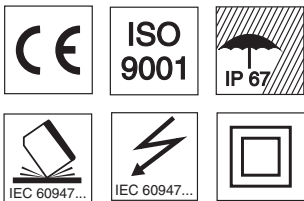
- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2 mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



Electrical connection



We reserve the right to make changes • ods_02e.fm



Accessories:
(available separately • see page 808)

- Mounting systems
- Programming software



Specifications

Optical data

Measurement range ¹⁾	100 ... 600mm
Resolution	≤ 5mm
Light source	LED (modulated light)
Wavelength	880nm (infrared)
Light spot diameter	approx. 10mm (over entire measurement range)

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	±0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	20 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 150mA
Switching output	PNP transistor, high-active
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Digital output RS 232 ³⁾	9600 Baud
RS 485 ³⁾	9600 Baud, no termination
Transmission protocol ⁴⁾	2 byte transmission, continuous data flow

Indicators

LED green	continuous light	teach-in on GND	teach-in on +U_B
	flashing	ready	
	off	error	teaching procedure
LED yellow	continuous light	no voltage	
	flashing	objects inside teach-in measurement distance	
	off	object outside teach-in measurement distance	teaching procedure

Mechanical data

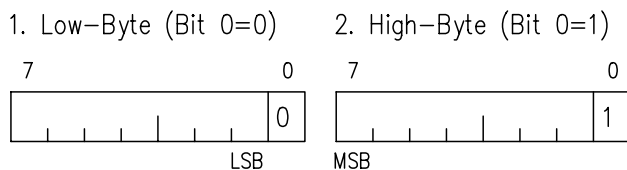
Housing	Metal housing
Optics cover	diecast zinc
Weight	glass
Connection type	380g
	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C / -30°C ... +70°C
Protective circuit ⁵⁾	1, 2, 3
VDE safety class ⁶⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²
- 2) Same object, measured object ≥50x50mm²
- 3) Higher baud rates can be set
- 4) 2 byte transmission protocol
- 5) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 6) Rating voltage 250VAC

Measurement value = 14 Bit



Order guide

	Designation	Part No.
Terminals		
RS 232	ODS 96M/D-5020-600-222	500 81131
RS 485	ODS 96M/D-5030-600-223	500 81132
M12 connector		
RS 232	ODS 96M/D-5020-600-422	500 81133
RS 485	ODS 96M/D-5030-600-423	500 81134

Tables

Diagrams

Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- **Teaching procedure:** Position measured object at desired measurement distance. Connect teach input to +U_B for ≥ 2s. Reconnect teach input to GND, switching output is programmed.

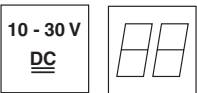


ODS 96

Optical distance sensors

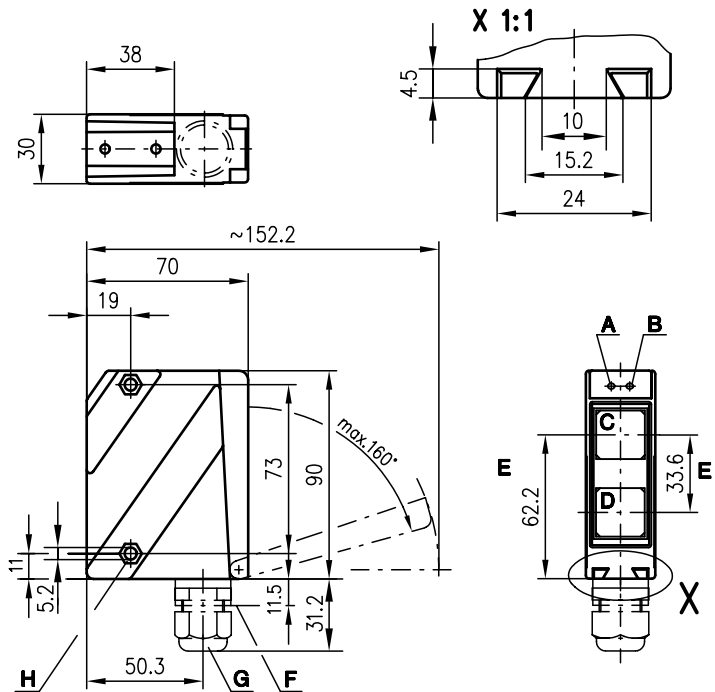


100 ... 600mm

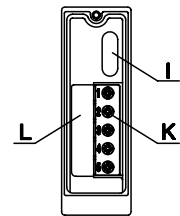


- Reflection-independent distance information
- Highly insensitive to extraneous light
- Measurement range and mode adjustable
- Two teachable switching outputs

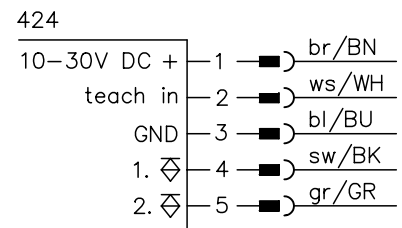
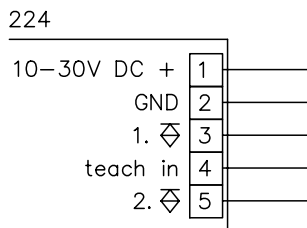
Dimensioned drawing



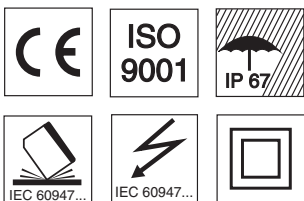
- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



Electrical connection



We reserve the right to make changes • ods_04e.fm



Accessories:
 (available separately • see page 808)

- Mounting systems
- Programming software



Specifications

Optical data

Measurement range ¹⁾	100 ... 600mm
Resolution	≤ 0.5mm
Light source	LED (modulated light)
Wavelength	880nm (infrared)
Light spot diameter	approx. 10mm (over entire measurement range)

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	± 0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	20 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 150mA
Switching outputs	2 PNP switching outputs, high-active
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA per transistor output

Indicators

LED green	continuous light
	flashing
	off
LED yellow	continuous light
	flashing
	off

teach-in on GND

ready
error
no voltage
object inside measurement range
object outside measurement range
no object detected

teach-in on +U_B

teaching procedure
teaching procedure

Mechanical data

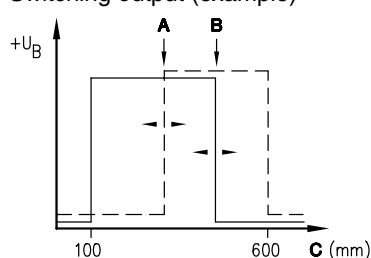
Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²
 2) Same object, measured object ≥ 50x50mm²
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Switching output (example)



A 2nd switching output
B 1st switching output
C Measurement distance

Order guide

Terminals

2 PNP switching outputs

Designation

ODS 96M/S-5040-600-224

Part No.

500 81135

M12 connector

2 PNP switching outputs

ODS 96M/S-5040-600-424

500 81137

Tables

Diagrams

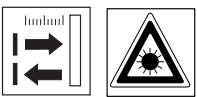
Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- **Teaching procedure:** Position measured object at 1st desired measurement distance. Connect teach input to +U_B for ≥ 2s. Both LEDs are flashing simultaneously. Reconnect teach input to GND, 1st switching output is programmed. Position measured object at 2nd desired measuring distance. Connect teach input to +U_B for ≥ 2s. Both LEDs are flashing alternately. Reconnect teach input to GND, 2nd switching output is programmed. The procedure can be repeated as desired, leave teach input connected to GND in idle mode.

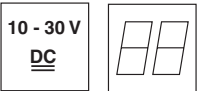


ODS 96

Optical laser distance sensors

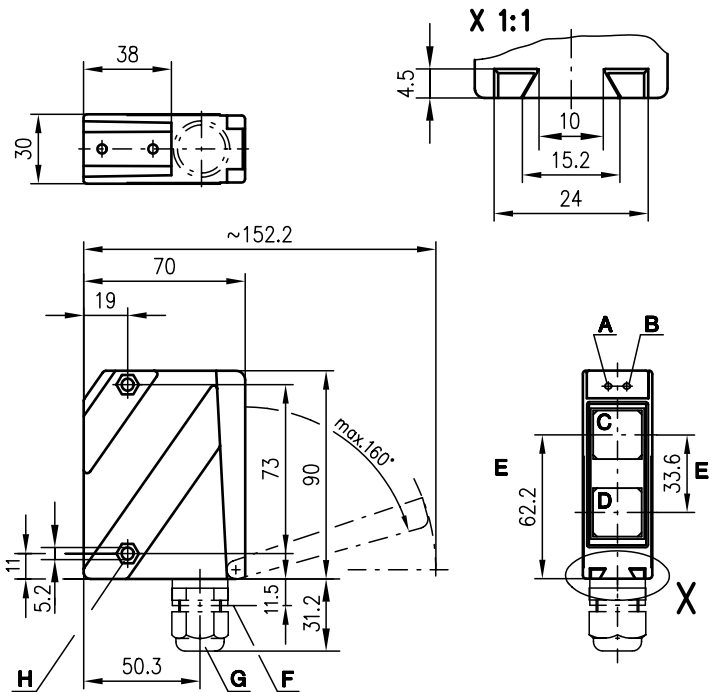


200 ... 2000mm

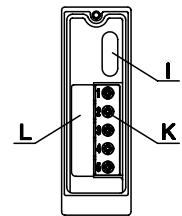


- Reflection-independent distance information
- Highly insensitive to extraneous light
- RS 232 or RS 485 interface
- Measurement range and mode adjustable
- Switching output (teachable with RS 232, adjustable with RS 485)

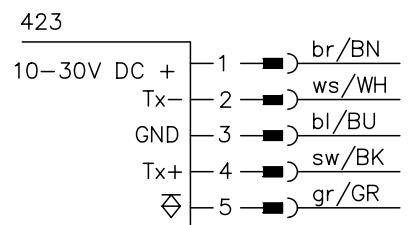
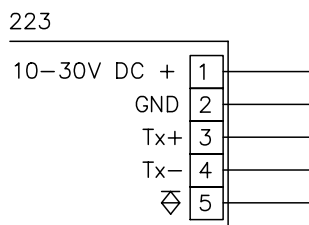
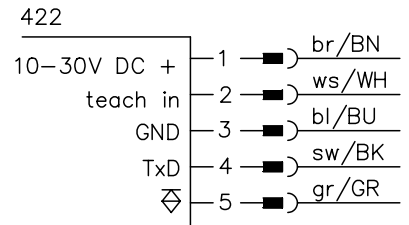
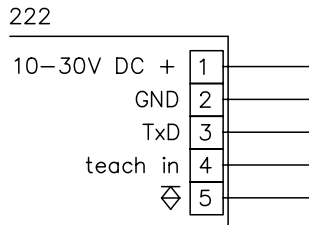
Dimensioned drawing



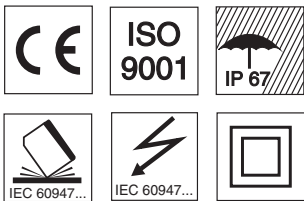
- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



Electrical connection



We reserve the right to make changes • ods_03e.fm



Accessories: (available separately • see page 808)

- Mounting systems
- Programming software



Specifications

Optical data

Measurement range ¹⁾	200 ... 2000mm
Resolution	≤ 5mm
Light source	laser (modulated light)
Wavelength	660nm (visible red light)
Light spot diameter	divergent, 3x12mm ² at 2m
Laser warning notice	see remarks

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	± 0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	10 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 150mA
Switching output	PNP transistor, high-active
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Digital output RS 232 ³⁾	9600 Baud
RS 485 ³⁾	9600 Baud, no termination
Transmission protocol ⁴⁾	2byte transmission, continuous data flow

Indicators

LED green	continuous light
	flashing
	off
LED yellow	continuous light
	flashing
	off

teach-in on GND

ready
error
no voltage
Objects inside
teach-in measurement
distance
object outside teach-in
measurement distance

teach-in on +U_B

teaching procedure
teaching procedure

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

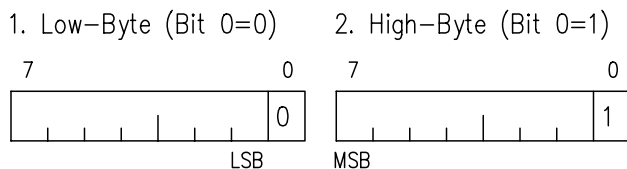
Metal housing

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
Protective circuit ⁵⁾	1, 2, 3
VDE safety class ⁶⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

- 1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²
- 2) Same object, measured object ≥ 50x50mm²
- 3) Higher baud rates can be set
- 4) 2byte transmission protocol
- 5) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 6) Rating voltage 250VAC

Measurement value = 14 Bit



Order guide

Terminals

RS 232	ODS 96M/D-5080-222	500 30599
RS 485	ODS 96M/D-5090-223	500 30600

M12 connector

RS 232	ODS 96M/D-5080-422	500 30601
RS 485	ODS 96M/D-5090-423	500 30602

ODS 96M/D... laser - 03

Tables

Diagrams

Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- Teaching procedure: Position measured object at desired measurement distance. Connect teach input to +U_B for ≥ 2s. Reconnect teach input to GND, switching output is programmed.

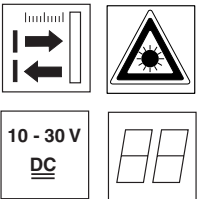
LASERSTRAHLUNG / LASER LIGHT
 NICHT IN DEN STRAHL BLICKEN
 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

ODS 96
 Pulse duration < 32ms
 Quiescent period > 5ms
 P_{max} ≤ 1mW
 λ = 670nm



ODS 96

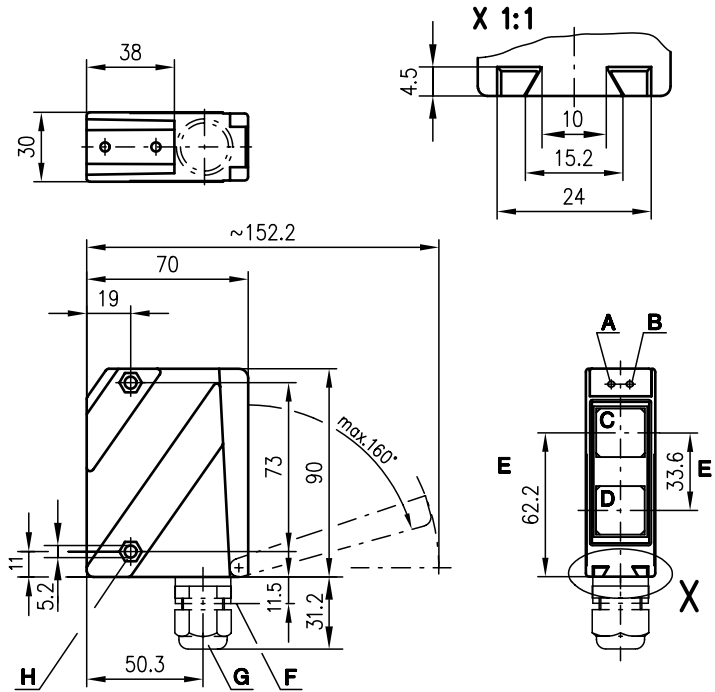
Optical laser distance sensors



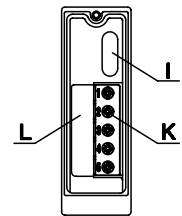
200 ... 2000 mm

- Reflection-independent distance information
- Highly insensitive to extraneous light
- Measurement range and mode adjustable
- Two teachable switching outputs

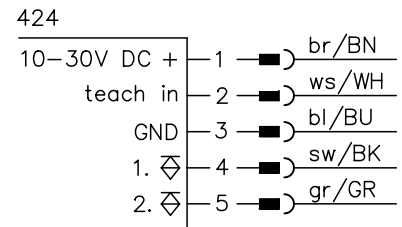
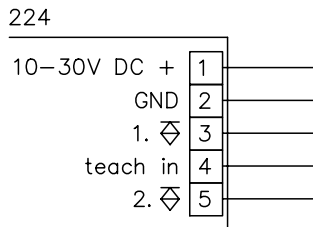
Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter
- D Receiver
- E Optical axis
- F Device plug M12x1
- G Screwed cable gland PG11 for Ø5 ... 10mm
- H Countersinking for SK nut M5, 4.2mm deep
- I Parameter plug
- K Connection terminals
- L Cable entry



Electrical connection

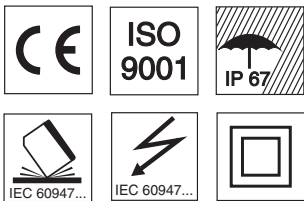


Accessories:

(available separately • see page 808)

- Mounting systems
- Programming software

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Specifications

Optical data

Measurement range ¹⁾	200 ... 2000mm
Resolution	≤ 5mm
Light source	laser (modulated light)
Wavelength	660nm (visible red light)
Light spot diameter	divergent, 3x12mm ² at 2m
Laser warning notice	see remarks

Error limits

Absolute measurement accuracy ¹⁾	± 2% (relative to the measurement distance)
Repeatability ²⁾	± 0.5%
b/w detection thresholds (6%/90%)	< 1%

Timing

Switching frequency	10 ... 100Hz
Response time	≤ 100ms
Delay before start-up	≤ 300ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 150mA
Switching outputs	2 PNP switching outputs, high-active
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA per transistor output

Indicators

LED green	continuous light	teach-in on GND	teach-in on +U_B
	flashing	ready	
	off	error	teaching procedure
LED yellow	continuous light	no voltage	
	flashing	object inside	
	off	measurement range	
		object outside	teaching procedure
		measurement range	
		no object detected	

Mechanical data

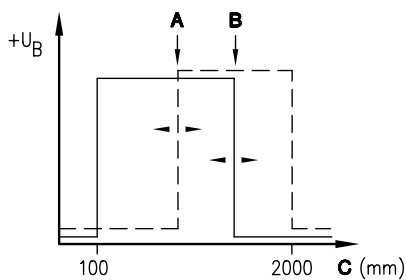
Housing	diecast zinc
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connectors

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... + 70°C
Protective circuit ³⁾	1, 2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

1) Luminosity coefficient 6% ... 90%, over complete temperature range, measured object ≥ 50x50mm²
 2) Same object, measured object ≥ 50x50mm²
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Switching output (example)



A 2nd switching output
B 1st switching output
C Measurement distance

Order guide

Terminals

2 PNP switching outputs

M12 connector

2 PNP switching outputs

Designation	Part No.
ODS 96M/S-5100-224	500 30603
ODS 96M/S-5100-424	500 30604

Tables

Diagrams

Remarks

- Switching frequency depends on the reflectivity of the measured object and on the measurement mode.
- **Teaching procedure:** Position measured object at 1st desired measurement distance. Connect teach input to +U_B for ≥ 2s. Both LEDs are flashing simultaneously. Reconnect teach input to GND, 1st switching output is programmed. Position measured object at 2nd desired measuring distance. Connect teach input to +U_B for ≥ 2s. Both LEDs are flashing alternately. Reconnect teach input to GND, 2nd switching output is programmed. The procedure can be repeated as desired, leave teach input connected to GND in idle mode.

LASERSTRAHLUNG / LASER LIGHT
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 DO NOT STARE INTO BEAM
 LASERKLASSE 2
 CLASS 2 LASER PRODUCT
 IEC 60825-1-am2 (2001-01)

ODS 96
 Pulse duration < 32ms
 Quiescent period ≥ 5ms
 P_{max} ≤ 1mW
 λ = 670nm

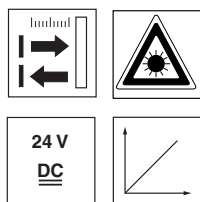
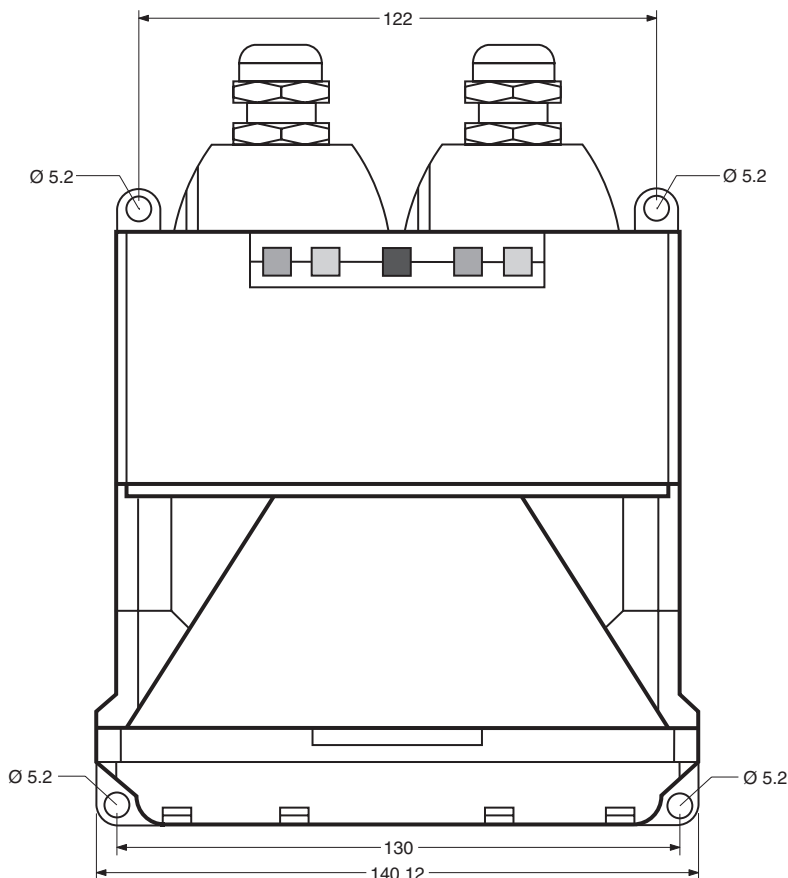


rotoScan ROD-4

Optical distance sensors



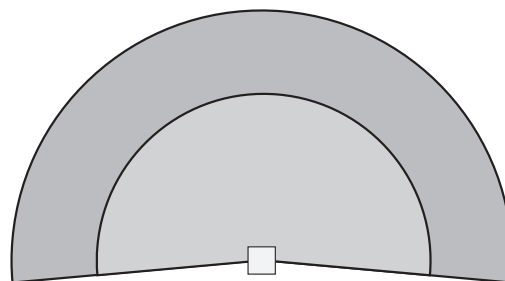
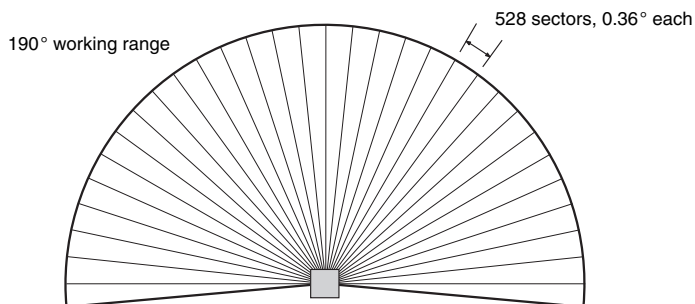
Dimensioned drawing



0 ... 15m

- The rotoScan ROD-4 is an area scanning distance sensor for the detection of objects. The light beam is reflected by a rotating mirror and directed over a semicircular area (190°) with a radius of max. 50m.
- The area is divided into two detection areas, each with a radius of 15m. The size of the area to be evaluated can be freely defined in each detection area.
- It is possible to store 4 detection area pairs in the ROD-4 and to switch between these pairs, for example, to define various heights or allowed overhangings.

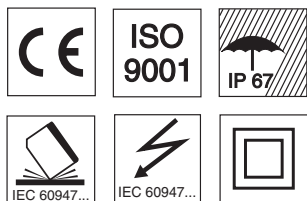
Measurement principle



Working field (50m)

Detection area 1 (max. 15m)

Detection area 2 (max. 15m)



Accessories:

(available separately • see page 808)

- Mounting systems
- Programming software
- Various connection cables

We reserve the right to make changes • ods_10e.fm



Specifications

Optical data

Scanning range (per detection area)	0 ... 15m
Angular range	max. 190°
Angular resolution	0.36°
Scanning rate	25 scans/s or 40ms/scan
Transmitter with infrared laser diode	laser safety class 1 (eye safe), wavelength = 905nm beam divergence = 2mrad time base = 100s

Detection area 1 and 2

Reflectivity	from min. 1.8% (flat black)
Object size	> 20mm at distance of 4m > 100mm at distance of 15m
Response time	at least 80ms (corresponds to 2scans)
Number of detection area pairs	4 (selectable via switching inputs)
Output	3 x PNP transistor output 24V/250mA
Measurement value resolution per sector	5mm
Repeatability	10...90% diffuse reflection at 4m distance ± 15mm

Electrical data

Voltage supply	+24VDC +20%/-30%
Overcurrent protection	via fuse 2A semi time-lag in the switching cabinet
Current consumption	approx. 400mA (use 1A power supply), approx. 1A with heating
Power consumption	< 60W at 24V including the outputs
Overvoltage protection	overvoltage protection with protected limit stop

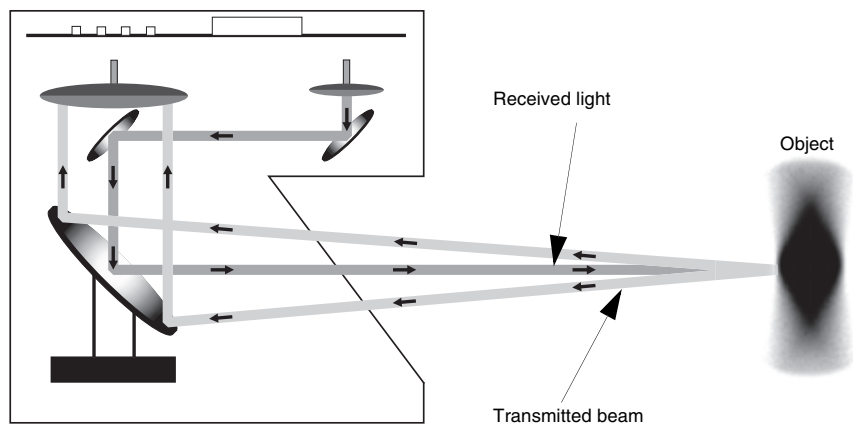
Mechanical data

Housing	diecast aluminium, plastic
Weight	3.6kg
Connection type	2 connectors (can be plugged from above, solder connection)

Environmental data

Ambient temp. (operation/storage)	-0°C ... +50°C/-20°C ... +60°C -20°C ... +50°C/-20°C ... +60°C (with heating)
VDE safety class	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

Operating principle



Order guide

	Designation	Part No.
With heating	ROD-4	500 36010
	ROD-4-06	500 38614

Tables

Remarks

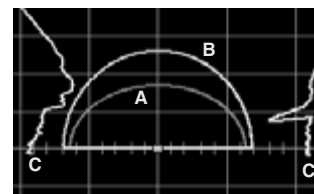
"RODsoft" configuration software

The configuration software "RODsoft" runs under Windows 95/98/NT/2000 and offers the following possibilities:

- Programming of the detection areas
- Parameterisation of other data
- Visualisation of the detection area with measurement values
- Error code display
- Support of various languages

There are various methods with which detection areas can be programmed, for example:

- "Teach-in" function
- Numerical and graphical entry of the detection areas
- "Edit" function



A Detection area 1
B Detection area 2
C Current measurement values



Accessories

ODS

M12 connectors



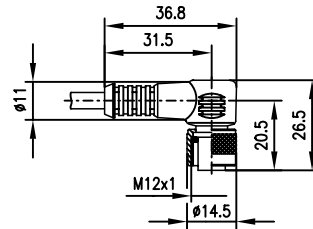
For devices with M12 connectors, there are available: 2 connectors with ready-made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050) plugged and screwed: IP 67

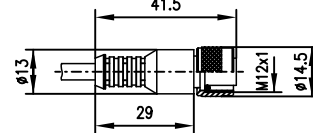
Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

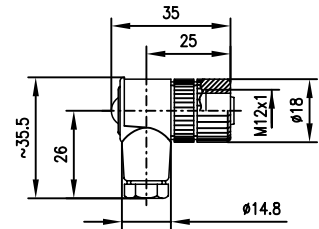
Dimensioned drawings



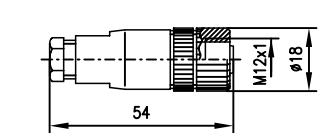
KB 095-5000-5



KB 095-5000-5A



KD 095-5



KD 095-5A

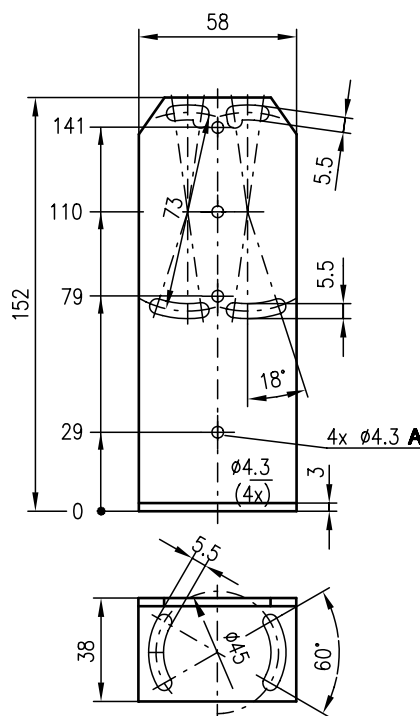
Selection table

M12 connectors			
with cable (5m) 5-pin		without cable	
KB 095-5000-5 Part No. 500 20500	KB 095-5000-5A Part No. 500 20499	KD 095-5 Part No. 500 20502	KD 095-5A Part No. 500 20501

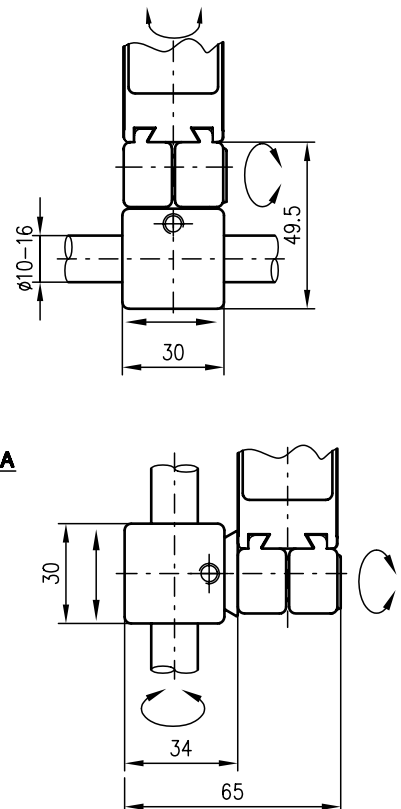
Dimensioned drawings

BT 96

UMS 96



A for screw M5



Mounting systems

BT 96 (Part No. 500 25570)



UMS 96 (Part No. 500 26204)



KB-ODS 96-1500 (Part No. 500 82007)



Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes * ods_zu_e.fm



Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index

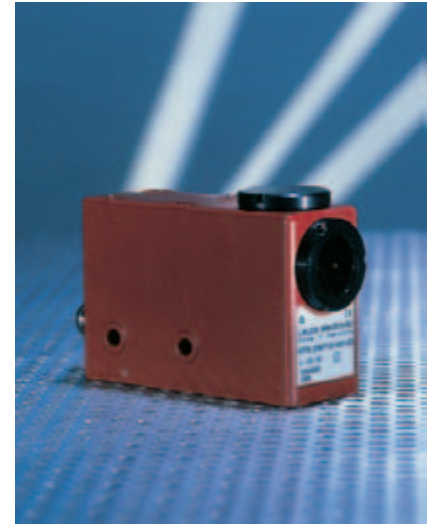


Contrast scanners, colour sensors, luminescence scanners

Overview and advantages

Contrast scanners

- KRTM 20 with multicolour transmitter (red, green, blue)
- KRTG 20 with green light transmitter
- Very dynamic compensation of drift, temperature, and lustre
- Different teach-in variants for optimum process integration
- Reversible switching thresholds
- Response time digital/analogue: 20µs/0.6µs
- PNP, NPN and analogue outputs
- Interchangeable objectives: 12mm, 20mm and 50mm
- Teach-in via keyboard or remote calibration
- 20ms pulse stretching can be switched on
- Light/dark switching



Colour sensors

- Multicolour LED transmitter
- Colour detection with incident light and transmitted light
- Detection of different colours via 2/4 digital outputs or via an analogue output
- Up to four reference colours can be stored
- Programming via teach-in
- Analogue evaluation with transmitter switchover

Luminescence scanners

- LED with UV light
- Scanning ranges up to 300mm
- Differentiation between visible and invisible luminescing material
- Miniature construction
- PNP, NPN and analogue outputs



Operating principle	Designation	Typ. scanning range limit	Operating voltage		Output						
			12 ... 30VDC	10 ... 30VDC	PNP	2 x PNP (2 colours)	4 x PNP (4 colours)	NPN	Analogue + PNP	Analogue + NPN	
	Contrast scanner with digital and analogue output - multi colour (RGB)										
	KRTM 20M/P-12-1320-S12	12mm	•		•						
	KRTM 20M/V-12-1526-S12	12mm	•						•		
	KRTM 20M/N-12-1320-S12	12mm	•					•			
	KRTM 20M/V-12-1626-S12	12mm	•								•
	KRTM 20M/P-20-1320-S12	20mm	•		•						
	KRTM 20M/V-20-1526-S12	20mm	•						•		
	KRTM 20M/N-20-1320-S12	20mm	•					•			
	KRTM 20M/V-20-1626-S12	20mm	•								•
	KRTM 20M/P-50-1320-S12	50mm	•		•						
	KRTM 20M/V-50-1526-S12	50mm	•						•		
	KRTM 20M/N-50-1320-S12	50mm	•					•			
	KRTM 20M/V-50-1626-S12	50mm	•								•
	KRTM 20M/P-12-1420-S12	12mm	•		•						
	KRTM 20M/N-12-1420-S12	12mm	•					•			
	KRTM 20M/P-20-1420-S12	20mm	•		•						
	KRTM 20M/N-20-1420-S12	20mm	•					•			
	KRTM 20M/P-50-1420-S12	50mm	•		•						
	KRTM 20M/N-50-1420-S12	50mm	•					•			
	KRTM 20M/V-50-1427-S12	12mm	•						•		
	KRTM 20M/V-50-1428-S12	12mm	•								•
	KRTM 20M/V-20-1427-S12	20mm	•						•		
	KRTM 20M/V-20-1428-S12	20mm	•								•
	KRTM 20M/V-50-1427-S12	50mm	•						•		
	KRTM 20M/V-50-1428-S12	50mm	•								•
	KRTM 20M/P-12-1720-S12	12mm	•		•						
	KRTM 20M/N-12-1720-S12	12mm	•					•			
	KRTM 20M/P-20-1720-S12	20mm	•		•						
	KRTM 20M/N-20-1720-S12	20mm	•					•			
	KRTM 20M/P-50-1720-S12	50mm	•		•						
	KRTM 20M/N-50-1720-S12	50mm	•					•			
	KRTM 20M/V-12-1727-S12	12mm	•						•		
	KRTM 20M/V-12-1728-S12	12mm	•								•
	KRTM 20M/V-20-1727-S12	20mm	•						•		
	KRTM 20M/V-20-1728-S12	20mm	•								•
	KRTM 20M/V-50-1727-S12	50mm	•						•		
	KRTM 20M/V-50-1728-S12	50mm	•								•
	Contrast scanner with digital and analogue output - green light										
	KRTG 20M/P-12-1320-S12	12mm	•		•						
	KRTG 20M/N-12-1320-S12	12mm	•					•			
	KRTG 20M/V-12-1526-S12	12mm	•						•		
	KRTG 20M/V-12-1626-S12	12mm	•								•
	KRTG 20M/P-20-1320-S12	20mm	•		•						
	KRTG 20M/N-20-1320-S12	20mm	•					•			
	KRTG 20M/V-20-1526-S12	20mm	•						•		
	KRTG 20M/V-20-1626-S12	20mm	•								•
	KRTG 20M/P-50-1320-S12	50mm	•		•						
	KRTG 20M/N-50-1320-S12	50mm	•					•			
KRTG 20M/V-50-1526-S12	50mm	•						•			
KRTG 20M/V-50-1626-S12	50mm	•								•	
KRTG 20M/P-12-1420-S12	12mm	•		•							
KRTG 20M/N-12-1420-S12	12mm	•					•				
KRTG 20M/V-12-1427-S12	12mm	•						•			
KRTG 20M/V-12-1428-S12	12mm	•								•	
KRTG 20M/P-20-1420-S12	20mm	•		•							
KRTG 20M/N-20-1420-S12	20mm	•					•				



Operating principle	Designation	Typ. scanning range limit	Operating voltage		Output					
			12 ... 30VDC	10 ... 30VDC	PNP	2 x PNP (2 colours)	4 x PNP (4 colours)	NPN	Analogue + PNP	Analogue + NPN
	Contrast scanner with digital and analogue output - green light (cont.)									
	KRTG 20M/V-20-1427-S12	20mm	•						•	
	KRTG 20M/V-20-1428-S12	20mm	•							•
	KRTG 20M/P-50-1420-S12	50mm	•		•					
	KRTG 20M/N-50-1420-S12	50mm	•					•		
	KRTG 20M/V-50-1427-S12	50mm	•						•	
	KRTG 20M/V-50-1428-S12	50mm	•							•
	KRTG 20M/P-20-1820-S12	20mm	•		•					
	KRTG 20M/N-20-1820-S12	20mm	•					•		
	KRTG 8/24-10-S12	10mm		•	•				•	
	Colour sensors with digital output									
	CRT 448M/P-40-002-S12	40mm		•		•				
	CRT 448M/P-40-004-S12	40mm		•			•			
	Colour sensors with analogue output									
	CRTM 20M/V-50-0001-S12	12, 20, 50mm	•						•	
	Luminescence scanner with digital and analogue output									
	LRT 440/24-30-004-S12	0 ... 70mm		•	•				•	
	LRT 440/24-50-004-S12	0 ... 120mm		•	•				•	
	LRT 440/24-50-104-S12	0 ... 120mm		•	•				•	
	LRT 440/24-50-000-S12	0 ... 120mm		•				•	•	
	LRT 440/24-50-006-S12	0 ... 120mm		•	•				•	
	LRT 440/24-50-002-S12	0 ... 120mm		•	•				•	
	LRT 440/24-50-001-S12	0 ... 120mm		•	•				•	
	LRT 440/24-150-004-S12	0 ... 300mm		•	•				•	
	Luminescence scanner, miniature construction with digital output									
	LRT 40/4-10-04, 5000	2 ... 40mm		•	•					
	LRT 40/4-10-14	2 ... 40mm		•	•					



Light source			Switching frequency	Adjustment		Teach process				Connection		Page
red/green/blue	green	UV/blue		Teach-in	Potentiometer	Static	Dynamic - standard	Dynamic with marker preselection	Background	M12	Cable	
	•		25kHz	•			•			•		835
	•		25kHz	•			•			•		835
	•		25kHz	•			•			•		835
	•		25kHz	•			•			•		835
	•		25kHz	•			•			•		835
	•		25kHz	•			•			•		835
	•		25kHz	•					•	•		839
	•		25kHz	•					•	•		839
	•		10kHz	•						•		841
•			1.6kHz	•			•			•		845
•			1.6kHz	•			•			•		845
•			100Hz/80kHz	•						•		851
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	1kHz		•					•		853
		•	2kHz	•							•	855
		•	2kHz		•						•	855



KRTM 20

Multi colour contrast scanner RGB

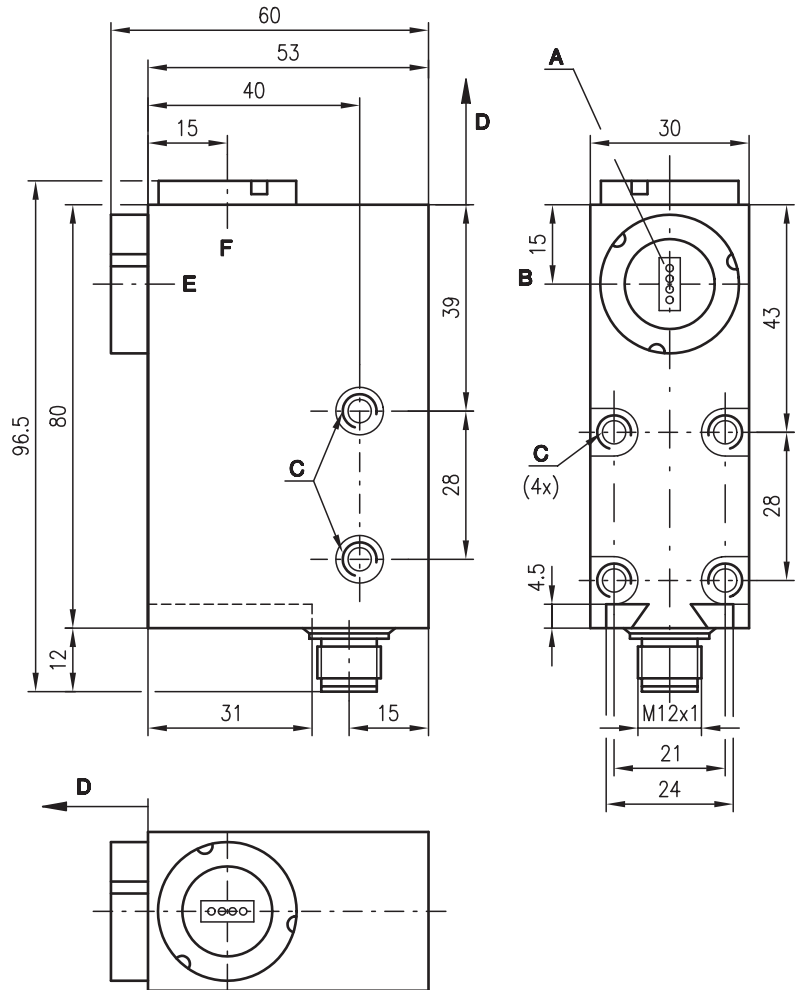


12mm
20mm
50mm



- Static teach-in procedure
- Switching frequency 25,000Hz
- 3 transmitters in the colours red, green, blue
- Programming by means of teach-in (via button or remote calibration)

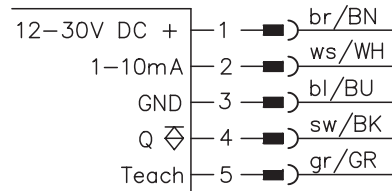
Dimensioned drawing



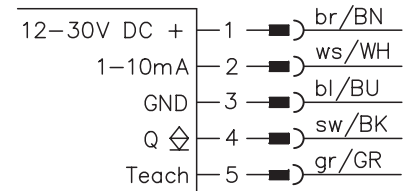
- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

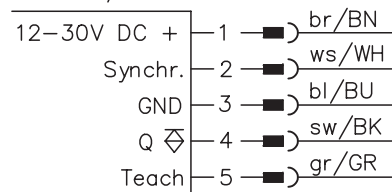
KRTM 20M/V ...-1526-S12



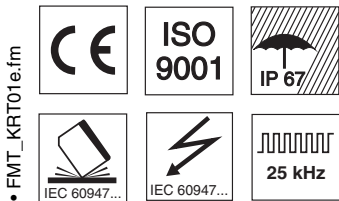
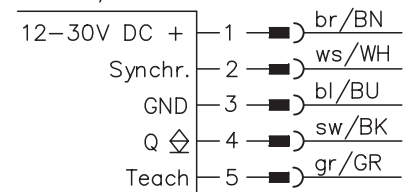
KRTM 20/V ...-1626-S12



KRTM 20M/P ...-S12



KRTM 20/N ...-S12



Accessories:

(available separately • see page 856)

- M12 connectors, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives

We reserve the right to make changes • FMT_KRT01e.fm



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	3.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx1.2mm
Light spot dimensions with objective 3	10.0mmx2.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

Timing

Switching frequency	max. 25kHz
Response time	min. 20µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5ms

Teach input

PNP: active / not active	$U_B/0V$ or not connected
NPN: active / not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching

20ms, can be activated via button

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section **Preferred types** (page 819)

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.

KRTM 20

Function principle of the contrast scanner

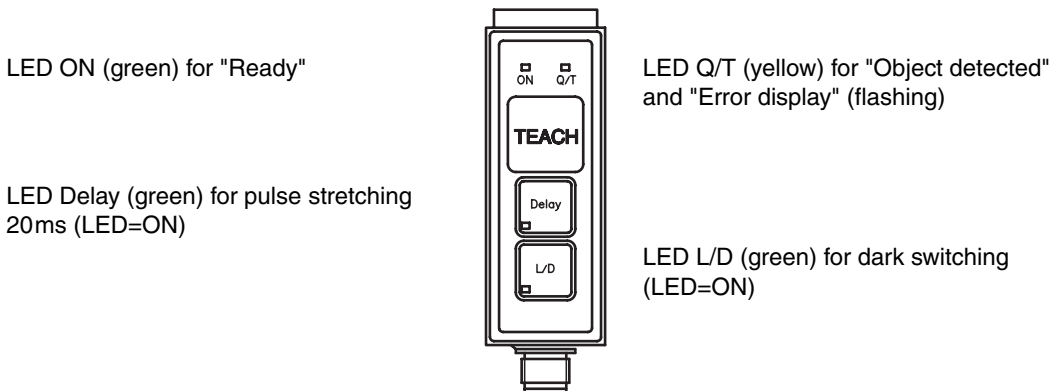
These contrast scanners are devices which, with the aid of multiple transmitter colours (red, green, blue), can differentiate between extremely small differences in contrast (grey tones). By means of automatic colour selection when teaching the markers (objects), the transmitter colour affording the greatest functional safety is selected for the current contrast combination.

In this way any number of marker/background combinations can be detected with optimal functional safety. The typical colour shortcomings of devices with single-colour or white LED transmitters are thus eliminated. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught.

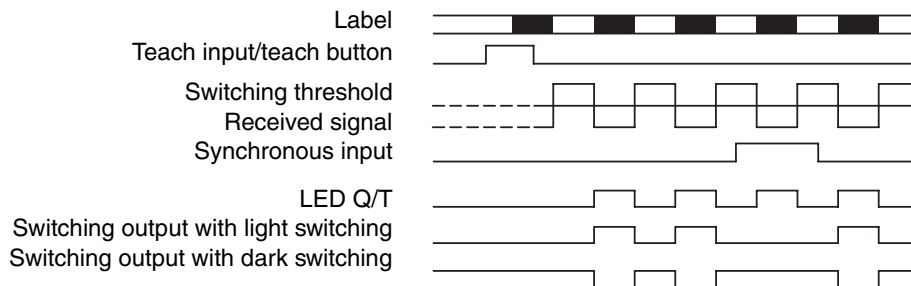
Each transmitter colour consists of 4 LEDs. A longish light spot with four points is formed in the focal point. This very small, extremely bright light spot guarantees a high repeatability and positioning accuracy. For the case that the marker or background is not optimally printed, the light spot can be focused by slightly changing the scanning distance in such a way that a homogeneous, rectangular light spot is formed.

With this teaching type, background and marker must be placed statically below the light spot. Using the synchronisation input, the switching output can be activated or deactivated.

Controls and indicators



Signal response during teach-in



Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the light spot on the background	Red, green or blue light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	All colours are on White light spot is visible	All LEDs flash
Position the light spot on the marker	All colours are on White light spot is visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Changeover to red, green or blue Red, green or blue light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	All colours off	ON (green) illuminated Q/T (yellow) flashing (error)



Preferred types

Selection table		Order code →											
Equipment ↓		KRTM 20M/P-12-1320-S12 Part No. 500 32780	KRTM 20M/N-12-1320-S12 Part No. 500 32781	KRTM 20M/V-12-1526-S12 Part No. 500 33834	KRTM 20M/V-12-1626-S12 Part No. 500 33833	KRTM 20M/P-20-1320-S12 Part No. 500 32782	KRTM 20M/N-20-1320-S12 Part No. 500 32783	KRTM 20M/V-20-1526-S12 Part No. 500 33859	KRTM 20M/V-20-1626-S12 Part No. 500 33861	KRTM 20M/P-50-1320-S12 Part No. 500 32784	KRTM 20M/N-50-1320-S12 Part No. 500 32785	KRTM 20M/V-50-1526-S12 Part No. 500 33863	KRTM 20M/V-50-1626-S12 Part No. 500 33865
Scanning range	12mm	●	●	●	●								
	20mm					●	●	●	●				
	50mm									●	●	●	●
Transmitter colour	RGB	●	●	●	●	●	●	●	●	●	●	●	●
	green												
Light spot orientation	vertical	●	●	●	●	●	●	●	●	●	●	●	●
	horizontal												
	round												
Optical outlet	front												
	head	●	●	●	●	●	●	●	●	●	●	●	●
Output wiring	PNP	●		●		●		●		●		●	
	NPN		●		●		●		●		●		●
	analogue current			●	●			●	●			●	●
Other features	static teach-in	●	●	●	●	●	●	●	●	●	●	●	●
	dynamic teach-in, standard												
	dynamic teach-in with marker preselection												
	teach-in, background												
	synchronous input	●	●			●	●			●	●		

Additional types on request



KRTM 20

Multi colour contrast scanner RGB



12mm
20mm
50mm



- Standard dynamic teach-in procedure
- Switching frequency 25,000Hz
- 3 transmitters in the colours red, green, blue
- Programming by means of teach-in (via button or remote calibration)

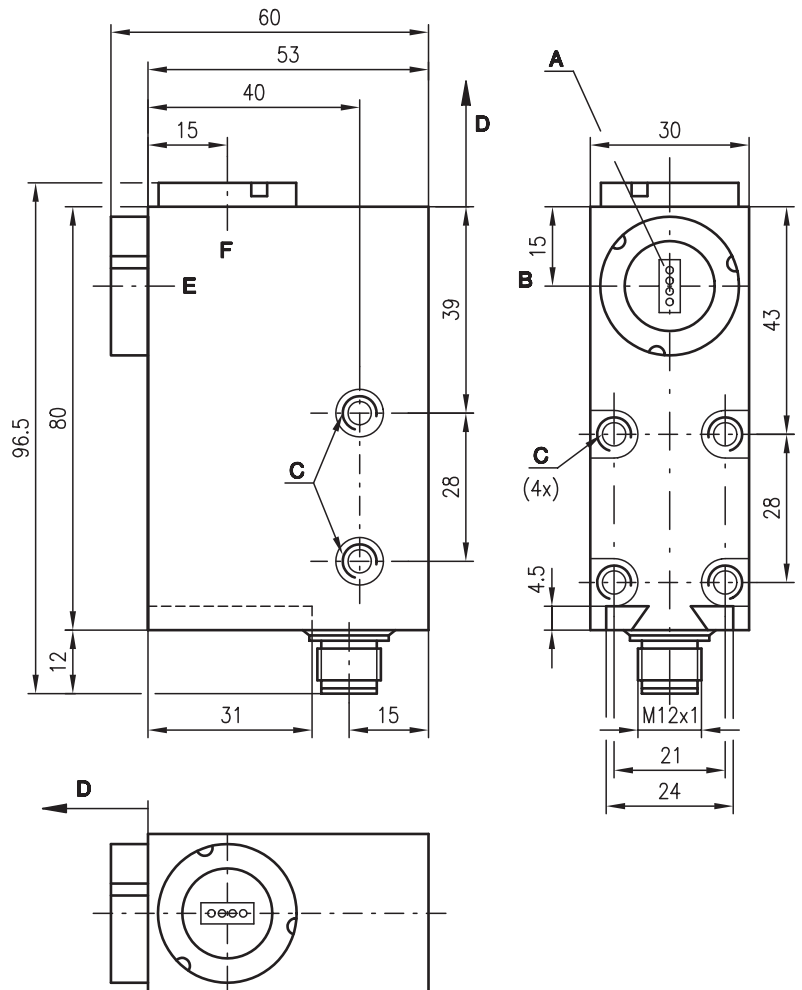


Accessories:

(available separately • see page 856)

- M12 connectors, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives

Dimensioned drawing



- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

KRTM 20M/V ...-1427-S12

12-30V DC +	1	br/BN
1-10mA	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR

KRTM 20/V ...-1428-S12

12-30V DC +	1	br/BN
1-10mA	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR

KRTM 20M/P ...-S12

12-30V DC +	1	br/BN
Synchr.	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR

KRTM 20/N ...-S12

12-30V DC +	1	br/BN
Synchr.	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR

Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	3.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx1.2mm
Light spot dimensions with objective 3	10.0mmx2.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

Timing

Switching frequency	max. 25kHz
Response time	min. 20µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5ms

Teach input

PNP: active/not active	$U_B/0V$ or not connected
NPN: active/not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching

20ms, can be activated via button

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section **Preferred types** (page 823)

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.
- You can change the selection of the switching threshold by simultaneously pressing the Delay and L/D buttons during Power-On.
Power-On:
LED ON (illuminated)
LED ON (flashing)

KRTM 20

Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of multiple transmitter colours (red, green, blue), can differentiate between extremely small differences in contrast (grey tones). By means of automatic colour selection when teaching the markers (objects), the transmitter colour affording the greatest functional safety is selected for the current contrast combination.

