



**DS 60**  
**Distance Sensor**



## Application Field

The DS 60 distance sensors operate according to the principle of time of flight measurement. The compact sensor makes large and adjustable scanning distances possible with very precise distance detection.

Almost any objects, including tilted ones, are detected dependably in front of a shiny background (e.g., zinc-coated steel sheets or window panes) within the scanning range.

A connectable pilot light simplifies precise alignment on the scanning object.

One sensor model with a red light laser and a small light spot makes the detection of even the smallest objects at large distances possible. Precise alignment is made using a visible, red laser beam.

Another sensor model operates using Diamond Grade reflective tape. This switches when the reflective tape falls short of the previously set distance (not comparable to a photoelectric switch during light path interruption).

Two switching outputs signal whether the set distances are reached.

## DS 60 Dt0 IR Distance to Object, Infrared Light

### Variant Dt0 IR – Application field

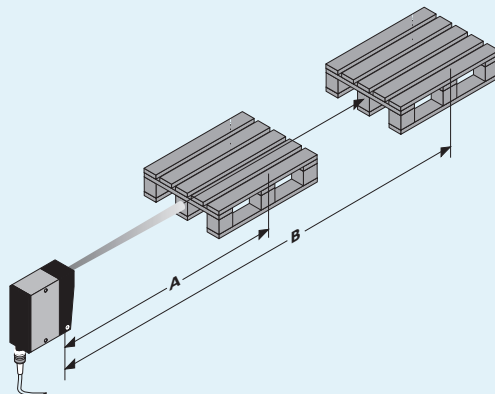
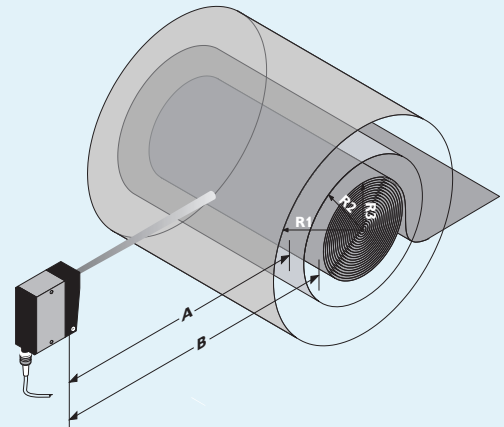
Detecting the distance between sensor and object.

The object can move toward the sensor during positioning.

Falling short of the previously set distance triggers the switching outputs.

#### ► Task:

Determining the diameter of a (shining) aluminum or (dark) steel coil.  
The distances A (switching output  $Q_1$ ) and B (switching output  $Q_2$ ) are taught in.  
Radius R1 = switching distance A:  
switching output  $Q_1$  is actuated,  
Radius R2 = switching distance B:  
switching output  $Q_2$  is actuated.



#### ◀ Task:

Detecting whether a compartment is vacant or contains one or two Euro-pallets.  
The sensor model with a 12 mm light spot measurement is especially suitable for precise detection of a pallet foot at a great distance. Problem-free alignment of the sensor using the pilot light.

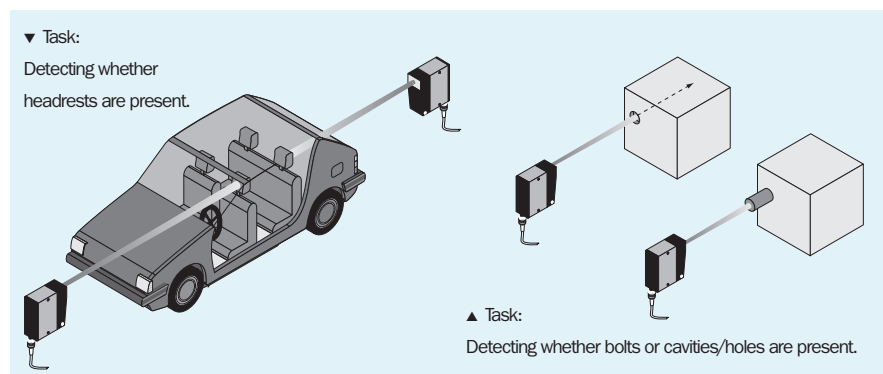
## DS 60 Dt0 R

### Distance to Object, Red Light

#### Variant Dt0 R – Application field

Detecting smaller objects and cavities or holes.

The object can move toward the sensor during positioning. Falling short of the previously set distance triggers the switching output.



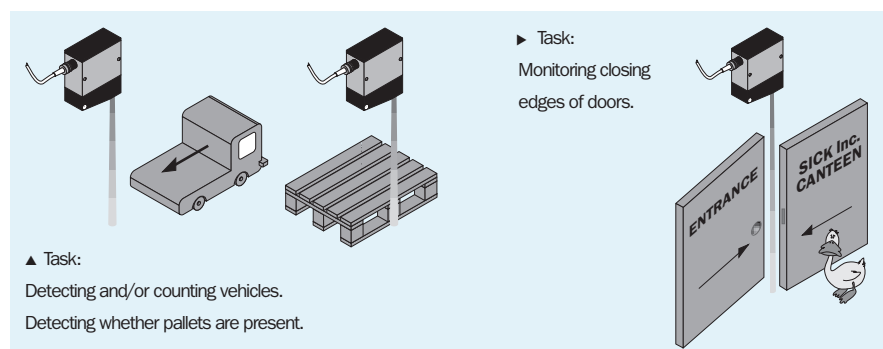
## DS 60 ObSB IR

### Object between Sensor and Back- ground, Infrared Light

#### Variant ObSB IR – Application field

Similar to a photoelectric reflex switch only that no reflector is required, but instead a stationary background (e.g., a floor).

The distance to the background is set, not the distance to the object. The switching output is triggered when an object is between the background and the sensor.



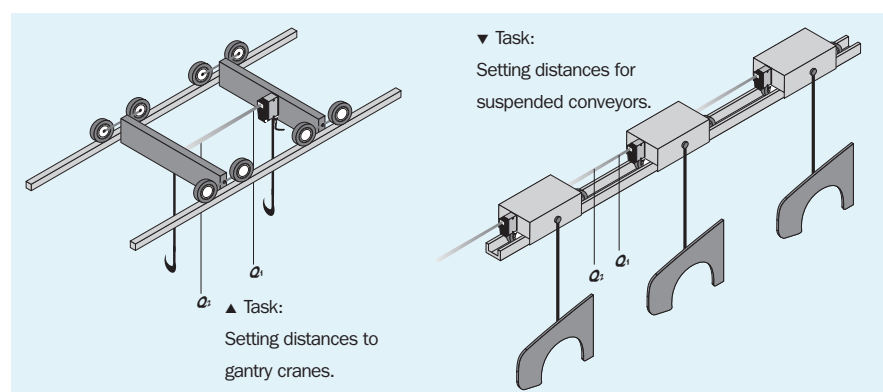
## DS 60 DtR IR


### Distance to Diamond Grade Reflective Tape, Infrared Light

#### Variant DtR IR – Application field

Setting distances from cranes, suspended conveyors and conveyors on the ground. The sensor function can be checked via a test input. A distance of up to 20 m can be separated into three sectors on the Diamond Grade reflective tape:

- Distance to tape greater than the taught-in distances  $Q_1$  and  $Q_2$
- Distance to tape between  $Q_1$  and  $Q_2$
- Distance to tape shorter than  $Q_1$



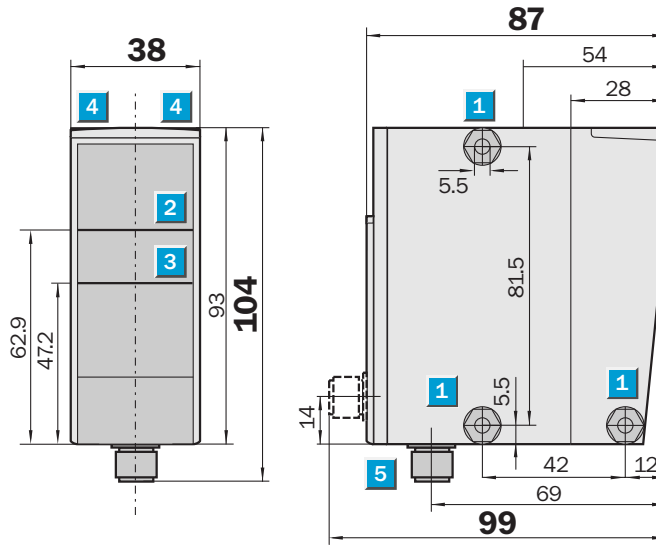

**Scanning Distance**  
**200 to 6000 mm**

Distance Sensor

- Background suppression up to 100 m against shiny objects
- High target dynamic: black ... extremely shiny
- Two function LED
- Red Pilot Light
- Teach-in