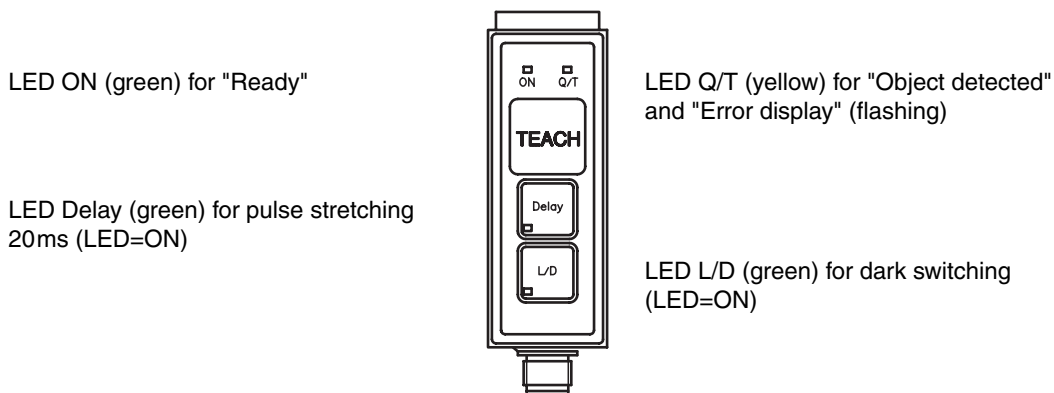
In this way any number of marker/background combinations can be detected with optimal functional safety. The typical colour shortcomings of devices with single-colour or white LED transmitters are thus eliminated. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught. Each transmitter colour consists of 4 LEDs. A longish light spot with four points is formed in the focal point. This very small, extremely bright light spot guarantees a high repeatability and positioning accuracy. For the case that the marker or background is not optimally printed, the light spot can be focused by slightly changing the scanning distance in such a way that a homogeneous, rectangular light spot is formed.

With this teaching type, the teaching process must be started on the background.

Using the synchronisation input, the switching output can be activated or deactivated. Adaptation of the taught switching threshold is performed as described under Remarks.

See also Remarks and Diagrams

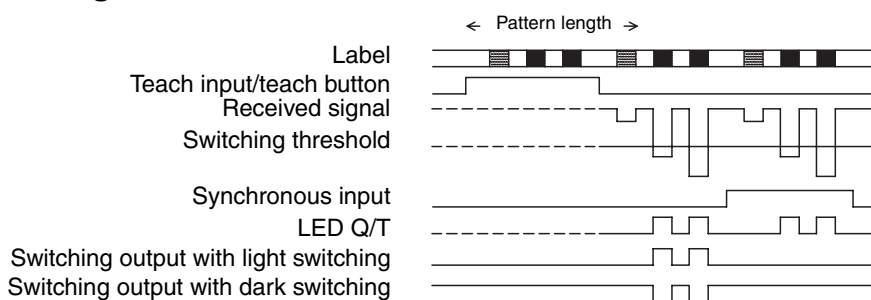
Controls and indicators



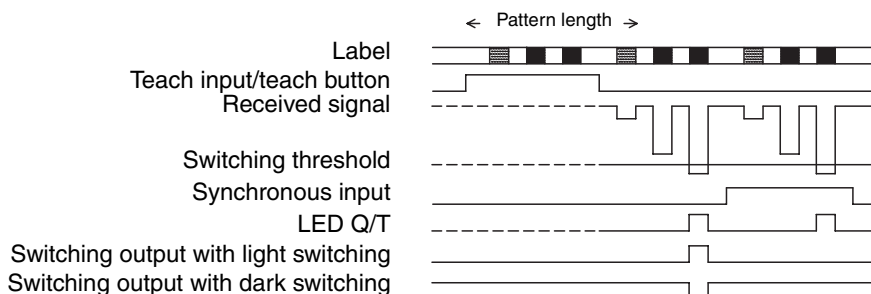
Signal propagation

After activating the teaching function, the markers have to be moved past the sensor for at least one pattern length. The teaching process must be started on the background and can be stopped anywhere. The sensor scans the paper in 10ms intervals and reveals the minimum and maximum contrast. After completing the teaching function, the switching threshold is set.

Centered switching threshold



Switching threshold close to marker contrast





Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the sensor above the background	Red, green or blue light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	All colours are on White light spot is visible	All LEDs flash
Move paper sheet for at least one pattern length	All colours are on White light spot is visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Changeover to red, green or blue Red, green or blue light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	All colours off	ON (green) illuminated Q/T (yellow) flashing (error)

Preferred types

Selection table		Order code →											
Equipment ↓		KRTM 20M/P-12-1420-S12 Part No. 500 33866	KRTM 20M/N-12-1420-S12 Part No. 500 33962	KRTM 20M/V-12-1427-S12 Part No. 500 35218	KRTM 20M/V-12-1428-S12 Part No. 50035219	KRTM 20M/P-20-1420-S12 Part No. 500 33963	KRTM 20M/N-20-1420-S12 Part No. 500 33964	KRTM 20M/V-20-1427-S12 Part No. 500 35220	KRTM 20M/V-20-1428-S12 Part No. 500 35221	KRTM 20M/P-50-1420-S12 Part No. 500 33965	KRTM 20M/N-50-1420-S12 Part No. 500 33966	KRTM 20M/V-50-1427-S12 Part No. 500 35222	KRTM 20M/V-50-1428-S12 Part No. 500 35223
Scanning range	12 mm	●	●	●	●								
	20 mm					●	●	●	●				
	50 mm									●	●	●	●
Transmitter colour	RGB	●	●	●	●	●	●	●	●	●	●	●	●
	green												
Light spot orientation	vertical	●	●	●	●	●	●	●	●	●	●	●	●
	horizontal												
	round												
Optical outlet	front												
	head	●	●	●	●	●	●	●	●	●	●	●	●
Output wiring	PNP	●		●		●		●		●		●	
	NPN		●		●		●		●		●		●
	analogue voltage												
	analogue current			●	●			●	●			●	●
Other features	static teach-in												
	dynamic teach-in, standard	●	●	●	●	●	●	●	●	●	●	●	●
	dynamic teach-in with marker preselection												
	teach-in, background												
	synchronous input	●	●				●	●		●	●		

Additional types on request



KRTM 20

Multi colour contrast scanner RGB

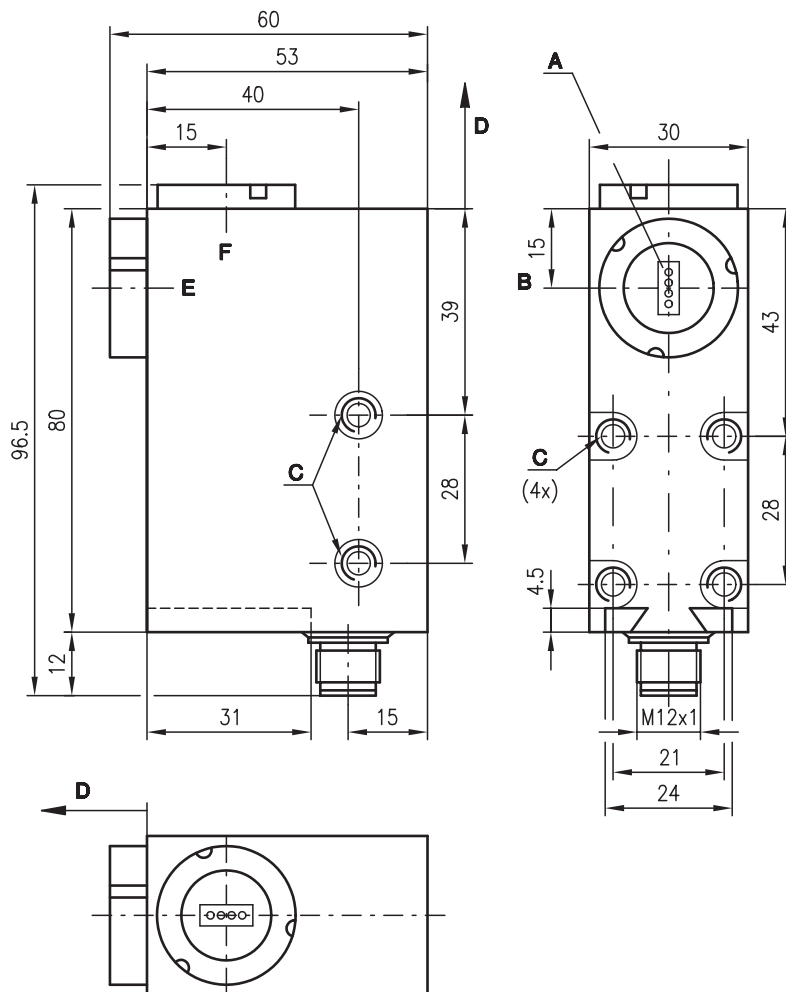


12mm
20mm
50mm



- Dynamic teach-in with marker contrast preselection
- Switching frequency 25,000Hz
- 3 transmitters in the colours red, green, blue
- Programming by means of teach-in (via button or remote calibration)

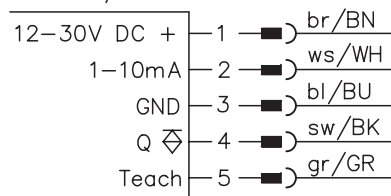
Dimensioned drawing



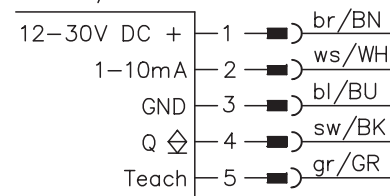
- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

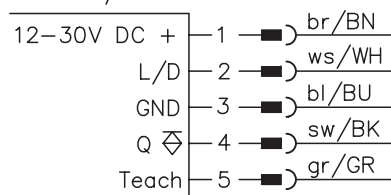
KRTM 20M/V ...-1727-S12



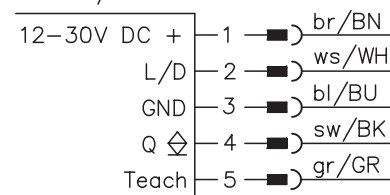
KRTM 20/V ...-1728-S12



KRTM 20M/P ...-S12



KRTM 20/N ...-S12



We reserve the right to make changes • FMT_KRT03e.fm



Accessories:

(available separately • see page 856)

- M12 connectors, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	3.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx1.2mm
Light spot dimensions with objective 3	10.0mmx2.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

Timing

Switching frequency	max. 25kHz
Response time	min. 20µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2.3
Standards applied	IEC 60947-5-2

Options

L/D input

PNP: dark markers/light markers	$U_B/0V$ or not connected
NPN: dark markers/light markers	$0V/U_B$ or not connected
L/D delay	≤ 0.5ms

Teach input

PNP: active / not active	$U_B/0V$ or not connected
NPN: active / not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching

20ms, can be activated via button

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section **Preferred types** (page 827)

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.
- With this teaching type, the teaching process can be started at any time. The marker contrast must be preset using the L/D button or the L/D input.

KRTM 20

Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of multiple transmitter colours (red, green, blue), can differentiate between extremely small differences in contrast (grey tones). By means of automatic colour selection when teaching the markers (objects), the transmitter colour affording the greatest functional safety is selected for the current contrast combination.

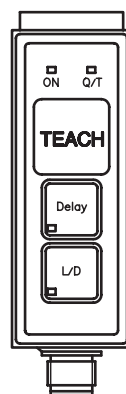
In this way any number of marker/background combinations can be detected with optimal functional safety. The typical colour shortcomings of devices with single-colour or white LED transmitters are thus eliminated. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught. Each transmitter colour consists of 4 LEDs. A longish light spot with four points is formed in the focal point. This very small, extremely bright light spot guarantees a high repeatability and positioning accuracy. For the case that the marker or background is not optimally printed, the light spot can be focused by slightly changing the scanning distance in such a way that a homogeneous, rectangular light spot is formed.

With this teaching type, the teaching process can be started at any time. The marker contrast must be preset using the L/D button or the L/D input.

Controls and indicators

LED ON (green) for "Ready"

LED Delay (green) for pulse stretching
20ms (LED=ON)



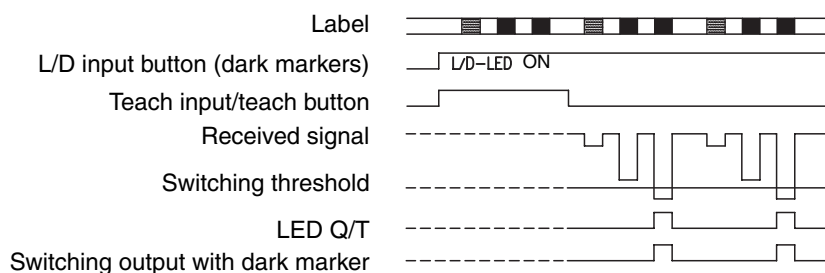
LED Q/T (yellow) for "Object detected"
and "Error display" (flashing)

LED L/D (green) for dark switching
(LED=ON)

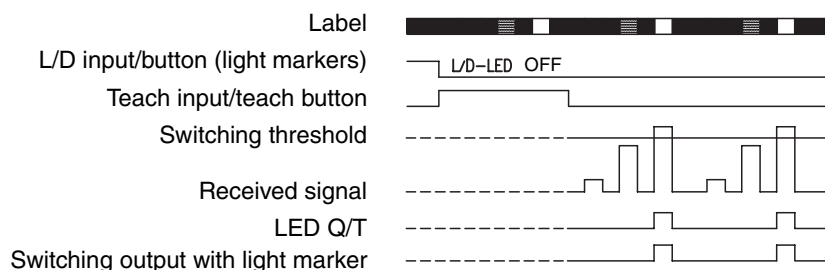
Signal propagation

Preset marker contrast using the L/D button or the L/D input. After activating the teaching function, the markers have to be moved past the sensor for at least one pattern length. Any starting point may be chosen (marker or background). The sensor scans the paper in 10ms intervals and reveals the minimum and maximum contrast. After completing the teaching function, the switching threshold is set depending on the contrast preselection.

Switching threshold with preset dark markers



Switching threshold with preset light markers





Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Preset marker contrast using the L/D button or the L/D input	Red, green or blue light spot visible	
Position the sensor at any point above the marker path	Red, green or blue light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	All colours are on White light spot is visible	All LEDs flash
Move marker path	All colours are on White light spot is visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Changeover to red, green or blue Red, green or blue light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	All colours off	ON (green) illuminated Q/T (yellow) flashing (error)

Preferred types

Selection table		Order code →											
Equipment ↓		KRTM 20M/P-12-1720-S12 Part No. 500 33867	KRTM 20M/N-12-1720-S12 Part No. 500 33968	KRTM 20M/V-12-1727-S12 Part No. 500 35224	KRTM 20M/V-12-1728-S12 Part No. 500 35225	KRTM 20M/P-20-1720-S12 Part No. 500 33969	KRTM 20M/N-20-1720-S12 Part No. 500 33970	KRTM 20M/V-20-1727-S12 Part No. 500 35226	KRTM 20M/V-20-1728-S12 Part No. 500 35227	KRTM 20M/P-50-1720-S12 Part No. 500 33971	KRTM 20M/N-50-1720-S12 Part No. 500 33972	KRTM 20M/V-50-1727-S12 Part No. 500 35228	KRTM 20M/V-50-1728-S12 Part No. 500 35229
Scanning range	12 mm	●	●	●	●								
	20 mm					●	●	●	●				
	50 mm									●	●	●	●
Transmitter colour	RGB	●	●	●	●	●	●	●	●	●	●	●	●
	green												
Light spot orientation	vertical	●	●	●	●	●	●	●	●	●	●	●	●
	horizontal												
	round												
Optical outlet	front												
	head	●	●	●	●	●	●	●	●	●	●	●	●
Output wiring	PNP	●		●		●		●		●		●	
	NPN		●		●		●		●		●		●
	analogue voltage												
	analogue current			●	●			●	●			●	●
Other features	static teach-in												
	dynamic teach-in, standard												
	dynamic teach-in with marker preselection	●	●	●	●	●	●	●	●	●	●	●	●
	teach-in, background												
	synchronous input	●	●			●	●			●	●		

Additional types on request



KRTG 20

Green light contrast scanner

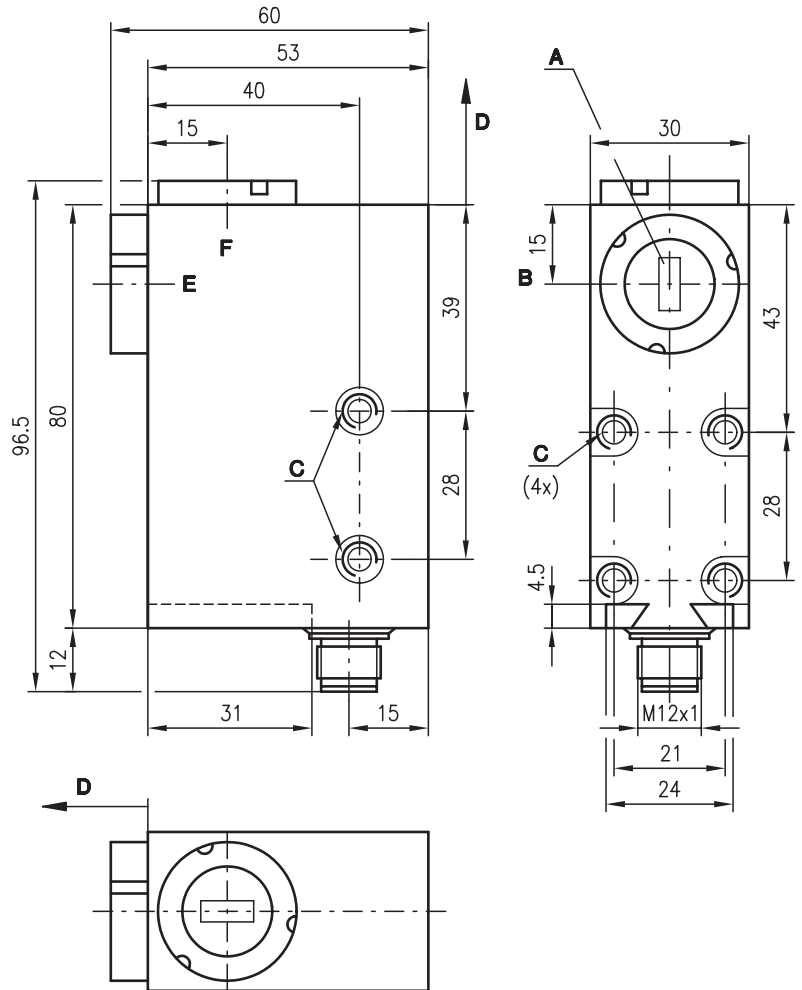


12mm
20mm
50mm



- Static teach-in procedure
- Switching frequency 25,000Hz
- Green transmitter LED with variable brightness
- Programming by means of teach-in (via button or remote calibration)

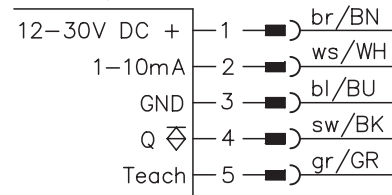
Dimensioned drawing



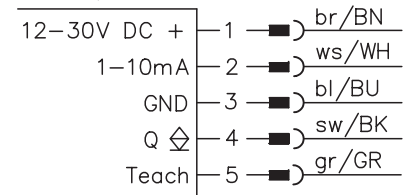
- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

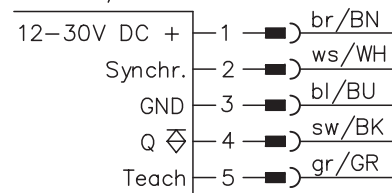
KRTG 20M/V ...-1526-S12



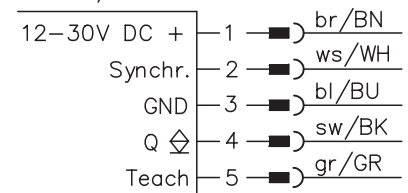
KRTG 20/V ...-1626-S12



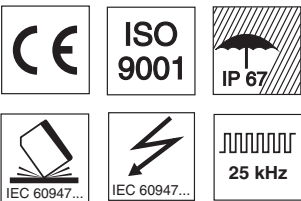
KRTG 20M/P ...-S12



KRTG 20/N ...-S12



We reserve the right to make changes • FMT_KRT04e.fm



Accessories:

(available separately • see page 856)

- M12 connectors, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	2.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx2.0mm
Light spot dimensions with objective 3	5.0mmx3.0mm
Light spot orientation	vertical
Light source	LED green, two brightness levels

Timing

Switching frequency	max. 25kHz
Response time	min. 20µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5ms

Teach input

PNP: active/not active	$U_B/0V$ or not connected
NPN: active/not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching

20ms, can be activated via button

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section **Preferred types** (page 831)

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.
- The transmission power (light spot brightness) is adapted automatically.

KRTG 20

Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of a green LED transmitter, can differentiate between extremely small differences in contrast (grey scale values). Their dynamic range is much wider compared to known devices. This is made possible by automatic amplifier adaptation and use of several transmission levels (brightnesses).

In this way any number of marker/background combinations can be detected with remarkably increased functional safety. Shiny markers can be safely detected. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught.

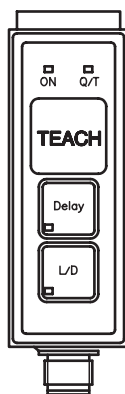
The diaphragm mounted in front of the receiver and the extremely bright light spot guarantee a high reproducibility and precision in positioning.

With this teaching type, background and marker must be placed statically below the light spot. Using the synchronisation input, the switching output can be activated or deactivated.

Controls and indicators

LED ON (green) for "Ready"

LED Delay (green) for pulse stretching
20ms (LED=ON)



LED Q/T (yellow) for "Object detected"
and "Error display" (flashing)

LED L/D (green) for dark switching
(LED=ON)

Switching threshold with preset dark markers



Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the light spot on the background	Green light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	Green light spot visible	All LEDs flash
Position the light spot on the marker	All colours are on White light spot is visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Green light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	No light spot visible	ON (green) illuminated Q/T (yellow) flashing (error)



Preferred types

Selection table		Order code →											
Equipment ↓		KRTG 20M/P-12-1320-S12 Part No. 500 32791	KRTG 20M/N-12-1320-S12 Part No. 500 32795	KRTG 20M/V-12-1526-S12 Part No. 500 32787	KRTG 20M/V-12-1626-S12 Part No. 500 32789	KRTG 20M/P-20-1320-S12 Part No. 500 32792	KRTG 20M/N-20-1320-S12 Part No. 500 32796	KRTG 20M/V-20-1526-S12 Part No. 500 34928	KRTG 20M/V-20-1626-S12 Part No. 500 34929	KRTG 20M/P-50-1320-S12 Part No. 500 32793	KRTG 20M/N-50-1320-S12 Part No. 500 32797	KRTG 20M/V-50-1526-S12 Part No. 500 34930	KRTG 20M/V-50-1626-S12 Part No. 500 34931
Scanning range	12mm	●	●	●	●								
	20mm					●	●	●	●				
	50mm									●	●	●	●
Transmitter colour	RGB												
	green	●	●	●	●	●	●	●	●	●	●	●	●
Light spot orientation	vertical	●	●	●	●	●	●	●	●	●	●	●	●
	horizontal												
	round												
Optical outlet	front												
	head	●	●	●	●	●	●	●	●	●	●	●	●
Output wiring	PNP	●		●		●		●		●		●	
	NPN		●		●		●		●		●		●
	analogue current			●	●			●	●			●	●
Other features	static teach-in	●	●	●	●	●	●	●	●	●	●	●	●
	dynamic teach-in, standard												
	dynamic teach-in with marker preselection												
	teach-in, background												
	synchronous input	●	●			●	●			●	●		

Additional types on request



KRTG 20

Green light contrast scanner

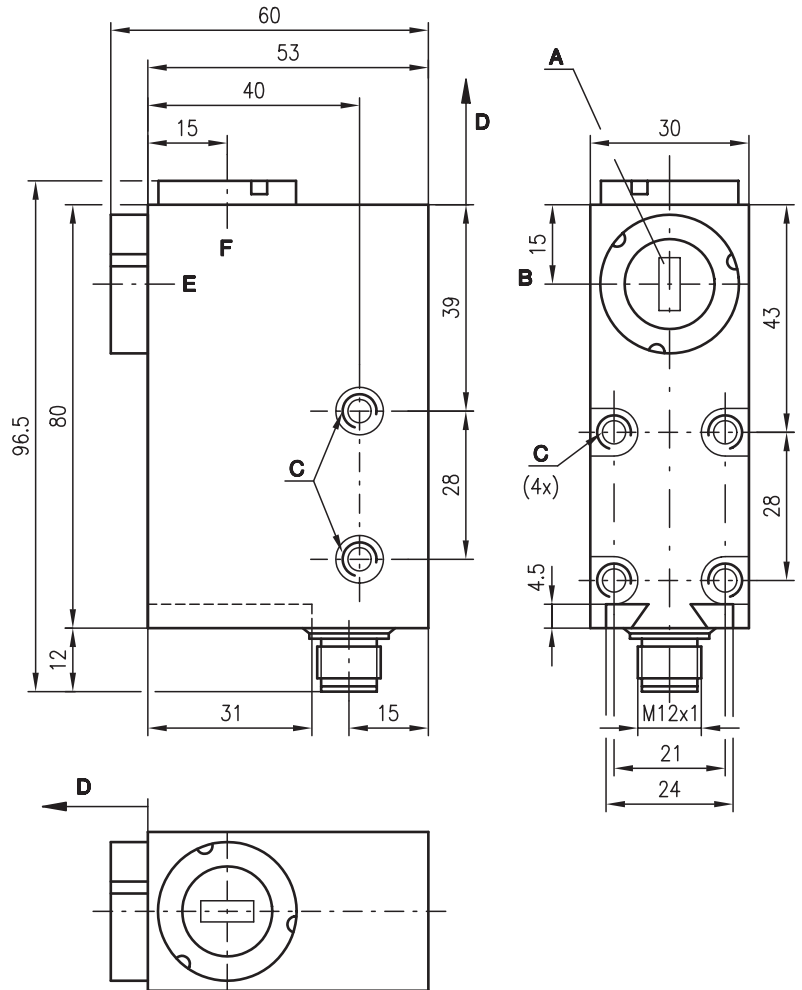


12mm
20mm
50mm



- Standard dynamic teach-in procedure
- Switching frequency 25,000Hz
- Green transmitter LED with variable brightness
- Programming by means of teach-in (via button or remote calibration)

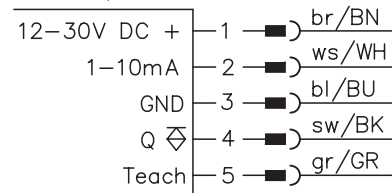
Dimensioned drawing



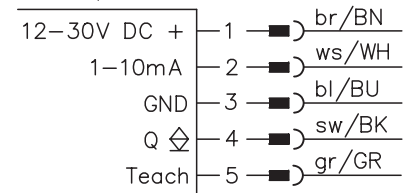
- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

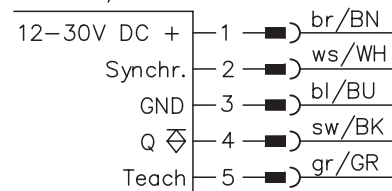
KRTG 20M/V ...-1427-S12



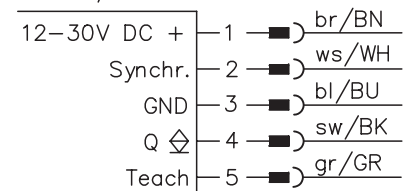
KRTG 20/V ...-1428-S12



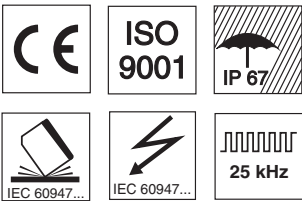
KRTG 20M/P ...-S12



KRTG 20/N ...-S12



We reserve the right to make changes • FMT_KRT05e.fm



Accessories:

(available separately • see page 856)

- M12 connectors, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	2.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx2.0mm
Light spot dimensions with objective 3	5.0mmx3.0mm
Light spot orientation	vertical
Light source	LED green, two brightness levels

Timing

Switching frequency	max. 25kHz
Response time	min. 20µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5ms

Teach input

PNP: active/not active	$U_B/0V$ or not connected
NPN: active/not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching

20ms, can be activated via button

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section **Preferred types** (page 835)

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.
- You can change the selection of the switching threshold by simultaneously pressing the Delay and L/D buttons during Power-On.
Power-On:
LED ON (illuminated)
LED ON (flashing)
- The transmission power (light spot brightness) is adapted automatically.

KRTG 20

Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of a green LED transmitter, can differentiate between extremely small differences in contrast (grey scale values). Their dynamic range is much wider compared to known devices. This is made possible by automatic amplifier adaptation and use of several transmission levels (brightnesses).

In this way critical marker/background combinations can be detected with remarkably increased functional safety. Shiny markers can be safely detected. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retight.

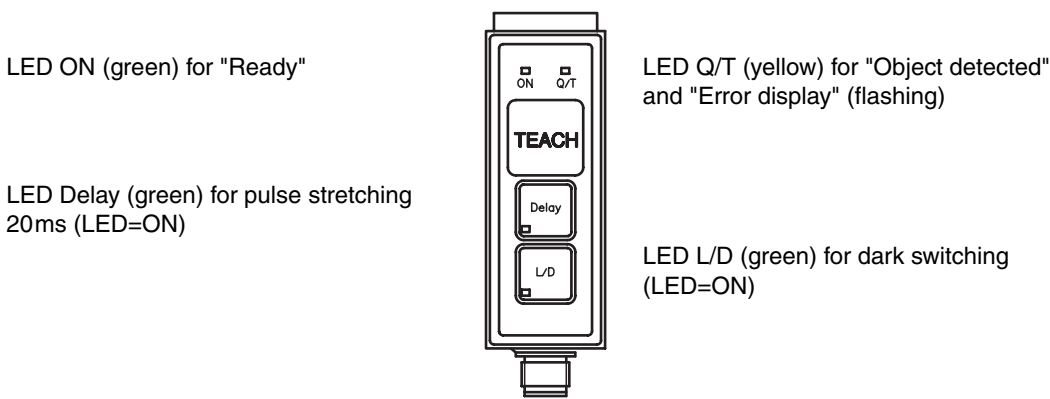
The diaphragm mounted in front of the receiver and the extremely bright light spot guarantee a high reproducibility and precision in positioning.

With this teaching type, the teaching process must be started on the background.

Using the synchronisation input, the switching output can be activated or deactivated. Adaptation of the taught switching threshold is performed as described under Remarks.

See also Remarks and Diagrams

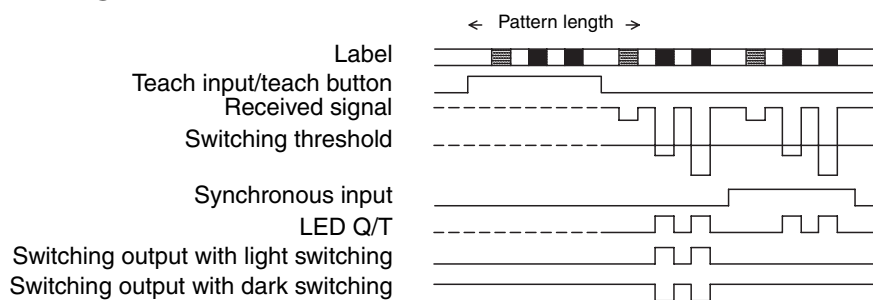
Controls and indicators



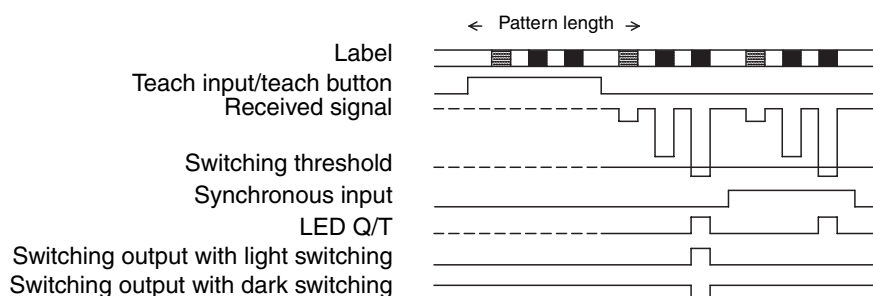
Signal propagation

After activating the teaching function, the markers have to be moved past the sensor for at least one pattern length. The teaching process must be started on the background and can be stopped anywhere. The sensor scans the paper in 10ms intervals and reveals the minimum and maximum contrast. After completing the teaching function, the switching threshold is set.

Centered switching threshold



Switching threshold close to marker contrast





Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the sensor above the background	Green light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	Green light spot visible	All LEDs flash
Move paper sheet for at least one pattern length	Green light spot visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Green light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	No light spot visible	ON (green) illuminated Q/T (yellow) flashing (error)

Preferred types

Selection table		Order code →											
Equipment ↓		KRTG 20M/P-12-1420-S12 Part No. 500 34946	KRTG 20M/N-12-1420-S12 Part No. 500 34947	KRTG 20M/V-12-1427-S12 Part No. 500 34935	KRTG 20M/V-12-1428-S12 Part No. 500 34936	KRTG 20M/P-20-1420-S12 Part No. 500 34948	KRTG 20M/N-20-1420-S12 Part No. 500 34949	KRTG 20M/V-20-1427-S12 Part No. 500 34937	KRTG 20M/V-20-1428-S12 Part No. 500 34938	KRTG 20M/P-50-1420-S12 Part No. 500 34950	KRTG 20M/N-50-1420-S12 Part No. 500 34951	KRTG 20M/V-50-1427-S12 Part No. 500 34939	KRTG 20M/V-50-1428-S12 Part No. 500 34940
Scanning range	12mm	●	●	●	●								
	20mm					●	●	●	●				
	50mm									●	●	●	●
Transmitter colour	RGB												
	green	●	●	●	●	●	●	●	●	●	●	●	●
Light spot orientation	vertical	●	●	●	●	●	●	●	●	●	●	●	●
	horizontal												
	round												
Optical outlet	front												
	head	●	●	●	●	●	●	●	●	●	●	●	●
Output wiring	PNP	●		●		●		●		●		●	
	NPN		●		●		●		●		●		●
	analogue voltage												
	analogue current			●	●			●	●			●	●
Other features	static teach-in												
	dynamic teach-in, standard	●	●	●	●	●	●	●	●	●	●	●	●
	dynamic teach-in with marker preselection												
	teach-in, background												
	synchronous input	●	●			●	●			●	●		

Additional types on request



KRTG 20

Green light contrast scanner

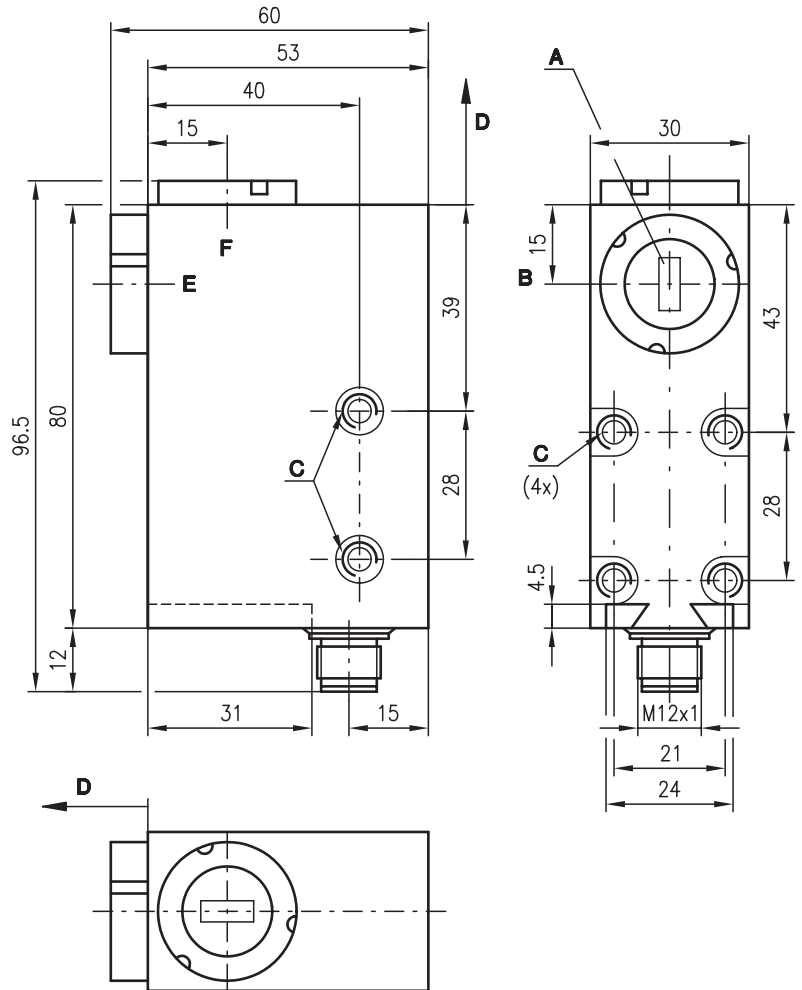


12mm
20mm
50mm



- Teach-in only on background
- Switching frequency 25,000Hz
- Green transmitter LED with variable brightness
- Programming by means of teach-in (via button or remote calibration)
- Detection of bright and dark contrasts

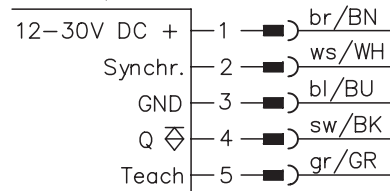
Dimensioned drawing



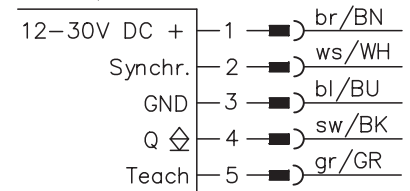
- A Light spot orientation vertical
- B Optical axis
- C M5/5.5 mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

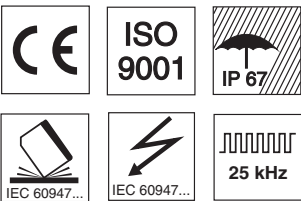
KRTG 20M/P ...-S12



KRTG 20/N ...-S12



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Accessories:

(available separately • see page 856)

- M12 connectors, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	2.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx2.0mm
Light spot dimensions with objective 3	5.0mmx3.0mm
Light spot orientation	vertical
Light source	LED green, two brightness levels

Timing

Switching frequency	max. 25kHz
Response time	min. 20µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5 ms

Teach input

PNP: active/not active	$U_B/0V$ or not connected
NPN: active/not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching

20ms, can be activated via button

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

see section **Preferred types** (page 839)

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.
- You can change the selection of the switching threshold by simultaneously pressing the Delay and L/D buttons during Power-On.
Power-On:
LED ON (illuminated)
± 12.5%
LED ON (flashing)
± 6.25%
- The transmission power (light spot brightness) is adapted automatically.

KRTG 20

Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of a green LED transmitter, can differentiate between extremely small differences in contrast (greyscale values). Their dynamic range is much wider compared to known devices. This is made possible by automatic amplifier adaptation and use of several transmission levels (brightnesses).

In this way, critical marker/background combinations can be detected with considerably increased functional safety. Shiny markers can be safely detected. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught.

The diaphragm mounted in front of the receiver and the extremely bright light spot guarantee a high reproducibility and precision in positioning. With this teaching type, the teaching process must only be performed on the background.

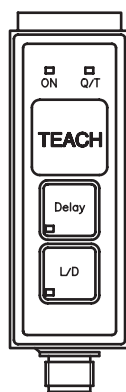
Using the synchronisation input, the switching output can be activated or deactivated. Adaptation of the taught switching threshold is performed as described under Remarks.

See also Remarks and Diagrams

Controls and indicators

LED ON (green) for "Ready"

LED Delay (green) for pulse stretching
20ms (LED=ON)



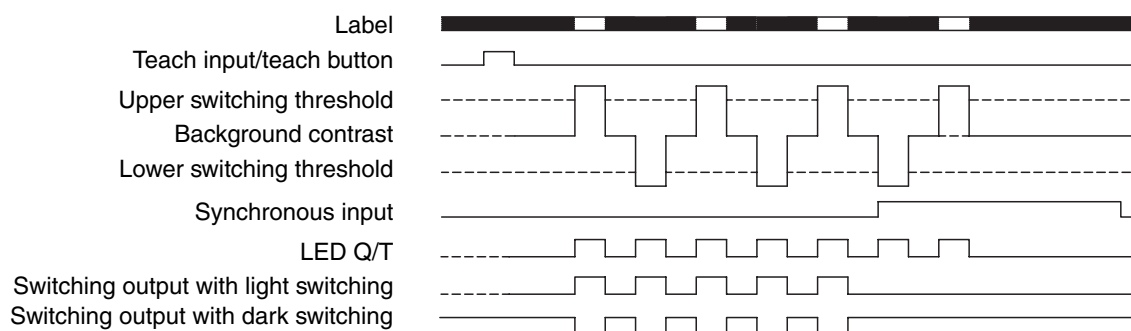
LED Q/T (yellow) for "Object detected"
and "Error display" (flashing)

LED L/D (green) for dark switching
(LED=ON)

Signal propagation

When the teach function is activated, the background must be statically positioned under the sensor. The switching threshold lies above and below the teach value. Upon conclusion of the teach function, the switching threshold is set on both sides of the background contrast.

The switching threshold (sensitivity) can be changed, see remarks for additional information.



Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the sensor above the background	Green light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	Green light spot visible	All LEDs flash
Release the teach button or set the teach line to low level	Green light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	No light spot visible	ON (green) illuminated Q/T (yellow) flashing (error)



Preferred types

Selection table		Order code →									
Equipment ↓		KRTG 20M/P-20-1820-S12 Part No. 500 36504	KRTG 20M/N-20-1820-S12 Part No. 500 36506								
Scanning range	12mm										
	20mm	●	●								
	50mm										
Transmitter colour	RGB										
	green	●	●								
Light spot orientation	vertical	●	●								
	horizontal										
	round										
Optical outlet	front										
	head	●	●								
Output wiring	PNP	●									
	NPN		●								
	analogue voltage										
	analogue current										
Other features	static teach-in										
	dynamic teach-in, standard										
	dynamic teach-in with marker preselection										
	teach-in, background	●	●								
	synchronous input	●	●								

Additional types on request



KRTG 8

Green light contrast scanner



10mm



- Static teach-in procedure
- Switching frequency 10,000 Hz
- Green transmission LED
- M12 turning connector

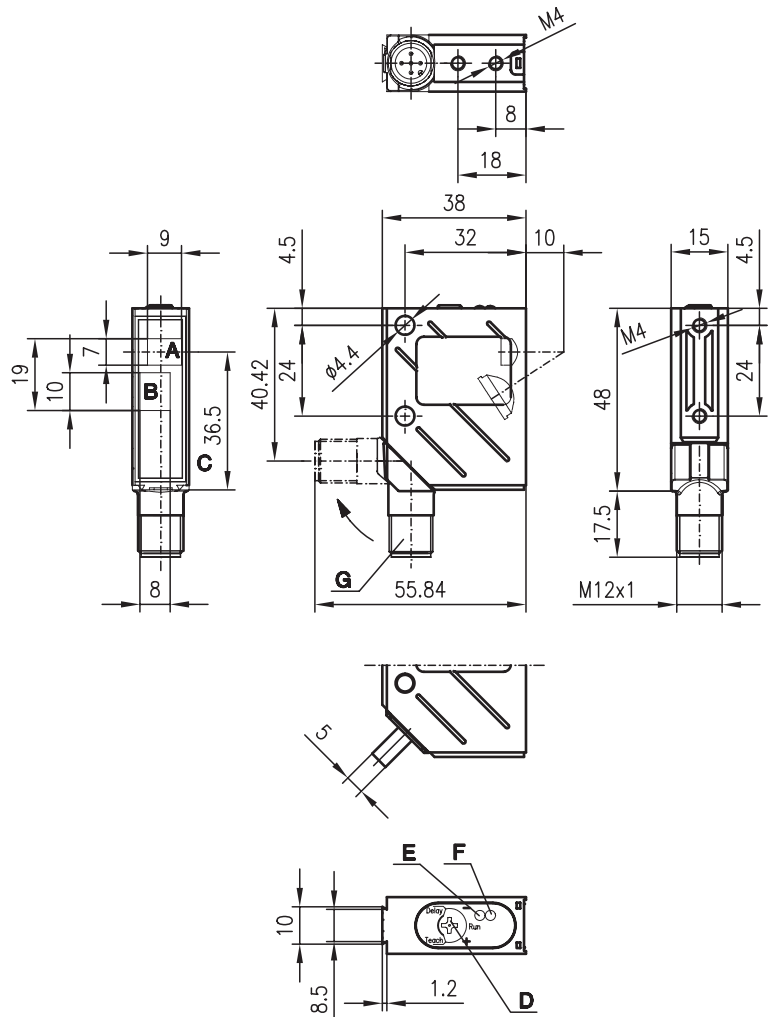


Accessories:

(available separately • see page 856)

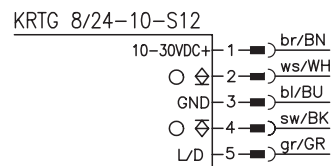
- M12 connectors (KD ...)
- Cable (KB ...)
- Mounting systems

Dimensioned drawing



- A Transmitter
- B Receiver
- C Optical axis
- D Operational control
- E LED green
- F LED yellow
- G 90° turning connector

Electrical connection



We reserve the right to make changes • 8_e02e.fm



Specifications

Optical data

Scanning range ¹⁾	10mm ± 1 mm
Light spot dimensions	2mmx2mm
Light source	LED green

Timing

Switching frequency	10kHz
Response time	50µs
Delay before start-up	≤ 650ms

Electrical data

Operating voltage U_B	10 ... 30VDC
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	1 PNP and 1 NPN switching output
Function characteristics	light/dark reversible
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED green	ready
LED green flashing	teaching in progress
LED yellow	object detected
LED yellow flashing	device or teach error

Mechanical data

Housing	metal
Optics cover	glass
Weight	70g
Connection type	M12 connector, 5-pin

Environmental data

Ambient temp. (operation/storage)	-40°C ... +60°C / -40°C ... +70°C
Protective circuit ²⁾	2, 3
VDE safety class ³⁾	II, all-insulated
Protection class ⁴⁾	IP 67
Electromagnetic compatibility	IEC60947-5-2

Options

L/D input ⁵⁾	
Dark switching/light switching	$U_B/0V$ or not connected
L/D delay	< 0,5 ms
Pulse delay ⁶⁾	10ms, can be activated via step switch

- 1) Scanning range: recommended range with performance reserve
 2) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 3) Rating voltage 250VDC
 4) In stop position of the turning connector (turning connector locked)
 5) L/D switching is activated after "teach-in" or "power on"
 6) Relative to object

Tables

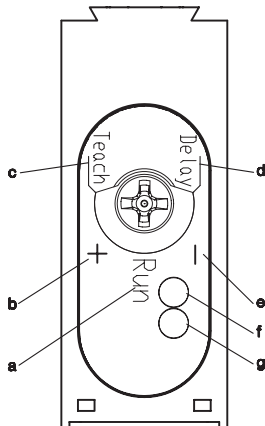
Diagrams

Remarks

- With shiny objects, the sensor is to be mounted perpendicular to the object surface.

Order guide

Designation	Part No.
KRTG 8/24-10-S12	500 36376

KRTG 8
Controls and indicators


- a Switch position **Run**
- b Switch position **+**
- c Switch position **Teach**
- d Switch position **Delay**
- e Switch position **-**
- f Operation and teach indicator (LED green)
- g Object/light path (LED yellow)

Step switch		Function
	Run	Teach and Run position for marker contrast
	Teach	Teach position for background contrast
	+	Switching threshold is increased by +5%
	-	Switching threshold is reduced by -5%
	Delay	Activate/deactivate 10ms pulse stretching

The step switch must be set to > 1 s to allow the individual functions to be activated.

Signal propagation




Teach procedure for statical teach-in

	Operation	Transmitter	LED green	LED yellow
1	Position the light spot on the background	Green light spot visible	ON	ON/OFF
2	Switch the step switch from Run -> Teach	Green light spot visible	3Hz	OFF
3	Position the light spot on the marker	Green light spot visible	3Hz	OFF
4	Switch the step switch from Teach -> Run	Green light spot visible	3Hz	OFF
	Teach-in successful	Green light spot visible	ON	ON
	Teach-in error	Green light spot flashes with 3Hz	OFF	3Hz

The step switch must be set to > 1 s to allow the individual functions to be activated.

Changing the switching threshold

	Operation	Transmitter	LED green	LED yellow
1	Step switch in position Run	Green light spot visible	ON	ON/OFF
2	Switch the step switch from Run -> (+/-)	Green light spot visible	OFF	OFF
3	Sensitivity is changed in steps of 5% each	Green light spot visible	1 Hz	OFF
4	Switch the step switch from (+/-) -> Run	Green light spot visible	ON	ON/OFF

In switch position (+), the switching threshold is increased by 5% every second.

In switch position (-), the switching threshold is increased by 5% every second.

Modification of switching threshold activated:green LED = 1 Hz

Maximum value switching threshold reached:LED green = ON

Minimum value switching threshold reached:LED green = OFF

Pulse stretching on/off

	Operation	Transmitter	LED green	LED yellow
1	Step switch in position Run	Green light spot visible	ON	ON/OFF
2	Switch the step switch from Run -> Delay	Green light spot visible	OFF	ON/OFF
3	Status display of the pulse stretching	Green light spot OFF	10Hz	Status display: ON=Delay active OFF=Delay not active
4	10s waiting time before switching After 10s delay value modified	Green light spot OFF	10Hz	Status display: ON=Delay active OFF=Delay not active
5	Switch the step switch from Delay -> Run	Green light spot visible	ON	ON/OFF



CRT 448

Colour sensors with digital outputs

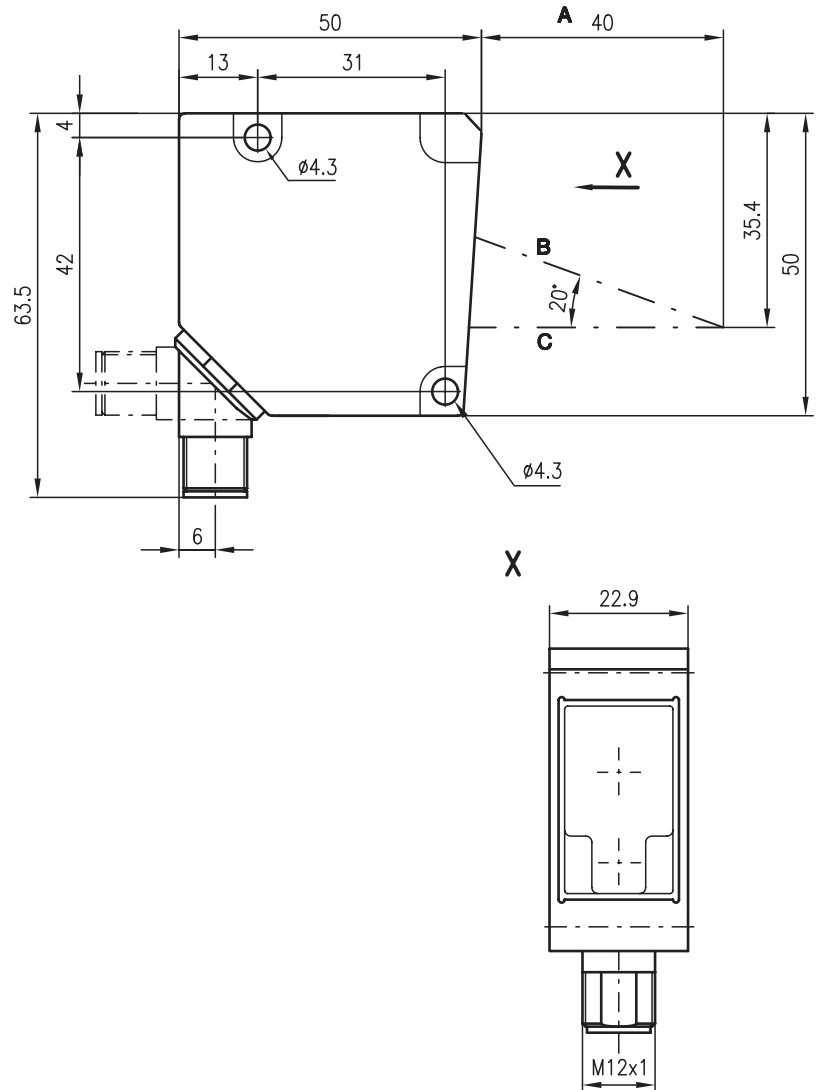


40mm

10 - 30 V
DC

- Scanner with visible light spot for colour detection
- Independent teach-in of up to 4 reference colours (channels)
- Separately adjustable tolerance steps for each colour (channel)
- Easy adjustment through clearly organised control panel with 3 buttons or via control input

Dimensioned drawing



- A** Scanning range
B Transmitter axis
C Receiver axis

Electrical connection

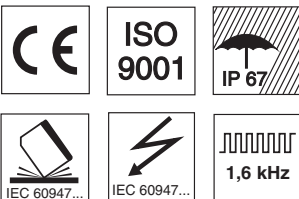
CRT 448M/P-40-004-S12

Ext. Teach	1	—	ws/WH
10-30V DC +	2	—	br/BN
CH1	3	◇	gn/GN
CH2	4	◇	ge/YE
CH3	5	◇	gr/GR
CH4	6	◇	rs/PK
GND	7	—	bl/BU
Synchr.	8	—	rt/RD

CRT 448M/P-40-002-S12

Ext. Teach	1	—	ws/WH
10-30V DC +	2	—	br/BN
CH1	3	◇	gn/GN
CH2	4	◇	ge/YE
NC	5	—	
NC	6	—	
GND	7	—	bl/BU
Synchr.	8	—	rt/RD

We reserve the right to make changes • FMT_CRT01e.fm



Accessories:

(available separately • see page 856)

- M12 connectors, 8-pin (KD ...)
- Ready-made cables (KB ...)



Specifications

Optical data

Scanning range ¹⁾	40mm
Light source	LEDs (red, green, blue)
Light spot	3x5mm

Timing

Switching frequency	1.667 kHz
Response time	0.3ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Bias current	≤ 80 mA
Switching output/channels (CH...)	4 PNP transistor outputs or 2 PNP transistor outputs
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA per channel
Adjustment	adjustable/teachable via 3 buttons (channel selection, tolerance selection, teach-in mode)

Indicators

LED yellow	switching state per channel
LED green	ready/tolerance selection
LED orange	display during teach-in mode
LED orange flashing	fault indication during teach-in mode

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	125g
Connection type	M12 connector, 8-pin, can be turned by 90°

Environmental data

Ambient temperature (operation)	-10°C ... +55°C
Protection class	IP 67
VDE safety class	II
Protective circuit ²⁾	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronisation input (Synchr.)	active $\leq 1/3U_B$ or not connected, not active $\geq 2/3U_B$
Control input (Ext. Teach)	protocol with response via channel 1 (CH 1)

1) Scanning range: recommended scanning range

2) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

	Designation	Part No.
4 channels	CRT 448M/P-40-004-S12	500 61177
2 channels	CRT 448M/P-40-002-S12	500 61175

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- Normally use dry, clean, and soft cloth for cleaning the optics cover. Use pure alcohol for intensive cleaning.

CRT 448

Function principle of the colour sensor

Many sensors are capable of differentiating between light and dark or matt and shiny. As soon as colour is to serve as a distinguishing criterium, however, normal sensors are quickly pushed to their limits.

As a result, colour sensors are of increasing importance in industrial automation.

The applications range from sorting coloured objects to the detection or inspection of coloured surfaces. Materials such as powders, granulates, fluids as well as metals, glasses, papers, plastics and textiles can be reliably detected in this way.

Simple operation makes it possible to teach-in the reference colour and to adjust the tolerance range.

During operation, the colour sensor compares the taught-in colour with the measured colour. If the values lie within the set tolerance range, the sensor passes on the match to the controller via a switching output.

Controls and indicators

Indicator LED CH (yellow)		Button for channel selection (CH button)
Indicator LED TOL (green)		Button for tolerance selection (TOL button)
Indicator LED SET (orange)		Button for teach mode (SET button)

Indicator LED	Run mode	Teach-in mode
CH4 x yellow	Switching state display of output/channel 1 to 4.	Display of the selected channel from 1 to 4.
TOL3 x green	Run mode is indicated by illumination of all LEDs.	Display of the selected tolerance level (1 ... 5) of the selected channel.
SET1 x orange		Illuminated LED indicates the teach mode. Flashing LED indicates measurement in progress. Slowly or fast flashing LED indicates errors during the measurement procedure.

Control button	Run mode	Teach-in mode
CH button for channel selection	Without function	a) selection of the next channel b) back to run mode on error
TOL button for tolerance selection	Without function	a) selection of the next level with higher tolerance b) back to run mode on error
SET button for teach mode	The device changes to teach mode after the button is pressed for more than 1.5s.	a) measurement procedure is started. b) the values are stored and the device goes back to run mode

Run mode/operating mode

The sensor is in run mode after application of the operating voltage.

- All three green tolerance LEDs (TOL-LEDs) are illuminated
- The four yellow LEDs (CH-LEDs) display the state of the outputs (channels)

Manual teach-in mode

To teach the colours and the tolerance level, proceed as follows:

1. Position the sensor correctly towards the object (scanning distance, angle, etc.).
2. Pressing the SET button for at least 1.5s switches the sensor to the teach mode and switches on the orange SET LED.
3. Pressing the CH button always selects the next channel, which is indicated by the associated yellow LED. Channel 1 follows channel 4.
4. Pressing the TOL button always selects the next-higher tolerance level (1 to 5), which is indicated by the corresponding green LED(s). Tolerance level 1 follows tolerance level 5.

Tolerance levels:

Tolerance level 1	Tolerance level 2	Tolerance level 3	Tolerance level 4	Tolerance level 5
For distinguishing between subtle differences in colour				For distinguishing between coarse differences in colour



5. Pressing the SET button starts the measurement of the reference colour which is to be taught in. During this process, the orange SET LED flashes (approx. 4Hz). If the orange SET LED flashes slowly or quickly, no reference colour can be taught in. The old reference colour remains stored. Return to run mode by pressing the TOL or CH button (cancel function).
If the orange SET LED flashes slowly (approx. 2Hz), the object which is to be taught-in is too dark or possibly too far away.
If the orange SET LED flashes quickly (approx. 10Hz), the object which is to be taught-in is too light or shiny. This may be corrected by using a wider angle between the sensor and object.
6. Pressing the SET button concludes the teach process. The orange LED switches off and the transmitter diode is briefly switched off. The new values (colour and tolerance level) are stored and the sensor returns to the run mode.

The synchronisation input

With the synchronisation input, you can specify exactly when colour matching is to begin and end.

This corresponds to the activation and deactivation of the sensor. After changing from passive to active, the detection commences after max. 0.3ms, after which time the switching outputs are actualised.

When switching from active to passive, all switching outputs are switched off after max. 0.14ms.

With an unconnected input (Synchr.) or input (Synchr.) $\leq 1/3U_B$, the sensor is active.

With input (Synchr.) on $\geq 2/3U_B$, the sensor is passive.

The visible light spot is always visible independent of the state of the input.

A typical application is, for example, a multicoloured object on which the colour is to be inspected at only a certain location and other areas are to be suppressed. Any possible erroneous detections which occur as the light spot passes from the object to the background can be prevented in this way.

External teach-in mode

In this mode, full remote operation and adjustment of the sensor are possible. The sensor continues to return important acknowledgements. This is ensured by a serial interface similar to the RS 232. The device is operated using a standard terminal program. Data transmission occurs at 9600baud, without parity, as well as 8 data bits and 1 stop bit.

The pin assignments are as follows:

Input	Ext. Teach	Pin 1	ws/WH
GND	GND	Pin 7	bl/BN
Output	CH 1	Pin 3	gr/GN

To enter the external teach-in mode, the synchronisation input must be passive for at least 300ms.

Note: Synchronisation input passive = voltage is being applied $\geq 2/3U_B$
To exit external teach-in mode, a command must be entered via the terminal program.

The following commands, which are entered via the terminal program, are available:

@	Start command for the external teach mode (together with synchr. passive)
cx<CR><LF>	Selection of the channel. The parameter x ([1 ... 4] resp. [1 ... 2] in two-channel operation) indicates the respective channel
tx<CR><LF>	Selection of the tolerance. The parameter x [1 ... 5] indicates the respective tolerance level
e<CR><LF>	Execution command (execute). With the execution command, the previously set channel is taught-in with the selected tolerance and the result stored. If no channel and/or no tolerance are/is selected before executing the execute command, the command is ignored and an error message is output by the sensor. If the object which is to be taught-in is either too light or too dark, the command is ignored and a corresponding error message returned.
q<CR><LF>	Exit external teach mode without saving.

The following messages are returned in external teach mode by the sensor:

<SPC>ok<CR><LF>	ok
<SPC>??<CR><LF>	The previously entered command was executed General error This error message occurs in the following cases: - Command could not be interpreted (invalid input) - Parameter lies outside of the valid range - No tolerance and/or no channel selected prior to executing the execute command(s)
<SPC>hi<CR><LF>	Intensity too high. The object is too light or shiny.
<SPC>lo<CR><LF>	Intensity too low. The object is too dark.



CRTM 20

Colour sensors with analogue output

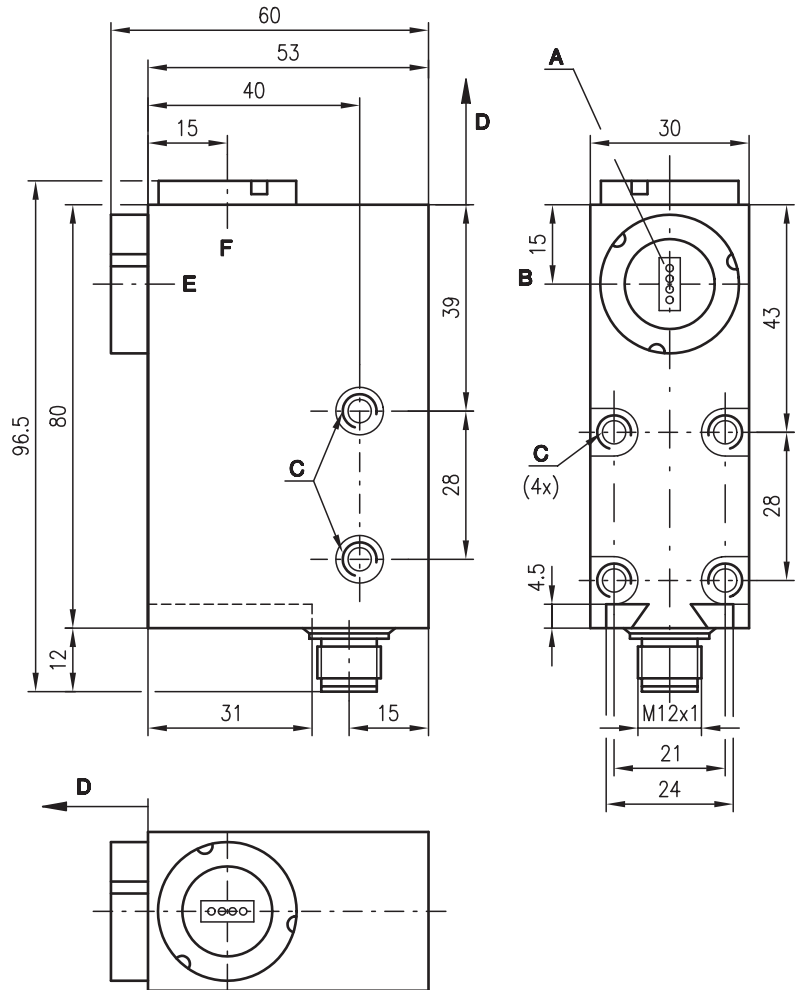


12mm
20mm
50mm



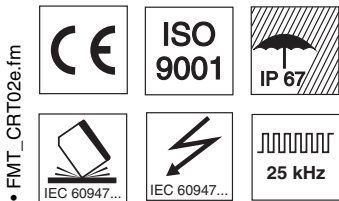
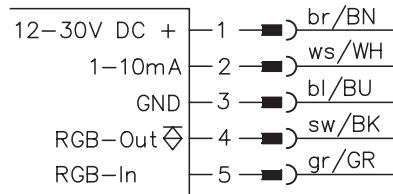
- Scanner for colour detection with analogue output
- Red, green, and blue measurement via just one analogue output
- Remote changeover of transmitter colours

Dimensioned drawing



- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection



Accessories:

(available separately • see page 856)

- M12 connector, 5-pin (KD ...)
- Interchangeable objectives
- Tool for changing objectives

We reserve the right to make changes • FMT_CRT02e.fm



Specifications

Optical data

Scanning range with objective 1	12mm ± 5mm (see remarks)
Scanning range with objective 2	20mm ± 5mm (see remarks)
Scanning range with objective 3	50mm ± 5mm (see remarks)
Light spot dimensions with objective 1	3.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx1.2mm
Light spot dimensions with objective 3	10.0mmx2.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

Timing

RGB colour changeover	max. 2.5ms per colour change
Response time of analogue output	12.5µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED yellow flashing	Q/T "device error" or white calibration

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, Stainless steel, 5-pin

Environmental data

Ambient temperature (operation)	-25°C ... +55°C / -40°C ... +70°C
Protection class	IP 67
VDE safety class	II
Protective circuit ¹⁾	2, 3
Standards applied	IEC 60947-5-2

Options

RGB changeover (RGB-In)

Set colour blue (reset)	U_B ≥ 100ms (see signal response)
RGB changeover	dropping edge (see signal response)

RGB feedback (RGB-Out)

PNP: pulse pause	(see signal response)
Delay time after changeover	≤ 1ms

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

see section **Preferred types** (page 851)

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- After changing the objective, white balance is to be performed (see "controls and indicators").

CRTM 20

Function principle of the colour sensor

This colour sensor is a device which relays the object colour to the control system via just one analogue output through the use of multiple transmitter colours.

For this purpose, the transmitter colours (red, green, blue) must be changed over. The corresponding colour values (RGB) of the object are then output in sequence at the analogue output.

The control system needs to supply just one analogue input and one digital output. The otherwise standard, three-channel analogue analysis, which requires a considerable amount of hardware, is thus not necessary.

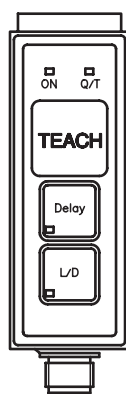
The currently activated transmitter colour is output via RGB-Out.

Each transmitter colour consists of 4 LEDs. An elongated light spot containing four dots is thereby formed at the focal point. In the event that inhomogenous colours are detected, the light spot can be defocused by slightly changing the scanning distance in such a way that a homogenous, rectangular light spot is formed.

Controls and indicators

LED ON (green) for "Ready"

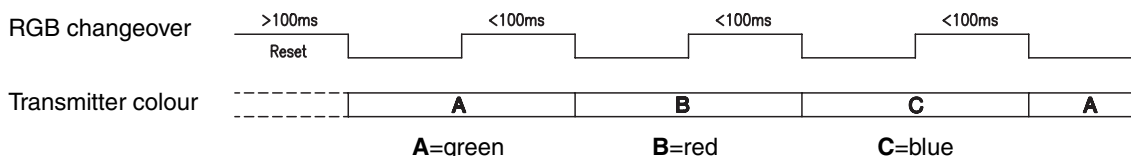
The Teach, Delay and LD buttons are not active



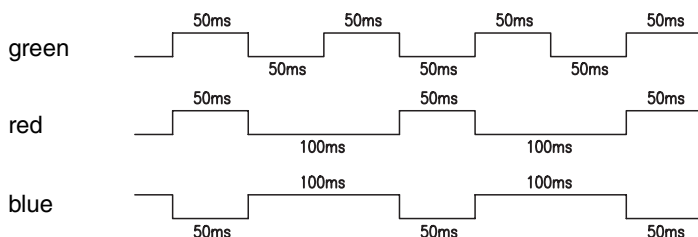
LED Q/T (yellow) "error indicator" (flashing) or white calibration

Signal propagation

Parameterising the transmitter colour via pin 5 (RGB-In)



Feedback of the transmitter colour via pin 4 (RGB-Out)



White calibration

The device is delivered with a 50mm objective. White calibration was performed prior to delivery for this scanning range.

12mm, 20mm and 50mm objectives are available. The scanning range and light-spot geometry can, in this way, be adjusted for the given application.

White calibration should be performed again after changing the objective. This is done by positioning a sheet of white paper (90%) at the appropriate scanning range (12mm, 20mm or 50mm) below the light spot. Then simultaneously press the Delay and L/D buttons for approx. 5sec. The sensor acknowledges the new white calibration by briefly flashing the Q/T LED. The entire dynamic range of the sensor is then also available for the changed scanning range.



Preferred types

Selection table		Order code →	CRTM 20M/V-50-0001-S12 Part No. 500 36094													
Equipment ↓																
Scanning range	12mm															
	20mm															
	50mm	●														
Transmitter colour	RGB	●														
	green															
Light spot orientation	vertical	●														
	horizontal															
	round															
Optical outlet	front															
	head	●														
Output wiring	PNP															
	NPN															
	analogue voltage															
	analogue current	●														
Other features	RGB transmitter can be changed over	●														

Additional types on request



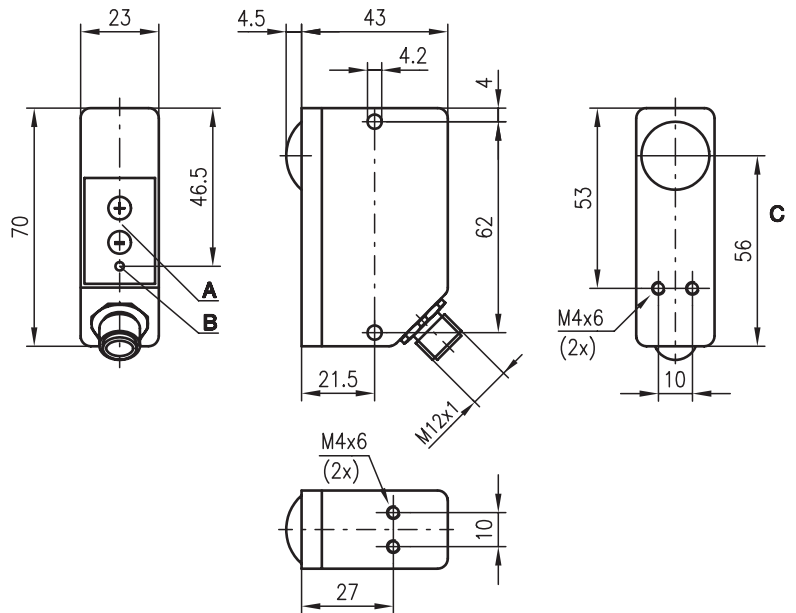
LRT 440

Luminescence scanner

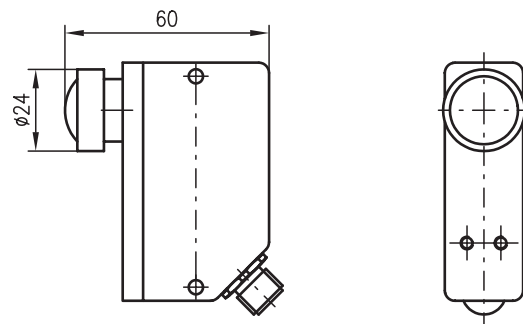


Dimensioned drawing

LRT 440...-30-...
LRT 440...-50-...



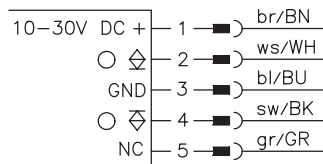
LRT 440...-150-...



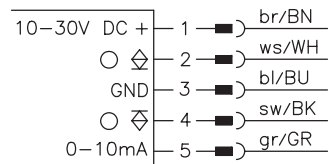
- A Control button panel
- B Indicator diode
- C Optical axis

Electrical connection

without analogue output



with analogue output



0 ... 70mm
0 ... 120mm
0 ... 300mm



- LED with UV light
- Detection of luminescent objects and markings
- Round light spot
- Various filterings
- Large scanning range
- Analogue output



Accessories

(available separately • see page 856)

- M12 connectors (KD ...)
- Ready-made cables (KB ...)

(part of the delivery contents):

- 2m connection cable

We reserve the right to make changes • FMT_LRT01e.fim

Specifications

Optical data

Typ. scanning range limit ¹⁾	0 ... 70mm (see diagrams) 0 ... 120mm (see diagrams) 0 ... 300mm (see diagrams)
Light source	LED
Wavelength	370nm (UV light) 470nm (blue light)
Light spot diameter	see diagrams
Average life ²⁾	≥ 100000hours

Timing

Switching frequency	1kHz
Response time	0.5ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching outputs	1 PNP transistor output 1 NPN transistor output
Analogue output	0 ... 10mA (see remarks)
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with keyboard (see remarks)

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	250g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protection class	IP 67
VDE safety class	III
Protective circuit ³⁾	2, 3
Standards applied	IEC 60947-5-2

1) Typ. scanning range limit: max. attainable range without performance reserve

2) at +25°C

3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

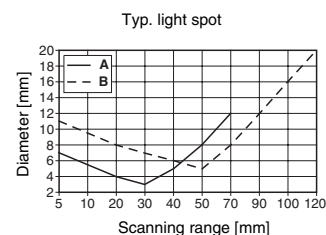
Order guide

Selection table		Order code →							
Equipment ↓		LRT 440/24-30-004-S12 Part No. 500 37907	LRT 440/24-50-004-S12 Part No. 500 37908	LRT 440/24-150-004-S12 Part No. 500 37909	LRT 440/24-50-104-S12 Part No. 500 37910	LRT 440/24-50-000-S12 Part No. 500 37911	LRT 440/24-50-006-S12 Part No. 500 37912	LRT 440/24-50-002-S12 Part No. 500 37913	LRT 440/24-50-001-S12 Part No. 500 37914
Typ. scanning range limit/ optics	0 ... 70mm/30mm	●							
	0 ... 120mm/50mm		●		●	●	●	●	●
	0 ... 300mm/150mm			●					
Luminescence detection of	blue/colourless	●	●	●	●				
	red					●			
	yellow	●	●	●	●		●		
	yellowish green	●	●	●	●			●	
	orange								●
Transmitter diode	370nm	●	●	●	●		●		
	470nm					●		●	●
Analogue output					●				

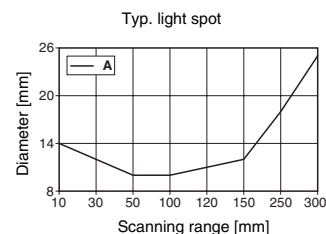
Additional types on request

Tables

Diagrams



- A Optics 30mm
- B Optics 50mm



- A Optics 150mm

Remarks

- Sensitivity adjustment in 256 steps. Maximum setting by continuously pressing the button for 20sec.
- The analogue output value is changed by the sensitivity adjustment.
- Additional types on request
 - Square light spot
 - 10kHz switching frequency
 - Filter variants
 - Analogue output



LRT 40

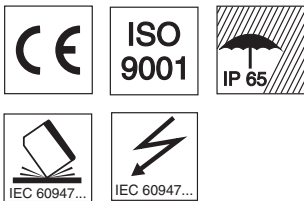
Luminescence scanner



2 ... 40mm



- LED with UV light
- Detection of luminescent objects and markings
- Round light spot
- Various filterings
- Large scanning range



We reserve the right to make changes • FMT_LRT02e.fm

Accessories

(available separately • see page 856)

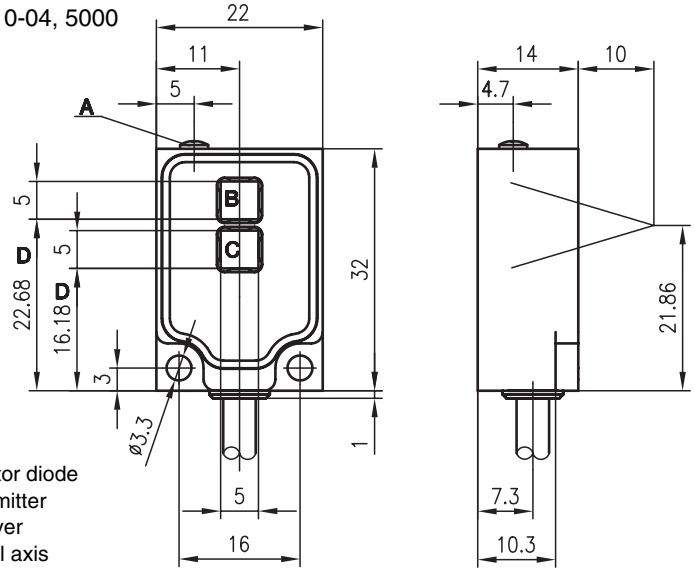
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

(part of the delivery contents):

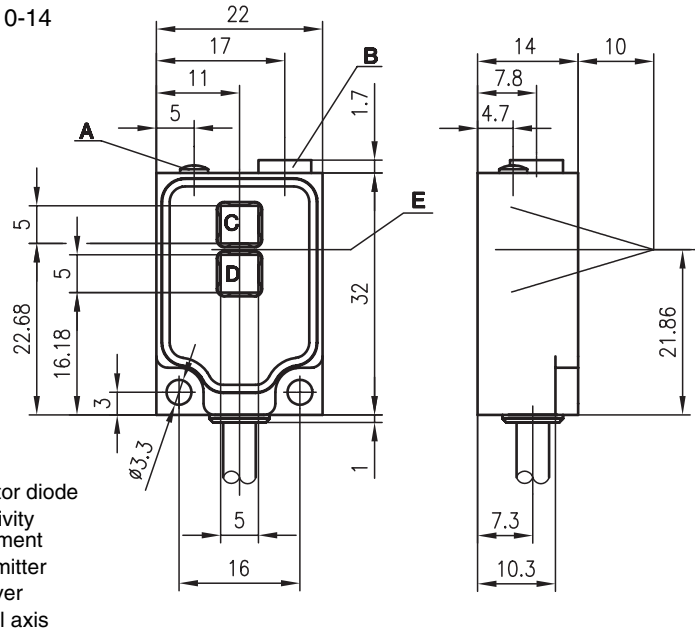
- 2m connection cable

Dimensioned drawing

LRT 40/4-10-04, 5000

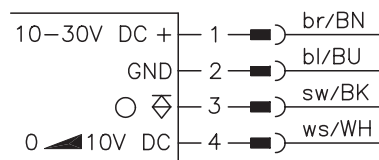


LRT 40/4-10-14

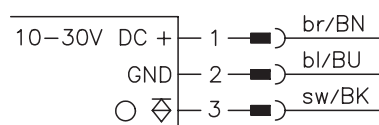


Electrical connection

LRT 40/4-10-04, 5000



LRT 40/4-10-14



Specifications

Optical data

Typ. scanning range limit ¹⁾	2 ... 40mm (see diagrams)
Scanning range ²⁾	5 ... 20mm
Light source	LED (modulated light)
Wavelength	370nm
Light spot diameter	see diagrams
Average life ³⁾	≥ 100000hours

Timing

Switching frequency	2kHz
Response time	0.25ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 4mA
Switching outputs	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA
Sensitivity	adjustable with potentiometer 270° or remote calibration pin 2: 0 ... > 10V (min. ... max. sensitivity) open (50% sensitivity) $R_i = 30k\Omega$

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	aluminium
Optics cover	glass
Weight	250g
Connection type	cable 2000mm, 3x0.14mm ² cable 5000mm, 3x0.14mm ²

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protection class	IP 67
VDE safety class	III
Protective circuit ⁴⁾	2, 3
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
 2) Scanning range: recommended range with performance reserve
 3) at +25°C
 4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

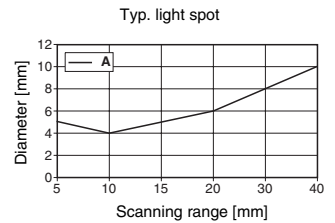
Order guide

Selection table		Order code →								
Equipment ↓		LRT 40/4-10-04-5000 Part No. 500 38116	LRT 40/4-10-14 Part No. 500 38115							
Luminescence detection of	colourless/blue	●	●							
	red	●	●							
	yellow	●	●							
	yellowish green	●	●							
	orange	●	●							
Sensitivity adjustment	potentiometer		●							
	remote calibration	●								

Additional types on request

Tables

Diagrams



A Optics 10mm

Remarks

- Sensitivity adjustment with 270° potentiometer or remote calibration.



M12 connectors



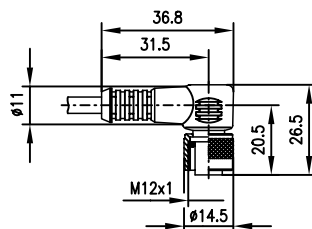
For devices with M12 connectors, there are available: 2 connectors with ready-made 5m cable and 2 connectors with screw connection.

Protection class (DIN 40050) plugged and screwed: IP 67

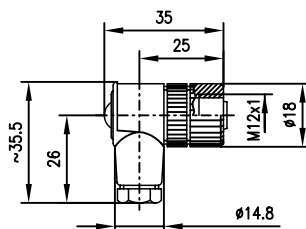
Important:

With throughbeam photoelectric sensors, a connector is required both for the transmitter and the receiver.

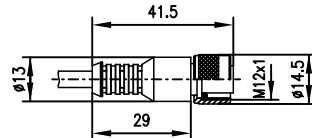
Dimensioned drawings



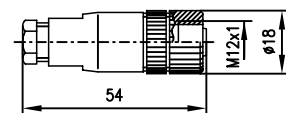
KB 095-5000-5



KD 095-5



KB 095-5000-5A



KD 095-5A

Selection table

M12 connectors			
with cable (5m, 5-pin)		without cable	
KB 095-5000-5 Part No. 500 20500	KB 095-5000-5A Part No. 500 20499	KD 095-5 Part No. 500 20502	KD 095-5A Part No. 500 20501
with cable (2m/5m, 8-pin)			
	KB 448-2000-8A Part No. 500 32411		
	KB 448-5000-8A Part No. 500 33061		

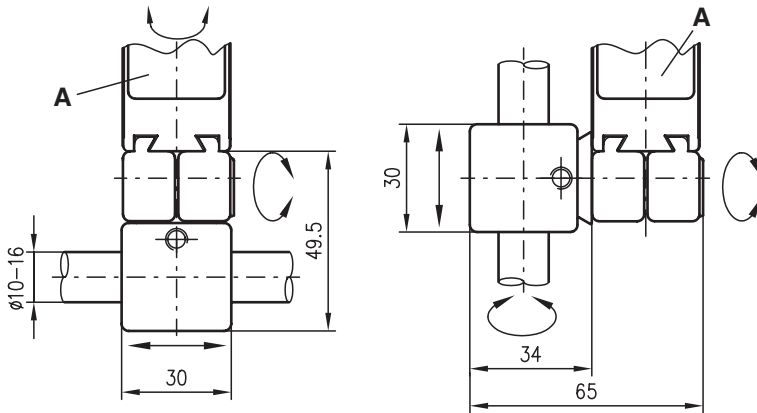
Additional information in section "Accessories" from page 925 onwards!

We reserve the right to make changes *fmt_zu_e.fm



Dimensioned drawings

UMS 96

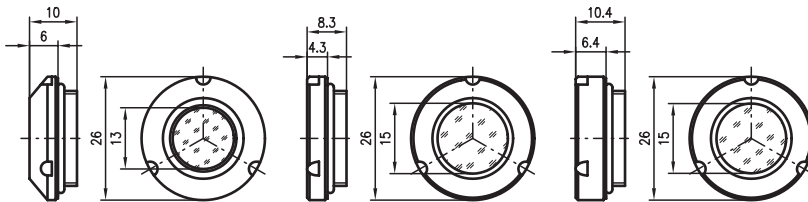


A Sensor

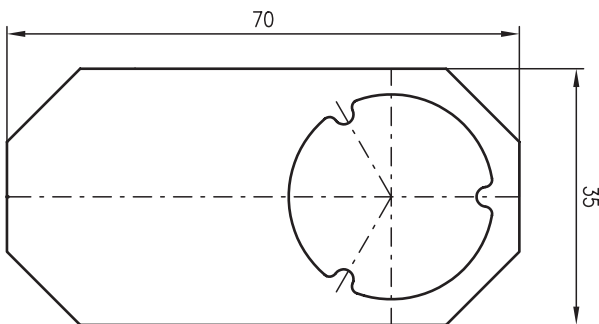
OB-12

OB-20

OB-50



WZ-OB



Mounting systems

UMS 96 (Part No. 500 26204)



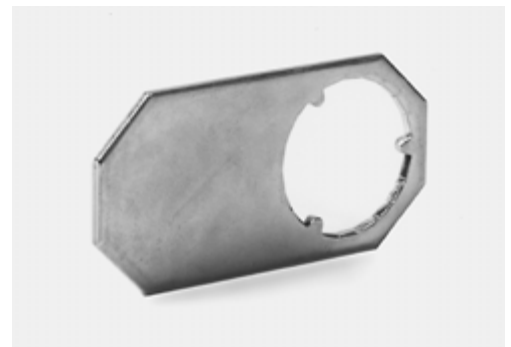
OB-12 (Part No. 500 34051)

OB-20 (Part No. 500 34050)

OB-50 (Part No. 500 34049)



WZ-OB (Part No. 500 34118)







Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index





92 Series - Ex Overview and advantages

Medium-size series in robust metal housing with glass cover for application in potentially explosive atmospheres

Operating principles:

- Throughbeam photoelectric sensors
- Retro-reflective photoelectric sensors with polarisation filter
- Diffuse reflection light scanners with background suppression

Switching output acc. to DIN 19234 (NAMUR)

Connection via M12 connector

- Explosion protection EEx ia IIC T6
- Protection class intrinsic safety for easy installation and commissioning

Accessories:

- Isolated switching amplifier with 24VDC and transistor or relay output
- Isolated switching amplifier with 230VAC and relay output
- Mounting systems





Operating principle	Designation	Typ. oper. range limit/ typ. scan. range limit	Housing		Light source		Operating voltage			Output		
			Plastic	Metal	Red light	Infrared	190 ... 255VAC	10 ... 35VDC	5.5 ... 14VDC	Relay	NPN transistor	NAMUR
	LS 92/3-L Ex	15.6m		•		•			•			•
	PRK 92/3 L Ex	5m		•	•				•			•
	FRK 92/3-300 L Ex	300mm		•		•			•			•
	VS 401/N		•									•
	VS 401/R		•					•		•		
	VS 401/R-AC		•				•			•		



Switching frequency	Switching	Connection		Options					Page
		Light/dark	M12 connector	Terminals	Polarisation filter	Background suppression	Sensitivity adjustment	Wire break monitoring	
60Hz		•							865
60Hz		•		•					867
60Hz		•			•	•			869
10kHz	•			•			•	•	871
15Hz	•			•			•	•	871
15Hz	•			•			•		873



LS 92 Ex

Throughbeam photoelectric sensors

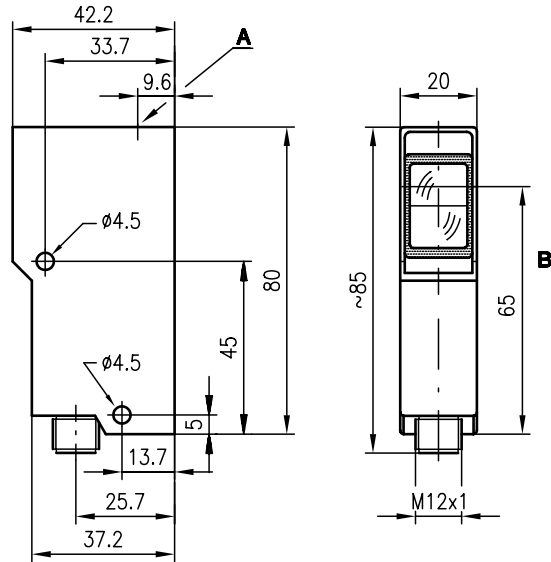


15.6m



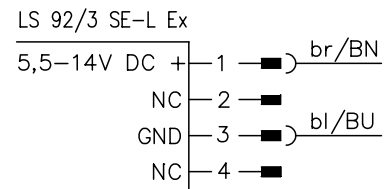
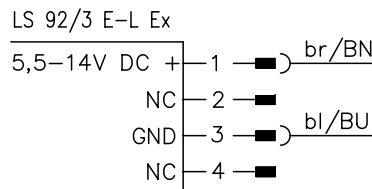
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Switching output acc. to DIN 19234 (NAMUR)
- In accordance with the directives of BG-Chemie
- Conformity certificate - BVS 97.D.2071
- EEx ia IIC T6

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection

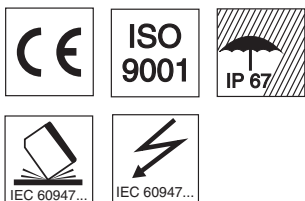


Accessories:

(available separately • see page 874)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Isolated switching amplifier

We reserve the right to make changes • 92x_a01e.fm





Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 15.6m
Operating range ²⁾	0 ... 12m
Light source	LED (modulated light)
Wavelength	880nm (infrared light)
Intensity	< 1.1mW/mm ²

Timing

Switching frequency	60Hz
Response time	8.5ms
Delay before start-up	≤ 100ms

Electrical data

Nominal voltage	8.2VDC
Operating voltage U _B	5.5 ... 14VDC (incl. residual ripple)
Residual ripple	max. 0.35V _{SS}
Bias current (light path interrupted)	≤ 1mA
Switching output	NAMUR (DIN 19234)
Function characteristics	light switching (light/dark setting on switching amplifier)

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	diecast zinc
Surface	antistatic epoxy coating (acc. to EN 50014)
Optics	glass
Weight	140g
Connection type	M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
VDE safety class ³⁾	II
Protective circuit ⁴⁾	2
Protection class	IP 67
Standards applied	IEC 60947-5-2

Explosion protection

Labelling (CENELEC)	EEx ia IIC T6
Maximum safe voltage	U _{max} 13V
Maximum safe current	I _{max} 40mA
Internal capacitance C _i	≤ 70nF
Internal inductance L _i	≤ 200µH

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) Rating voltage 250 VAC

4) 2=polarity reversal protection

Order guide

	Designation	Part No.
Transmitter and receiver	LS 92/3-L Ex	
Transmitter	LS 92/3 Se-L Ex	500 80722
Receiver	LS 92/3 E-L Ex	500 80721

Tables

Diagrams

Remarks

- For operation in potentially explosive atmospheres, an isolated switching amplifier is required.
- One isolated switching amplifier each is required per device, receiver or transmitter.



PRK 92 Ex

Retro-reflective photoelectric sensors with polarisation filter



5m



- Compact construction with glass optics and stainless steel housing, protection class IP 67 for industrial application
- Switching output acc. to DIN 19234 (NAMUR)
- In accordance with the directives of BG-Chemie
- Conformity certificate - BVS 97.D.2071
- EEx ia IIC T6



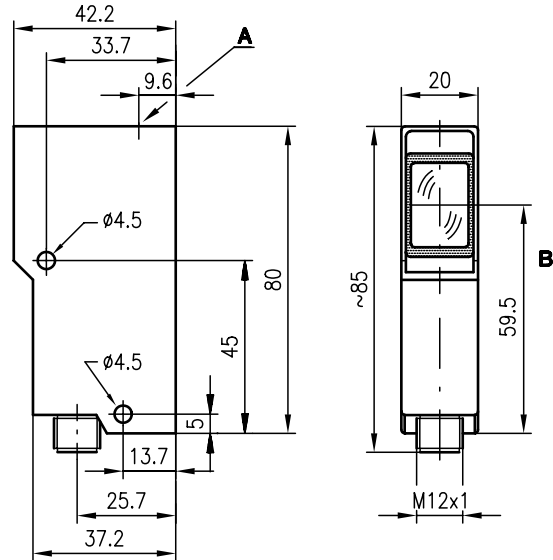
We reserve the right to make changes • 92x_b01e.fm

Accessories:

(available separately • see page 874)

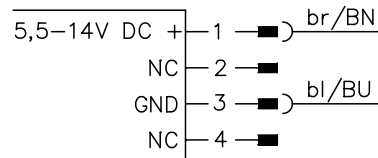
- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Reflectors
- Reflective tapes
- Isolated switching amplifier

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection





Specifications

Optical data

Operating range (TK(S) 100x100) ¹⁾	0.2 ... 5m
Light source	LED (modulated light)
Wavelength	660nm (visible red light, polarised)
Intensity	< 1.1 mW/mm ²

Timing

Switching frequency	60Hz
Response time	8.5ms
Delay before start-up	≤ 100ms

Electrical data

Nominal voltage	8.2VDC
Operating voltage U _B	5.5 ... 14VDC (incl. residual ripple)
Residual ripple	max. 0.35V _{SS}
Bias current (light path interrupted)	≤ 1mA
Switching output	NAMUR (DIN 19234)
Function characteristics	light switching (light/dark setting on switching amplifier)

Indicators

LED yellow	light path free
------------	-----------------

Mechanical data

Housing	diecast zinc
Surface	antistatic epoxy coating (acc. to EN 50014)
Optics	glass
Weight	140g
Connection type	M12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
VDE safety class ²⁾	II
Protective circuit ³⁾	2
Protection class	IP 67
Standards applied	IEC 60947-5-2

Explosion protection

Labelling (CENELEC)	EEx ia IIC T6
Maximum safe voltage	U _{max} 13V
Maximum safe current	I _{max} 40mA
Internal capacitance C _i	≤ 70nF
Internal inductance L _i	≤ 200µH

1) Operating range: recommended range with performance reserve

2) Rating voltage 250 VAC

3) 2=polarity reversal protection

Tables

Reflectors		Operating range
TK(S)	100x100	0.2 ... 5.0m
TK(S)	50x100	0.2 ... 4.0m
TK(S)	50x50	0.2 ... 3.5m
TK(S)	30x50	0.2 ... 2.0m
TK	82	0.5 ... 3.5m
TK	60	0.2 ... 2.0m
TK	45	0.3 ... 2.5m
Tape 2	100x100	0.4 ... 2.5m

TK ... = adhesive
TKS ... = screw type
Tape 2 = adhesive

Diagrams

Order guide

Designation	Part No.
PRK 92/3 L Ex	500 80723

Remarks

- For operation in potentially explosive atmospheres, an isolated switching amplifier is required.



FRK 92 Ex

Diffuse reflection light scanner with background suppression

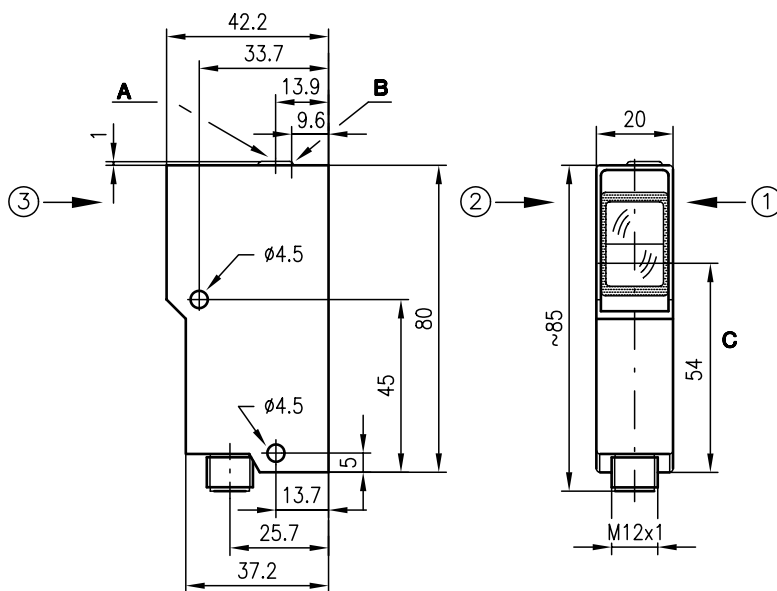


0.03 ... 0.3m



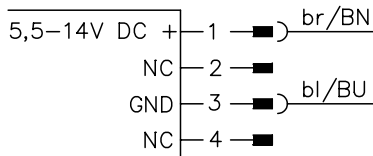
- Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
- Switching output acc. to DIN 19234 (NAMUR)
- In accordance with the directives of BG-Chemie
- Conformity certificate - BVS 97.D.2071
- EEx ia IIC T6

Dimensioned drawing



- A** Scanning range adjustment
 - B** Indicator diode
 - C** Optical axis
- Preferred entry direction for objects ① + ② + ③

Electrical connection



Accessories:

(available separately • see page 874)

- Mounting systems (BT 92, UMS 1)
- M12 connectors (KD ...)
- Isolated switching amplifier

We reserve the right to make changes • 92x_d01e.fm



Specifications

Optical data

Scanning range (white 90%)	30 ... 300mm
Adjustment range	50 ... 300mm
Light beam characteristic	divergent
Light source	LED (modulated light)
Wavelength	880nm (infrared light)
Intensity	< 1.1 mW/mm ²

Timing

Switching frequency	60Hz
Response time	8.5ms
Delay before start-up	≤ 100ms

Electrical data

Nominal voltage	8.2VDC
Operating voltage U _B	5.5 ... 14VDC (incl. residual ripple)
Residual ripple	max. 0.35V _{SS}
Bias current (without reflection)	≤ 1 mA
Switching output	NAMUR (DIN 19234)
Function characteristics	light switching (light/dark setting on switching amplifier)

Indicators

LED yellow	reflection
------------	------------

Mechanical data

Housing	diecast zinc
Surface	antistatic epoxy coating (acc. to EN 50014)
Optics	glass
Weight	140g
Connection type	M 12 connector

Environmental data

Ambient temp. (operation/storage)	-20°C ... +50°C/-30°C ... +70°C
VDE safety class ¹⁾	II
Protective circuit ²⁾	2
Protection class	IP 67
Standards applied	IEC 60947-5-2

Explosion protection

Labelling (CENELEC)	EEx ia IIC T6
Maximum safe voltage	U _{max} 13V
Maximum safe current	I _{max} 40mA
Internal capacitance C _i	≤ 70nF
Internal inductance L _i	≤ 200µH

- 1) Rating voltage 250VAC
2) 2=polarity reversal protection

Tables

Diagrams

Order guide

Designation	Part No.
FRK 92/3-300 L Ex	500 80724

Remarks

- For operation in potentially explosive atmospheres, an isolated switching amplifier is required.