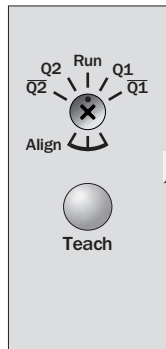
### Dimension illustration



### Setting options

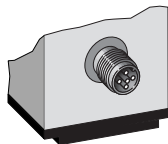
DS 60-P/-N21111  
 DS 60-P/-N21311  
 DS 60-P/-N41111  
 DS 60-P/-N41311  
 DS 60-P41111-S03

- 1 Mounting hole  $\varnothing$  5.2 mm
- 2 Optical axis – sender
- 3 Optical axis – receiver
- 4 Status indicator
- 5 M 12 plug, 5-pin
- 6 Control panel

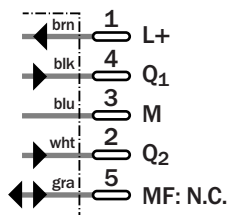


### Connection type

DS 60-P/-N21111	DS 60-P/-N41111	DS 60-P41111-S03
DS 60-P/-N21311	DS 60-P/-N41311	



### 5-pin, M 12



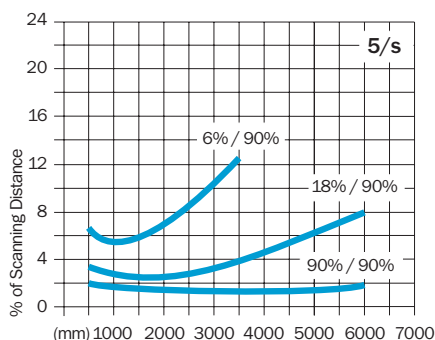
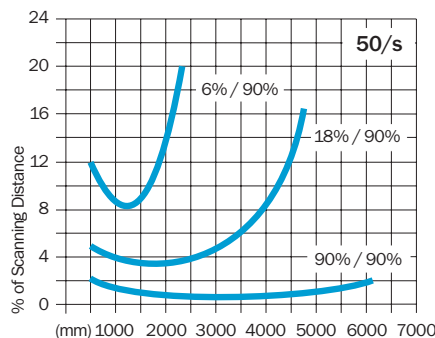
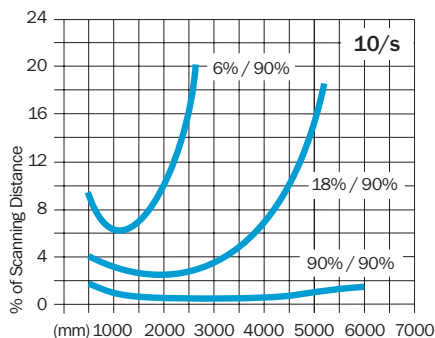
Technical data		DS 60	-P 21111	-N 21111	-P 21311	-N 21311	-P 41111	-N 41111	-P 41311	-N 41311	-P 41111- S03
Type of connection	M 12 plug, 5-pin										
Scanning distance, adjustable	200 mm to 6000 mm										
Object with 3% remission	80 mm to 1400 mm										
	80 mm to 1600 mm										
	80 mm to 1750 mm										
Object with 6% remission	80 mm to 2400 mm										
	80 mm to 2600 mm										
	80 mm to 3000 mm										
Object with 18% remission	80 mm to 4600 mm										
	80 mm to 5000 mm										
	80 mm to 5650 mm										
Object with 90% remission <sup>1)</sup>	80 mm to 6000 mm										
Light source <sup>2)</sup>	Laser diode, infrared										
Light spot at 6 m distance	∅ 60 mm										
	∅ 12 mm										
Supply voltage $V_s$ <sup>3)</sup>	18 to 30 V DC										
Power consumption <sup>4)</sup>	< 3 W										
Ripple <sup>5)</sup>	≤ 5 V <sub>pp</sub>										
Switching outputs (invertable)	Q <sub>1</sub> , Q <sub>2</sub>										
DS 60-P: PNP	HIGH = V <sub>s</sub> - (< 2 V)/LOW = 0 V										
DS 60-N: NPN	HIGH = V <sub>s</sub> /LOW ≤ 2 V										
Output current <sup>6)</sup>	100 mA										
Switching frequency	50/s										
	10/s										
	5/s										
Switching limit Q <sub>1</sub> /Q <sub>2</sub>	adjustable (Teach-in)										
Time delay	on request										
Multifunction MF	N.C./External Teach on request										
VDE protection class <sup>7)</sup>	II										
Laser protection class	1 (EN 60 825-1)										
Enclosure rating	IP 67										
Ambient temperature <sup>8)</sup>	Operation - 25 to + 50 °C										
	Storage - 25 to + 75 °C										
Weight	202 g										