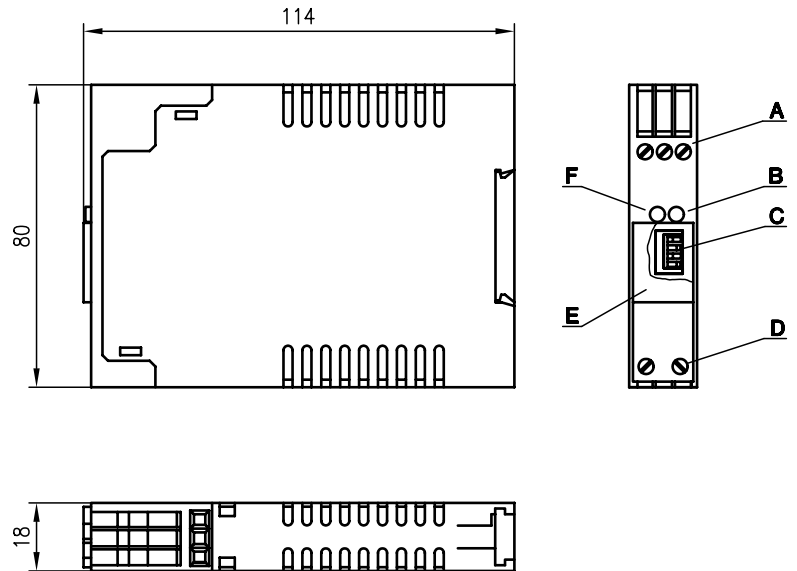


VS 401

Isolated switching amplifier



Dimensioned drawing



- A Connection terminals: operating voltage and switching output
- B LED 2: operating voltage
- C Switch for setting the operating modes
- D Connection terminals: input [EEx ia] IIC
- E Label area
- F Switching state and wire break/short-circuit



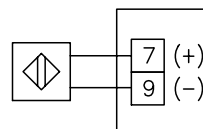
18 - 35 V
DC



- Intrinsically safe input [EEx ia] IIC
- Input, output and operating voltage are galvanically isolated
- Wire break/short circuit monitoring
- Operating modes adjustable
- Switching output with relay or transistor (NPN)
- 1 channel
- EMC according to NAMUR NE 21
- Top hat rail mounting
- Conformity certificate BVS 95.D.2093X

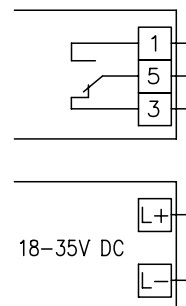
Electrical connection

potentially explosive area

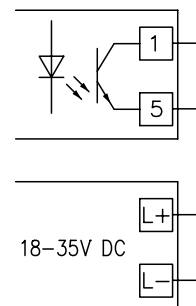


area without danger of explosions

VS 401/R



VS 401/N



Accessories:



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Specifications

Electrical data

Operating voltage	VS 401/R	18 ... 35VDC
Residual ripple		$\leq 5V_{SS}$
Power consumption		$\leq 0.77W$

VS 401/N

$\leq 0.58W$

Input

acc. to DIN 19234 (NAMUR)		
Current I_E for ON		$\geq 2.1mA$
Current I_E for OFF		$\leq 1.2mA$
Bias voltage		$\leq 8.2V$
Short-circuit current		$\leq 8.2mA$

Output

Switching voltage U_{max}	125VAC/150VDC
Switching current I_{max}	0.5A
Switching power P_{max}	50VA/25W
Transistor output	
Nominal voltage U_{CE}	
Nominal current	

short-circuit proof
35V
50mA

Timing

Switching frequency (max.)	15Hz	10kHz
Switching delay ON → OFF	5ms	13 μ s
Switching delay OFF → ON	5ms	40 μ s

Indicators

LED 1 green	Switching output ON short-circuit/wire break ready
LED 1 red	
LED 2 green	

Mechanical data

Housing	plastic (polyamide 6 GF)
Fire resistance housing	HB (UL standard 94)
Weight	120g
Mounting type	outside the potentially explosive area

Environmental data

Ambient temp. (operation/storage)	-10°C ... +65°C/-40°C ... +80°C
Protection class housing	IP 30
Protection class terminals	IP 20
Electromagnetic compatibility	IEC 1000-4-1...6, NAMUR NE 21

Explosion protection

Labelling (CENELEC)	[EEx ia] IIC/IIB
Classification	accompanying electrical device
Maximum safe voltage U_{max}	10.6V
Maximum safe current I_{max}	29.7mA
Max. power P_{max}	79mW
Max. external capacity IIC/IIB C_a	2.5/15 μ F
Max. external inductance IIC/IIB L_a	40/150mH

Order guide

	Designation	Part No.
Relay output	VS 401/R	500 30427
Transistor output	VS 401/N	500 30426

Tables

Operating modes

Input circuit	Output	Switch position			
		S1	S2	S3	S4
Contact closed	not active	-	ON	-	-
	active	-	OFF	-	-
Wire break/ short-circuit monitoring	not active	OFF	-	-	-
	active	ON	-	-	-

Diagrams

Remarks

- When connecting sensor and isolated switching amplifier, make sure not to exceed the permissible limit values for intrinsic safety.



VS 401

Isolated switching amplifier

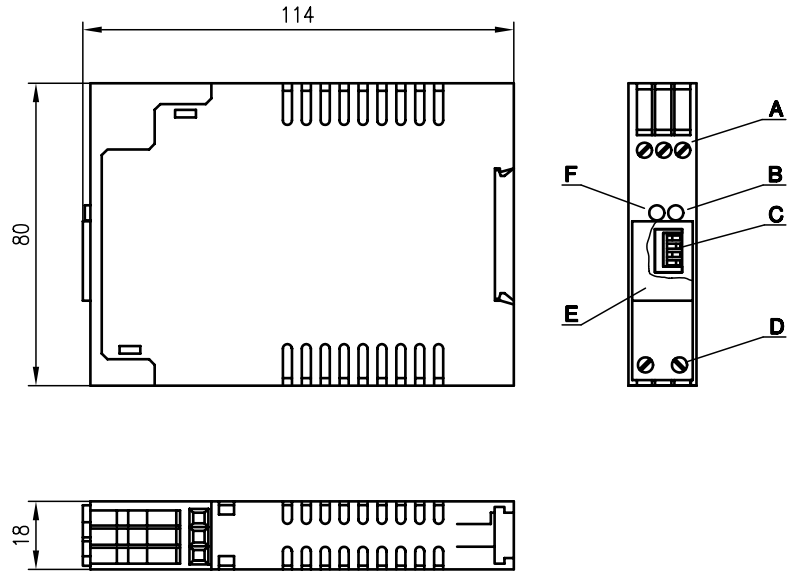


- Intrinsically safe input [EEx ia] IIC
- Input, output and operating voltage are galvanically isolated
- Wire break monitoring (may be deactivated)
- Operating modes adjustable
- Switching output with relay
- 1 channel
- EMC according to NAMUR NE 21
- Top hat rail mounting
- Conformity certificate PTB Ex-89.C.2025



Accessories:

Dimensioned drawing

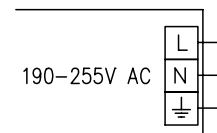
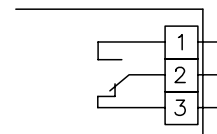
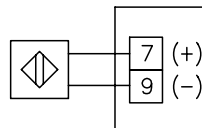


- A Connection terminals: operating voltage and switching output
- B LED 2: wire break
- C Switch for setting the operating modes
- D Connection terminals: input [EEx ia] IIC
- E Label area
- F switching state

Electrical connection

potentially explosive area

area without danger of explosions



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Specifications

Electrical data

Operating voltage	190 ... 255VAC
Frequency range	48 ... 62Hz
Power consumption	≤ 1VA

Input

acc. to DIN 19234 (NAMUR)	
Current I_E for ON	≥ 2.1mA
Current I_E for OFF	≤ 1.2mA
Bias voltage	≤ 8.2V
Short-circuit current	≤ 8.2mA

Output

Switching voltage U_{max}	250VAC/220VDC/≤ 24VDC
Switching current I_{max}	4A/0.1A/≤ 2A
Switching power P_{max}	100VA/22W/≤ 48W

Timing

Switching frequency (max.)	15Hz
Switching delay ON → OFF	≤ 10ms
Switching delay OFF → ON	≤ 10ms

Indicators

LED 1 green	switching output ON
LED 2 red	wire break

Mechanical data

Housing	plastic (polyamide 6 GF)
Fire resistance housing	HB (UL standard 94)
Weight	120g
Mounting type	outside the potentially explosive area

Environmental data

Ambient temp. (operation/storage)	-20°C ... +65°C/-40°C ... +70°C
Protection class housing	IP 30
Protection class terminals	IP 20
Electromagnetic compatibility	IEC 1000-4-1...6, NAMUR NE 21

Explosion protection

Labelling (CENELEC)	[EEx ia] IIC/IIB
Classification	accompanying electrical device
Maximum safe voltage U_{max}	10.5V
Maximum safe current I_{max}	32mA
Max. power P_{max}	84mW
Max. external capacity IIC/IIB C_a	510/2000nF
Max. external inductance IIC/IIB L_a	5/5mH

Tables

Operating modes

Input circuit	Output	Switch position			
		S1	S2	S3	S4
Contact closed	not active	0	1	0	0
	active	0	0	1	0
with wire break monitoring		1	X	X	0
without wire break monitoring		0	X	X	0
Test: Relay activated		0	0	0	1
Test: Relay currentless		0	0	0	0

X = any

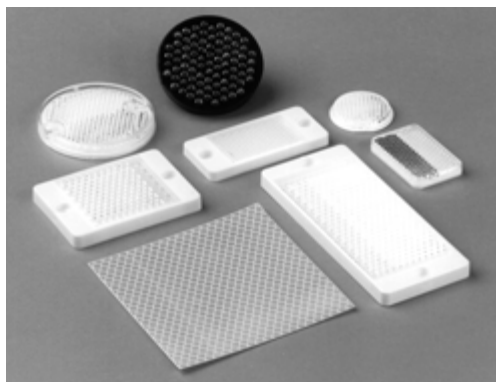
Diagrams

Order guide

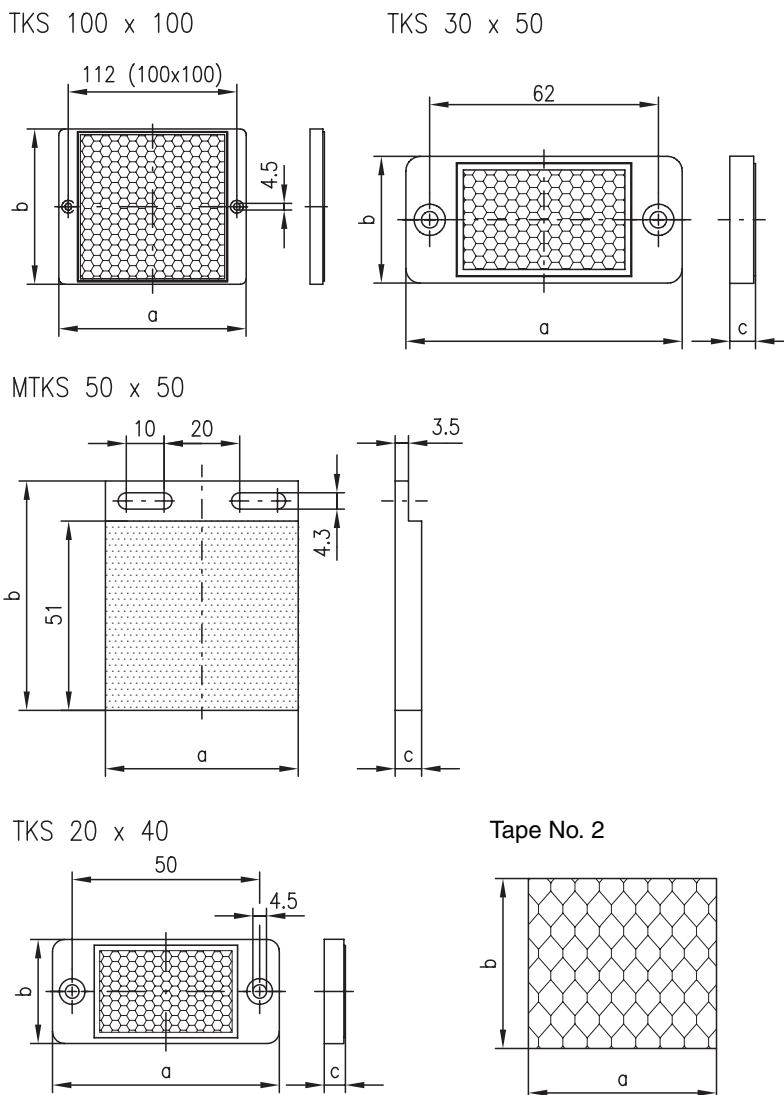
Designation	Part No.
VS 401/R-AC	500 30428

Remarks

- When connecting sensor and isolated switching amplifier, make sure not to exceed the permissible limit values for intrinsic safety.

Reflectors


- Reflectors and reflective tapes are ideally suited for Leuze retro-reflective photoelectric sensors. The performance data refer to the use of Leuze reflectors and reflective tapes. The range of retro-reflective photoelectric sensors depends on the type and size of the reflector.
- Adhesive and screw type versions permit universal installation.
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis.
- For retro-reflective photoelectric sensors with polarisation filters, only triad-type reflectors made of plastic or reflective tapes No 2 and No 3 may be used.

Dimensioned drawings

Order codes:

Designation	Part No.
TKS 100x100	500 22816
TK 100x100	500 03192
TKS 50x100	500 22815
TK 50x100	500 03191
MTKS 50x50	500 36188
TKS 50x50	500 22814
TKS 30x50	500 23525
TK 30x50	500 03189
TK 82	500 03187
TK 60	500 03186
TK 45	500 03185
Tape 2	500 11523
KB 092-5000-4 Ex	500 37784
KB 092-5000-4A Ex	500 37783
KD 095-5	500 20502
KD 095-5A	500 20501
BT 92	500 18415
UMS 1	500 22281
VS 401/N	500 30426
VS 401/R	500 30427
VS 401/R-AC	500 30428

Selection table

Designation	Temp. range	Dimensions [mm]			Fastening	
		a	b	c	screw type	adhesive
TKS 100x100	-20°C/+60°C	124.6	100	9.5	●	
TK 100x100 ²⁾	-20°C/+60°C	99	99	9	○	●
TKS 50x100	-20°C/+60°C	124.6	53.5	9.5	●	
TK 50x100 ²⁾	-20°C/+60°C	99	49.5	9	○	●
MTKS 50x50	-20°C/+60°C	51	60.7	7	●	
TKS 50x50	-20°C/+60°C	75	53.6	9.5	●	
TKS 30x50	-20°C/+60°C	75	34.5	9.5	●	
TK 30x50 ²⁾	-20°C/+60°C	48	32	6.8	○	●
TK 82 ¹⁾	-20°C/+60°C	84	9		●	
TK 60	-20°C/+60°C	64	8		●	
TK 45	-20°C/+60°C	46	8			●
Tape 2 ³⁾	-20°C/+60°C	100	100			●

- 1) heating capability (HTK 82)
 2) for screw mounting use mounting bracket
 3) available as sheet 914x749

Additional information in section "Accessories" from page 925 onwards!

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Selection table

Ready-made cables with 4-pin M12 connector	
5 m cable length	
Sensor designation	Cable designation (Part No.)
LS 92/3 Ex	KB 092-5000-4 Ex (Part No. 500 37784)
PRK 92/3 L Ex	
FRK 92/3-3000 L Ex	

M12 connectors			
with cable (5m cable length)		without cable	
KB 092-5000-4 Ex	KB 092-5000-4AEx	KD 095-5	KD 095-5A

Connectors, plugs, cables



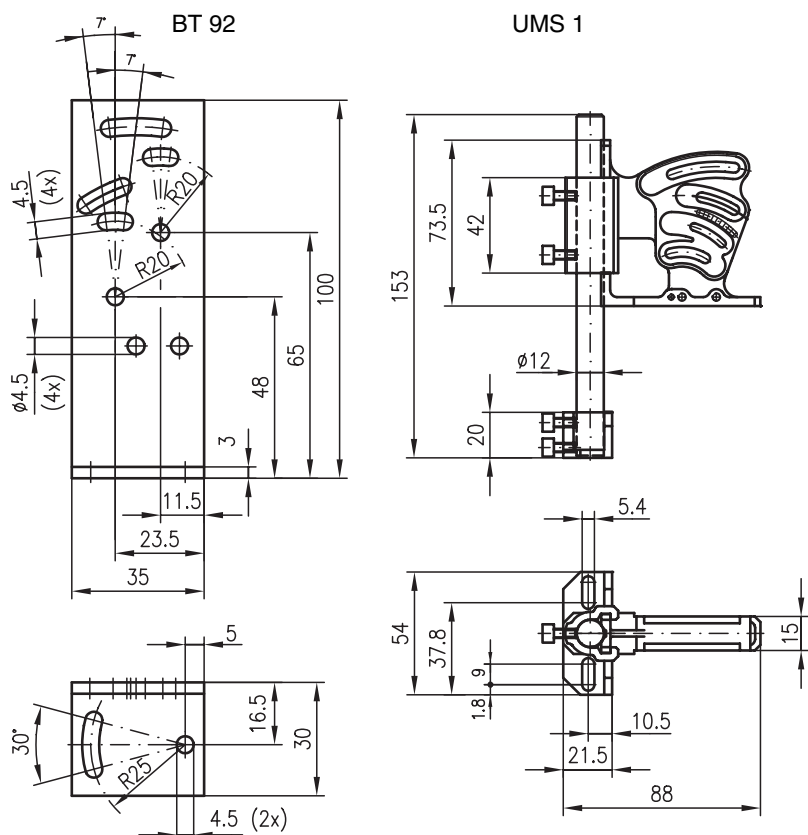
For the intrinsically safe devices of the 92 Ex Series, Leuze electronic offers plugs with ready-made blue cables of 5m length.

These blue cables have to be used in Ex zones 0 or 1 for intrinsically safe circuits.

For devices with M12 connectors, there are available: 2 connectors with ready-made 5m cable and 2 connectors with screw connection.

When ordering throughbeam photoelectric sensors, keep in mind that a connector is required both for the transmitter and receiver.

Dimensioned drawings



Mounting systems

BT 92



UMS 1







Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index



Protective photoelectric sensors with testing

Overview and advantages

Protective photoelectric sensors in safety category 2:

- 763 Series
- 46 Series
- 78 Series
- 85 Series
- 92 Series
- 95 Series
- 96 Series

Test-monitoring unit in safety category 2:

- TNT 32 with start testing
- TNT 33 with cyclical testing
- TNT 34 with cyclical testing
- TNT 35 with cyclical testing
- TMC 66 with cyclical testing and integrated muting function

Safety muting controller in safety category 2:

- SMC 33
- SMC 34

Accessories for protective photoelectric sensors in safety category 2:

- Extensive accessories ranging from connection cables to deflection mirrors

EC type examined components acc. to prEN 50100 or EN 61496





Operating principle	Designation	Typ. oper. range limit	Housing		Light source		Operating voltage		Output	
			Plastic	Metal	Red light	Infrared	10 ... 30VDC	24VDC ± 15%	PNP transistor	AS-interface
	LS 763/4.8, 2500	0 ... 8m		•		•		•	•	
	LS 763/4.8 L8	0 ... 8m		•		•		•	•	
	SLS 46/44.8-S12	0 ... 36m	•			•	•		•	
	SLS 46/44.8, 2000	0 ... 36m	•			•	•		•	
	SLS 46/44.8, 300-S12	0 ... 36m	•			•	•		•	
	SLS 78M/P-1730-T2-4	0 ... 150m		•		•		•	•	
	SLS 78M/P-1750-T2-2	0 ... 150m		•		•		•	•	
	SLS 78M/PR-1761-T2-2	0 ... 150m		•		•		•	•	
	SLS 85M/P-1750-T2-8	0 ... 78m		•		•		•	•	
	SLS 85M/P-1750-T2-4	0 ... 78m		•		•		•	•	
	LS 92/4.8-S	0 ... 16m		•		•	•		•	
	LS 92/4.8-S.1	0 ... 16m		•		•	•		•	
	LS 92/4.8-L	0 ... 16m		•		•	•		•	
	SLSR 95/44.8 L	0 ... 10m		•	•		•		•	
	SLS 96M/P-1070-T2-2	0 ... 65m		•		•	•		•	
	SLS 96M/P-1070-T2-4	0 ... 65m		•		•	•		•	
	SLS 96M/P-1071-T2-2	0 ... 65m		•		•	•		•	
	SLS 96M/P-1071-T2-4	0 ... 65m		•		•	•		•	
	SLS 96M/P-1200-T2-2	0 ... 39m		•	•		•		•	
	SLS 96M/P-1200-T2-4	0 ... 39m		•	•		•		•	
	SLS 96K/P-1070-T2-2	0 ... 65m	•			•	•		•	
	SLS 96K/P-1070-T2-4	0 ... 65m	•			•	•		•	
	SLS 96K/P-1200-T2-2	0 ... 39m	•		•		•		•	
	SLS 96K/P-1200-T2-4	0 ... 39m	•		•		•		•	
	SLS 96K/P-1207-T2-2	0 ... 39m	•		•		•		•	
	SRK 96M/P-1210-T2-47	0 ... 7m		•	•		•		•	
	SRK 96M/P-1210-T2-29	0 ... 7m		•	•		•		•	



Switching frequency	Switching		Connection					Options		Page
	Light/dark	Light	M12 connector	M8 connector	Standard plug	Connection cable	Terminal connection	Optics heating	Activation input	
100Hz		•				•			•	883
100Hz		•		•					•	885
200Hz	•		•						•	887
200Hz	•					•			•	887
200Hz	•					•			•	889
300Hz		•	•					•	•	891
200Hz		•					•	•	•	893
200Hz		•					•	•	•	893
300Hz		•			•			•	•	895
300Hz		•	•					•	•	895
200Hz	•				•				•	897
200Hz	•				•				•	897
200Hz	•		•						•	897
200Hz	•		•						•	899
500Hz		•					•		•	901
500Hz		•	•						•	901
500Hz		•					•	•	•	901
500Hz		•	•					•	•	901
500Hz		•					•		•	901
500Hz		•	•						•	901
500Hz		•					•		•	903
500Hz		•	•						•	903
500Hz		•					•		•	903
500Hz		•	•						•	903
500Hz		•					•		•	903
100Hz		•	•						•	905
100Hz		•					•		•	905



LS 763

Protective throughbeam photoelectric sensor



8m



- Protective throughbeam photoelectric sensor with high performance reserve in infrared light
- Activation input for testing and interlinking
- Compact construction with shock-resistant metal housing and glass optics
- LED indicator in transmitter and receiver for function monitoring
- PNP transistor output for PLC applications
- Flexible PUR connection cable for industrial application



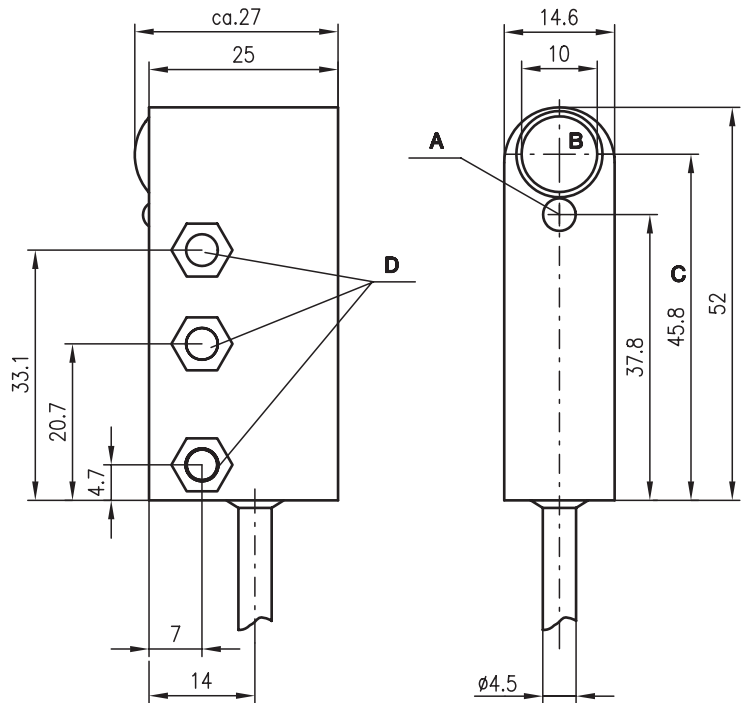
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Accessories:

(available separately)

- Mounting system (BT 763)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

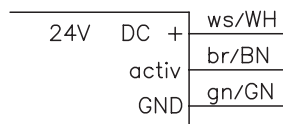
Dimensioned drawing



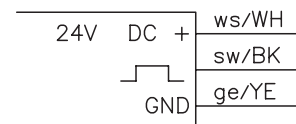
- A Indicator diode
- B Transmitter/receiver
- C Optical axis
- D Flat nut M4 for insertion

Electrical connection

Transmitter



Receiver





Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 8m
Operating range ²⁾	0 ... 6m
Light source	LED (modulated light)
Wavelength	880nm
Optics diameter	10mm
Shadowing item	8mm
Eff. angle of radiation	max. $\pm 4^\circ$ acc. to prEN 50100-2 (edition 08/94)

Timing

Switching frequency	100Hz
Response time	min. 5ms

Electrical data

Operating voltage U_B ³⁾	24VDC $\pm 15\%$
Residual ripple	$\leq 10\%$ of U_B (peak/peak)
Bias current	receiver ≤ 15 mA transmitter ≤ 20 mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

Receiver	
LED red	light path interrupted
LED green	light path free
Transmitter	
LED yellow	transmitter ON

Mechanical data

Housing	diecast zinc, electroplated
Optics	mineral glass
Weight	130g
Connection type	cable, PUR, length 2.5m

Environmental data

Ambient temp. (operation/storage)	$-20^\circ\text{C} \dots +60^\circ\text{C} / -30^\circ\text{C} \dots +70^\circ\text{C}$
Protective circuit ⁴⁾	2, 3
Protection class	IP 65
Standards applied	IEC 90647-5-2

Options

Activation input activ	
Transmitter active/not active	$\geq 20V / \leq 2V$ or not connected
Activation/disable delay	≤ 0.5 ms
Input resistance	$10k\Omega \pm 10\%$

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 4) 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
Transmitter and receiver	LS 763/4.8, 2500	
Transmitter	LS 763/2.8 Se, 2500	500 27465
Receiver	LS 763/4 E, 2500	500 27466

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: $\varnothing 8$ mm.



LS 763

Protective throughbeam photoelectric sensor



8m



- Protective throughbeam photoelectric sensor with high performance reserve in infrared light
- Activation input for testing and interlinking
- Compact construction with shock-resistant metal housing and glass optics
- LED indicator in transmitter and receiver for function monitoring
- PNP transistor output for PLC applications
- Connection via M8 connector

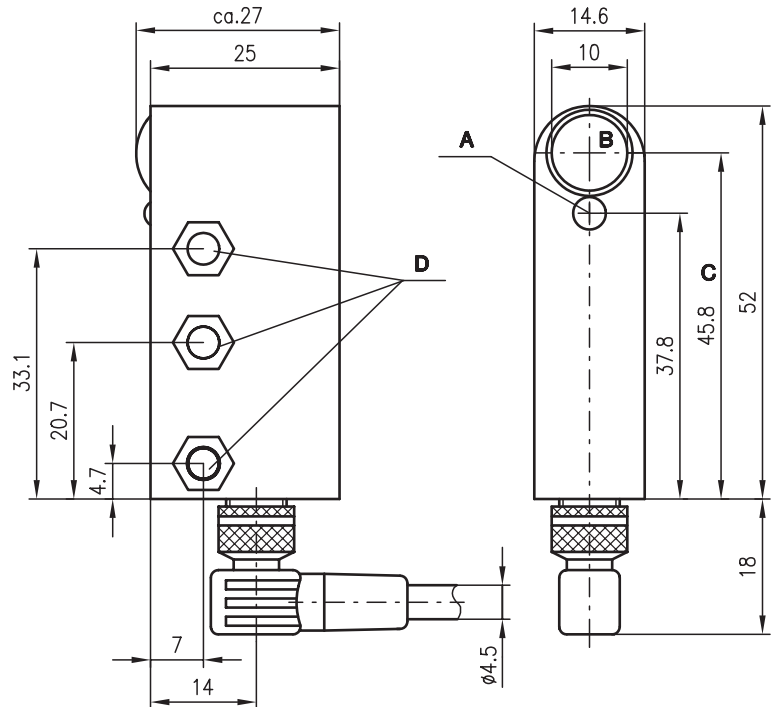


Accessories:

(available separately)

- Mounting system (BT 763)
- Connection cable 5m
 - Axial BK7 KB-003-5000-3A
 - Angled BK7 KB-003-5000-3
- Test-monitoring unit:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

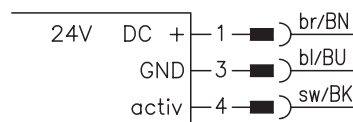
Dimensioned drawing



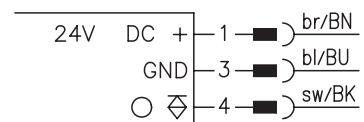
- A Indicator diode
- B Transmitter/receiver
- C Optical axis
- D Flat nut M4 for insertion

Electrical connection

Transmitter



Receiver





Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 8m
Operating range ²⁾	0 ... 6m
Light source	LED (modulated light)
Wavelength	880nm
Optics diameter	10mm
Shadowing item	8mm
Eff. angle of radiation	max. $\pm 4^\circ$ acc. to prEN 50100-2 (edition 08/94)

Timing

Switching frequency	100Hz
Response time	min. 5ms

Electrical data

Operating voltage U_B ³⁾	24VDC $\pm 15\%$
Residual ripple	$\leq 10\%$ of U_B (peak/peak)
Bias current	receiver ≤ 15 mA transmitter ≤ 20 mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA

Indicators

Receiver	
LED red	light path interrupted
LED green	light path free
Transmitter	
LED yellow	transmitter ON

Mechanical data

Housing	diecast zinc, electroplated
Optics	mineral glass
Weight	130g
Connection type	M8 connector

Environmental data

Ambient temp. (operation/storage)	$-20^\circ\text{C} \dots +60^\circ\text{C} / -30^\circ\text{C} \dots +70^\circ\text{C}$
Protective circuit ⁴⁾	2, 3
Protection class	IP 65
Standards applied	IEC 90647-5-2

Options

Activation input activ	
Transmitter active/not active	$\geq 20V / \leq 2V$ or not connected
Activation/disable delay	≤ 0.5 ms
Input resistance	$10k\Omega \pm 10\%$

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) Functional extra/low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 4) 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
Transmitter and receiver	LS 763/4.8 L8	
Transmitter	LS 763/2.8 Se L8	500 81024
Receiver	LS 763/4 E L8	500 81025

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: $\varnothing 8$ mm.



SLS 46

Protective throughbeam photoelectric sensors



36m

10 - 30 V
DC

BWS
Typ 2



- Protective throughbeam photoelectric sensors with high performance reserve in infrared light
- Solid plastic housing, protection class IP 67 for industrial application
- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- Activation input for testing and interlinking

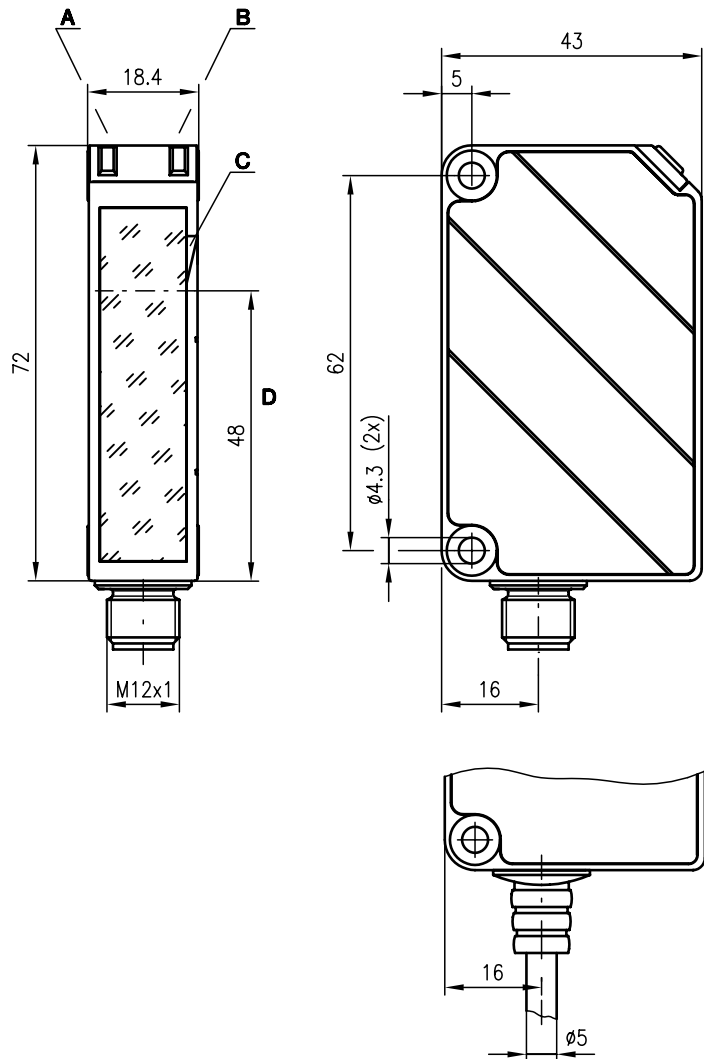


Accessories:

(available separately)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

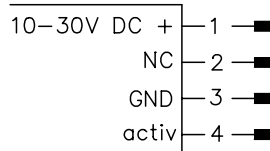
Dimensioned drawing



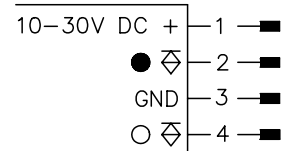
- A Indicator diode green
- B Indicator diode yellow
- C Marker
- D Optical axis

Electrical connection

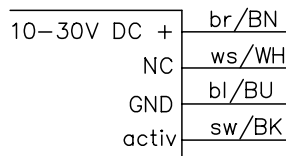
SLSS 46.8-S12



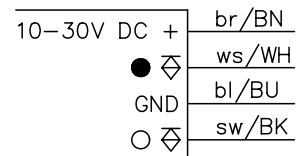
SLSE 46/44-S12



SLSS 46.8, 2000



SLSE 46/44, 2000



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Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 36m
Operating range ²⁾	0 ... 30m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED green	ready
LED yellow	transmitter active

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100g
Connection type	M 12 connector, or cable, cable length: 2000mm, PVC

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V
Activation/disable delay	≤ 1ms / ≤ 2ms
Input resistance	10KΩ ± 10%

- 1) Operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	SLS 46/44.8-S12	
Transmitter with activation input	SLSS 46.8-S12	500 60935
Receiver	SLSE 46/44-S12	500 60936
with 2m cable		
Transmitter and receiver	SLS 46/44.8, 2000	
Transmitter with activation input	SLSS 46.8, 2000	500 60939
Receiver	SLSE 46/44, 2000	500 60940

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing). Minimum blackening object: Ø22mm. At the device, the tip of the marker indicates the location of the optical axis.



SLS 46

Protective throughbeam photoelectric sensors



36m

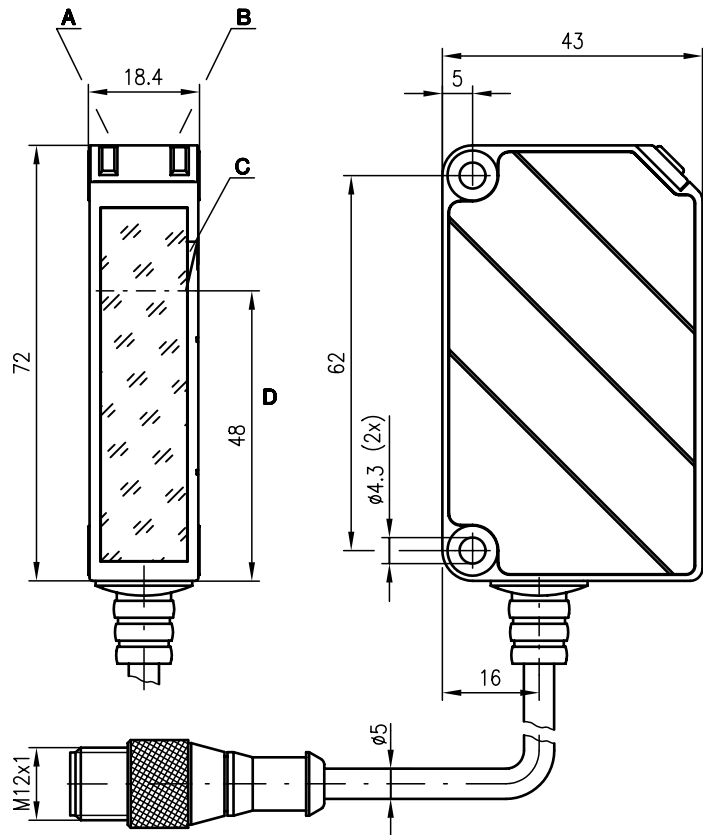
10 - 30 V
DC

BWS
Typ 2



- Protective throughbeam photoelectric sensors with high performance reserve in infrared light
- Solid plastic housing, protection class IP 67 for industrial application
- Wide voltage range 10 ... 30V with PNP switching output for PLC applications
- Activation input for testing and interlinking

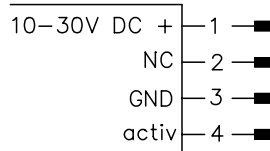
Dimensioned drawing



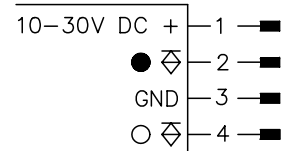
- A Indicator diode green
- B Indicator diode yellow
- C Marker
- D Optical axis

Electrical connection

SLSS 46.8, 300-S12



SLSE 46/44, 300-S12



Accessories:

(available separately)

- Mounting systems (BT 46.1, BT 46.1.5, BT 46.2)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

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Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 36 m
Operating range ²⁾	0 ... 30 m
Light source	LED (modulated light)
Wavelength	880 nm

Timing

Switching frequency	200 Hz
Response time	2.5 ms
Delay before start-up	≤ 100 ms

Electrical data

Operating voltage U_B	10 ... 30 VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 30 mA
Switching output	PNP transistor
Function characteristics	light/dark switching (complementary)
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100 mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED green	ready
LED yellow	transmitter active

Mechanical data

Housing	plastic
Optics cover	plastic
Weight	100 g
Connection type	cable with M12 connector, cable length: 300 mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C / -40°C ... +70°C
Protective circuit ³⁾	2, 3
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input activ	≥ 8V / ≤ 2V
Transmitter active/not active	≤ 1 ms / ≤ 2 ms
Activation/disable delay	≤ 1 ms / ≤ 2 ms
Input resistance	10 kΩ ± 10%

- 1) Operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250 VAC

Order guide

	Designation	Part No.
with M12 connector		
Transmitter and receiver	SLS 46/44.8, 300-S12	
Transmitter with activation input	SLSS 46.8, 300-S12	500 60937
Receiver	SLSE 46/44, 300-S12	500 60938

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
 Minimum blackening object: Ø22 mm.
 At the device, the tip of the marker indicates the location of the optical axis.



SLS 78

Protective throughbeam photoelectric sensors

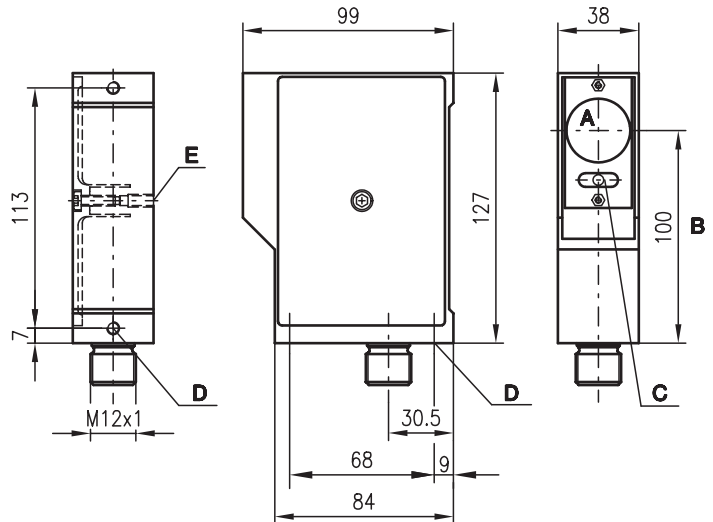


0 ... 150m



- Activation input for testing and interlinking
- Connection via M12 connector
- Integrated optics heating

Dimensioned drawing

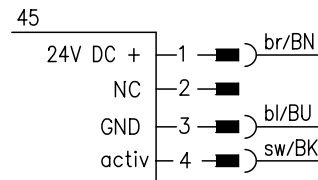


- A Transmitter/receiver
- B Optical axis
- C Indicator diodes
- D Device fixture M6x9
- E Device fixture M6x12

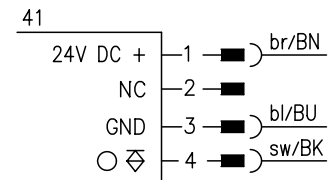


Electrical connection

Transmitter



Receiver



Accessories:

(available separately)

- Mounting systems (BT 16, UMS 78)
- Alignment aid ARH 2
- M12 connectors (KD ...)
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

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Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 150m
Operating range ²⁾	0 ... 120m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	300Hz
Response time	1.7ms
Delay before start-up	≤ 200ms
Input pulse	min. 1.7ms

Electrical data

Operating voltage U_B	24VDC ± 20%
Residual ripple	≤ 15% of U_B
Bias current	receiver ≤ 35mA transmitter ≤ 60mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA

Indicators

Receiver

LED red	light path interrupted
LED green	light path free
LED green flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
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Mechanical data

Housing	diecast aluminium
Optics	glass, eff. angle of radiation ± 4° acc. to prEN 50100-2 (edition 08/94)
Weight	463g
Connection type	M12 connector, 4-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -30°C ... +70°C
VDE safety class	III
Protective circuit ³⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7kΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
Transmitter and receiver	SLS 78M/P-1730-T2-4	
Transmitter	SLSS 78M-1720-T2-45	500 29536
Receiver	SLSE 78 M/P-1730-T2-41	500 80323

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø30mm.

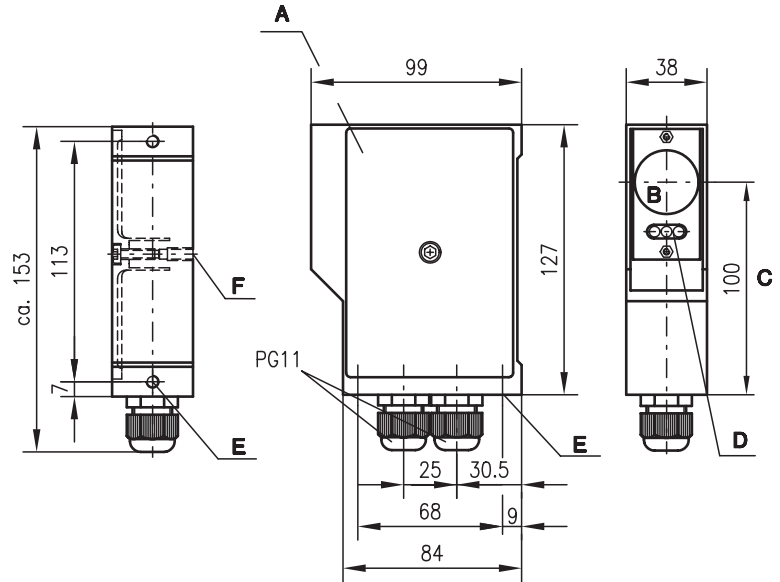


SLS 78

Protective throughbeam photoelectric sensors



Dimensioned drawing



0 ... 150m



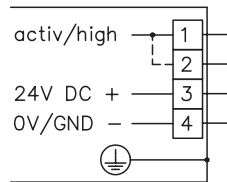
- Robust metal housing with glass lens, protection class IP 65 for industrial application
- Additional relay output with switching delay (slow release) without security function
- Integrated optics heating

- A** Removable lid • cheese head screw DIN 6912 M5x16 (machined)
- B** Transmitter/receiver
- C** Optical axis
- D** Indicator diodes
- E** Device fixture M6x9
- F** Device fixture M6x12

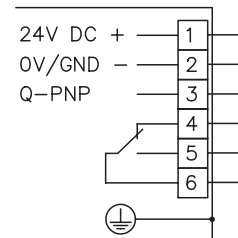


Electrical connection

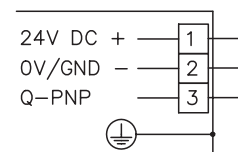
SLSS 78M-1720-T2-24



SLSE 78M/PR-1741-T2-29



SLSE 78M/P-1730-T2-21



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Accessories:

(available separately)

- Mounting systems (BT 16, UMS 78)
- Alignment aid ARH 2
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 150m
Operating range ²⁾	0 ... 120m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 200ms
Input pulse	min. 2ms

Electrical data

Operating voltage U_B	24VDC ± 20%
Residual ripple	≤ 15% of U_B
Bias current	receiver ≤ 55mA transmitter ≤ 70mA
Switching output	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 200mA
Relay output	slow release 0 ... 10s without security function

Indicators

Receiver

LED red	light path interrupted
LED green	light path free
LED green flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
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Mechanical data

Housing	diecast aluminium
Optics	glass, eff. angle of radiation ± 4° acc. to prEN 50100-2 (edition 08/94)
Weight	463g
Connection type	terminals, max. 2.5mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C / -30°C ... +70°C
VDE safety class	III
Protective circuit ³⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7kΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
Transmitter and receiver	SLS 78M/P-1750-T2-2	
Transmitter	SLSS 78M-1720-T2-24	500 24730
Receiver	SLSE 78 M/P-1730-T2-21	500 24731
Transmitter and receiver	SLS 78M/PR-1761-T2-2	
Transmitter	SLSS 78M-1720-T2-24	500 24730
Receiver	SLSE 78 M/PR-1741-T2-29	500 24732

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø30mm.

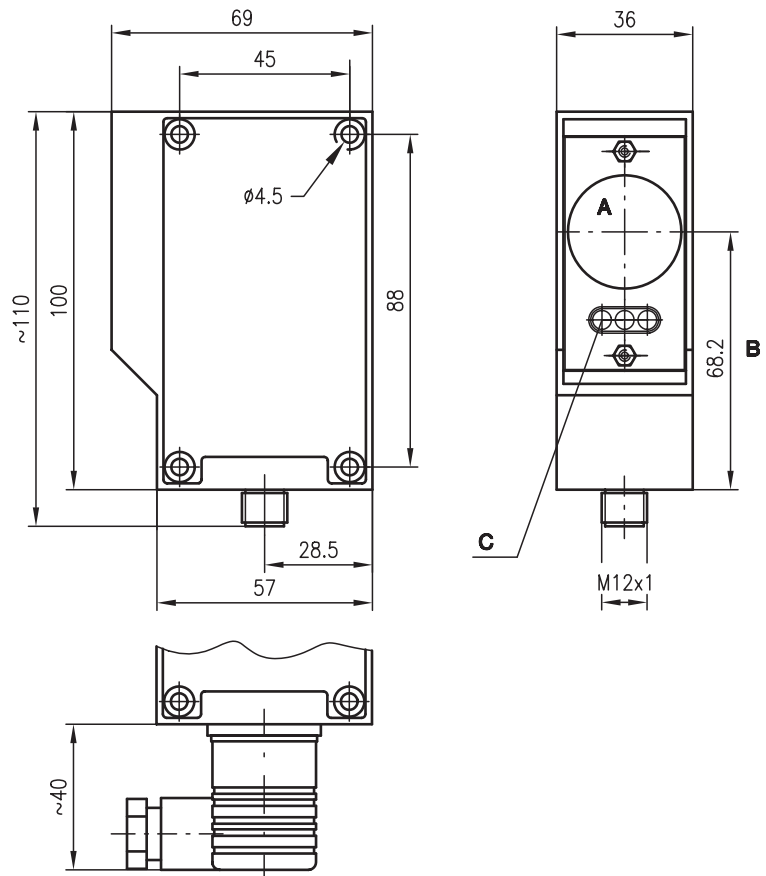


SLS 85

Protective throughbeam photoelectric sensors



Dimensioned drawing



- A Transmitter/receiver
- B Optical axis
- C Indicator diode



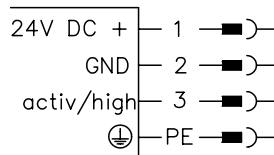
0 ... 78m



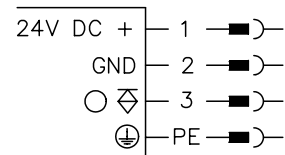
- Activation input for testing and interlinking
- LED indicator in transmitter and receiver
- Connection via M12 connector or standard plug with screw connector up to 1.5mm²
- Integrated optics heating

Electrical connection

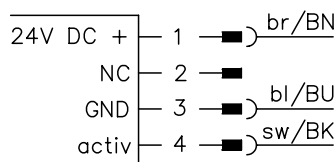
83 Transmitter



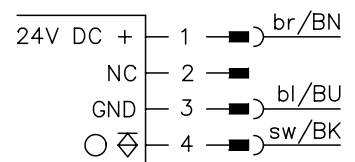
81 Receiver



45 Transmitter



41 Receiver



Accessories:

(available separately)

- Fastening and adjustment angle BT 85
- M12 connection cable
- M12 connectors - with screw terminals (KD ...)
- Laser alignment aid ARH 78
- Test-monitoring unit:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 85_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 78m
Operating range ²⁾	0 ... 60m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	300Hz
Response time	min. 1.7ms
Delay before start-up	≤ 5ms

Electrical data

Operating voltage U_B	24V DC ± 15%
Residual ripple	≤ 15%
Bias current	receiver ≤ 35mA transmitter ≤ 60mA
Switching output ³⁾	PNP transistor output
Function characteristics	light switching
Signal voltage high/low	≥ $(U_B - 2V) / \leq 2V$
Output current	max. 200mA

Indicators

Receiver

LED red	light path interrupted
LED green	light path free
LED green flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
------------	----------------

Mechanical data

Housing	diecast aluminium
Optics	glass
Weight	280g
Connection type	M 12 connector or standard plug with screw connector up to 1.5mm ²

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-30°C ... +70°C
VDE safety class	I for SLS... - 83/81
VDE safety class ⁴⁾	II for SLS... - 41/45
Protective circuit ⁵⁾	1, 2, 3
Protection class	IP 65
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 400µs
Input resistance	4.7k< Ω ± 10%

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) functional extra-low voltage with reliable disconnection or protective extra-low voltage (VDE 0100/T 410)
 4) Rating voltage 250 VAC
 5) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection

Order guide

	Designation	Part No.
with standard plug		
Transmitter and receiver	SLS 85M/P-1750-T2-8	
Transmitter	SLSS 85M-1720-T2-83	500 24733
Receiver	SLSE 85M/P-1730-T2-81	500 24734
with M 12 connector ¹⁾		
Transmitter and receiver	SLS 85M/P-1750-T2-4	
Transmitter	SLSS 85M-1720-T2-45	500 26255
Receiver	SLSE 85M/P-1730-T2-41	500 26267

- 1) not part of the delivery contents

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1 category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø30mm.

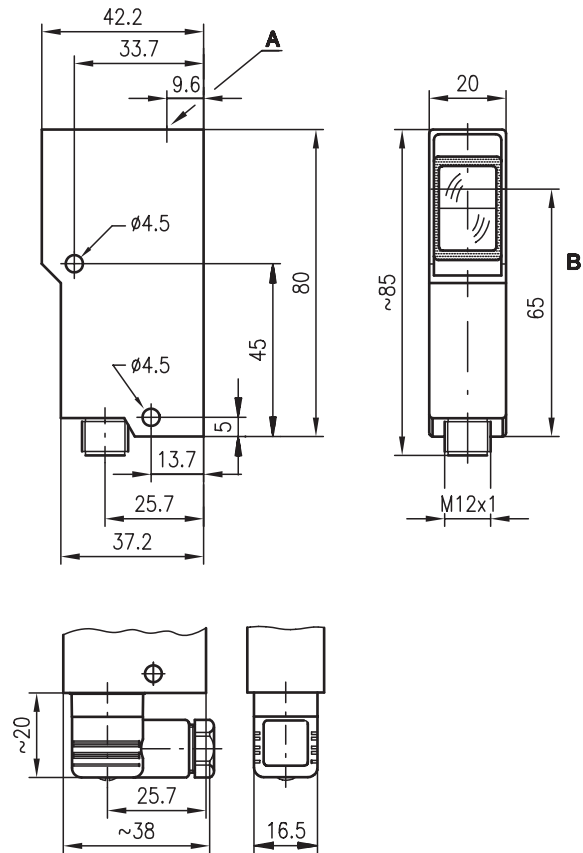


LS 92

Protective throughbeam photoelectric sensors



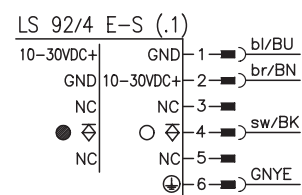
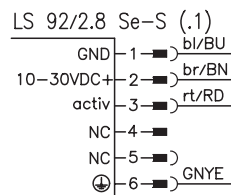
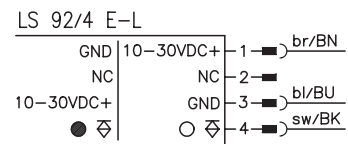
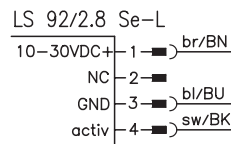
Dimensioned drawing



LS 92/2.8 Se-S
LS 92/4 E-S
LS 92/4 E-S.1
LS 92/2.8 Se-S.1

A Indicator diode
B Optical axis

Electrical connection



16m

10 - 30 V
DC

BWS
Typ 2



- Activation input for testing and interlinking
• Compact construction with robust diecast zinc housing and glass optics for protection against environmental influences
• Light or dark switching by reversing the polarity of the operating voltage
• Electrical connection with M 12 connector or 6-pin standard plug



Accessories:

(available separately)

- Mounting systems (BT 92, UMS 1)
• M12 connectors (KD ...)
• Ready-made cables (KB ...)
• Test-monitoring units:
- TNT 32 (Part No. 500 20476)
- TNT 33 (Part No. 500 28158)
- TNT 34 (Part No. 500 81023)
- TNT 35 (Part No. 500 33058)
- TMC 66 (Part No. 500 82121)

We reserve the right to make changes • 92_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 16m
Operating range ²⁾	0 ... 12m
Light source	LED (modulated light)
Wavelength	880nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U _B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U _B
Bias current	≤ 35mA
Switching output	PNP transistor output
Function characteristics	light or dark switching (by reversing the polarity of U _B)
Signal voltage high/low	≥ (U _B -2V)/≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED yellow	transmitter ON
------------	----------------

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	140g
Connection type	M12 connector or 6-pin standard plug

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
VDE safety class	I for S types
VDE safety class ³⁾	II for L types (M12 connector)
Protective circuit ⁴⁾	2, 3
Protection class	IP 67, IP 65 for all S types
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7K<Ω ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) Rating voltage 250VAC

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

	Designation	Part No.
with 6-pin standard plug		
Transmitter and receiver	LS 92/4.8-S	
Transmitter	LS 92/2.8 Se-S	500 11218
Receiver	LS 92/4 E-S	500 11217
with M12 connector		
Transmitter and receiver	LS 92/4.8-L	
Transmitter	LS 92/2.8 Se-L	500 22703
Receiver	LS 92/4 E-L	500 22704
with 6-pin standard plug without cable connector		
Transmitter and receiver	LS 92/4.8-S.1	
Transmitter	LS 92/2.8 Se-S.1	500 20360
Receiver	LS 92/4 E-S.1	500 20573

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø13mm.



SLSR 95

Protective throughbeam photoelectric sensors



0 ... 10m



- Protective throughbeam photoelectric sensor with high performance reserve in visible red light
- Small construction with glass cover and robust zinc diecast housing, protection class IP 67 for industrial application
- Complementary outputs for light/dark switching or as a control function

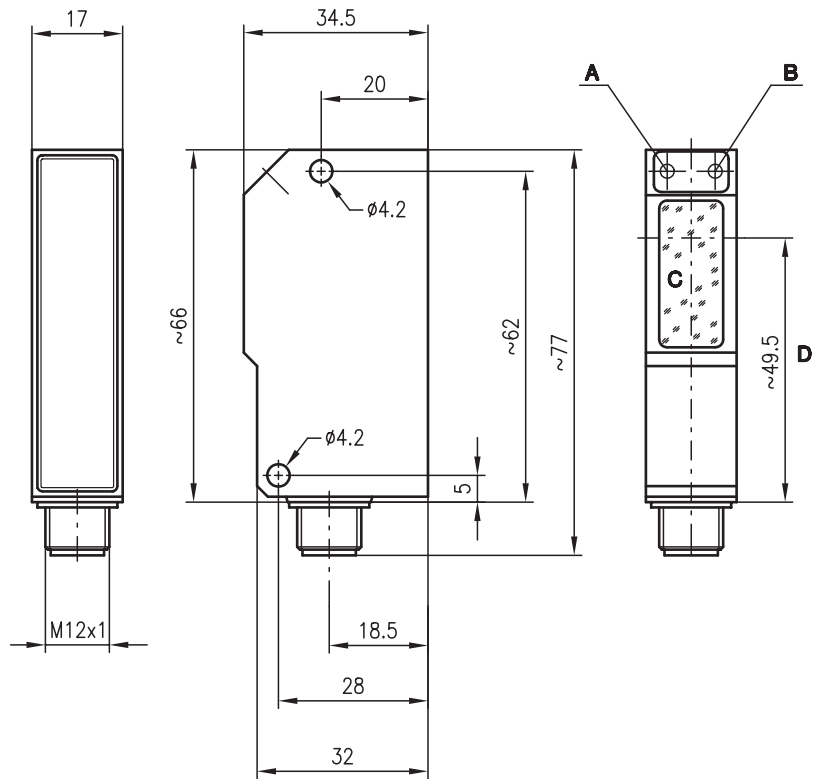


Accessories:

(available separately)

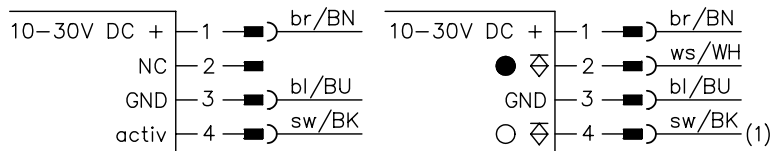
- Mounting systems (BT 95, UMS 1)
- M12 connectors (KD ...)
- Ready-made cables in straight or angular versions, length 5m (KB ...)
- Test-monitoring unit:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

Dimensioned drawing



- A Switching indicator yellow
- B Operation indicator green
- C Transmitter/receiver
- D Optical axis

Electrical connection



(1) For operation with Leuze test-monitoring units, the photoelectric sensor must be connected in light switching mode (pin 4)

We reserve the right to make changes • 95_a03e.fm



Specifications

Optical data

Typ. operating range limit ¹⁾	0 ... 10m
Operating range ²⁾	0 ... 8m
Light source	LED (modulated light)
Wavelength	660nm

Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 35mA
Switching output	2 PNP transistor outputs, complementary
Function characteristics	light/dark switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

Receiver

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Transmitter

LED green	ready
LED yellow	transmitter ON

Mechanical data

Housing	diecast zinc
Optics	glass
Weight	90g
Connection type	M 12 connector, stainless steel receiver 4-pin, transmitter 4-pin

Environmental data

Ambient temp. (operation/storage) ³⁾	-25°C (-30°C) ... +60°C/-40°C ... +70°C
Protective circuit ⁴⁾	2, 3
VDE safety class ⁵⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V/≤ 2V or not connected
Activation/disable delay	≤ 1ms
Input resistance	4.7kΩ ± 10%

1) Typ. operating range limit: max. attainable range without performance reserve

2) Operating range: recommended range with performance reserve

3) -30°C with operating voltage continuously applied

4) 2=polarity reversal protection, 3=short-circuit protection for all outputs

5) Rating voltage 250VAC

Order guide

	Designation	Part No.
Transmitter and receiver	SLSR 95/44.8 L	
Transmitter	SLSR 95/2.8 SE-L	500 80183
Receiver	SLSR 95/44 E-L	500 80184

Tables

Diagrams

Remarks

The protective throughbeam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).

The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø 13mm.



SLS 96

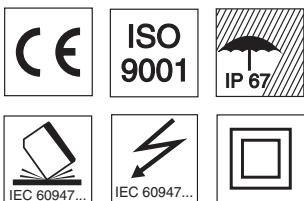
Protective throughbeam photoelectric sensors



65 m
39 m



- Protective throughbeam photoelectric sensor cat. 2 (testing) with high performance reserve in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- 2 indicators each at the transmitter and receiver for displaying their status when commissioning and in operation
- Optics heating for use with low temperatures
- Connection via M12 connector or terminal compartment

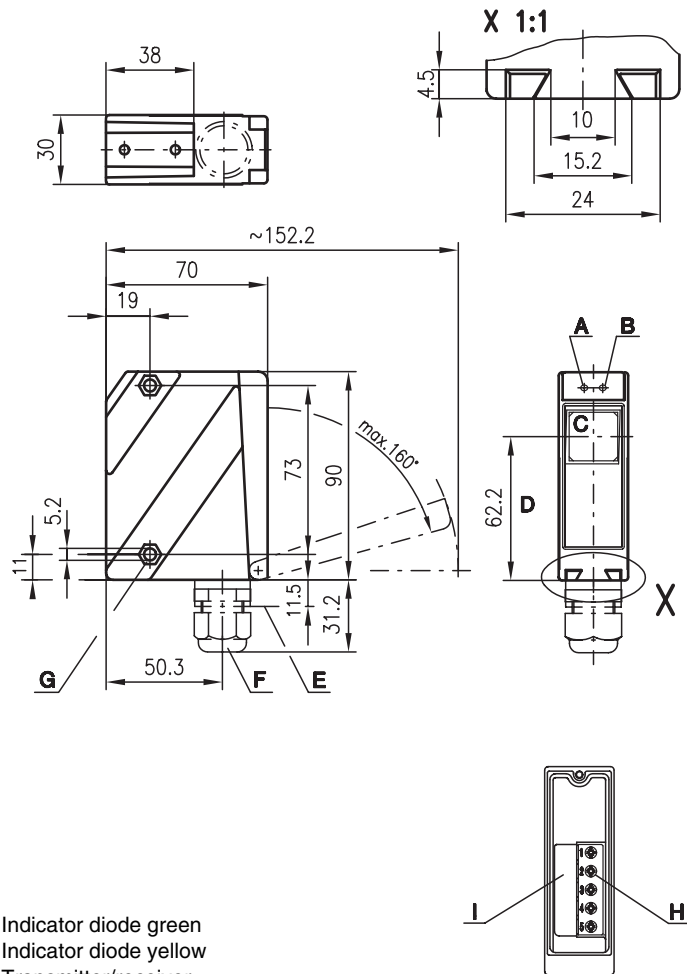


Accessories:

(available separately)

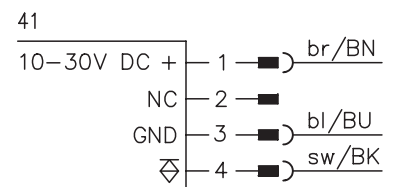
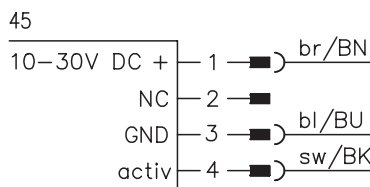
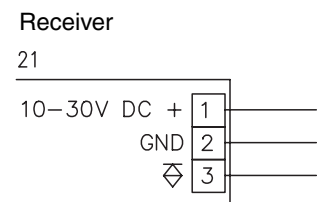
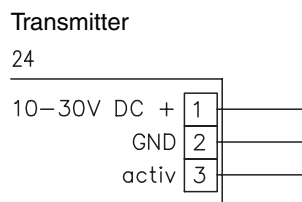
- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

Dimensioned drawing



- A** Indicator diode green
- B** Indicator diode yellow
- C** Transmitter/receiver
- D** Optical axis
- E** Device plug M12x1
- F** Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G** Countersinking for SK nut M5, 4.2mm deep
- H** Connection terminals
- I** Cable entry

Electrical connection





Specifications

Optical data

Typ. operating range limit ¹⁾
 Operating range ²⁾
 Light source
 Wavelength

Infrared light

0 ... 65m
 0 ... 50m
 LED (modulated light)
 880nm

Red light

0 ... 39m
 0 ... 30m
 LED (modulated light)
 660nm

Timing

Sensor switching frequency 500Hz
 Sensor response time 1ms
 Delay before start-up ≤ 200ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple ≤ 15% of U_B
 Bias current ≤ 50mA
 Switching output PNP transistor
 Function characteristics light switching
 Signal voltage high/low ≥ (U_B-2V)/≤ 2V
 Output current max. 100mA

Indicators

LED green ready

Receiver

LED yellow light path free
 LED yellow flashing light path free, no performance reserve

Transmitter

LED yellow transmitter active

Mechanical data

Housing diecast zinc
 Optics cover glass
 Weight 380g
 Connection type terminals or M12 connector

Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-40°C ... +70°C
 Protective circuit ³⁾ 1, 2, 3
 VDE safety class ⁴⁾ II, all-insulated
 Protection class IP 67
 Standards applied IEC 60947-5-2

Options

Optics heating for temperature changes, prevents fogging
 Low temperature to -35°C
 Activation input activ ≥ 8V/≤ 2V
 Transmitter active/not active ≤ 1ms
 Activation/disable delay 10KΩ ± 10%
 Input resistance

- 1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø 28mm.

SLS = Pair consisting of
 SLSS = Transmitter
 SLSE = Receiver

Order guide

Selection table		Order code →						
Equipment ↓		SLS 96M/P-1070-T2-2 Part No. 500 25213 (Tr) Part No. 500 25192 (Re)	SLS 96M/P-1070-T2-4 Part No. 500 25215 (Tr) Part No. 500 25193 (Re)	SLS 96M/P-1071-T2-2 Part No. 500 29454 (Tr) Part No. 500 29455 (Re)	SLS 96M/P-1071-T2-4 Part No. 500 80478 (Tr) Part No. 500 80479 (Re)	SLS 96M/P-1200-T2-2 Part No. 500 25209 (Tr) Part No. 500 31562 (Re)	SLS 96M/P-1200-T2-4 Part No. 500 31249 (Tr) Part No. 500 31250 (Re)	
Housing	metal	●	●	●	●	●	●	
	plastic							
Light source	red light (30m)					●	●	
	infrared light (50m)	●	●	●	●			
Connection	terminals	●		●		●		
	M12 connector		●		●		●	
Features	optics heating/low temp.			●	●			
	activation input	●	●	●	●	●	●	
	filter for multi-axis operation							

SLS 96M/P-1070-T2-2

SLSS 96M-1080-T2-24
 SLSE 96M/P-1070-T2-21

SLS 96M/P-1070-T2-4

SLSS 96M-1080-T2-45
 SLSE 96M/P-1070-T2-41

SLS 96M/P-1071-T2-2

SLSS 96M-1090-T2-24
 SLSE 96M/P-1071-T2-21

SLS 96M/P-1071-T2-4

SLSS 96M-1090-T2-45
 SLSE 96M/P-1071-T2-41

SLS 96M/P-1200-T2-2

SLSS 96M-1210-T2-24
 SLSE 96M/P-1200-T2-21

SLS 96M/P-1200-T2-4

SLSS 96M-1210-T2-45
 SLSE 96M/P-1200-T2-41



SLS 96

Protective throughbeam photoelectric sensors



65 m
39 m



- Protective throughbeam photoelectric sensor cat. 2 (testing) with high performance reserve in visible red light or infrared light
- Robust metal housing with glass cover or plastic housing, protection class IP 67 for industrial application
- 2 indicators each at the transmitter and receiver for displaying their status when commissioning and in operation
- Optics heating for use with low temperatures
- Connection via M12 connector or terminal compartment

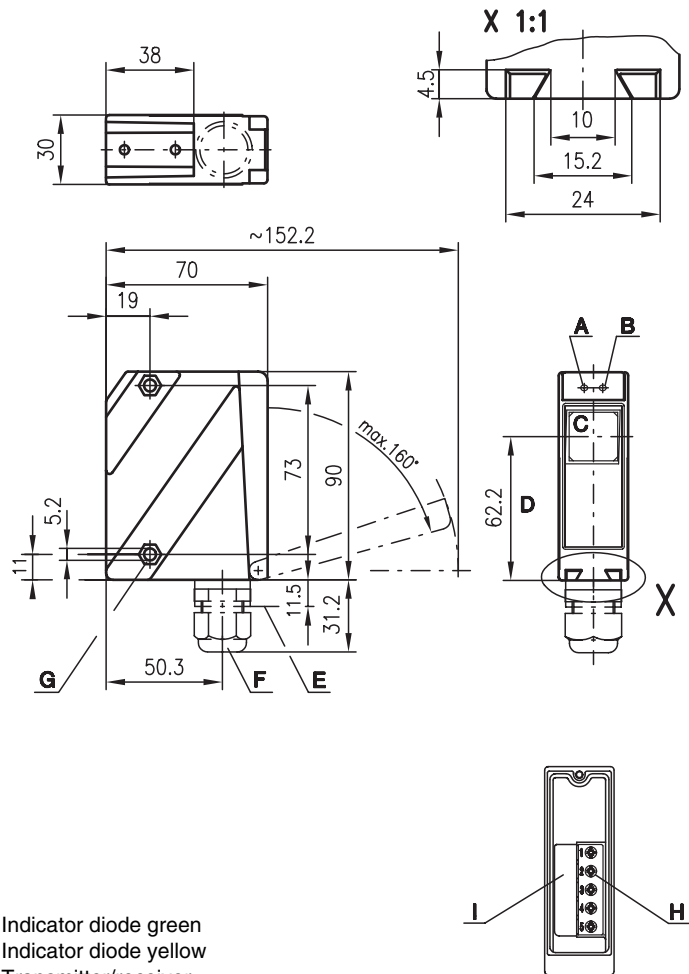


Accessories:

(available separately)

- Mounting systems (BT 96, BT 96.1, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Alignment aid ARH 96
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)

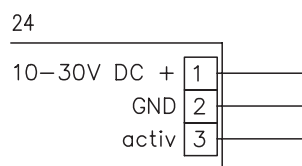
Dimensioned drawing



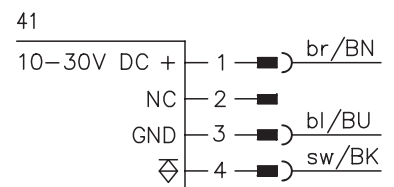
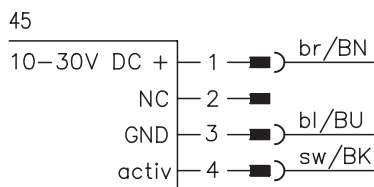
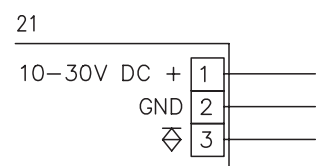
- A Indicator diode green
- B Indicator diode yellow
- C Transmitter/receiver
- D Optical axis
- E Device plug M12x1
- F Screwed cable gland M16x1.5 for Ø 5 ... 10mm
- G Countersinking for SK nut M5, 4.2mm deep
- H Connection terminals
- I Cable entry

Electrical connection

Transmitter



Receiver



We reserve the right to make changes • 96_a12e.fm



Specifications

Optical data	Infrared light	Red light
Typ. operating range limit ¹⁾	0 ... 65m	0 ... 39m
Operating range ²⁾	0 ... 50m	0 ... 30m
Light source	LED (modulated light)	LED (modulated light)
Wavelength	880nm	660nm
Timing		
Sensor switching frequency	500Hz	
Sensor response time	1ms	
Delay before start-up	≤ 200ms	
Electrical data		
Operating voltage U _B	10 ... 30VDC (incl. residual ripple)	
Residual ripple	≤ 15% of U _B	
Bias current	≤ 50mA	
Switching output	PNP transistor	
Function characteristics	light switching	
Signal voltage high/low	≥ (U _B -2V)/≤ 2V	
Output current	max. 100mA	
Indicators		
LED green	ready	
Receiver		
LED yellow	light path free	
LED yellow flashing	light path free, no performance reserve	
Transmitter		
LED yellow	transmitter active	
Mechanical data	Plastic housing	
Housing	polycarbonate	
Optics cover	plastic	
Weight	150g	
Connection type	terminals or M12 connector	
Environmental data		
Ambient temp. (operation/storage)	-20°C ... +60°C/-40°C ... +70°C	
Protective circuit ³⁾	1, 2, 3	
VDE safety class ⁴⁾	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	
Options		
Optics heating	for temperature changes, prevents fogging	
Low temperature	to -35°C	
Activation input activ	≥ 8V/≤ 2V	
Transmitter active/not active	≤ 1ms	
Activation/disable delay	10KΩ ± 10%	
Input resistance		

1) Typ. operating range limit: max. attainable range without performance reserve
 2) Operating range: recommended range with performance reserve
 3) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
 4) Rating voltage 250VAC

Tables

Remarks

- The protective through-beam photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1. Minimum blackening object: Ø 28mm.

Order guide

Selection table		Order code →					
Equipment ↓		SLS 96K/P-1070-T2-2 Part No. 500 81292 (Tr) Part No. 500 81293 (Re)	SLS 96K/P-1070-T2-4 Part No. 500 31559 (Tr) Part No. 500 31561 (Re)	SLS 96K/P-1200-T2-2 Part No. 500 28009 (Tr) Part No. 500 28010 (Re)	SLS 96K/P-1200-T2-4 Part No. 500 28011 (Tr) Part No. 500 28012 (Re)	SLS 96K/P-1207-T2-2 Part No. 500 28009 (Tr) Part No. 500 35078 (Re)	
Housing	metal						
	plastic	●	●	●	●	●	
Light source	red light (30m)			●	●	●	
	infrared light (50m)	●	●				
Connection	terminals	●		●		●	
	M 12 connector		●		●		
Features	optics heating/low temp.						
	activation input	●	●	●	●	●	
	filter for multi-axis operation					●	

SLS = Pair consisting of
 SLSS = Transmitter
 SLSE = Receiver

- SLS 96K/P-1070-T2-2**
 SLSS 96K-1080-T2-24
 SLSE 96K/P-1070-T2-21
- SLS 96K/P-1070-T2-4**
 SLSS 96K-1080-T2-45
 SLSE 96K/P-1070-T2-41
- SLS 96K/P-1200-T2-2**
 SLSS 96K-1210-T2-24
 SLSE 96K/P-1200-T2-21
- SLS 96K/P-1200-T2-4**
 SLSS 96K-1210-T2-45
 SLSE 96K/P-1200-T2-41
- SLS 96K/P-1207-T2-2**
 SLSS 96K-1210-T2-24
 SLSE 96K/P-1207-T2-21



SRK 96

Protective retro-reflective photoelectric sensors



0.5 ... 7 m



- Protective retro-reflective photoelectric sensor category 2 (testing) with high performance reserve in visible red light and infrared light
- Robust metal housing with glass cover, protection class IP 67 for industrial application
- Activation input for function testing and interlinking
- 2 LEDs for status display when commissioning and in operation.
- Connection via M12 connector or terminal compartment

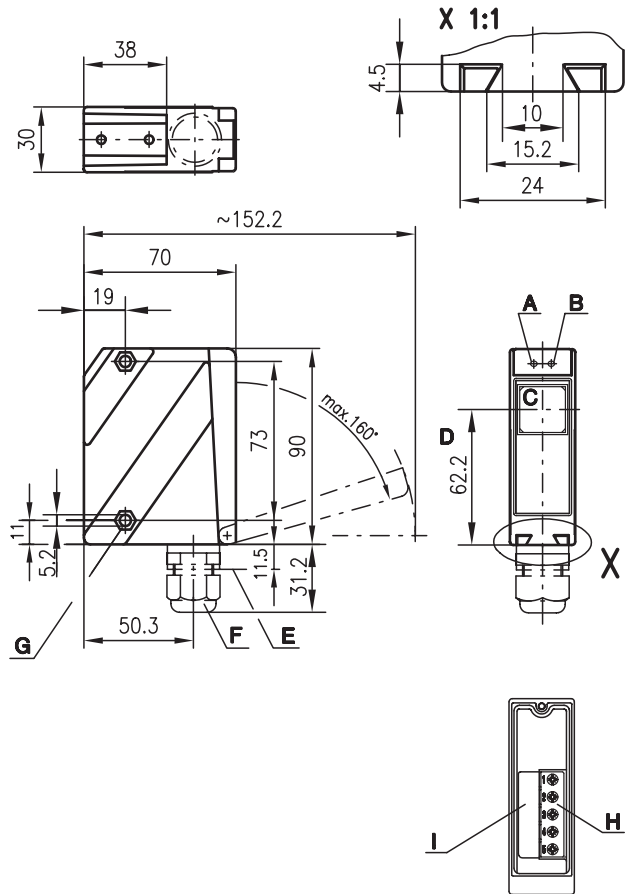


Accessories:

(available separately)

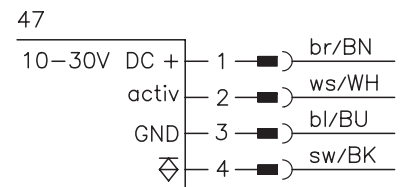
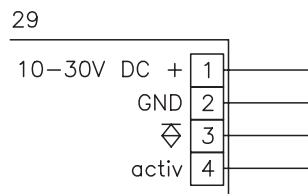
- Mounting systems (BT 96, UMS 96, BT 450.1-96)
- M12 connectors (KD ...)
- Reflector PTKS 50x50, 20x40, 100x100
- Test-monitoring units:
 - TNT 32 (Part No. 500 20476)
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
 - TNT 35 (Part No. 500 33058)
 - TMC 66 (Part No. 500 82121)
- Connection cable for series connection of several sensors (BK7 KB-4-SRK 96-600-4)

Dimensioned drawing



- A Indicator diode green
- B Indicator diode yellow
- C Transmitter/receiver
- D Optical axis
- E Device plug M12
- F Screwed cable gland M16x1.5 for Ø 5 ... 10 mm
- G Countersinking for SK nut M5, 4.2mm deep
- H Connection terminals
- I Cable entry

Electrical connection



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Specifications

Optical data

Typ. operating range limit ¹⁾	0.5 ... 7m
Operating range ²⁾	0.5 ... 6m
with reflector	PTKS 50x50, PTKS 20x40, PTKS 100x100
Light source	red light laser diode
Wavelength	670nm
Laser warning notice	see remarks

Timing

Sensor switching frequency	100Hz
Sensor response time	6ms
Delay before start-up	≤ 200ms

Electrical data

Operating voltage U_B	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Bias current	≤ 40mA
Switching output	PNP transistor
Function characteristics	light switching
Signal voltage high/low	≥ ($U_B - 2V$) / ≤ 2V
Output current	max. 100mA

Indicators

LED green	ready
LED yellow	light path free
LED yellow flashing	light path free, no performance reserve

Mechanical data

Housing	diecast zinc, yellow
Optics cover	glass
Weight	380g
Connection type	terminals or M12 connector

Environmental data

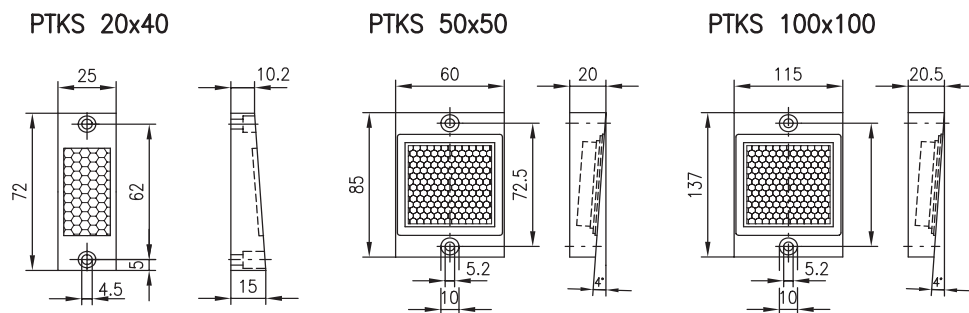
Ambient temp. (operation/storage)	-10°C ... +50°C / -30°C ... +60°C
Protective circuit ³⁾	1, 2, 3, 4
VDE safety class ⁴⁾	II, all-insulated
Protection class	IP 67
Standards applied	IEC 60947-5-2

Options

Activation input activ	
Transmitter active/not active	≥ 8V / ≤ 2V
Input resistance	10KΩ ± 10%
Testing time	12ms + response time test monitoring unit

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 1=transient protection, 2=polarity reversal protection, 3=short circuit protection for all outputs, 4=interference blanking
- 4) Rating voltage 250VAC

Dimensioned drawing - reflector



Order guide

with M12 connector
with terminal connection

Designation	Part No.
SRK 96M/P-1210-T2-47	500 60918
SRK 96M/P-1210-T2-29	500 60919

Tables

Reflectors	Operating range
PTKS 100x100	0.5 ... 6m
PTKS 50x50	0.5 ... 6m
PTKS 20x40	0.5 ... 4m

Remarks

- The protective retro-reflective photoelectric sensor SRK 96... only works in connection with the special reflectors PTKS 50x50, PTKS 20x40 or PTKS 100x100
- The reflectors have to be installed in the correct position.
- The protective retro-reflective photoelectric sensor is a contactless active protective device only in connection with a safety-relevant control system, in which the cyclical testing of transmitter and receiver is carried out according to EN 61496-1, category 2 (testing).
- The power supply unit used to operate the photoelectric sensor has to be able to compensate for changes and interruptions of the supply voltage acc. to EN 61496-1.

LASERSTRAHLUNG / LASER LIGHT
NICHT IN DEN STRAHL BLICKEN
DO NOT STARE INTO BEAM
LASERKLASSE 2
CLASS 2 LASER PRODUCT
IEC 60825-1-am2 (2001-01)

SRK 96

Pulse duration 9.5μs
Quiescent period 548μs
P_{max} ≤ 1.2mW ± 10%
λ = 670nm

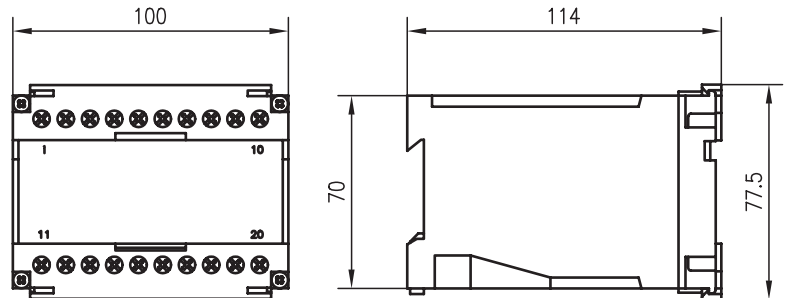


TNT 32

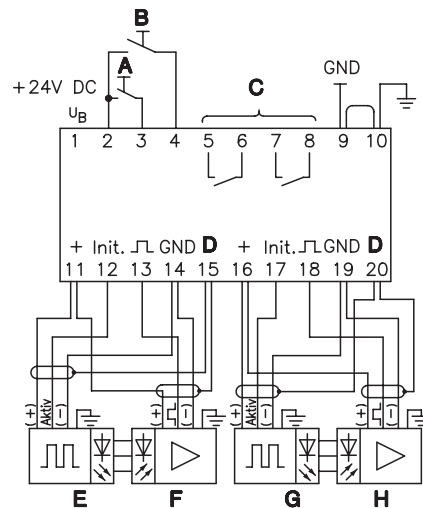
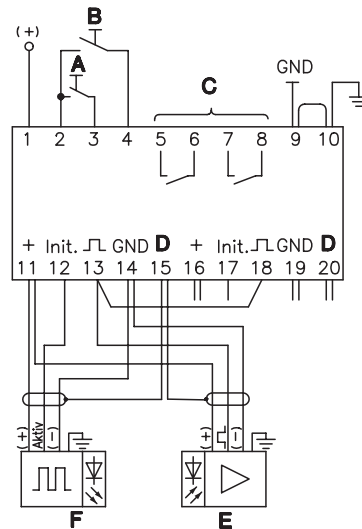
Test monitoring unit



Dimensioned drawing



Electrical connection



- A Test 1
- B Test 2
- C Outputs
- D Shield
- E Re 1
- F Tr 1
- G Re 2
- H Tr 2

- Connection possibility for all throughbeam protective photoelectric sensors (AOPD category 2) with test or activation input
- Starting test with 2 channel test input
- 2 channel output with forced security relay contacts
- Integrated start and restart-disable



Accessories:

(available separately)

- EC model tested throughbeam protective photoelectric sensors of the series:
 - 46 Series
 - 78 Series
 - 85 Series
 - 92 Series
 - 95 Series
 - 96 Series
 - 763 Series

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Specifications

Electrical data

Supply

Operating voltage U_B
Residual ripple
Current consumption
Response time

24VDC
 $\leq 15\%$ of U_B
approx. 200mA
 ≤ 20 ms

Test inputs

Voltage
Current
Pulse duration

$+U_B$ (active high)
 ≤ 25 mA
 ≥ 60 ms

Outputs

2 voltage free relay contacts (make-contact)
Switching voltage
Switching current
Fuse

220VAC
2.0A
2A MT

10 ... 60VDC
2A (resistive load)

Mechanical data

Dimensions
Weight
Housing
Connection

100x77.5x114mm (WxHxD)
approx. 470g
polycarbonate, cover ABS/v-o grey
screw connections
2x2.5mm² acc. to DIN 46288
snap-on mounting for standard rail

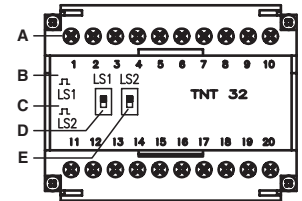
Mounting type

Environmental data

Ambient temp. (operation/storage)
Protection class

-20°C ... +60°C/-30°C ... +70°C
IP 40 (only for application in electrical operating rooms/
switching cabinet with minimum protection class IP 54 is
suitable)

Tables



- A Connection terminals
- B Status display light barrier 1
- C Status display light barrier 2
- D Selector switch activation level light barrier LS1
- E Selector switch activation level light barrier LS2

Diagrams

Order guide

Designation	Part No.
TNT 32	500 20476

Remarks

- The test monitoring unit TNT 32 is an electro sensitive protective device (ESPE) category 2 according to prEN 50100-1, only in connection with an EC certified protective photoelectric sensor (AOPD category 2).

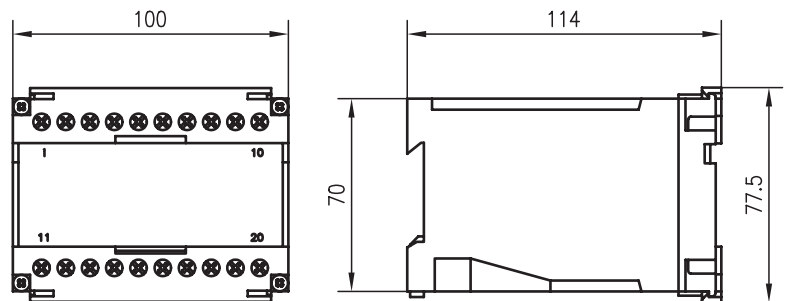


TNT 33

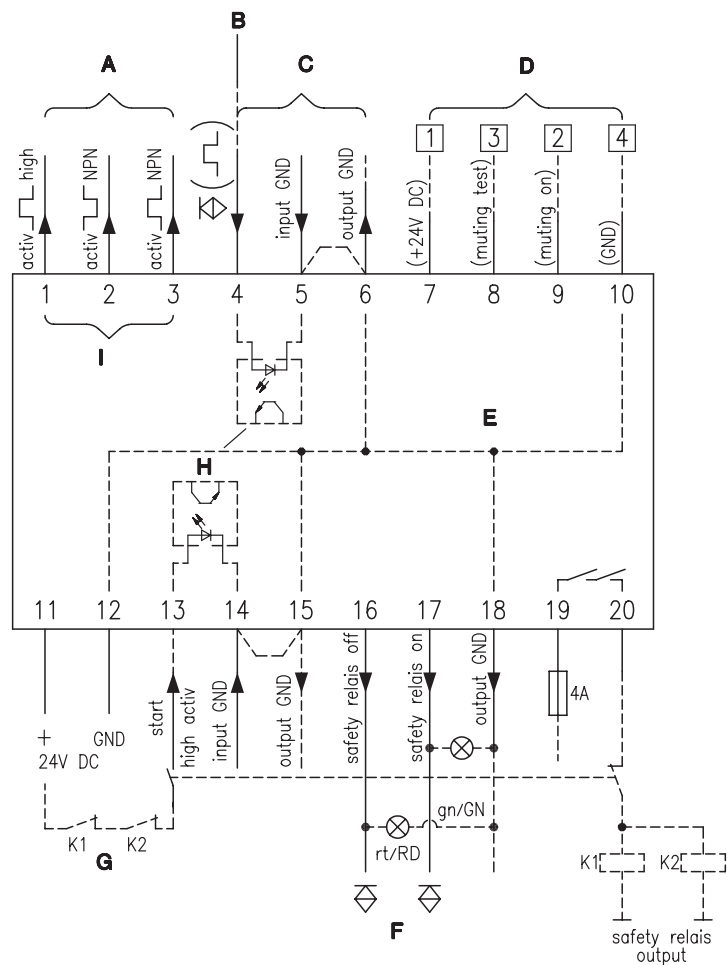
Test monitoring unit



Dimensioned drawing



Electrical connection



- A Transmitter
- B Switching output receiver
- C Receiver
- D SMC 33
- E Internal GND connections
- F Signal outputs PNP, max. 100mA
- G Relay monitoring
- H Optical coupler
- I Reference GND = U_B-GND

Accessories:

(available separately)

- Safety muting controller
 - SMC 33 (Part No. 500 28157)
 - SMC 34 (Part No. 500 82120)

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Specifications

Electrical data

Operating voltage U_B 24VDC (incl. residual ripple)
 Residual ripple $\leq 15\%$ of U_B
 Current consumption approx. 200mA
 Response time ≤ 20 ms

Sensors

Transmitter activation terminal 1 PNP (HIGH active)
 terminal 2 NPN (LOW active)
 terminal 3 NPN (HIGH active)
 Receiver input voltage free optical coupler input
 input current approx. 5mA at 24VDC

Muting

Muting test PNP (HIGH active)
 Muting input voltage free optical coupler input
 input current approx. 5mA at 24VDC

Inputs/outputs

Start input "START" voltage free optical coupler input
 input current approx. 5mA at 24VDC
 Delay before start-up at U_B ON approx. 2s
 Signalling outputs PNP transistor output, 100mA
 short-circuit and polarity reversal protection
 Safety relays "OFF" safety output opened, output (HIGH active)
 Safety relays "ON" safety output closed, output (HIGH active)
 Function characteristics (antivalent) if incandescent lamps are connected, the cold resistance of the filament must be at least 240Ω
 Safety output voltage free N.O. contact
 max. current load 4A
 Fuse external with max. 4AMT
 Overvoltage category 4 for rating voltage 300VAC
 acc. to VDE 0110 part 1

Mechanical data

Housing polycarbonate, cover ABS/v-o grey
 Connection screw terminals max. connection cross section $2 \times 2.5\text{mm}^2$ acc. to DIN 46288
 Mounting type snap-on mounting on top hat rail
 Weight 200g

Environmental data

Ambient temp. (operation/storage) $-20^\circ\text{C} \dots +60^\circ\text{C} / -30^\circ\text{C} \dots +70^\circ\text{C}$
 Protection class IP 40 (only for application in electrical operating rooms/
 switching cabinet with minimum protection class IP 54 is suitable)
 Contact protection acc. to VBG 4 and VDE 0106 part 100

Order guide

Designation	Part No.
TNT 33	500 28158

Tables

Protective photoelectric sensor AOPD type 2 (extract)

Designation	Operating range
LS 763/4.8	6m
SLSR 95/44.8 L	8m
LS 92/4.8 L	12m
LS 92/4.8 S	12m
LS 92/4.8,6000	12m
SLS 96M/P-...T2	50m
SLSR 96K/P-...T2	30m
SLS 85M/P-1750-T2-8	60m
SLS 78M/P-1750-T2-8	120m
SLS 46/44.8-S12	30m
SRK 96	6m

Diagrams

Remarks

- The test monitoring unit TNT 33 is a contactless active protective device according to EN 61496-1, only in connection with an EC certified protective photoelectric sensor category 2.
- Extensive description is part of every shipment.

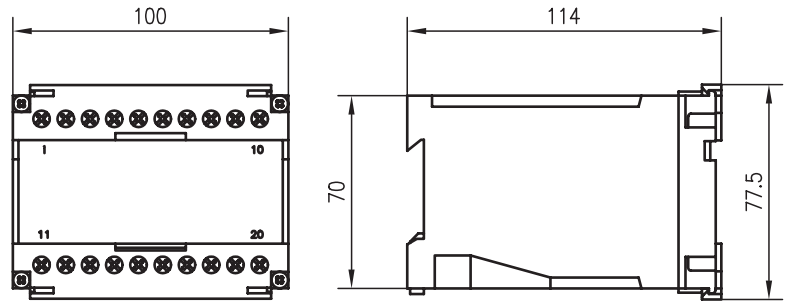


TNT 34

Test monitoring unit



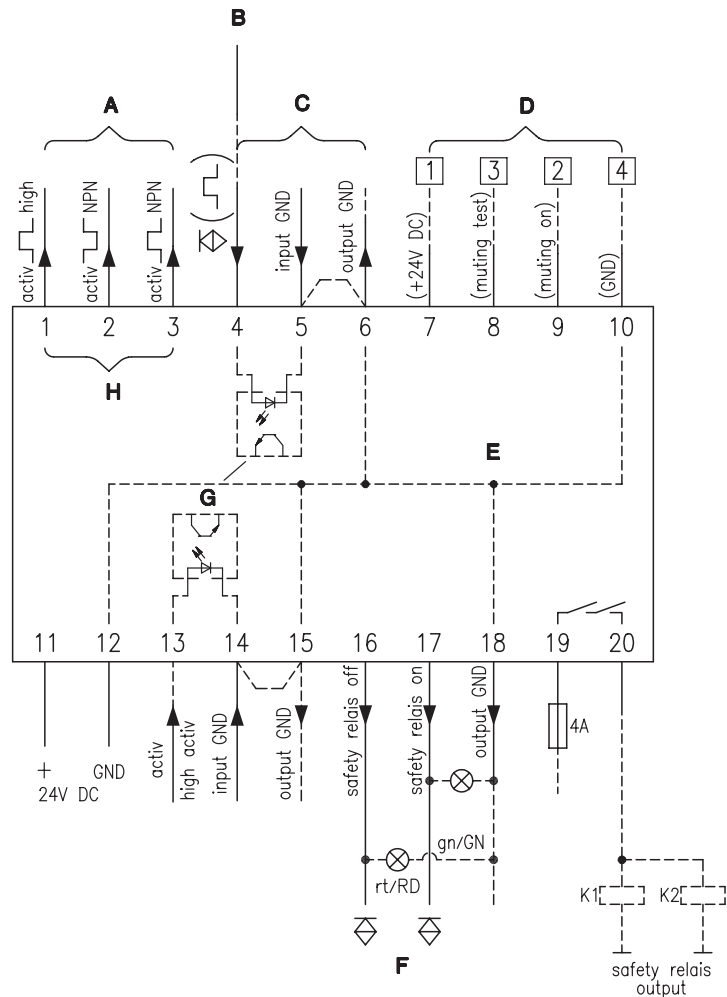
Dimensioned drawing



- High security through permanent cyclic test in time intervals of 2 sec.
- Highest operating safety through microcontroller technique
- Security relay output with fault protected monitoring
- No interruption of operation during test procedure
- Connection possibility for all current testable protective photoelectric sensors
- Integrated muting switching input
- Optical coupler inputs for high interference protection
- Separate signalling outputs as PNP transistor outputs



Electrical connection



- A Transmitter
- B Switching output receiver
- C Receiver
- D SMC 33
- E Internal GND connections
- F Signal outputs PNP, max. 100mA
- G Optical coupler
- H Reference GND = U_B-GND

Accessories:

(available separately)

- Safety muting controller
 - SMC 33 (Part No. 500 28157)
 - SMC 34 (Part No. 500 82120)

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Specifications

Electrical data

Operating voltage U_B	24VDC (incl. residual ripple)
Residual ripple	$\leq 15\%$ of U_B
Current consumption	approx. 200mA
Response time	≤ 20 ms

Sensors

Transmitter activation	terminal 1 PNP (HIGH active) terminal 2 NPN (LOW active) terminal 3 NPN (HIGH active)
Receiver input	voltage free optical coupler input input current approx. 5mA at 24VDC

Muting

Muting test	PNP (HIGH active)
Muting input	voltage free optical coupler input input current approx. 5mA at 24VDC

Inputs/outputs

Activation input "activ"	voltage free optical coupler input input current approx. 5mA at 24VDC
Delay before start-up at U_B ON	approx. 2s
Signalling outputs	PNP transistor output, 100mA short-circuit and polarity reversal protection
Safety relays "OFF"	safety output opened, output (HIGH active)
Safety relays "ON"	safety output closed, output (HIGH active)
Function characteristics (antivalent)	if incandescent lamps are connected, the cold resistance of the filament must be at least 240Ω
Safety output	voltage free N.O. contact max. current load 4A
Fuse	external with max. 4AMT
Overtoltage category acc. to VDE 0110 part 1	4 for rating voltage 300VAC

Mechanical data

Housing	polycarbonate, cover ABS/v-o grey
Connection	screw terminals max. connection cross section $2 \times 2.5\text{mm}^2$ acc. to DIN 46288
Mounting type	snap-on mounting on top hat rail
Weight	200g

Environmental data

Ambient temp. (operation/storage)	$-20^\circ\text{C} \dots +60^\circ\text{C}/-30^\circ\text{C} \dots +70^\circ\text{C}$
Protection class	IP 40 (only for application in electrical operating rooms/ switching cabinet with minimum protection class IP 54 is suitable)
Contact protection	acc. to VBG 4 and VDE 0106 part 100

Order guide

Designation	Part No.
TNT 34	500 81023

Tables

Protective photoelectric sensor AOPD
type 2 (extract)

Designation	Operating range
LS 763/4.8	6m
SLSR 95/44.8 L	8m
LS 92/4.8 L	12m
LS 92/4.8 S	12m
LS 92/4.8,6000	12m
SLS 96M/P-...T2	50m
SLSR 96K/P-...T2	30m
SLS 85M/P-1750-T2-8	60m
SLS 78M/P-1750-T2-8	120m
SLS 46/44.8-S12	30m
SRK 96	6m

Diagrams

Remarks

- The test monitoring unit TNT 34 is a contactless active protective device according to EN 61496-1, only in connection with an EC certified protective photoelectric sensor category 2.
- Extensive description is part of every shipment.