1) Also shiny  
 2) Average service life 100 000 h, at room temperature = + 25 °C  
 3) Limit values, reverse polarity protected

4) Without load  
 5) Must be within V<sub>s</sub> tolerances  
 6) Outputs Q<sub>1</sub> and Q<sub>2</sub> short-circuit protected


7) Withstand voltage 50 V DC  
 8) Do not distort cable below 0 °C

Scanning distance



Ordering information

Type	Part no.
DS 60-P21111	1 016 361
DS 60-P21311	1 016 393
DS 60-P41111	1 016 687
DS 60-P41311	1 016 689
DS 60-N21111	1 016 394
DS 60-N21311	1 016 686
DS 60-N41111	1 016 688
DS 60-N41311	1 016 690
DS 60-P41111-S03	1 023 745

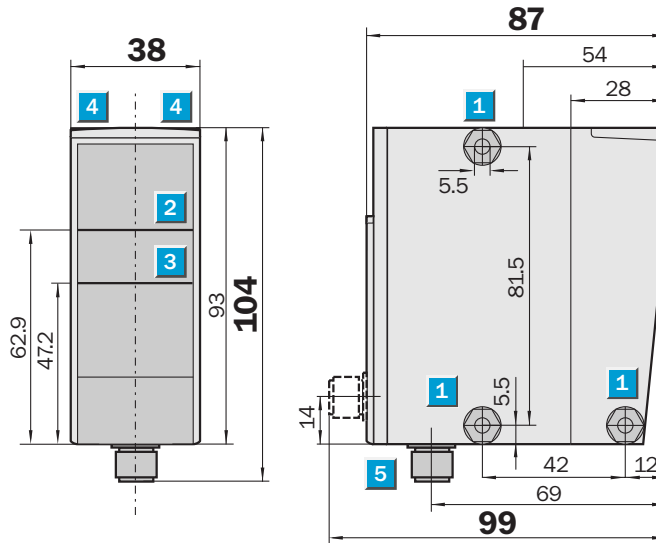

**Scanning Distance**  
**200 to 6000 mm**

Distance Sensor

- Background suppression up to 100 m against shiny objects
- High target dynamic: black ... extremely shiny
- Two function LED
- Precise alignment by red laser light
- Teach-in



### Dimension illustration



### Setting options

DS 60-P/-N21211

DS 60-P/-N41211

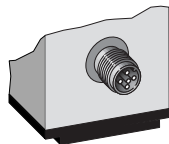


- 1 Mounting hole  $\varnothing$  5.2 mm
- 2 Optical axis – sender
- 3 Optical axis – receiver
- 4 Status indicator
- 5 M 12 plug, 5-pin
- 6 Control panel