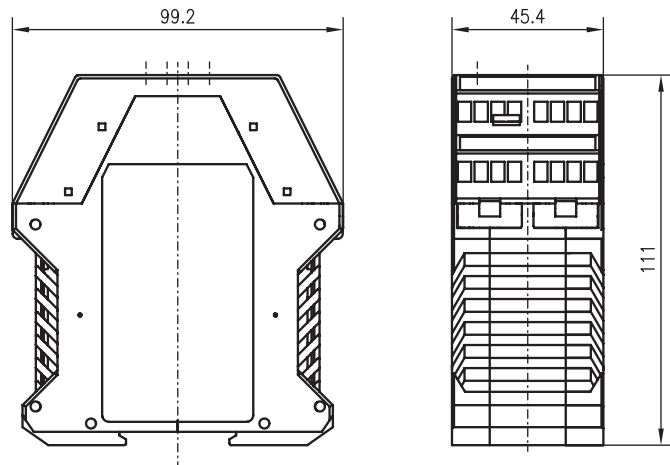


TNT 35

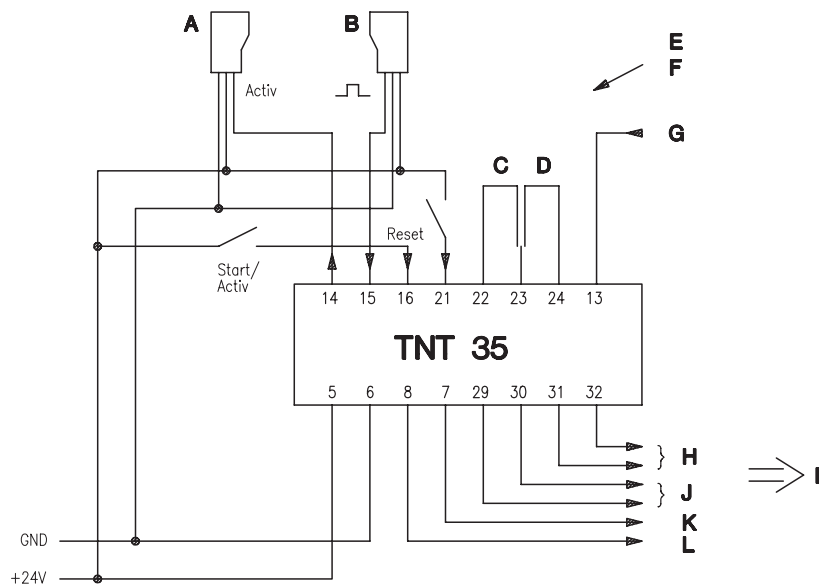
Test monitoring unit



Dimensioned drawing



Electrical connection



- A Transmitter
- B Receiver
- C Operation with start/restart-disable
- D Operation without start-/restart-disable
- E Selection of the operating mode by bridging:
terminal 22 and 23 (with start/restart-disable)
or
terminal 23 and 24 (without start/restart-disable)
- F Factory setting for the bridge is between terminals 22 and 23
(with start/restart-disable function)
- G EDM (contactor monitoring, feedback control loop)
- H Safety relay output 2
- I EMERGENCY SHUTDOWN
- J Safety relay output 1
- K Signal output "Safety on"
- L Signal output "Error"



- High security through permanent cyclic test in time intervals of 2 sec.
- Highest operating safety through microcontroller technique
- Security relay output with fault protected monitoring
- No interruption of operation during test procedure
- Connection possibility for all current testable protective photoelectric sensors
- Optical coupler inputs for high interference protection
- Separate signalling outputs as PNP transistor outputs
- Selectable start and restart-disable



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Accessories:



Specifications

Electrical data

Operating voltage U_B	24VDC $\pm 15\%$
Residual ripple	$\leq 15\%$
Current consumption	approx. 200mA
Response time	$\leq 20\text{ms}$
Delay before start-up	approx. 2s

Sensors

Transmitter activation	PNP (HIGH active)
Receiver input	optical coupler input
	Input current approx. 10mA

Inputs/outputs

Start input "START"	optical coupler input (HIGH active)
	Input current approx. 10mA
Reset input	optical coupler input (HIGH active)
	Input current approx. 10mA
Relay monitoring (EDM)	optical coupler input (HIGH active)
	Input current approx. 10mA
Signal output "Safety on"	PNP transistor output, 100mA
	short-circuit and polarity reversal protection
Signal output "Error"	PNP transistor output, 100mA
	short-circuit and polarity reversal protection
Safety output	voltage free N.O. contacts
	max. current load 4A
Fuse	external with max. 4AMT
Overvoltage category	2 for rating voltage 300VAC
	acc. to VDE 0110 part 1

Mechanical data

Housing	polyamide PA6.6/grey
Connection	screw terminals
	connection cross section 0.2 ... 2.5mm
Mounting type	snap-on mounting on top hat rail acc. to EN 50022
Weight	approx. 200g
Dimensions (WxHxD)	45mm x 100mm x 115mm

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protection class	IP 40 (only for application in electrical operating rooms/ switching cabinet with minimum protection class IP 54 is suitable)
Contact protection	acc. to VBG 4 and VDE 0106 part 100

Tables

Protective photoelectric sensor AOPD
type 2 (extract)

Designation	Operating range
LS 763/4.8	6m
SLSR 95/44.8 L	8m
LS 92/4.8 L	12m
LS 92/4.8 S	12m
LS 92/4.8,6000	12m
SLS 96M/P-...T2	50m
SLSR 96K/P-...T2	30m
SLS 85M/P-1750-T2-8	60m
SLS 78M/P-1750-T2-8	120m
SLS 46/44.8-S12	30m
SRK 96	6m

Diagrams

Order guide

Designation	Part No.
TNT 35	500 33058

Remarks

- The test monitoring unit TNT 35 is a contactless active protective device according to EN 61496-1, only in connection with an EC certified protective photoelectric sensor category 2.
- Extensive description is part of every shipment.

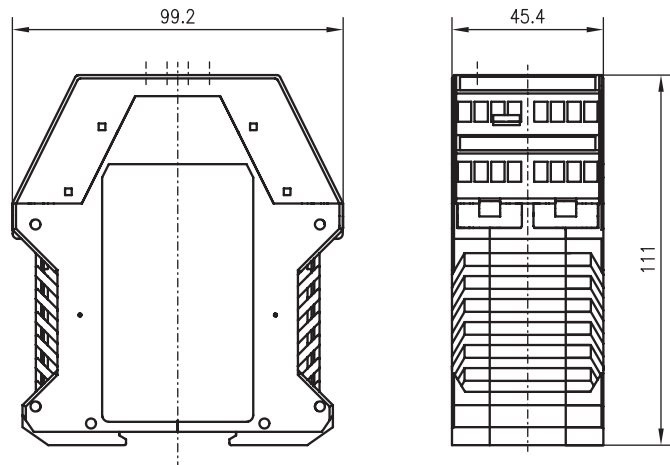


TNT 35

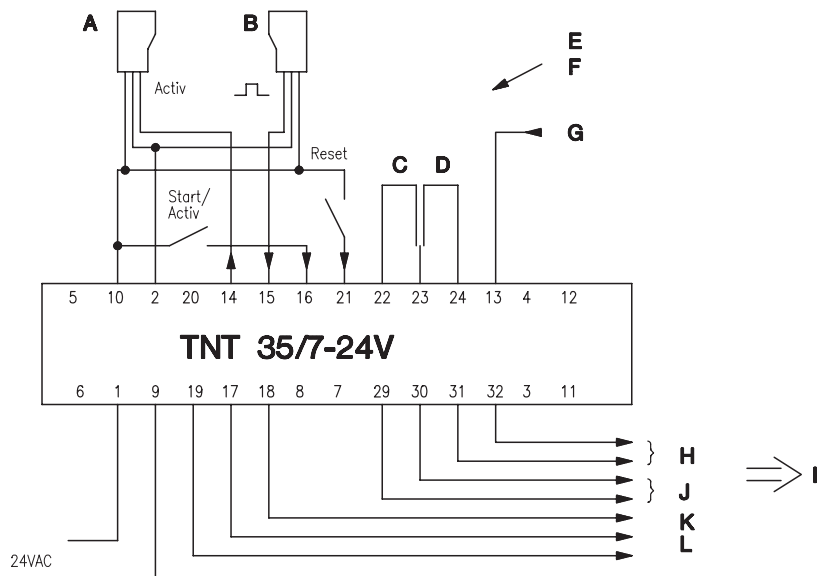
Test monitoring unit



Dimensioned drawing



Electrical connection



- A Transmitter
- B Receiver
- C Operation with start/restart-disable
- D Operation without start/restart-disable
- E Selection of the operating mode by bridging:
terminal 22 and 23 (with start/restart-disable)
or
terminal 23 and 24 (without start/restart-disable)
- F Factory setting for the bridge is between terminals 23 and 24
(with start/restart-disable function)
- G EDM (contactor monitoring, feedback control loop)
- H Safety relay output 2
- I EMERGENCY SHUTDOWN
- J Safety relay output 1
- K Signal output "Safety"
- L Signal output "Error"



- High security through permanent cyclic test in time intervals of 2 sec.
- Highest operating safety through microcontroller technique
- Security relay output with fault protected monitoring
- No interruption of operation during test procedure
- Connection possibility for all current testable protective photoelectric sensors
- Optical coupler inputs for high interference protection
- Separate signalling outputs as PNP transistor outputs
- Selectable start and restart-disable



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Accessories:



Specifications

Electrical data

Operating voltage U_B	24VAC +15%/-10%
Frequency	50Hz/60Hz
Current consumption	approx. 200mA
Response time	≤ 20ms
Delay before start-up	approx. 2s

Sensors

Transmitter activation	PNP (HIGH active)
Receiver input	optical coupler input
Sensor supply	Input current approx. 10mA 24VDC, max. 200mA

Inputs/outputs

Start input "START"	optical coupler input (HIGH active) Input current approx. 10mA
Reset input	optical coupler input (HIGH active) Input current approx. 10mA
Relay monitoring (EDM)	optical coupler input (HIGH active) Input current approx. 10mA
Signal output "Safety on"	PNP transistor output, 100mA short-circuit and polarity reversal protection
Signal output "Safety"	voltage free relay contacts break-contact/make-contact combination max. current load 4A
Signal output "Error"	PNP transistor output, 100mA short-circuit and polarity reversal protection
Safety output	voltage free N.O. contacts max. current load 4A
Fuse	external with max. 4AMT
Overvoltage category	2 for rating voltage 300VAC acc. to VDE 0110 part 1

Mechanical data

Housing	polyamide PA6.6/grey
Connection	screw terminals connection cross section 0.2 ... 2.5mm snap-on mounting on top hat rail acc. to EN 50022
Mounting type	approx. 300g
Weight	45mm x 100mm x 115mm
Dimensions (WxHxD)	

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protection class	IP 40 (only for application in electrical operating rooms/ switching cabinet with minimum protection class IP 54 is suitable)
Contact protection	acc. to VBG 4 and VDE 0106 part 100

Order guide

Designation	Part No.
TNT 35/7-24V	500 33059

Tables

Protective photoelectric sensor AOPD
type 2 (extract)

Designation	Operating range
LS 763/4.8	6m
SLSR 95/44.8 L	8m
LS 92/4.8 L	12m
LS 92/4.8 S	12m
LS 92/4.8,6000	12m
SLS 96M/P-...T2	50m
SLSR 96K/P-...T2	30m
SLS 85M/P-1750-T2-8	60m
SLS 78M/P-1750-T2-8	120m
SLS 46/44.8-S12	30m
SRK 96	6m

Diagrams

Remarks

- The test monitoring unit TNT 35/7-24V is a contactless active protective device according to EN 61496-1, only in connection with an EC certified protective photoelectric sensor category 2.
- Extensive description is part of every shipment.

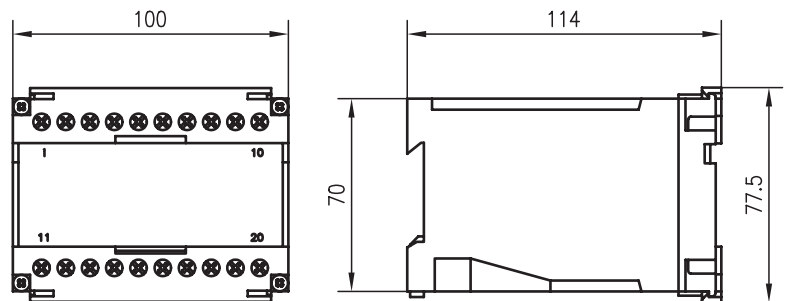


TMC 66

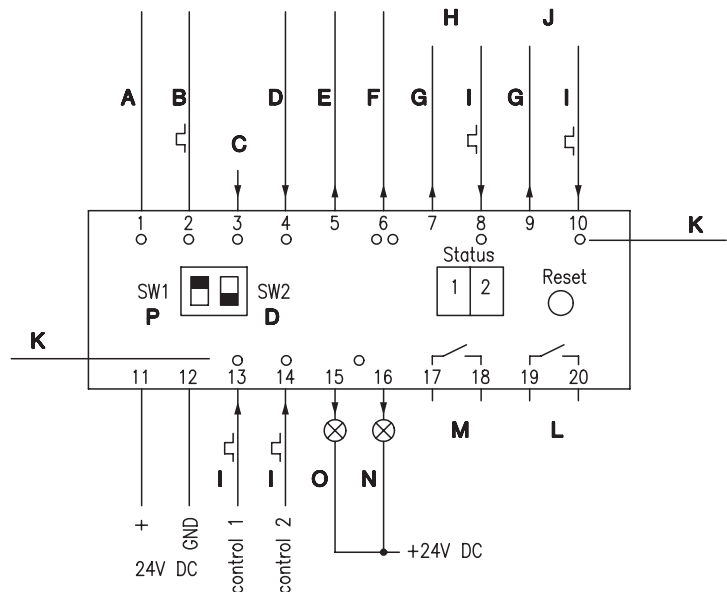
Test monitoring unit



Dimensioned drawing



Electrical connection



- High security through permanent cyclic test in time intervals of 2 sec.
- Security relay output with fault protected monitoring
- No interruption of operation during test procedure
- Connection possibility for all current testable protective photoelectric sensors
- Selectable start and restart-disable and contactor control
- Processing of PLC control signals as muting sender
- Integrated muting function
- Connection for two monitored muting warning lights (necessary acc. to EN 61496-1)
- Integrated self-containing mode (start with dimmed AOPD)
- Separate signalling outputs as PNP transistor outputs

- A** SLS transmitter active
- B** SLS receiver
- C** Start
- D** Relay monitoring
- E** Signal output "Error"
- F** Signal output "Safety on"
- G** Output Test
- H** Start 1
- I** Input
- J** Start 2
- K** Indicator diodes
- L** Safety relay output 2
- M** Safety relay output 1
- N** Muting lamp 1
- O** Muting lamp 2
- P** start/restart-disable
- Status 1** Test monitoring unit - SLS
- Status 2** Muting controller



Accessories:

(available separately)

- Testable muting sender - suitable:
 - PRK 96 K/P-1361-29 (Part No. 500 80476)
 - PRK 97/4.8 L (Part No. 500 80474)
 - IPRK 92/4.8 S (Part No. 500 14199)
 - PRK 46/4.8-S12 (Part No. 500 60920)
- all throughbeam photoelectric sensors with (.8) activation input

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Specifications

Specifications

Operating voltage U_B	24VDC \pm 15% (incl. residual ripple)
Residual ripple	\leq 15% of U_B
Current consumption	approx. 200mA
Response time	\leq 20ms

Sensors

Transmitter activation	PNP (HIGH active)
Receiver input	optical coupler input ¹⁾
Activation muting sender	PNP (HIGH active)
Input muting sender	optical coupler input ¹⁾

Inputs/outputs

Start input	optical coupler input (HIGH active) ¹⁾
Signal output "Error"	PNP transistor output, 100mA ²⁾
Signal output "Safety on"	PNP transistor output, 100mA ²⁾
Muting preparation Control 1/Control 2	optical coupler inputs (HIGH active) ¹⁾
Muting light signal transmitter ³⁾	N.O. contacts, 24VDC, max. 2A integrated filament monitoring optical coupler input (HIGH active), ¹⁾
Relay monitoring	voltage free N.O. contacts,
Safety output	max. current load 4A internal with max. 4AMT for rating voltage 300VAC acc. to VDE 0110 part 1
External fuse protection	
Overtoltage category 4	

Mechanical data

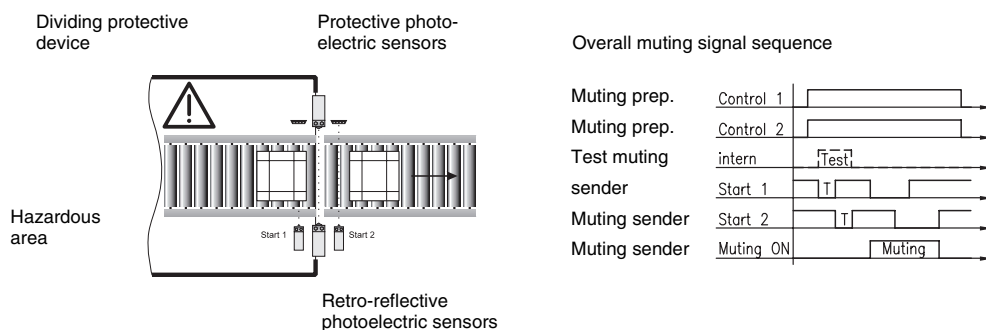
Housing	polycarbonate, cover ABS/v-o grey
Connection	screw terminals max. connection cross section 2x2.5mm ² acc. to DIN 46288
Mounting type	snap-on mounting on top hat rail
Weight	200g

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protection class	IP 40 (only for application in electrical operating rooms/ switching cabinet with minimum protection class IP 54 is suitable)
Contact protection	acc. to VBG 4 and VDE 0106 part 100

- 1) Input current approx. 10mA
 2) short-circuit and polarity reversal protection
 3) Acc. to EN 61496-1 light density min. 200cd/m², light area min. 1cm²

Muting system structure



Muting procedure

Before inducing a muting function, a test of the connected muting signal senders, e.g. retro-reflective photoelectric sensor with activation input, via the muting preparatory signals Control 1 and Control 2 is performed.

With the TMC 66, a start of the unit can be performed even with dimmed protective photoelectric sensors. This "self-containing mode" can be induced with the start condition $U_{B ON}$, if using retro-reflective photoelectric sensors or security switches as muting sender.

The muting function starts with actuation of the first muting sensor "Start 1" and ends with the release of the second muting sensor "Start 2" and the switching off of the muting preparatory signals. A new muting process starts with the new activation of the muting preparatory signals.

Order guide

Designation	Part No.
TMC 66	500 82121

Tables

Diagrams

Remarks

- The TMC 66 test monitoring unit is a contactless active protective device according to EN 61496-1, only in connection with an EC certified protective photoelectric sensor category 2.
- Extensive description is part of every shipment.
- Max. test response time for muting senders Start 1 and Start 2 is 240ms for each sender.

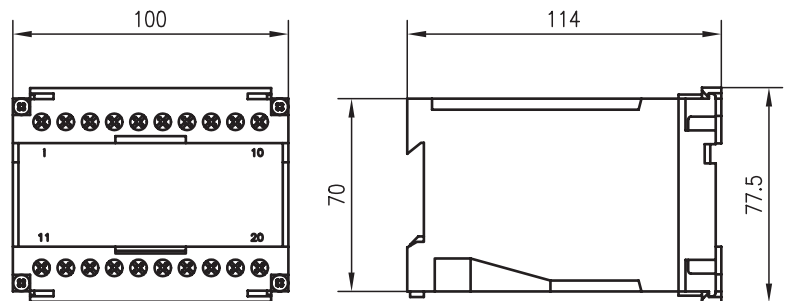


SMC 33

Safety muting controller

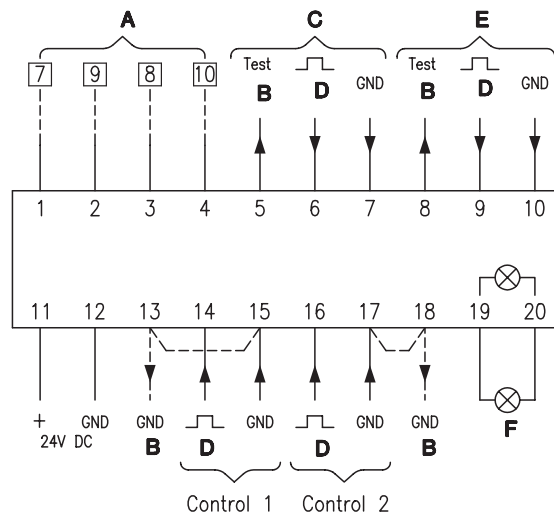


Dimensioned drawing

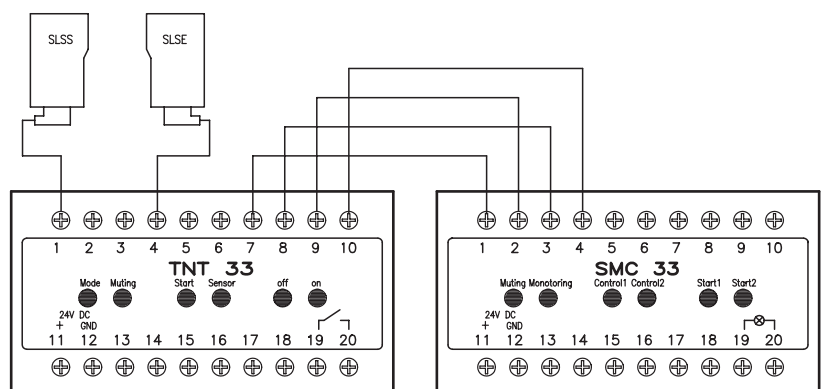


- Connection to TNT 33 and TNT 34 test monitoring unit
- System self-test in connection with TNT 33 and TNT 34
- Processing of PLC control signals as muting sender
- Integrated direction identification
- Connection for monitored muting warning light (necessary acc. to EN 61496-1)
- Integrated self-containing mode (start with dimmed AOPD)

Electrical connection



G



- A TNT 33
- B Output
- C Start 1
- D Input
- E Start 2
- F Muting lamp
- G System architecture

Accessories:

(available separately)

- Test monitoring unit
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
- Testable muting sender suitable:
 - PRK 96 K/P-1361-29 (Part No. 500 80476)
 - PRK 97/4.8 L (Part No. 500 80474)
 - IPRK 92/4.8 S (Part No. 500 14199)
 - PRK 46/4.8-S12 (Part No. 500 60920)
- all throughbeam photoelectric sensors with (.8) activation input

We reserve the right to make changes • SLS_s05e.fm

Specifications

Specifications

Operating voltage U_B	24VDC \pm 15% (incl. residual ripple)
Residual ripple	\leq 15% of U_B
Current consumption	approx. 200mA (without muting light signal transmitter)

Inputs

Test input	PNP (HIGH active) ¹⁾
Muting preparation Control 1	PNP (HIGH active) ¹⁾
Muting preparation Control 2	PNP (HIGH active) ¹⁾
Input Start 1 (muting sender 1)	PNP (HIGH active) ¹⁾
Input Start 2 (muting sender 2)	PNP (HIGH active) ¹⁾

Outputs

Muting output	PNP (HIGH active)
Test output Start 1	PNP (HIGH active)
Test output Start 2	PNP (HIGH active)
Muting light signal transmitter ²⁾	N.O. contacts, 24VDC, max. 2A connectable directly to SMC 33, integrated filament monitoring

Mechanical data

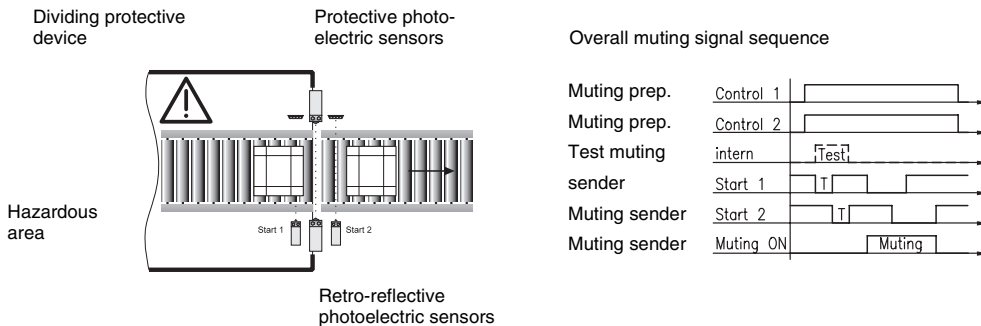
Housing	polycarbonate, cover ABS/v-o grey
Connection	screw terminals max. connection cross section 2x2.5mm ² acc. to DIN 46288
Mounting type	snap-on mounting on top hat rail
Weight	200g

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protection class	IP 40 (only for application in electrical operating rooms/ switching cabinet with minimum protection class IP 54 is suitable)
Contact protection	acc. to VBG 4 and VDE 0106 part 100

- 1) Voltage free optical coupler input, input current approx. 5mA at 24VDC
2) Acc. to EN 61496-1 light density min. 200cd/m², light area min. 1cm²

Muting system structure



Muting procedure

Before inducing a muting function, a test of the connected muting signal senders, e.g. retro-reflective photoelectric sensor with activation input, security switch with make-contact and break-contact or PLC control signals for the muting start and stop function via the muting preparatory signals Control 1 and Control 2 is performed.

If using PLC control signals, the muting preparation has to be made possible by different signal sources.

With the SMC 33 a start of the unit can be performed even with dimmed protective photoelectric sensors. This "self-containing mode" can be induced with the start condition $U_{B ON}$, if using retro-reflective photoelectric sensors or security switches as muting sender. If using PLC control signals for muting start and stop, this "self-containing mode" can be performed without switching off the supply voltage.

The muting function starts with actuation of the first muting sensor "Start 1" and ends with the release of the second muting sensor "Start 2" and the switching off of the muting preparatory signals. A new muting process starts with the new activation of the muting preparatory signals.

Order guide

Designation	Part No.
SMC 33	500 28157

Tables

Diagrams

Remarks

- The safety muting controller SMC 33 can only be operated in connection with the test monitoring unit TNT 33.
- The SMC 33 muting controller fulfils the requirements of the safe bypassing circuit type 2 according to EN 61496-1.
- Maximum test response time of the muting senders Start 1 and Start 2 is 120ms for each sender.
- Extensive description is part of every shipment.

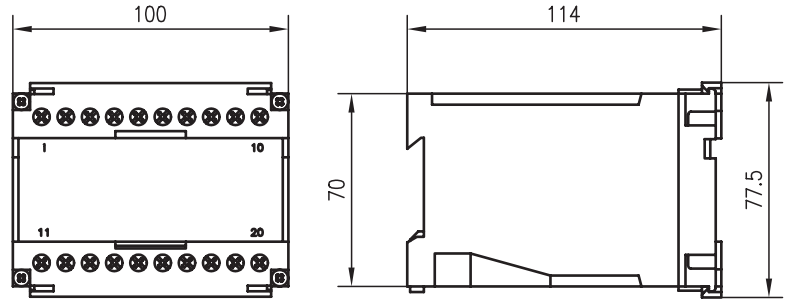


SMC 34

Safety muting controller

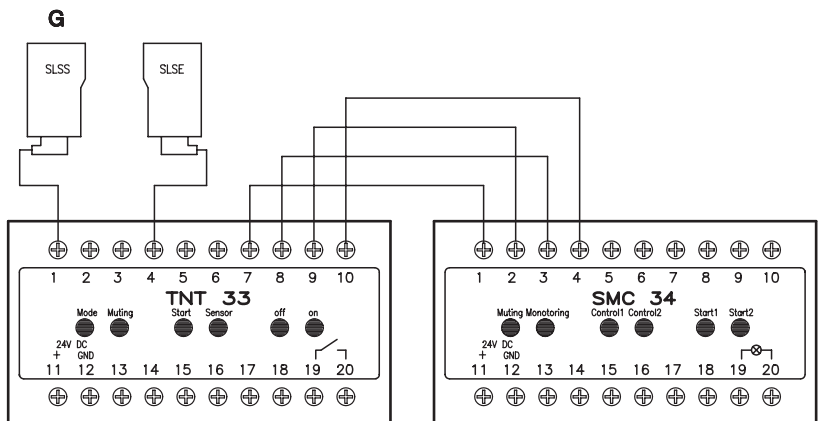
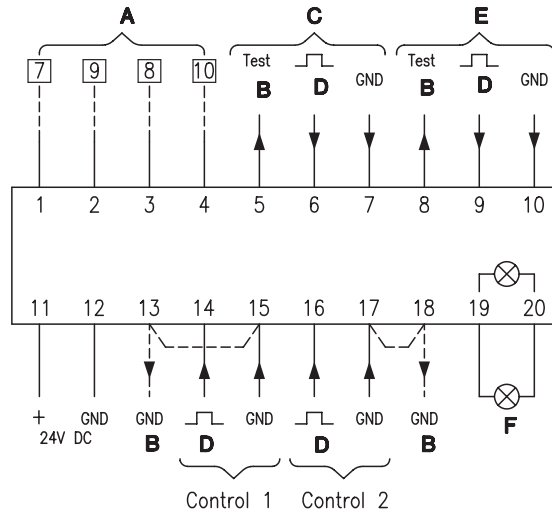


Dimensioned drawing



- Connection to TNT 33 and TNT 34 test monitoring unit
- System self-test in connection with TNT 33 and TNT 34
- Processing of PLC control signals as muting sender
- Integrated direction identification
- Connection for monitored muting warning light (necessary acc. to EN 61496-1)
- Integrated self-containing mode (start with dimmed AOPD)

Electrical connection



- A** TNT 33
- B** Output
- C** Start 1
- D** Input
- E** Start 2
- F** Muting lamp
- G** System architecture

Accessories:

(available separately)

- Test monitoring unit
 - TNT 33 (Part No. 500 28158)
 - TNT 34 (Part No. 500 81023)
- Testable muting sender suitable:
 - PRK 96 K/P-1361-29 (Part No. 500 80476)
 - PRK 97/4.8 L (Part No. 500 80474)
 - IPRK 92/4.8 S (Part No. 500 14199)
 - PRK 46/4.8-S12 (Part No. 500 60920)
- all throughbeam photoelectric sensors with (.8) activation input

We reserve the right to make changes • SLS_s06e.fm

Specifications

Specifications

Operating voltage U_B	24VDC \pm 15% (incl. residual ripple)
Residual ripple	\leq 15% of U_B
Current consumption	approx. 200mA (without muting light signal transmitter)

Inputs

Test input	PNP (HIGH active) ¹⁾
Muting preparation Control 1	PNP (HIGH active) ¹⁾
Muting preparation Control 2	PNP (HIGH active) ¹⁾
Input Start 1 (muting sender 1)	PNP (HIGH active) ¹⁾
Input Start 2 (muting sender 2)	PNP (HIGH active) ¹⁾

Outputs

Muting output	PNP (HIGH active)
Test output Start 1	PNP (HIGH active)
Test output Start 2	PNP (HIGH active)
Muting light signal transmitter ²⁾	N.O. contacts, 24VDC, max. 2A connectable directly to SMC 34, integrated filament monitoring

Mechanical data

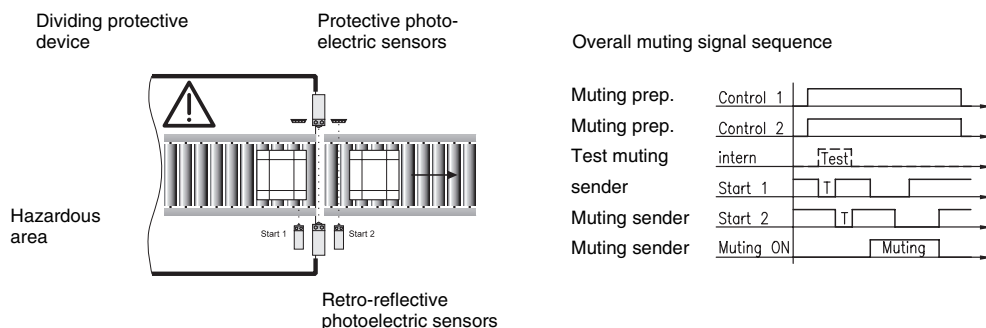
Housing	polycarbonate, cover ABS/v-o grey
Connection	screw terminals max. connection cross section 2x2.5mm ² acc. to DIN 46288
Mounting type	snap-on mounting on top hat rail
Weight	200g

Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ... +70°C
Protection class	IP 40 (only for application in electrical operating rooms/ switching cabinet with minimum protection class IP 54 is suitable)
Contact protection	acc. to VBG 4 and VDE 0106 part 100

- 1) Voltage free optical coupler input, input current approx. 5mA at 24VDC
2) Acc. to EN 61496-1 light density min. 200cd/m², light area min. 1cm²

Muting system structure



Muting procedure

Before inducing a muting function, a test of the connected muting signal senders, e.g. retro-reflective photoelectric sensor with activation input, security switch with make-contact and break-contact or PLC control signals for the muting start and stop function via the muting preparatory signals Control 1 and Control 2 is performed.

If using PLC control signals, the muting preparation has to be made possible by different signal sources.

With the SMC 34 a start of the unit can be performed even with dimmed protective photoelectric sensors. This "self-containing mode" can be induced with the start condition $U_{B ON}$, if using retro-reflective photoelectric sensors or security switches as muting sender. If using PLC control signals for muting start and stop, this "self-containing mode" can be performed without switching off the supply voltage.

The muting function starts with actuation of the first muting sensor "Start 1" and ends with the release of the second muting sensor "Start 2" and the switching off of the muting preparatory signals. A new muting process starts with the new activation of the muting preparatory signals.

Order guide

Designation	Part No.
SMC 34	500 82120

Tables

Diagrams

Remarks

- The safety muting controller SMC 34 can only be operated in connection with the test monitoring unit TNT 33.
- The SMC 34 muting controller fulfils the requirements of the safe bypassing circuit type 2 according to EN 61496-1.
- Max. test response time for muting senders Start 1 and Start 2 is 240ms for each sender.
- Extensive description is part of every shipment.





Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index

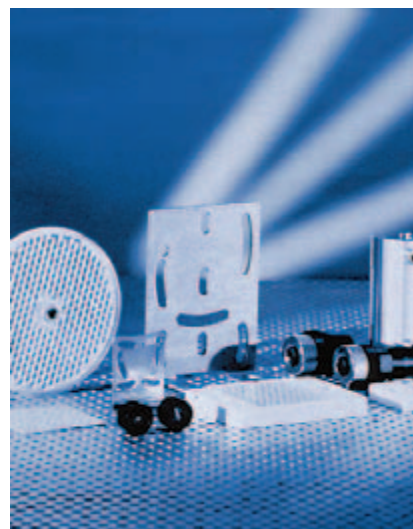




Accessories



- Connectors with ready-made cable in different lengths and variations
- Connectors with screw and solder connection for self-fitting purposes
- Time modules
- Extensive program of reflectors made of plastic and glass, as well as reflective tapes
- Different mounting systems and mounting brackets for all sensors
- Alignment aids for unproblematic commissioning of the photoelectric sensors



Overview:

- Mounting systems page 926
- Connection leads page 946
- Round connectors page 948
- Laser alignment aids page 952
- Reflectors page 954
- Time modules page 964
- Devices for programming and parameter setting on request



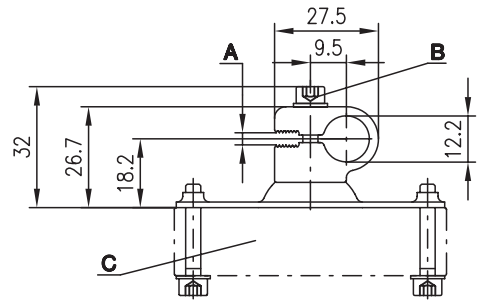


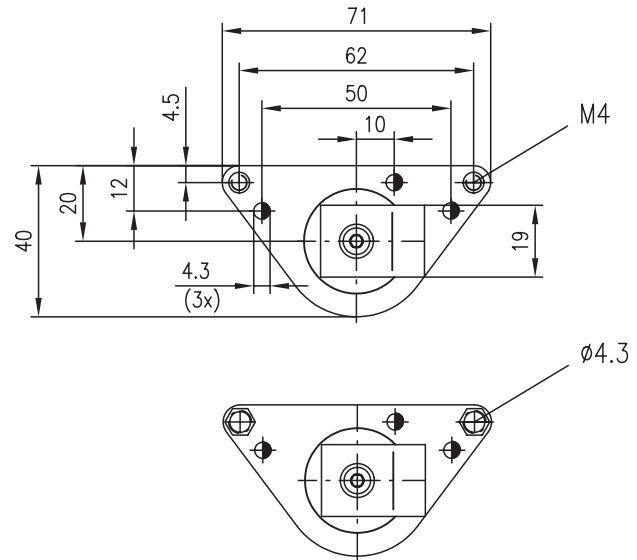
Designation		Figure	Material			Series / Sensors												
			Metal	Stainless steel	Plastic	KRT models	46 Series	96 Series	450 Series	92 Series	95 Series	97 Series	72 Series	8 Series	18 Series	80 Series	85 Series	78 Series
Rod mounting (round)		A																
BT 46.1	12mm	A1	•				•											
BT 46.1.5	12mm	A2		•			•											
BT 20	12mm	A3	•															
BT 450.1	10mm	A4	•				•			•								
BT 450.2	14mm	A4	•				•			•								
BT 450.1-96	10mm	A5	•				•	•										
UMS 96	10 ... 16mm	A6	•			•		•										
UMS 96-450	10 ... 16mm	A7	•					•										
UMS 96-95	10 ... 16mm	A8	•							•								
UMS 1-02.1	10 ... 12mm	A9	•					•										
UMS 1	10 ... 12mm	A10	•						•	•	•	•		•				
BT 95-96		A11	•							•								
BT 450-96		A12	•					•										
UMS 8	10 ... 14mm	A13	•										•					
UMS 8.1	10 ... 14mm	A14	•										•					
UMS 8.2	10 ... 14mm	A15	•										•					
BT 8-D	10 ... 14mm	A16	•										•					
Mounting bracket		B																
BT 92		B1	•						•		•							
BT 95		B2	•							•				•				
BT 85		B3	•														•	
BT 96		B4	•					•										
BT 450		B5	•					•										
BT 96.1		B6	•					•										
BT 78		B7	•															•
BT 80		B8	•													•		
BT 08		B9	•															•
BT 518.1		B10	•															
BT 525.1		B11	•															
BT 525.2		B12	•															
BT 713		B13	•															
BT 713-66		B14	•															
BT 404		B15	•															
BT 3		B16	•															
BT 96.4		B17	•					•										
BT 406		B18	•															
BT 408		B19	•															
BT 318		B20	•															
BT 8		B21	•										•					
Mounting and alignment systems		C																
BT 64		C1	•															
BT 66		C2	•															
BT 85.1		C3	•														•	
BT 8-ARH		C4	•										•					
Mounting straps		D																
BT 01		D1			•													
BT 01-ALU		D2	•															
BT 03		D3			•													
BT 8-C		D4	•										•					

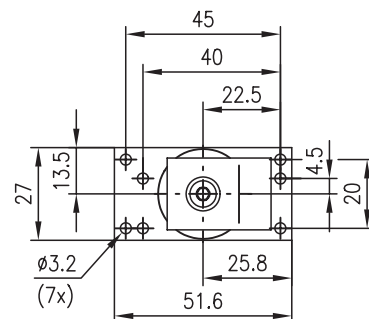
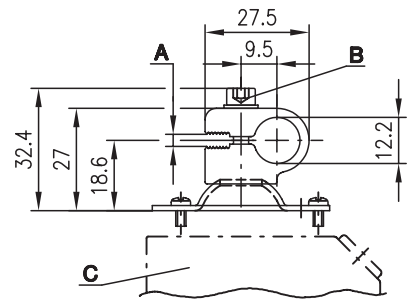


Series / Sensors												Reflectors (TKS, MKS, ...)						Page
3 Series	404 Series	406 Series	408 Series	713 Series	525 Series	64 Series	66 Series	518 Series	318 Series	28 Series	75 Series	40x40	40x60	30x60	30x50	50x50	20x60	
																		928
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Explanations
Dimensioned drawings
A1
BT 46.1 (Part No. 500 30556)

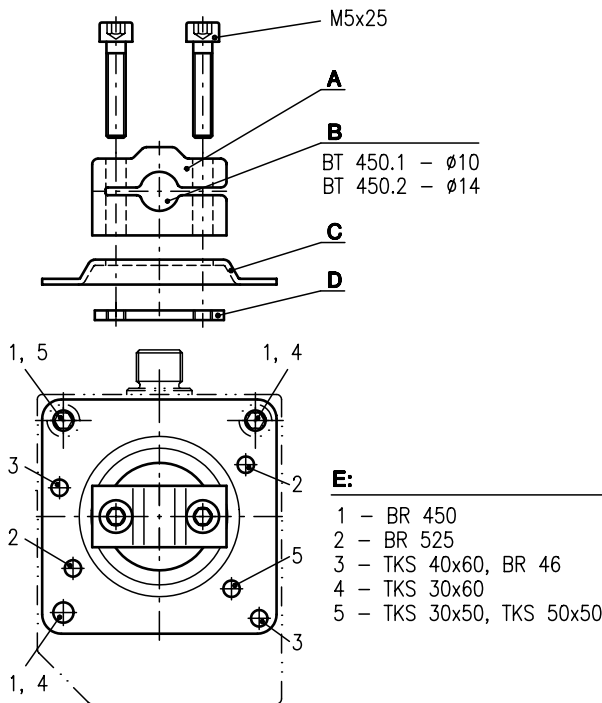
A1

A2
BT 46.1.5 (Part No. 500 82104)

A2

A3
BT 20 (Part No. 500 60503)

A3


- A** Slit for clamping sheet metal
sheet metal thickness: 1.5 to 3mm
- B** Screw DIN 912-M4
- C** Sensor

Dimensioned drawings

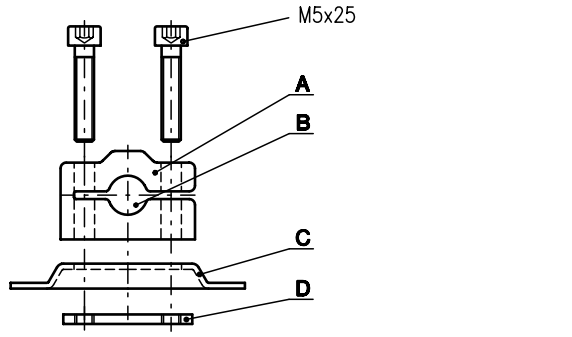


(A4)

(A4)

BT 450.1 (Part No. 500 29632)

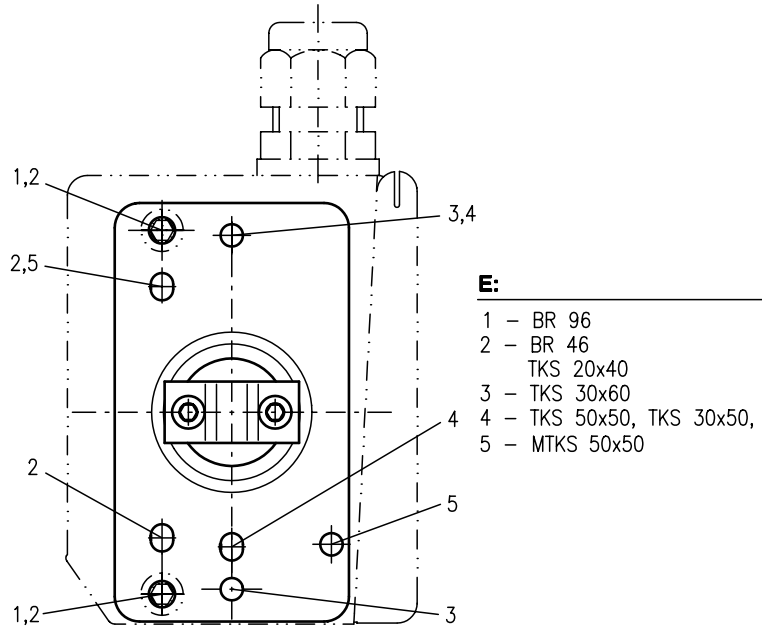
BT 450.2 (Part No. 500 29684)



(A5)

(A5)

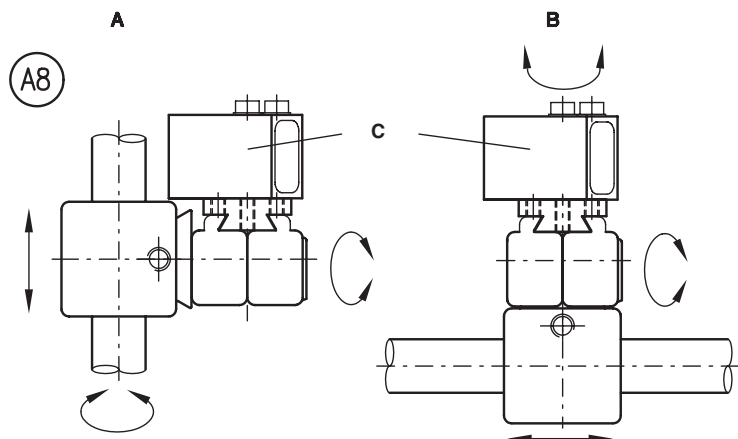
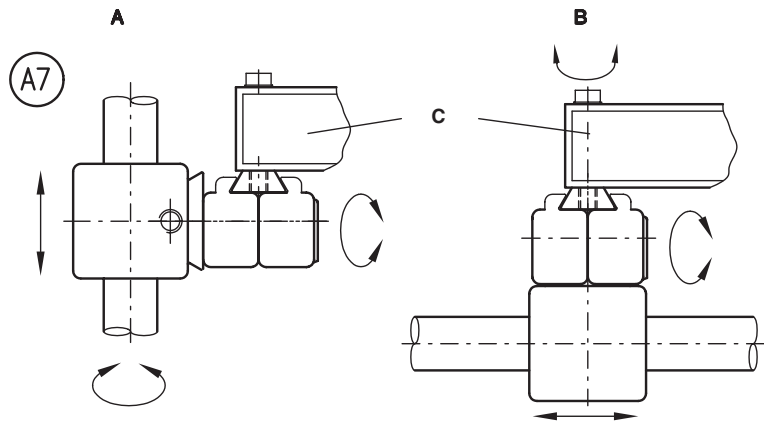
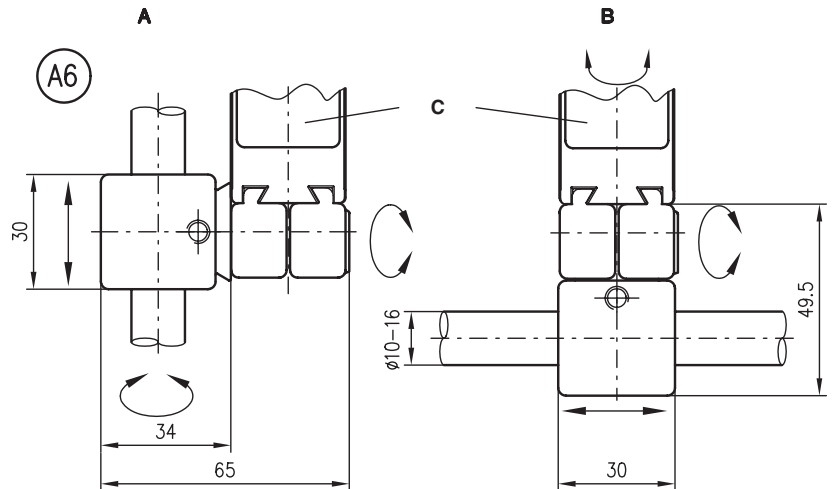
BT 450.1-96 (Part No. 500 82084)



- A Block clamp
- B Rod diameter
- C Fastening plate
- D Tapped disk
- E Fastening holes for

Explanations
(A6)
UMS 96 (Part No. 500 26204)
(A7)
UMS 96-450 (Part No. 500 29070)

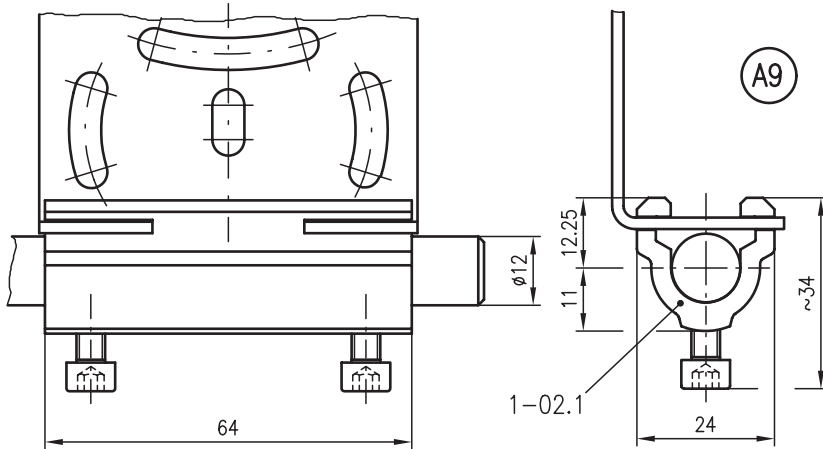
 see **(A4)**
(A8)
UMS 96-95 (Part No. 500 80334)

 see **(A4)**
Dimensioned drawings


- A** Assembly at the side
- B** Cross assembly
- C** Sensor



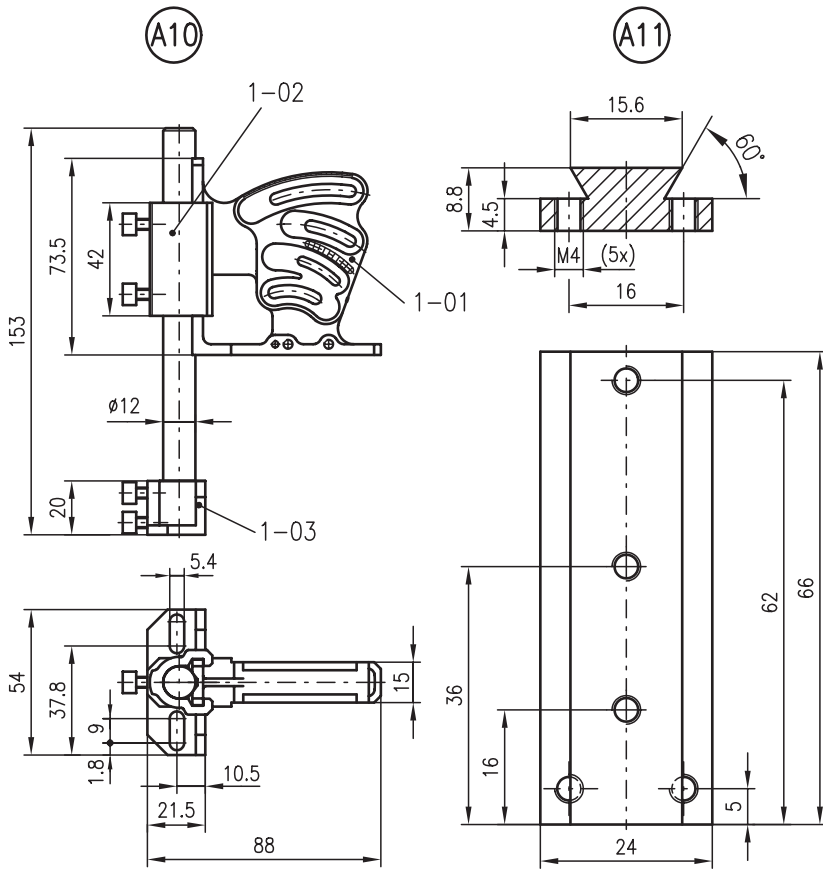
Dimensioned drawings



A9

UMS 1-02.1 (Part No. 500 25923)

= UMS 1 in connection with BT 450 (B5)



A10

A11

A10

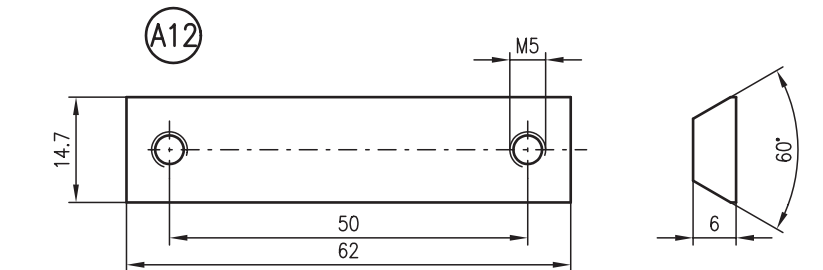
UMS 1-03 (Part No. 500 22283)

UMS 1-02 (Part No. 500 22282)

UMS 1-01 (Part No. 500 22281)

A11

BT 95-96 (Part No. 500 29067)



A12

A12

BT 450-96 (Part No. 500 80200)

- A Assembly at the side
- B Cross assembly
- C Sensor

Explanations
A13
UMS 8-D10 (Ø10mm, Part No. 500 35020)

UMS 8-D12 (Ø12mm, Part No. 500 35021)

UMS 8-D14 (Ø14mm Part No. 500 35022)

A14
UMS 8.1-D10 (Ø10mm, Part No. 500 35023)

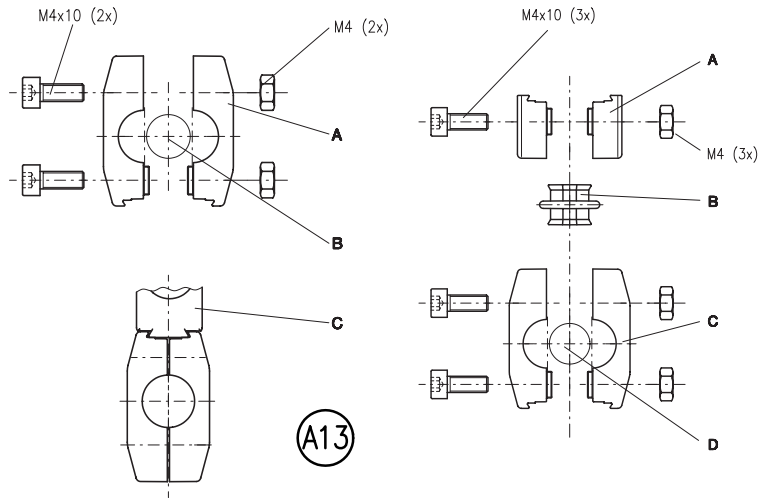
UMS 8.1-D12 (Ø12mm, Part No. 500 35024)

UMS 8.1-D14 (Ø14mm, Part No. 500 35025)

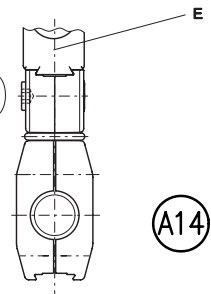
A15
UMS 8.2-D10 (Ø10mm, Part No. 500 35026)

UMS 8.2-D12 (Ø12mm, Part No. 500 35027)

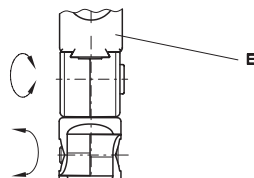
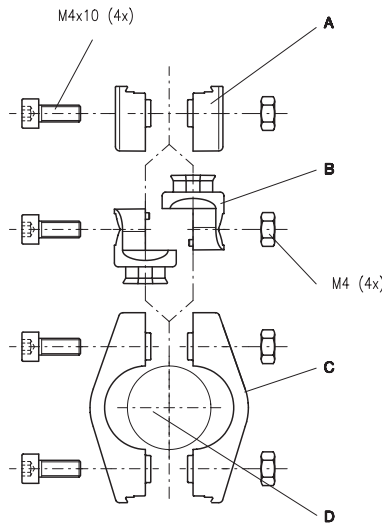
UMS 8.2-D14 (Ø14mm, Part No. 500 35028)

Dimensioned drawings


- A** Clamp
- B** Rod
- C** Sensor



- A** Receptable
- B** Joint
- C** Clamp
- D** Rod
- E** Sensor



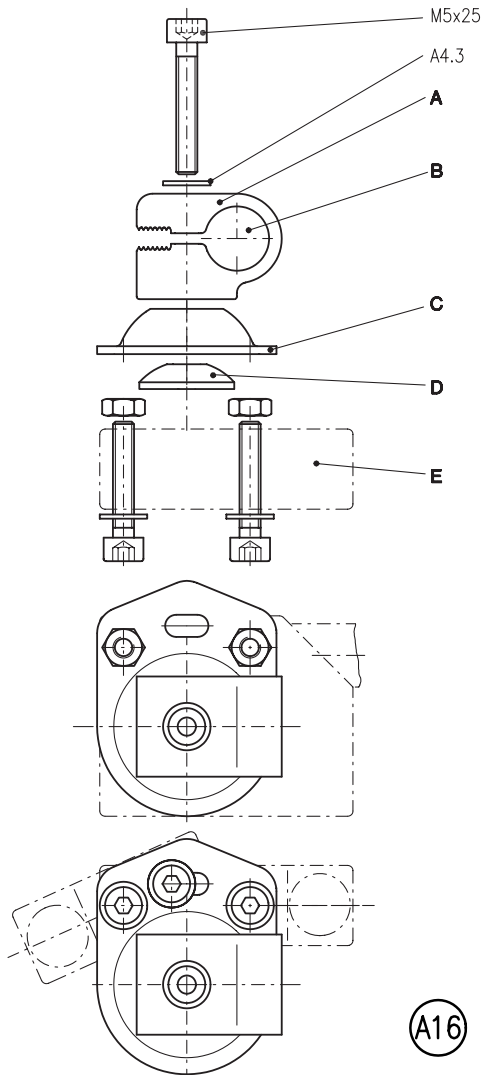
- A** Receptable
- B** Joint
- C** Clamp
- D** Rod
- E** Sensor

A15



Dimensioned drawings

Explanations



(A16)

BT 8-D10 (Ø10mm, Part No. 500 35017)

BT 8-D12 (Ø12mm, Part No. 500 35018)

BT 8-D14 (Ø14mm, Part No. 500 35019)

- A Block clamp
- B Rod diameter
- C Fastening plate
- D Tapped disk
- E Sensor

(A16)



Explanations

B1

BT 92 (Part No. 500 18415)

B2

BT 95 (Part No. 500 20833)

B3

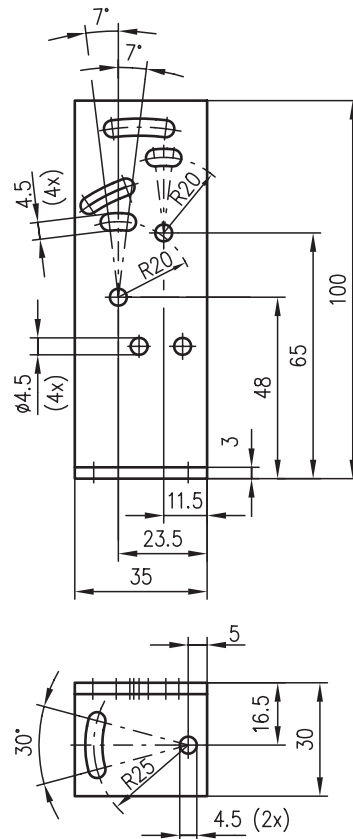
BT 85 (Part No. 500 03376)

B4

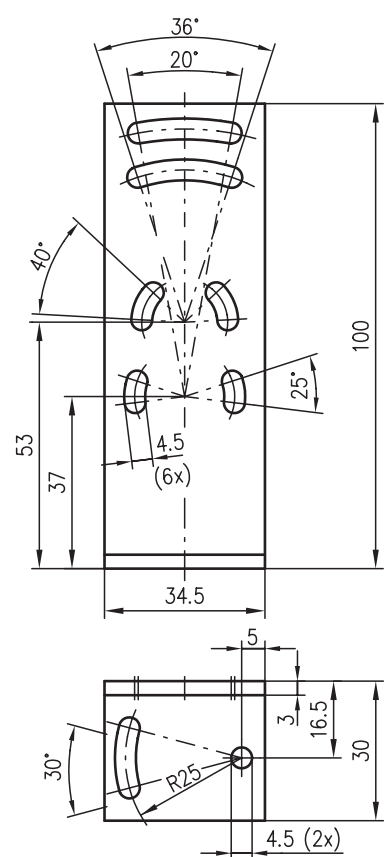
BT 96 (Part No. 500 25570)

Dimensioned drawings

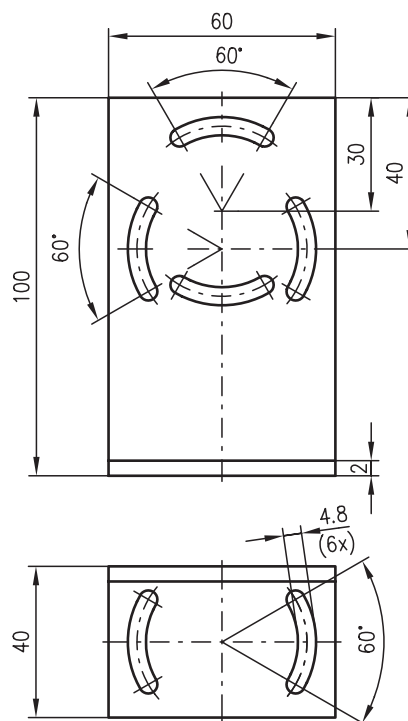
B1



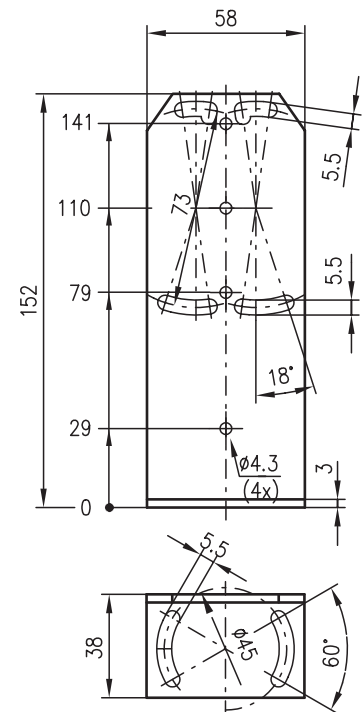
B2



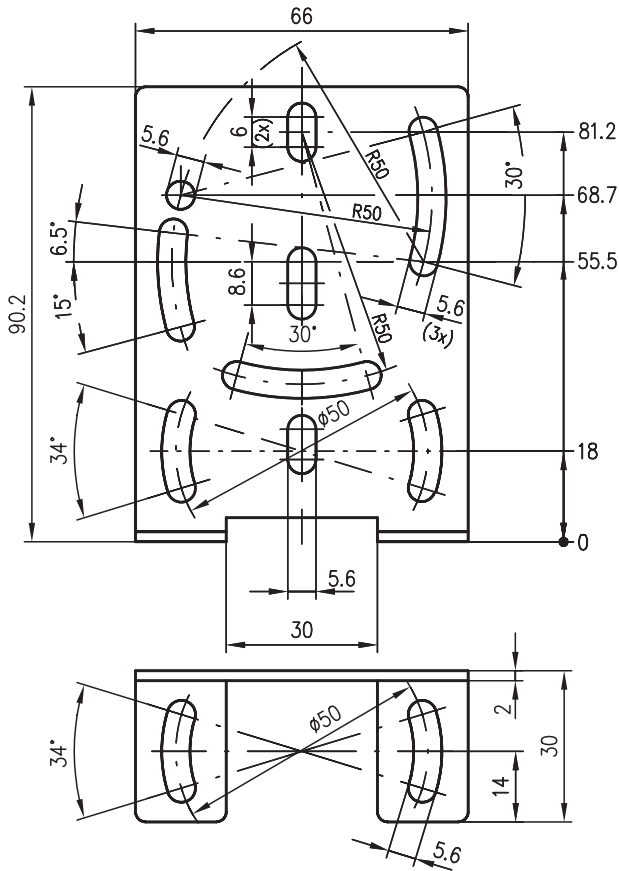
B3



B4



Dimensioned drawings

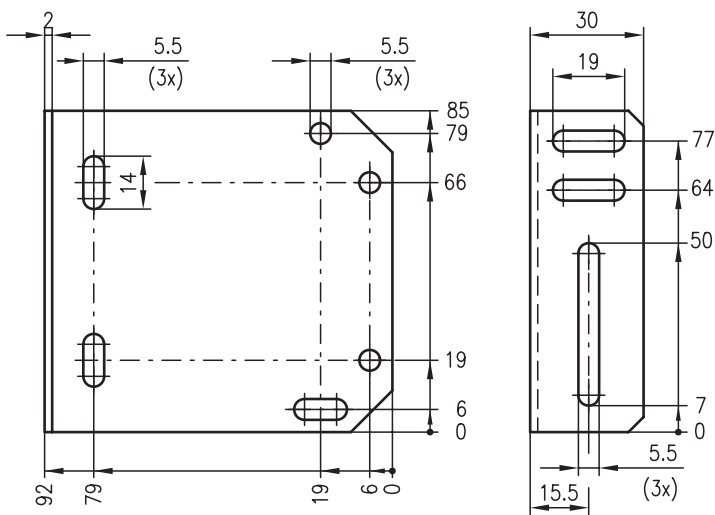


B5

B5

BT 450 (Part No. 500 25573)

Explanations



B6

B6

BT 96.1 (Part No. 500 80614)



BT

Mounting devices/systems

Explanations

B7

BT 78 (Part No. 500 03374)

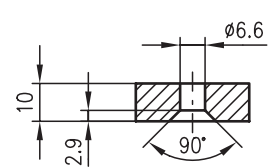
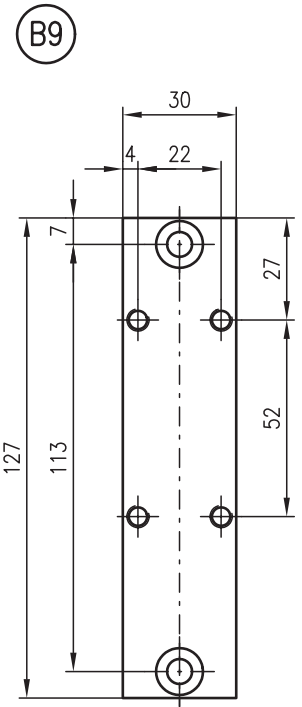
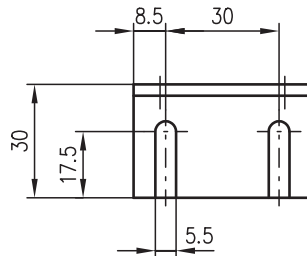
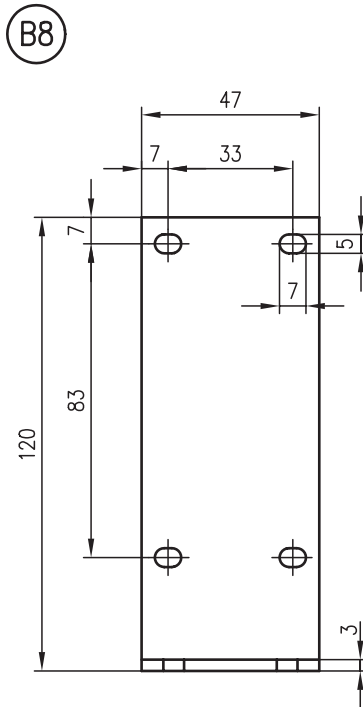
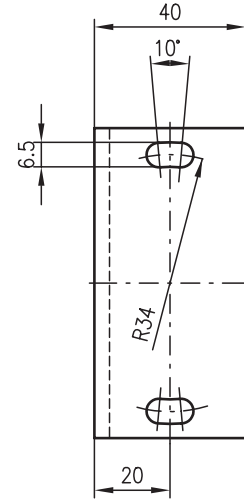
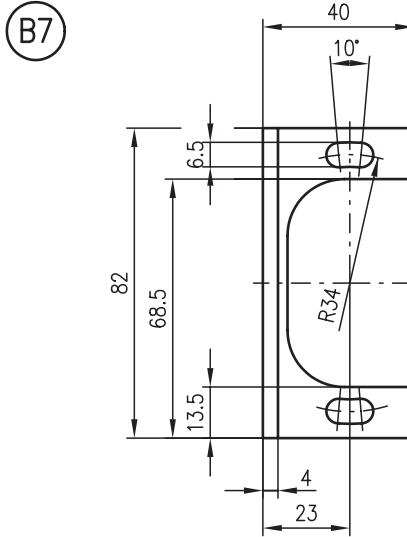
B8

BT 80 (Part No. 500 03375)

B9

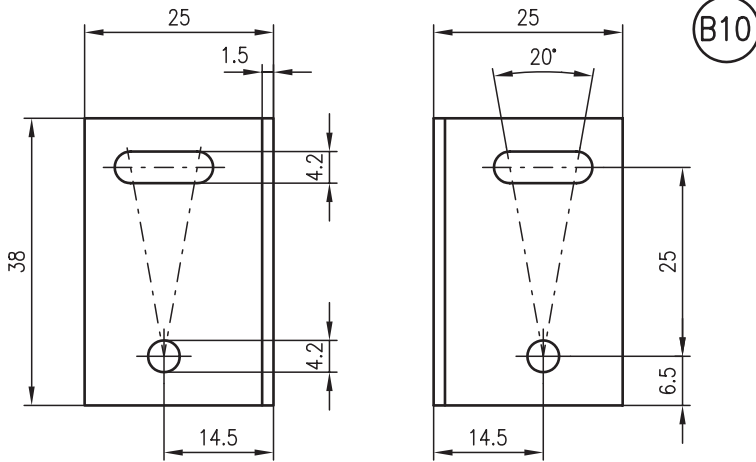
BT 08 (Part No. 500 09417)

Dimensioned drawings





Dimensioned drawings

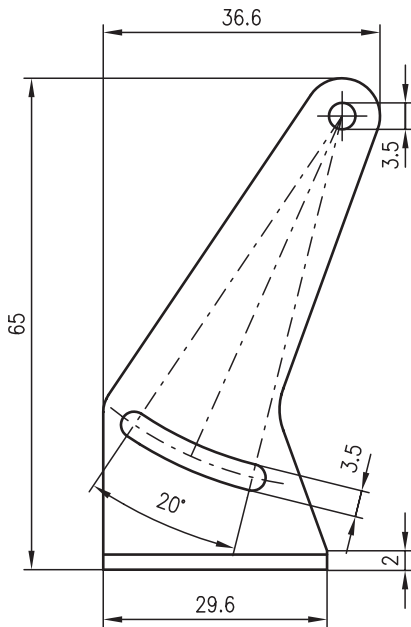


(B10)

(B10)

BT 518.1 (Part No. 500 80534)

(B11)



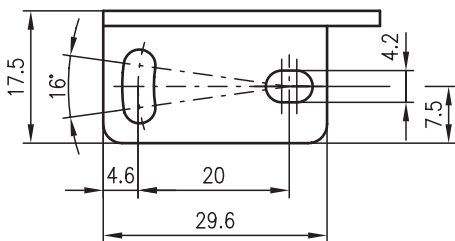
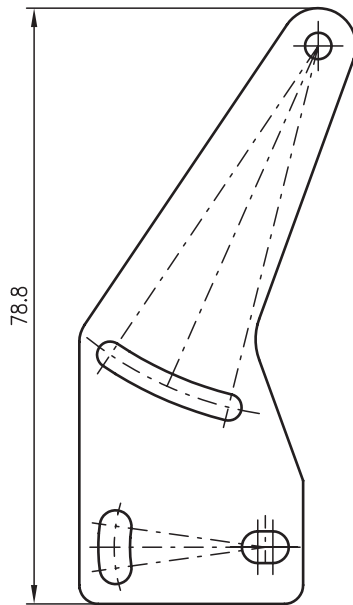
(B12)

(B11)

BT 525.1 (Part No. 500 80535)

(B12)

BT 525.2 (Part No. 500 80536)





BT

Mounting devices/systems

Explanations

B13

BT 713 (Part No. 500 80776)

B14

BT 713-66 (Part No. 500 30809)

Bracket for BT 66

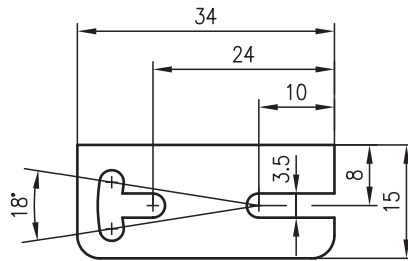
see C2

B15

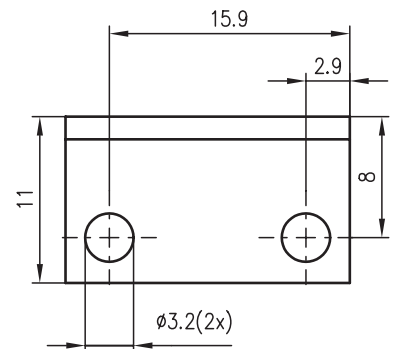
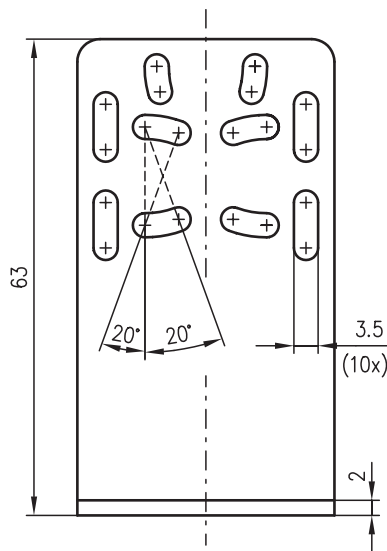
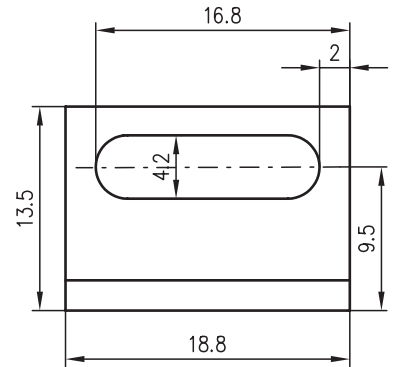
BT 404

Dimensioned drawings

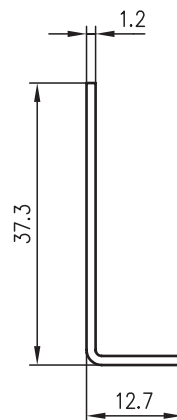
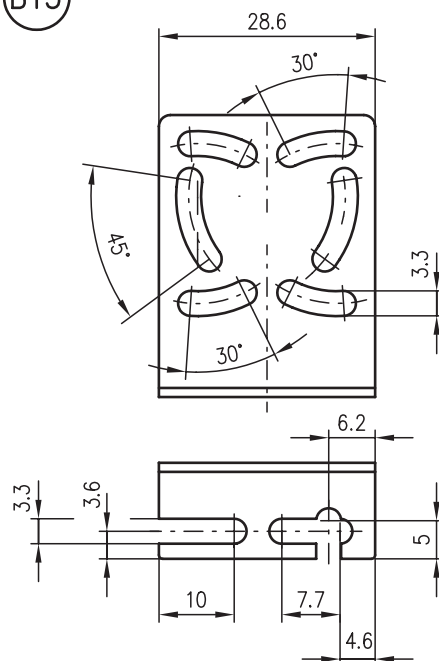
B13



B14



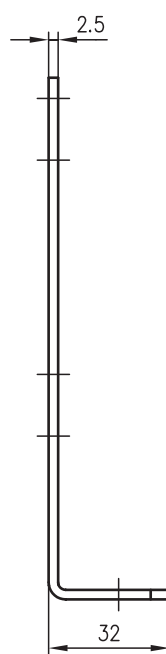
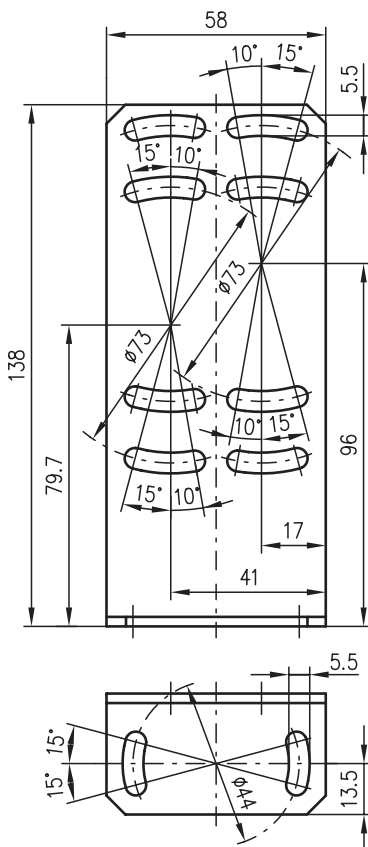
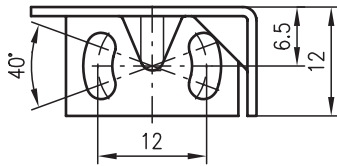
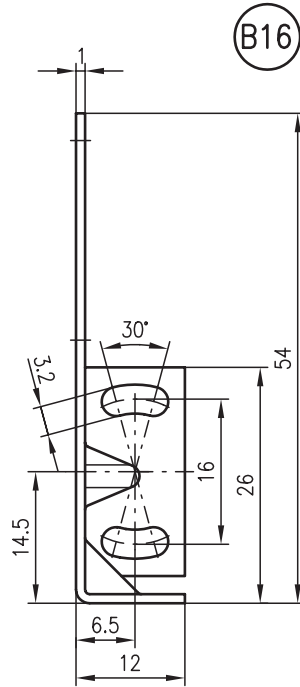
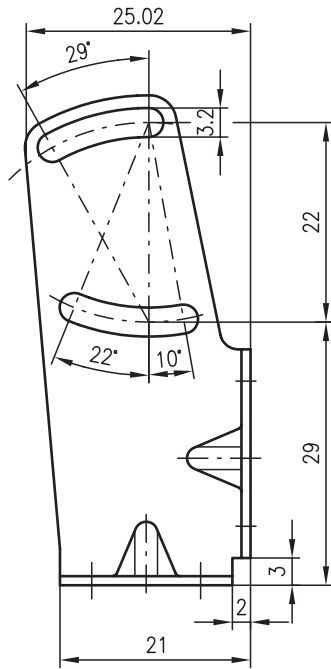
B15





Dimensioned drawings

Explanations



B16

B16

BT 3 (Part No. 500 60511)

B17

B17

BT 96.4 (Part No. 500 32319)



BT

Mounting devices/systems

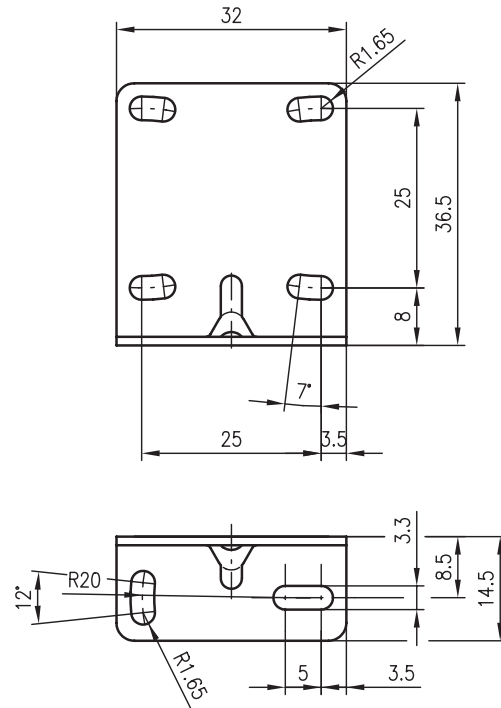
Explanations

B18

BT 406 (Part No. 500 24073)

Dimensioned drawings

B18



B19

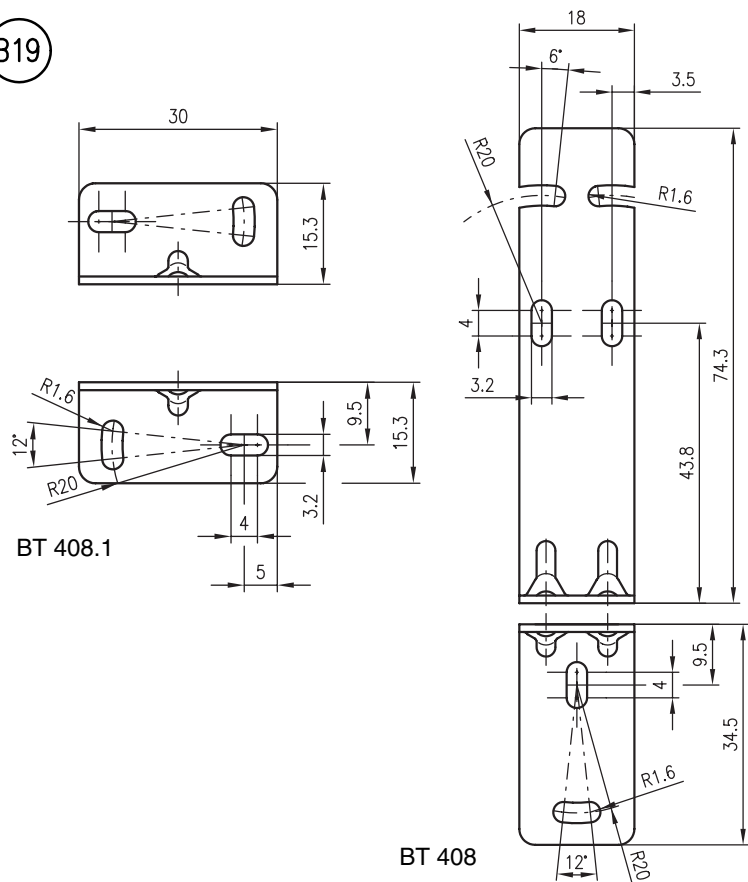
BT 408 (Part No. 500 34072)

BT 408.1 (Part No. 500 34398)

BT 408 for devices with vertical optics,

BT 408.1 for axial optics (...408A...).

B19





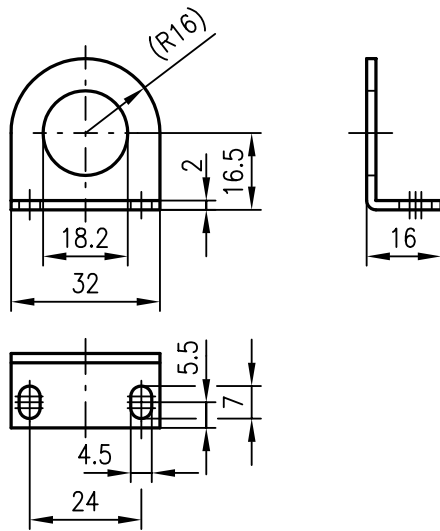
Dimensioned drawings

Explanations

(B20)

(B20)

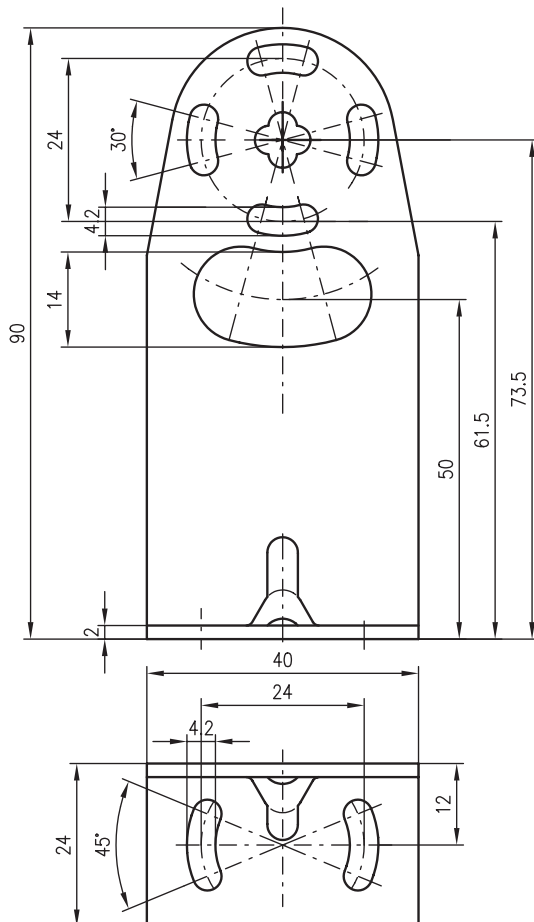
BT 318 (Part No. 500 33876)



(B21)

(B21)

BT 8 (Part No. 500 36195)





BT

Mounting devices/systems

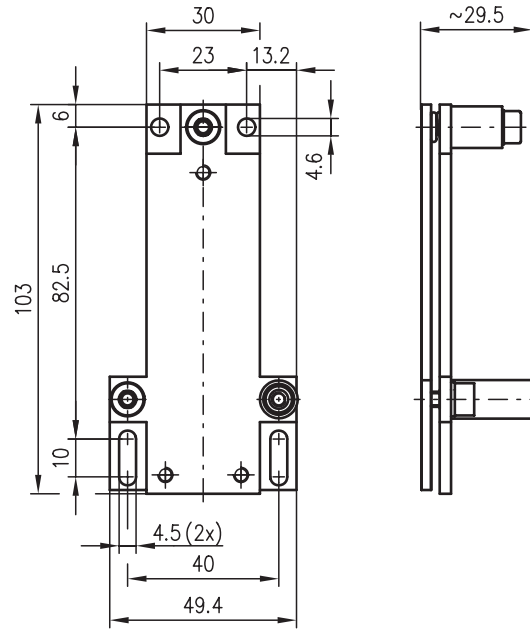
Explanations

C1

BT 64 (Part No. 500 80152)

Dimensioned drawings

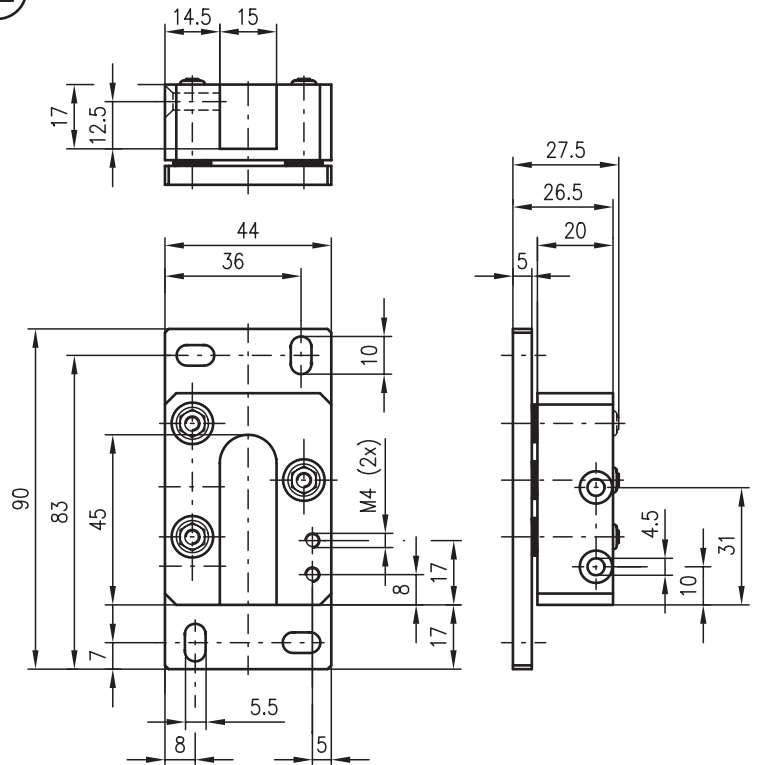
C1



C2

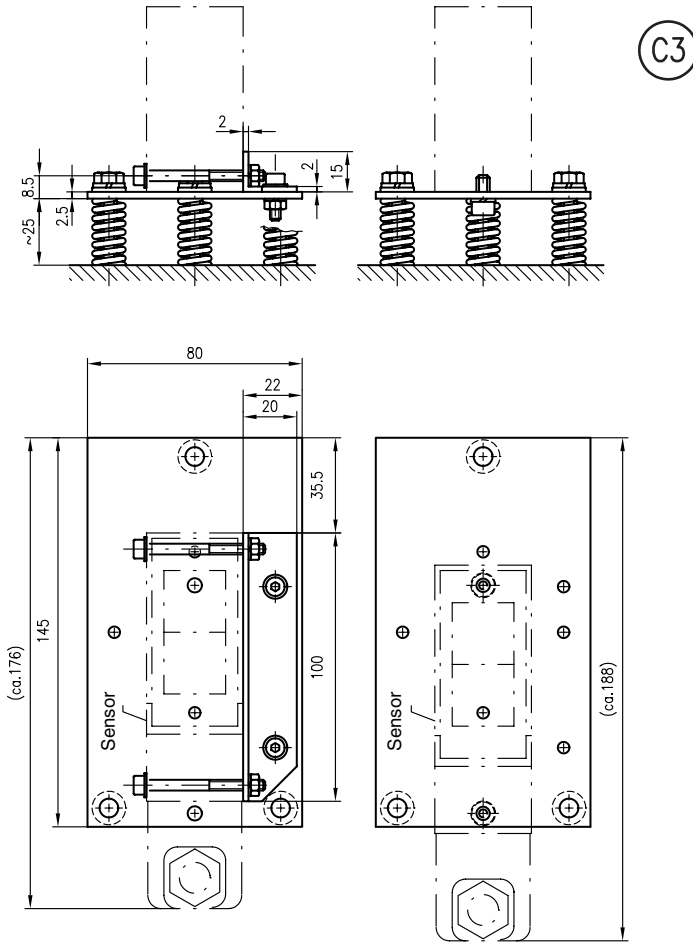
BT 66 (Part No. 500 16515)

C2



Dimensioned drawings

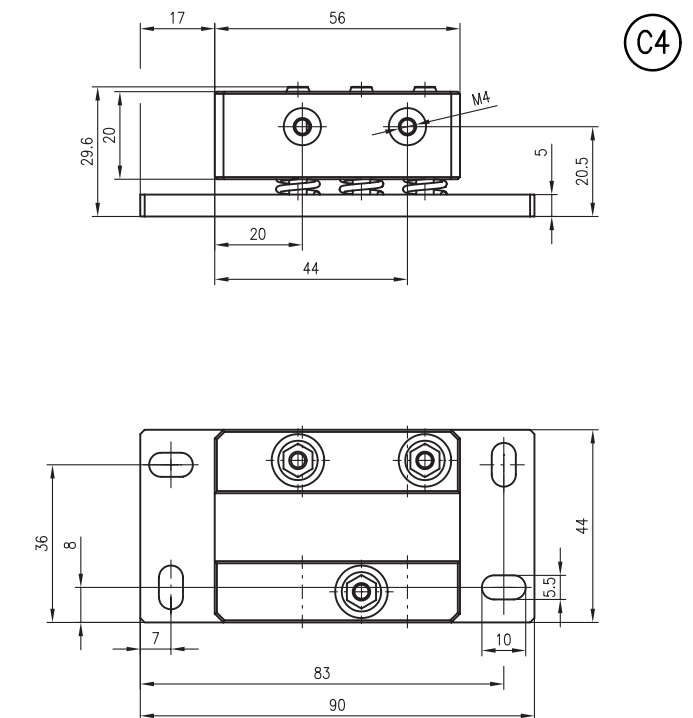
Explanations



C3

C3

BT 85.1 (Part No. 500 17436)



C4

C4

BT 8-ARH (Part No. 500 35030)



BT

Mounting devices/systems

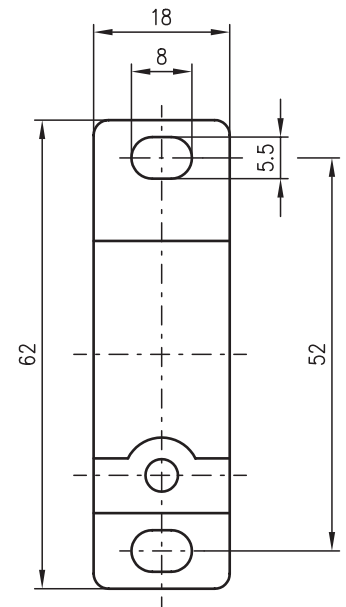
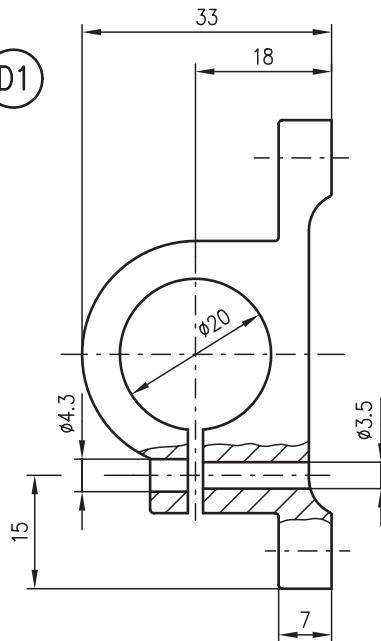
Explanations

Dimensioned drawings

D1

BT 01 (Part No. 500 03371)

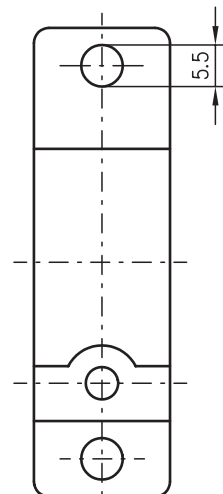
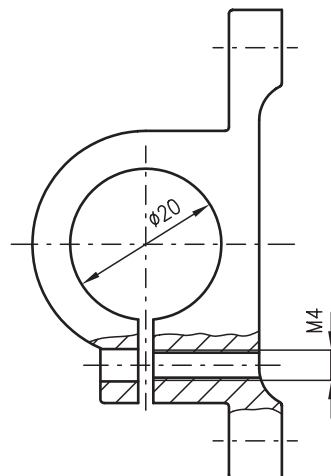
D1



D2

BT 01-ALU (Part No. 500 09411)

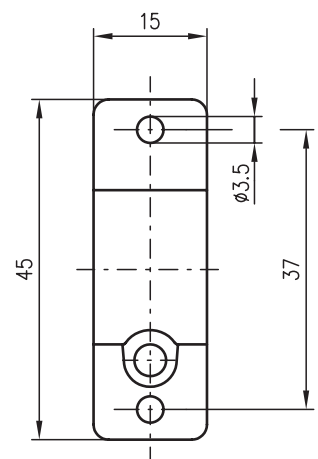
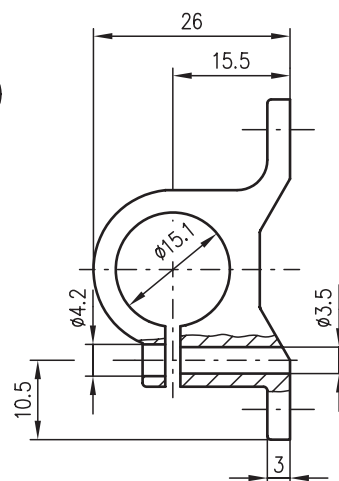
D2



D3

BT 03 (Part No. 500 03373)

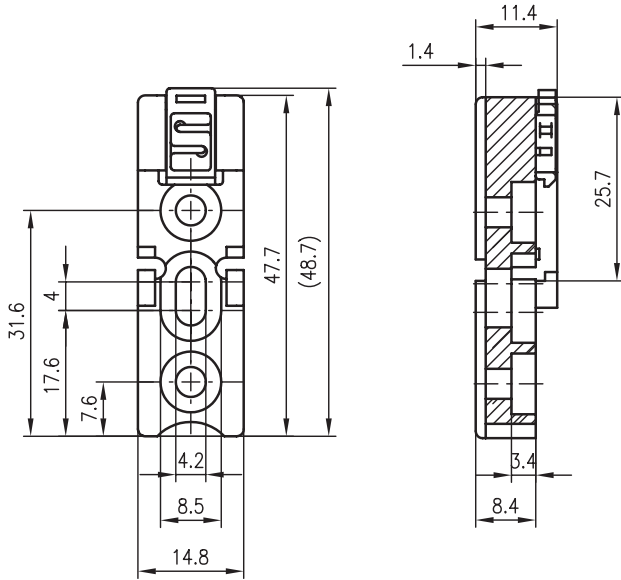
D3



Dimensioned drawings

Explanations

BT 8-C15

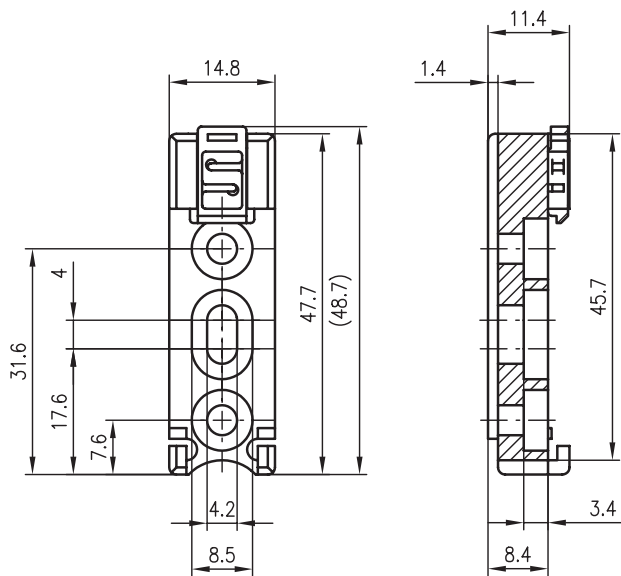


D4

D4

BT 8-C15 (Part No. 500 35016)
 BT 8-C35x7,5 (Part No. 500 35015)

BT 8-C35x7,5





Connection leads selection table

Series →		18	8	303	318	412	618	450	46	518	525	61	64	713	72	78	3	
Designation ↓		With plug S-types e.g.: RK 18/4 GS	With M12 connector L-types e.g.: RK 18/4 GDL	With M8 connector L8-types e.g.: RK 18/4 GL8.5	With M12 connector	With M12 connector	With M12 connector	With M12 connector S12-types e.g.: PRK 450K/P-S12	With M18 connector S18-types e.g.: PRK 450K/P-S18	With M12 connector	With M12 connector	With M12 connector	With plug S-types e.g.: FRK 61/44-2000 S	With M12 connector	With M8 connector	With plug S-types e.g.: PRK 72/4 S	With M12 connector L-types e.g.: RK 72/4 L	With M12 connector
ready-made cables	BK7 KB-095-5000-5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-095-5000-5A	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-095-5000-5P	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-450-2000-4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-450-2000-4A	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-450-5000-4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-450-5000-4A	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-450-10000-4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-450-10000-4A	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-418-5000-3 (A, P)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	BK7 KB-713-5000-4				•										•			
	BK7 KB-713-5000-4A				•										•			
	BK7 KB-003-5000-3		•															
	BK7 KB-003-5000-3A		•															
	BK7 KB-003-10000-3A		•															
	BK7 KB-029-5000-3 SE																	
	BK7 KB-029-5000-3A SE																	
	BK7 KB-029-5000-2 E																	
	BK7 KB-029-5000-2A E																	
	BK7 KB-093-2000																	
	BK7 KB-093-6000																	
	BK7 KB-092-2000-4																	
	BK7 KB-092-2000-4 SE																	
	BK7 KB-092-2000-5																	
	BK7 KB-092-2000-6																	
	BK7 KB-092-6000-4																	
	BK7 KB-092-6000-4 SE																	
	BK7 KB-092-6000-5																	
	BK7 KB-092-6000-6																	
	BK7 KB-092-12000-4																	
	BK7 KB-092-12000-4 SE																	
	BK7 KB-092-12000-6																	
	BK7 KB-097-2000-4	•														•		
	BK7 KB-097-6000-4	•														•		
BK7 KB-097-12000-4	•														•			
BK7 KB-303-5000-4				•														
BK7 KB-303-5000-4A				•														
BK7 KB-448-2000-8A																		
BK7 KB-448-5000-8A																		
connectors for cables	KD 095-5	•			•	•	•	•	•	•	•	•	•		•	•	•	
	KD 095-5A	•			•	•	•	•	•	•	•	•	•		•	•	•	
	KD 095-4	•			•	•	•	•	•	•	•	•	•		•	•	•	
	KD 095-4A	•			•	•	•	•	•	•	•	•	•		•	•	•	
	KD 450-4							•										
	KD 450-4A							•										
	SOCKET BR97														•			
	SOCKET BR92																	
	SOCKET 85 DC																	
SOCKET 85 UC																		
SOCKET 85																		
Caption connection leads																		
e.g. KB - 450 - 2000 - 4A		<p> </p>																



Product overview round connectors (part 1)

Assembly →	Designation ↓	Part No.	Contact assignment		Conductor architecture			Cable length	Connector				Remark
			No. of pins	Figure	Connectable conductors in mm ²	Sheath diameter in mm	Sheath material		Connection for	Construction	Thread ring	Protection class	
	BK7 KB-095-5000-5	500 20500	5	R1	0.25	5	PVC	5m	M12	angular	metal	IP 67	
	BK7 KB-095-5000-5A	500 20499	5	R1	0.25	5	PVC	5m	M12	straight	metal	IP 67	
	BK7 KB-095-5000-5P	500 22012	5	R1	0.25	5	PUR	5m	M12	angular	metal	IP 67	
	BK7 KB-450-2000-4	500 80838	4	R2	0.34	5	PVC	2m	M12	angular	metal	IP 67	
	BK7 KB-450-2000-4A	500 80841	4	R2	0.34	5	PVC	2m	M12	straight	metal	IP 67	
	BK7 KB-450-5000-4	500 80839	4	R2	0.34	5	PVC	5m	M12	angular	metal	IP 67	
	BK7 KB-450-5000-4A	500 80842	4	R2	0.34	5	PVC	5m	M12	straight	metal	IP 67	
	BK7 KB-450-10000-4	500 80840	4	R2	0.34	5	PVC	10m	M12	angular	metal	IP 67	
	BK7 KB-450-10000-4A	500 80843	4	R2	0.34	5	PVC	10m	M12	straight	metal	IP 67	
	BK7 KB-418-5000-3	500 23545	3	R3	0.34	5	PVC	5m	M12	angular	metal	IP 67	
	BK7 KB-418-5000-3A	500 23544	3	R3	0.34	5	PVC	5m	M12	straight	metal	IP 67	
	BK7 KB-418-5000-3P	500 81482	3	R3	0.34	5	PUR	5m	M12	angular	metal	IP 67	
	BK7 KB-713-5000-4	500 29173	4	R4	0.25	5	PVC	5m	M8	angular	metal	IP 67	
	BK7 KB-713-5000-4A	500 29174	4	R4	0.25	5	PVC	5m	M8	straight	metal	IP 67	
	BK7 KB-003-5000-3	500 81179	3	R5	0.25	5	PVC	5m	M8	angular	metal	IP 67	
	BK7 KB-003-5000-3A	500 81180	3	R5	0.25	5	PVC	5m	M8	straight	metal	IP 67	
	BK7 KB-003-10000-3A	500 30826	3	R5	0.25	5	PVC	10m	M8	straight	metal	IP 67	
	BK7 KB-029-5000-3 SE	500 80864	3	R6	0.34	4	PVC	5m	M12	angular	metal	IP 67	
	BK7 KB-029-5000-3A SE	500 81156	3	R6	0.34	4	PVC	5m	M12	straight	metal	IP 67	
	BK7 KB-029-5000-2 E	500 81157	2	R7	0.34	4	PVC	5m	M12	angular	metal	IP 67	with shielding
	BK7 KB-029-5000-2A E	500 81158	2	R7	0.34	4	PVC	5m	M12	straight	metal	IP 67	with shielding
	BK7 KB-093-2000-3A	500 08099	3	R8	0.25	4	PVC	2m	M12	straight	metal	IP 67	
	BK7 KB-093-6000-3A	500 09882	3	R8	0.25	4	PVC	6m	M12	straight	metal	IP 67	
	BK7 KB-092-2000-4	500 11257	4	S1	0.25	4.7	PVC	2m	-	angular	-	IP 65	
	BK7 KB-092-2000-4 SE	500 11950	4	S2	0.25	4.7	PVC	2m	-	angular	-	IP 65	
	BK7 KB-092-2000-5	500 13169	5	S3	0.25	4.9	PVC	2m	-	angular	-	IP 65	
	BK7 KB-092-2000-6	500 11947	6	S4	0.25	5.5	PVC	2m	-	angular	-	IP 65	
	BK7 KB-092-6000-4	500 11258	4	S1	0.25	4.7	PVC	6m	-	angular	-	IP 65	
	BK7 KB-092-6000-4 SE	500 11951	4	S2	0.25	4.7	PVC	6m	-	angular	-	IP 65	
	BK7 KB-092-6000-5	500 13192	5	S3	0.25	4.9	PVC	6m	-	angular	-	IP 65	
	BK7 KB-092-6000-6	500 11948	6	S4	0.25	5.5	PVC	6m	-	angular	-	IP 65	
	BK7 KB-092-12000-4	500 11946	4	S1	0.25	4.7	PVC	12m	-	angular	-	IP 65	
	BK7 KB-092-12000-4 SE	500 11952	4	S2	0.25	4.7	PVC	12m	-	angular	-	IP 65	
	BK7 KB-092-12000-6	500 11949	6	S3	0.25	5.5	PVC	12m	-	angular	-	IP 65	
	BK7 KB-097-2000-4	500 11655	4	S5	0.25	4.7	PVC	2m	-	angular	-	IP 65	
	BK7 KB-097-6000-4	500 11656	4	S5	0.25	4.7	PVC	6m	-	angular	-	IP 65	
	BK7 KB-097-12000-4	500 11657	4	S5	0.25	4.7	PVC	12m	-	angular	-	IP 65	
	BK7 KB-303-5000-4	500 36152	4	R4	0.25	5	PVC	5m	M8*	angular	-	IP 67	snap-In
	BK7 KB-303-5000-4A	500 36153	4	R4	0.25	5	PVC	5m	M8*	straight	-	IP 67	snap-In
	BK7 KB-448-2000-8A	500 32411	8	R9	0.25	7	PVC	2m	M12	straight	metal	IP 67	
	BK7 KB-448-5000-8A	500 33061	8	R9	0.25	7	PVC	5m	M12	straight	metal	IP 67	

* Snap-in locking for the connectors (connector without swivel nut M8)

Caption connection leads

e.g. **KB - 450 - 2000 - 4A** — Axial
 Number of wires
 Length [mm]
 Designation
 Cable



R1		<table border="1"> <tr><td>1</td><td>br/BN</td></tr> <tr><td>2</td><td>ws/WH</td></tr> <tr><td>3</td><td>bl/BU</td></tr> <tr><td>4</td><td>sw/BK</td></tr> <tr><td>5</td><td>gr/GR</td></tr> </table>	1	br/BN	2	ws/WH	3	bl/BU	4	sw/BK	5	gr/GR	S1		<table border="1"> <tr><td>1</td><td>bl/BU</td></tr> <tr><td>2</td><td>br/BN</td></tr> <tr><td>3</td><td>NC</td></tr> <tr><td>4</td><td>sw/BK</td></tr> <tr><td>5</td><td>vi/VT</td></tr> <tr><td>⊥</td><td>gnge/GNYE</td></tr> </table>	1	bl/BU	2	br/BN	3	NC	4	sw/BK	5	vi/VT	⊥	gnge/GNYE		
1	br/BN																												
2	ws/WH																												
3	bl/BU																												
4	sw/BK																												
5	gr/GR																												
1	bl/BU																												
2	br/BN																												
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ARH

Laser alignment aids



50m

- Visible red light for exact and time-saving alignment
- Battery operation offers independence from mains supply
- Small weight and appropriate construction size for easy handling in difficult environments
- ARH 96 for fast mounting on sensors of the series 96
- ARH 2 for mounting on sensors of the series 78 and 85
- Laser box ARH 10 for self construction of alignment aids (customer-specific adaptation)

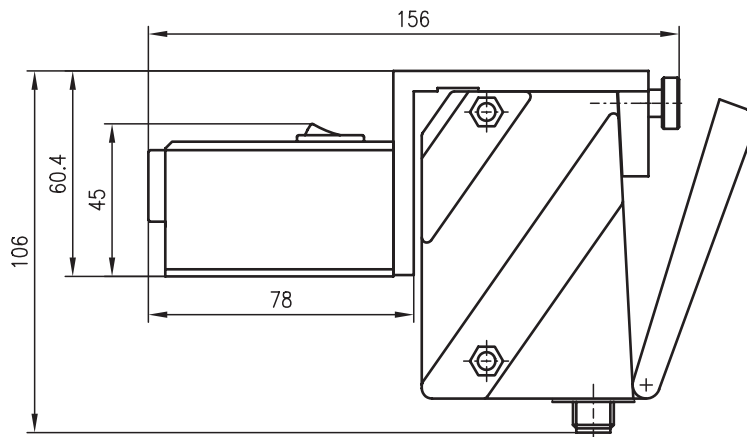


Accessories:

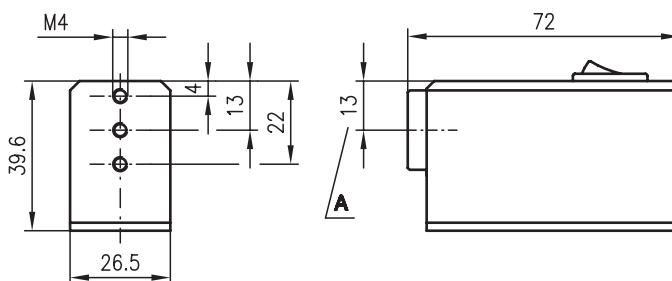
- 2x1.5V AAA batteries (built-in)

Dimensioned drawings

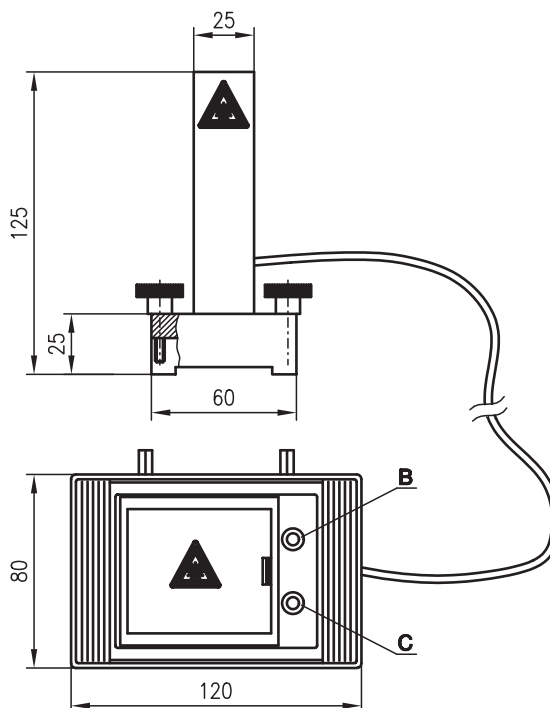
ARH 96



ARH 10



ARH 2



- A Optical axis
- B ON
- C OFF

We reserve the right to make changes • arh_01e.fm



Specifications

Electrical data

Voltage supply	2 commercially available AAA batteries 2x1.5V replaceable
Ready to operate	approx. 8 hours in permanent operation
Switching on/off	by pressing the flip switch
Visual range	approx. 50m depending on ambient light
Light wavelength	670nm (visible red light)
Laser warning notice	see remarks

Mechanical data

Housing	aluminium
---------	-----------

Environmental data

Ambient temp. (operation/storage)	-20°C ... +55°C/-30°C ... +70°C
Protection class	IP 45

Remarks

Mounting for ARH 96

The cover of the sensor (96 series) has to be open. The ARH 96 is fastened to the thread hole of the cover by using the knurl screw.

Mounting for ARH 2

The ARH 2 is fastened to the distance bolts of 78 and 85 series sensors by using the knurl screw.

Operation

After switching on through the flip switch, a laser beam projects a visible red light spot which simulates the optical axis of the transmitter respectively the receiver. Now, the transmitter can be adjusted in such a way, that the light spot hits, depending on the application:

- receiver/transmitter on the opposing side (through-beam photoelectric sensors)
- the reflector in the middle (retro-reflective photoelectric sensors)
- the object to be scanned (diffuse reflection light scanner)

Battery change

To change the AAA cells, the two screws M2.5 on the bottom and the cover have to be removed. Change the AAA cells acc. to the figure, mount the cover and fasten the screws.

Order guide

	Designation	Part No.
complete for 96 series	ARH 96	500 80502
complete for 78 series and 85 series	ARH 2	500 23547
laser-box	ARH 10	500 80537

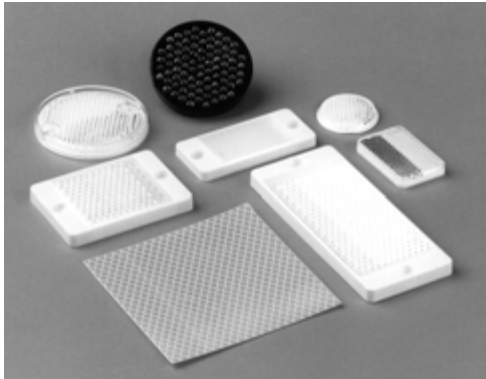




TKS

Reflectors

Reflectors



- Adhesive and screw type versions permit universal installation
- Material PMMA 8N (plexiglass) - no corrosion, long working life and high mechanical firmness
- Various format for optimal adaptation to all possible applications and mounting environments
- Micro triple version suitable for e.g. laser retro-reflective photoelectric sensors
- Unproblematic cleaning, because surface is resistant against current cleaners
- Precise optical alignment is not required, as the reflector may be slightly inclined relative to the optical axis

Order codes:

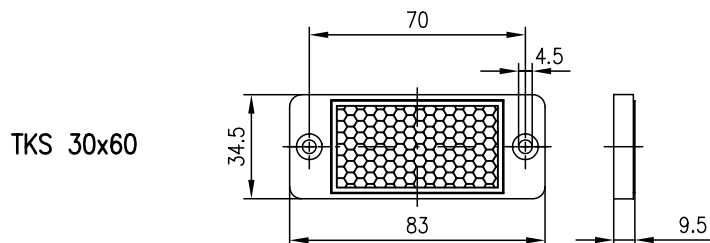
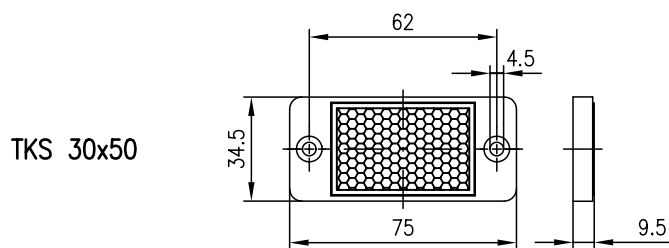
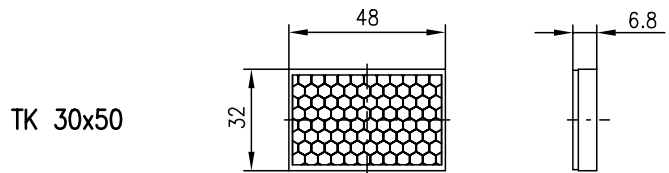
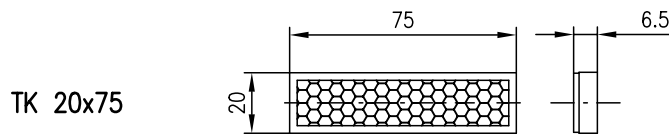
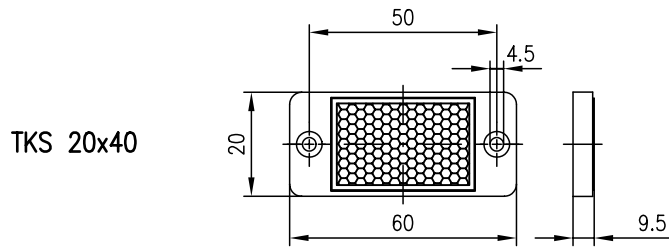
Designation	Part No.
TK 82	500 03187
TK 82.2	500 24127
TK 60	500 03186
TK 45	500 03185
TK 35	500 03184
TK 25	500 03183
TKS 25	500 27696
TK 20	500 03182
TK 100x100	500 03192
TK 50x100	500 03191
TK 40x180	500 03190
TK 40x180.1	500 22811
TK 30x50	500 03189
TK 20x75	500 03188
TKS 100x100	500 22816
TKS 50x100	500 22815
TKS 50x50	500 22814
TKS 30x500	500 27097
TKS 30x60	500 30433
TKS 30x50	500 23525
TKS 20x40	500 81283
MTKS 50x50	500 36188
TG 60	500 03179
TG 29	500 09374
TG 15	500 03177
TG 6	500 03176
UMS 96-82	500 27191
ET 045-01	500 09419
HTK 82	500 00068/69/71
Reflective tape 5870	500 09812/13
Reflective tape No. 2	500 11523
Reflective tape No.4	500 38062

Selection table

Series/ construction	Designation	Mounting		Dimensions [mm]
		screw- type	adhesive ¹⁾	
TK/round	TK 82	●		Ø84
	TK 82.2	●		Ø84
	TK 60	●	●	Ø65
	TK 45		●	Ø46
	TK 35		●	Ø36
	TK 25		●	Ø26
	TKS 25	●		Ø26
	TK 20		●	Ø21
TK/TKS ²⁾	TK 100x100	●	●	99x99
	TKS 50x100	●	●	50x99
	TK 40x180	●		41x181
	TK 40x180.1	●		41x181
	TK 30x50		●	30x46
	TK 20x75		●	20x75
	TKS 100x100	●	●	103x125
	TKS 50x100	●	●	54x125
	TKS 50x50	●	●	54x75
	TKS 30x500	●	●	35x505
	TKS 30x60	●	●	35x83
	TKS 30x50	●	●	35x75
TKS 20x40	●	●	20x60	
MTKS	MTKS 50x50	●		51x61
TG/round	TG 60	●		Ø60
	TG 29	●		Ø29
	TG 15	●		Ø18
	TG 6	●	●	Ø7
Other	UMS 96-82	●		mounting system with reflector TK 82
	ET 045-01	●		metal mounting bracket for TK 100x100 and TK 50x100
	HTK 82	●		
	Reflective tape 5870		● ³⁾	
	Reflective tape No.2		● ³⁾	
	Reflective tape No.4		● ³⁾	

- 1) Not self-adhesive
- 2) Screw mounting with mounting bracket ET 045-01 (2 pieces included in shipment)
- 3) Self-adhesive

We reserve the right to make changes * ref_01e.fm

Dimensioned drawings

Explanations
Reflector TKS 20x40 (Part No. 500 81283)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Reflector TK 20x75 (Part No. 500 03188)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: adhesive

Reflector TK 30x50 (Part No. 500 03189)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: adhesive

Reflector TKS 30x50 (Part No. 500 23525)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Reflector TKS 30x60 (Part No. 500 30433)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive



TKS

Reflectors

Explanations

Reflector TKS 30x500 (Part No. 500 27097)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type

Reflector TK 40x180 (Part No. 500 03190)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Reflector TK 40x180.1 (Part No. 500 22811)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: adhesive

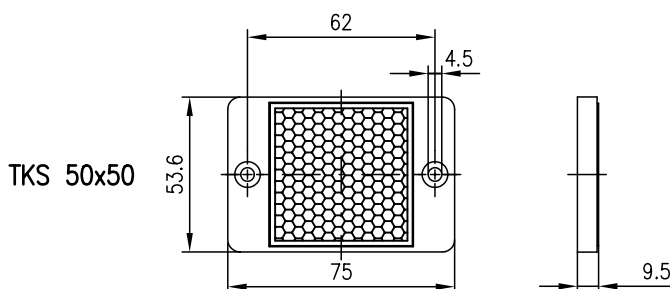
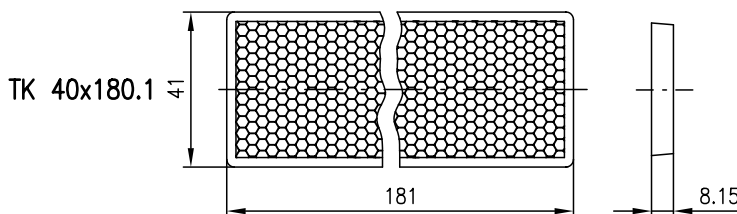
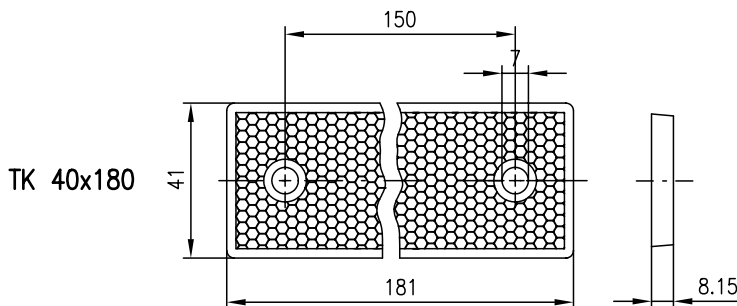
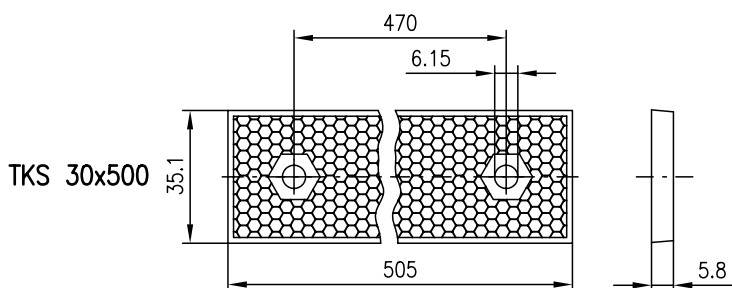
Reflector TKS 50x50 (Part No. 500 22814)

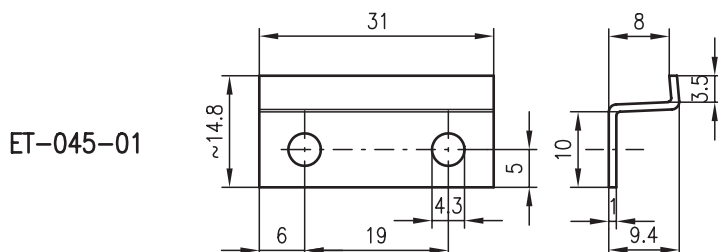
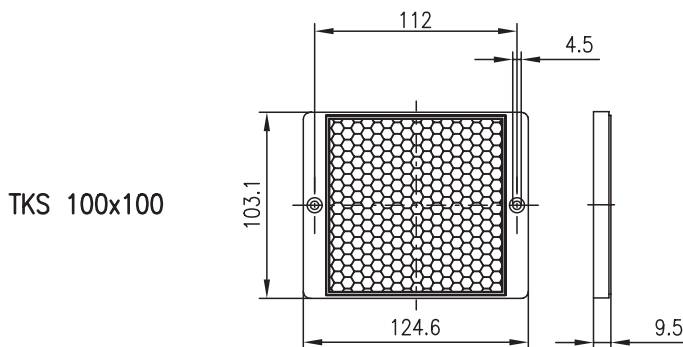
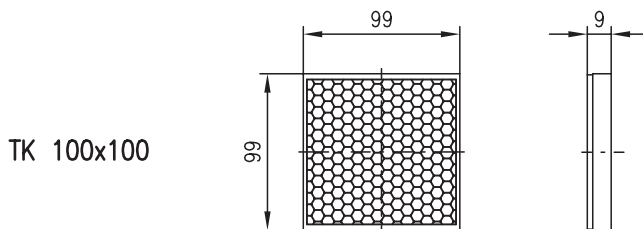
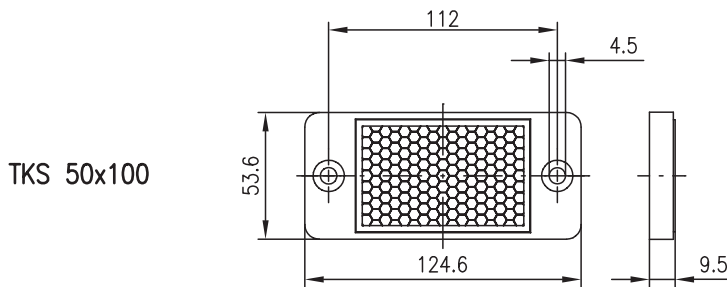
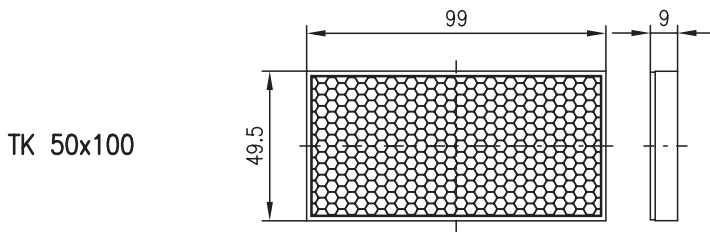
Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Dimensioned drawings



Dimensioned drawings

Explanations
Reflector TK 50x100 (Part No. 500 03191)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type (with mounting bracket ET-045-01), adhesive

Reflector TKS 50x100 (Part No. 500 22815)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Reflector TK 100x100 (Part No. 500 03192)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type (with mounting bracket ET-045-01), adhesive

Reflector TKS 100x100 (Part No. 500 22816)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Mounting bracket ET-045-01

(Part No. 500 09419)

for screw mounting of TK 50x100 and TK 100x100 (2 pieces included in shipment)

Explanations

Reflector TK 20 (Part No. 500 03182)
 Material: plastic PMMA 8N (plexiglass)
 Temperature range: -20°C ... +80°C
 Mounting: adhesive

Reflector TK 25 (Part No. 500 03183)
 Material: plastic PMMA 8N (plexiglass)
 Temperature range: -20°C ... +80°C
 Mounting: adhesive

Reflector TKS 25 (Part No. 500 27696)
 Material: plastic PMMA 8N (plexiglass)
 Temperature range: -20°C ... +80°C
 Mounting: thread bolt

Reflector TK 35 (Part No. 500 03184)
 Material: plastic PMMA 8N (plexiglass)
 Temperature range: -20°C ... +80°C
 Mounting: adhesive

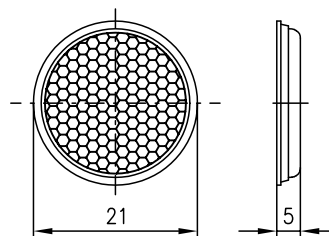
Reflector TK 45 (Part No. 500 03185)
 Material: plastic PMMA 8N (plexiglass)
 Temperature range: -20°C ... +80°C
 Mounting: adhesive

Remarks

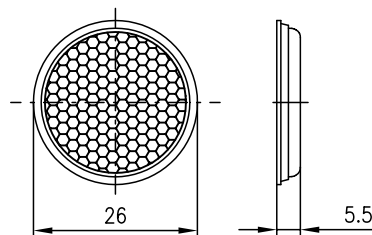
Based on the oriented prism structure, a higher range resp. performance reserve can be obtained through turning with reflectors which are slightly inclined towards the optical axis (preferred direction).

Dimensioned drawings

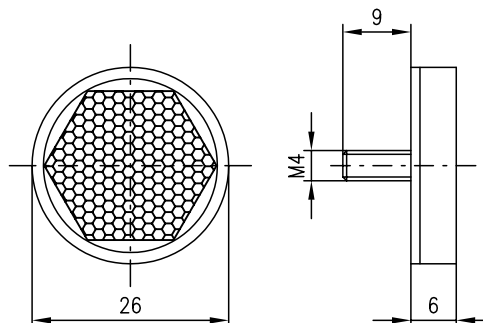
TK 20



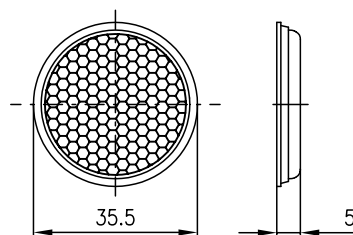
TK 25



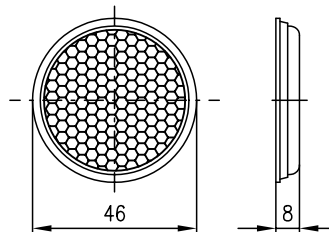
TKS 25

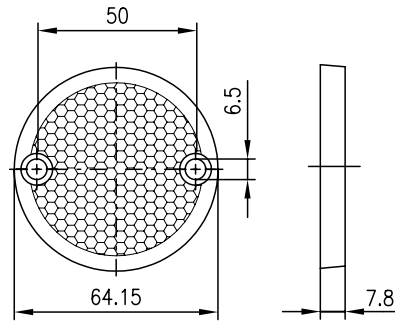
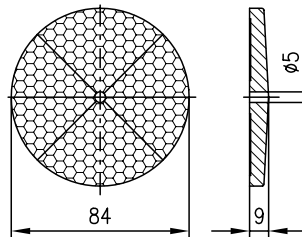
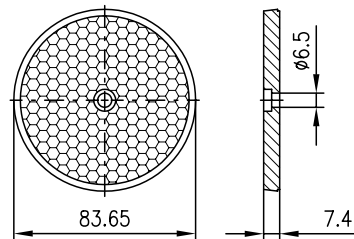
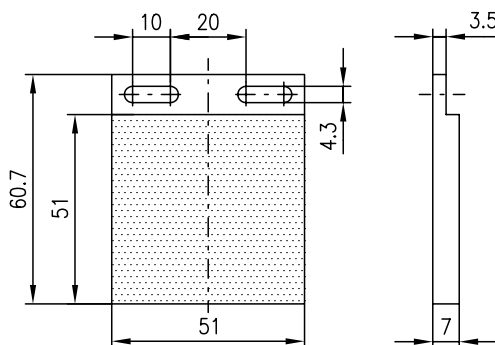


TK 35



TK 45



Dimensioned drawings
TK 60

TK 82

TK 82.2

MTKS 50x50

Explanations
Reflector TK 60 (Part No. 500 03186)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type, adhesive

Reflector TK 82 (Part No. 500 03187)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type

Note:

Constant reflection values through segmented triple areas (no preferred direction)

Reflector TK 82.2 (Part No. 500 24127)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type

Micro triple MTKS 50x50

(Part No. 500 36188)

Material: plastic PMMA 8N (plexiglass)

Temperature range: -20°C ... +80°C

Mounting: screw type

Explanations
Reflector TG 60 (Part No. 500 03179)

Material: glass

Temperature range: -20°C ... +120°C

Mounting: thread bolt

Reflector TG 29 (Part No. 500 09374)

Material: glass

Temperature range: -20°C ... +120°C

Mounting: thread bolt

Reflector TG 15 (Part No. 500 03177)

Material: glass

Temperature range: -20°C ... +120°C

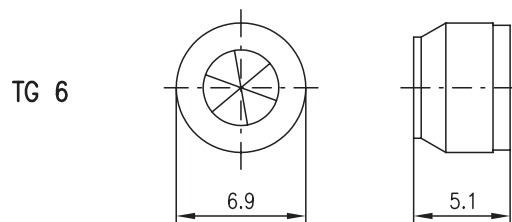
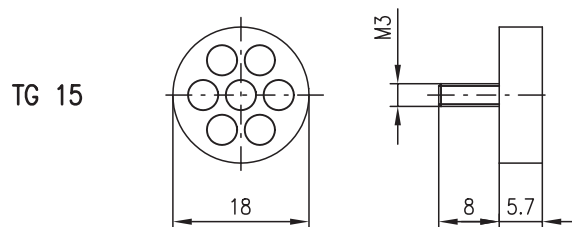
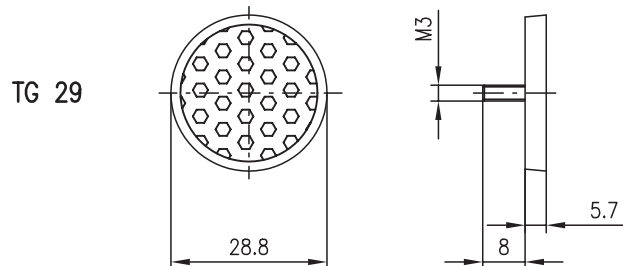
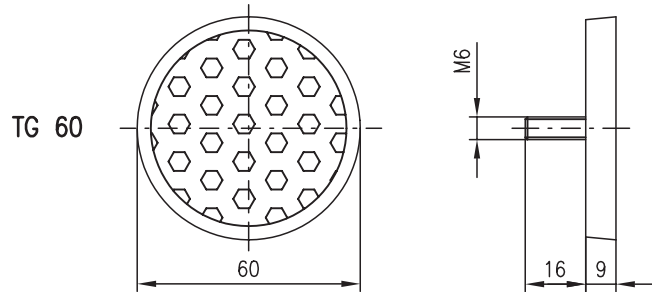
Mounting: thread bolt

Reflector TG 6 (Part No. 500 03176)

Material: glass

Temperature range: -20°C ... +120°C

Mounting: adhesive, pressable

Dimensioned drawings


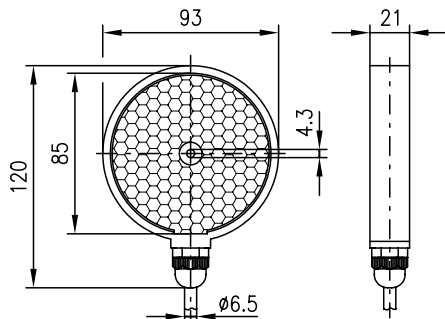


Dimensioned drawings

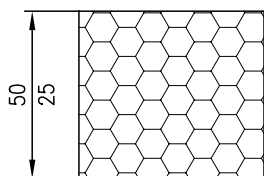
HTK 82 (230V AC)

HTK 82-115V

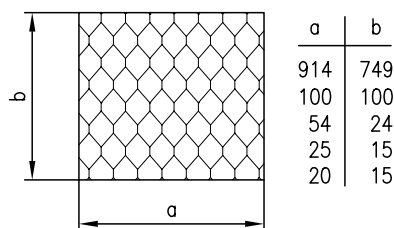
HTK 82-24V



Reflective 5870



Reflective Nr.2

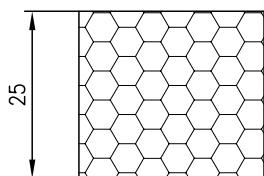


a	b
914	749
100	100
54	24
25	15
20	15

Important note!



Reflective Nr.4



Explanations

Heatable reflectors

HTK 82 (Part No. 500 00068)

HTK 82-115V (Part No. 500 00069)

HTK 82-24V (Part No. 500 00071)

Material: plastic

Temperature range: -20°C ... +80°C

Mounting: screw type

Cable length: 2000mm

Cable cross-section: 2x0.75mm²

Voltage (HTK 82...) Power consumption

24 VAC/DC 2.8W

110 VAC 2.0W

230 VAC 3.4W

Reflective tape 5870

(Part No. 500 09812/500 09813)

suitable for retro-reflective photoelectric sensors **without** polarisation filter

Material: plastic, cuttable

Width: - 25mm or 50mm

- cut goods

- other dimensions upon request

Thickness: 0.4 mm

Temperature range: -20°C ... +60°C

Mounting: self-adhesive

Reflective tape No. 2 (Part No. 500 11523/)

suitable for retro-reflective photoelectric sensors **with/without** polarisation filter

Material: plastic, cuttable

Width: - 100x100mm

- Sheet 914x749mm

Thickness: 0.5 mm

Temperature range: -20°C ... +60°C

Mounting: self-adhesive

Note:

The highest reflection values are reached with vertical alignment of the optical axis.

Reflective tape No. 4 (Part No. 500 38062/)

Data: see reflective tape No. 2

Note:

The highest reflection values are reached with vertical alignment of the optical axis.

No preferred direction



Explanations

Reflector PTKS 20x40 (Part No. 500 32273)

Housing material: aluminium anodised

Front cover: glass

Temperature range: -10°C ... +50°C

Mounting: screw type, adhesive

Reflector PTKS 50x50 (Part No. 500 60946)

Housing material: aluminium anodised

Front cover: glass

Temperature range: -10°C ... +50°C

Mounting: screw type, adhesive

Reflector PTKS 100x100 (Part No. 500 36095)

Housing material: aluminium anodised

Front cover: glass

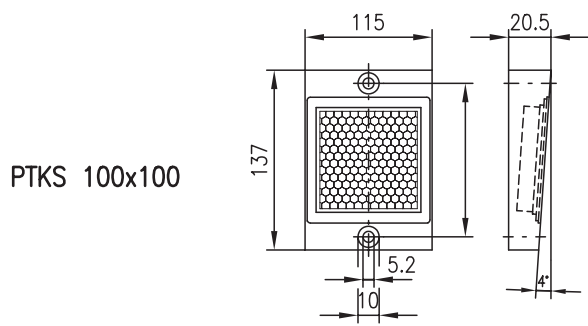
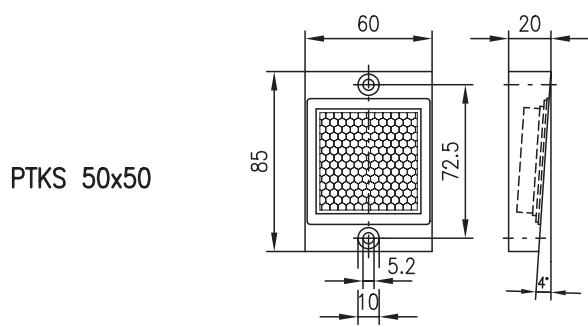
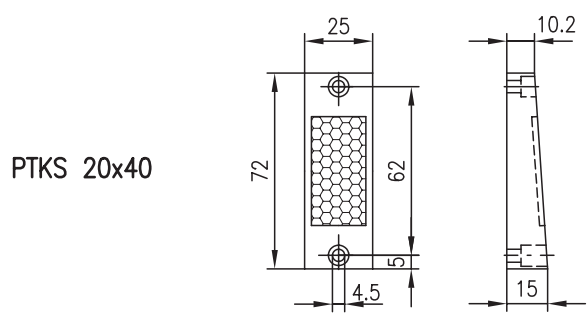
Temperature range: -10°C ... +50°C

Mounting: screw type, adhesive

Note:

The reflectors PTKS 20x40, PTKS 50x50 and PTKS 100x100 have to be installed in the correct position.

Dimensioned drawings





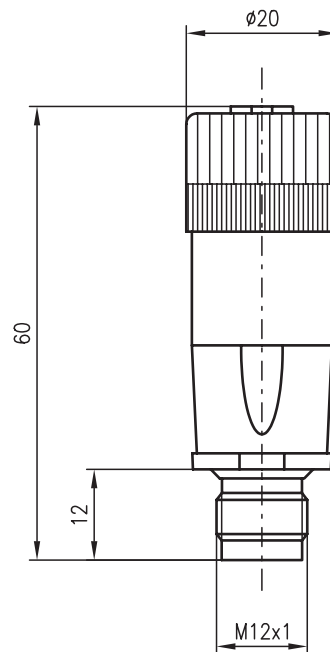


ZK T/4...

Time module

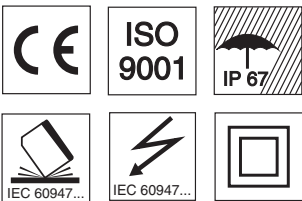


Dimensioned drawing

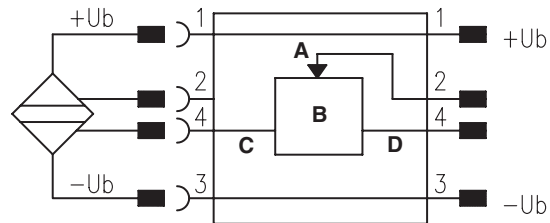


10 - 30 V
DC

- Programmable timer for pickup and dropout delay
- Direct adaptation between sensor and connecting cable
- Teach-in as turn-on or turn-off delay possible
- Simple setting by means of external teach-in
- No additional installation requirements
- Time range 1 – 65535ms
- Switching amplifier up to 400 mA



Electrical connection



- A Teach input
- B Timer
- C Input
- D Output

Accessories:
(available separately)

We reserve the right to make changes • zkt4_e.fm

Specifications

Timing

Switching frequency 10Hz (factory setting: 100ms dropout delay)
 Response time 0.1ms

Electrical data

Operating voltage U_B 10 ... 30VDC (incl. residual ripple)
 Residual ripple $\leq 10\%$ of U_B
 Bias current ≤ 400 mA, short-circuit proof
 Switching output PNP transistor
 Function characteristics factory setting: 100ms dropout delay
 Signal voltage high/low $\geq (U_B - 2V) / \leq 2V$ (PNP)
 Output current max. 400mA, short-circuit proof
 Power consumption ≤ 10 mA
 Input resistance ≥ 10 k Ω
 Input frequency ≤ 10 kHz

Indicators

LED red

Mechanical data

Housing plastic, PBTP/PA
 Dimensions $\varnothing 20 \times 60$
 Weight 15g
 Connection type input – M12 socket, 4-pin
 output – M12 plug, 4-pin

Environmental data

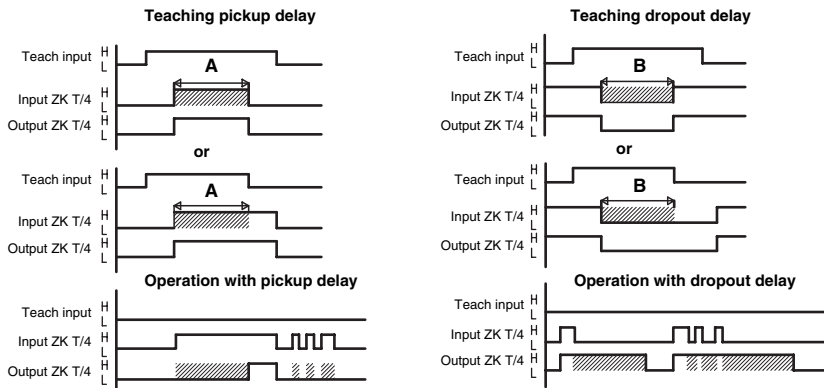
Ambient temp. (operation/storage) 0°C ... +60°C / -20°C ... +60°C
 Protection class IP 67
 Safety class II, only with connection at both ends, all-insulated

Remarks

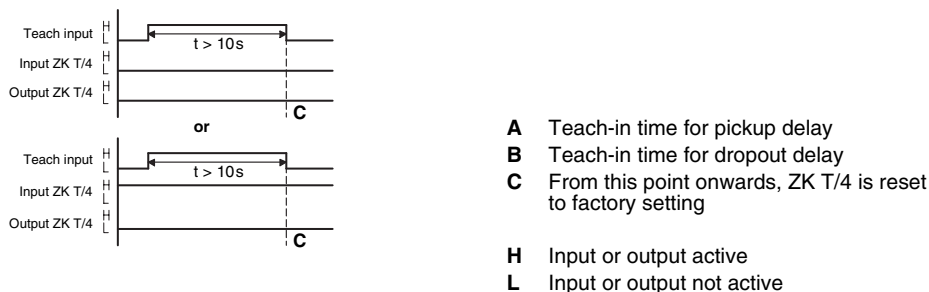
Adjustment

- The delay time is set using the "teaching input" and "input" signals. If, for example, a delay time of 4sec. is required, it can be set in the following way (the operating voltage must be switched on beforehand):
 1. Connect teaching input to $+U_B$
 2. Actuate sensor for 4sec.
 3. Disconnect teaching input from $+U_B$
- finished!
- Once the setting has been made, the device has a pickup delay of 4sec. The setting is retained even when the device is switched off.

Teaching pickup and dropout delay



Resetting to factory setting:
 100ms dropout delay



Order guide

Designation	Part No.
ZK T/4.00-S12	500 37113





Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

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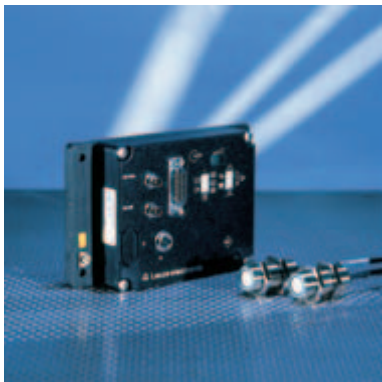




Further product range

Please order documents separately

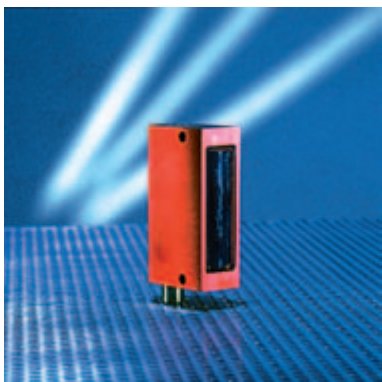




Double sheet testing units

Double sheet testing units prevent the pulling-in of double paper/cardboard sheets or foils on printing/paper processing machines or in packaging applications. The optimal solution for every application can be found due to the different physical principles of operation.

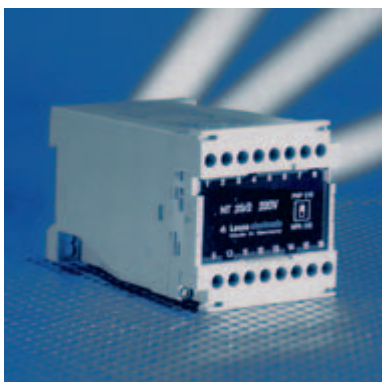
- DB 07 Optical system for control with the transmitted light process and manual adjustment.
- DB 11 Optical/capacitive system with automatic calibration for clock-controlled machines.
- DB 12 Ultrasonic system with varying functionality.
- DB 13 Ultrasonic system for connection of two detection units.
- DB 14 Ultrasonic/capacitive system with wide detection range and highest functionality.



Light attachment ILS 171

Throughbeam light attachment with dynamic switching behaviour for detection of small objects (e.g. ejection control).

	Operating range	Operating voltage	Switching output	Connection
ILS 171	1.5m/4m	24VDC	PNP	Plug



NT power supply units

The power supply units supply connected photoelectric sensors with 24VDC voltage. Relays are available for switching larger loads.

	Number of sensors	Operating voltage	Output	Connection	Sensor connection	Mounting type
NT 1/3	3	AC	Relay	Terminals	PNP/NPN	Screws
NT 7	1	AC	Relay	Terminals	PNP/NPN	Screws
NT 21	1	AC	Relay	Terminals	PNP/NPN	Screws, standard rail
NT 23/2	2	AC	Relay	Terminals	PNP/NPN	Screws, standard rail
NT 30	2	AC	Relay	Terminals	PNP/NPN	Screws



80 Series

Compact photoelectric sensor series in robust plastic housing

AC/DC respectively UC supply voltages as well as PNP/NPN or relay outputs enable unproblematic application in almost any environment.

4 through-borings enable a large number of installation possibilities even in mechanically difficult environment.

Type	Functions	Operating range/ Scanning range	Operating voltage	Output	Connection
RK 80/7	Retro-reflective photoelectric sensor	3m	20 ... 250VUC	Relay	Cable
RK 80/2	Retro-reflective photoelectric sensor	3m	11 ... 30VDC	NPN	Cable
RK 80/4	Retro-reflective photoelectric sensor	3m	11 ... 30VDC	PNP	Cable
RK 80/2GD	Retro-reflective photoelectric sensor	2m	24V ±10%	NPN	Cable
RK 80/2-200	Energetic scanner	200mm	11 ... 30VDC	NPN	Cable
RK 80/4-200	Energetic scanner	200mm	11 ... 30VDC	PNP	Cable
LS 80/7	Throughbeam photoelectric sensor	8m	230VAC	Relay	Cable

Accessories: Alignment angle BT 80 for universal fastening and exact alignment of the sensors.



Optical tool breakage control

Compact laser throughbeam photoelectric sensor for reliable detection of the smallest drillers, from e.g. >0.8mm.

The conception of the sensor enables the static and dynamic control at a desired point up to 8m distance between transmitter and receiver.

Visible light spot, receiver-side multi display (signal size) and integrated alignment / mounting system enable time saving, optimal adjustment of transmitter and receiver.

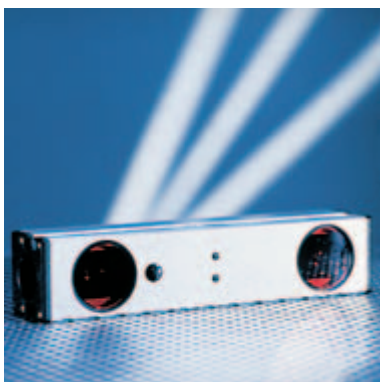
Warning output for contamination message.

Connection for pressurised air to keep the optical surfaces constantly clean, even under especially rough environmental conditions.

Designation	Operating range	Operating voltage	Output	Connection
BKL 706	8m ¹⁾	10 ... 30VDC	Static PNP Dynamic NPN ²⁾	Cable PUR or PVC

¹⁾ Longer operating ranges possible without diaphragms

²⁾ Pulse length on request



Diffuse reflection light scanner with background suppression

FRK 61, FRK 173

Robust construction with metal housing for most demanding requirements.

Reliable detection of almost every object with background suppression.

Two separately adjustable scanning ranges at the DFRK 61 allow for two separate switching points.

Voltage free switching output (relay/change-over), slow operation/slow release at the FRK 173 for optimal adjustment to the application.

Designation	Scanning range	Operating voltage	Output	Connection
DFRK 61	1/2m Two independent scanning ranges	DC	PNP	Plug
FRK 61	2m	DC	PNP	Plug
FRK 173/R-2000 DL	2m	11 ... 30VDC 11 ... 24VAC	Relay	M12





Optical Sensor ABCs

Cubic Series

Cylindrical Series – Mini photoelectric sensors – Fibre optic devices

Forked Photoelectric Sensors

Measuring Sensors

Contrast Scanners – Colour Sensors – Luminescence Scanners

Explosion Protection

Protective Photoelectric Sensors – Type 2

Accessories

Further Product Range

Appendix – Index





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500 61198	107	500 80319	129	500 80573	591
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