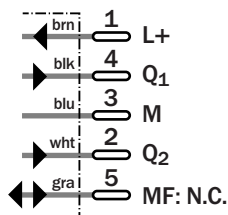
### Connection type

DS 60-P/-N21211

DS 60-P/-N41211



5-pin, M 12



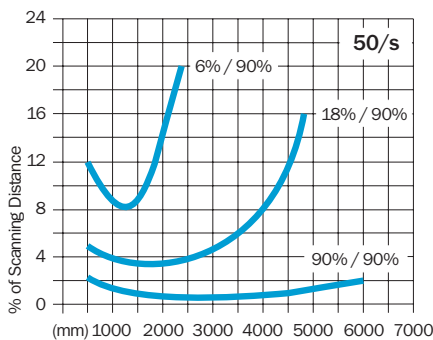
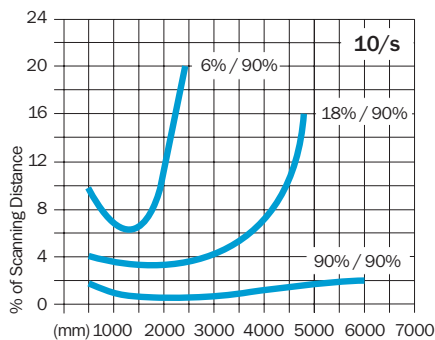
Technical data		DS 60		-P	-N	-P	-N						
				21211	21211	41211	41211						
<b>Type of connection</b>	M 12 plug, 5-pin												
<b>Scanning distance, adjustable</b>	200 mm to 6000 mm												
Object with 3% remission	80 mm to 1400 mm												
	80 mm to 1600 mm												
Object with 6% remission	80 mm to 2400 mm												
	80 mm to 2600 mm												
Object with 18% remission	80 mm to 4600 mm												
	80 mm to 5000 mm												
Object with 90% remission <sup>1)</sup>	80 mm to 6000 mm												
<b>Light source <sup>2)</sup></b>	Laser diode, red												
Light spot at 4.5 m distance	Ø 9 mm												
<b>Supply voltage <math>V_s</math> <sup>3)</sup></b>	18 to 30 V DC												
<b>Power consumption <sup>4)</sup></b>	< 3 W												
<b>Ripple <sup>5)</sup></b>	≤ 5 V <sub>pp</sub>												
<b>Switching outputs (invertable)</b>	Q <sub>1</sub> , Q <sub>2</sub>												
DS 60-P: PNP	HIGH = V <sub>s</sub> - (< 2 V)/LOW = 0 V												
DS 60-N: NPN	HIGH = V <sub>s</sub> /LOW ≤ 2 V												
<b>Output current <sup>6)</sup></b>	100 mA												
<b>Switching frequency</b>	50/s												
	10/s												
Switching limit Q <sub>1</sub> /Q <sub>2</sub>	adjustable (Teach-in)												
Time delay	on request												
<b>Multifunction MF</b>	N.C./External Teach on request												
<b>VDE protection class <sup>7)</sup></b>	II												
<b>Laser protection class</b>	2 (EN 60 825-1)												
<b>Enclosure rating</b>	IP 67												
<b>Ambient temperature <sup>8)</sup></b>	Operation - 25 to + 50 °C												
	Storage - 25 to + 75 °C												
<b>Weight</b>	202 g												

<sup>1)</sup> Also shiny  
<sup>2)</sup> Average service life 50 000 h, at room temperature = + 25 °C  
<sup>3)</sup> Limit values, reverse polarity protected

<sup>4)</sup> Without load  
<sup>5)</sup> Must be within V<sub>s</sub> tolerances  
<sup>6)</sup> Outputs Q<sub>1</sub> and Q<sub>2</sub> short-circuit protected


<sup>7)</sup> Withstand voltage 50 V DC  
<sup>8)</sup> Do not distort cable below 0 °C

**Scanning distance**



**Ordering information**

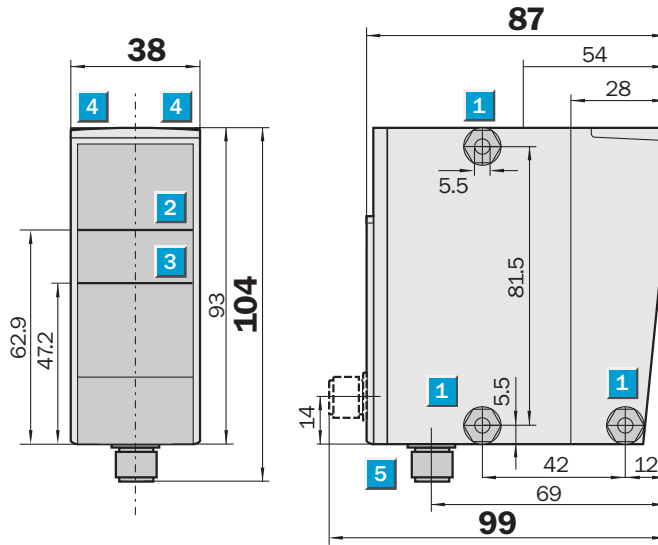
Type	Part no.
DS 60-P21211	1 016 396
DS 60-N21211	1 016 491
DS 60-P41211	1 016 691
DS 60-N41211	1 016 692

	<b>Scanning Distance</b> 200 to 6000 mm
<b>Distance Sensor</b>	

- Detection of extremely dark and shiny objects against a background
- High target dynamic: black ... extremely shiny
- Two function LED
- Red Pilot Light
- Teach-in



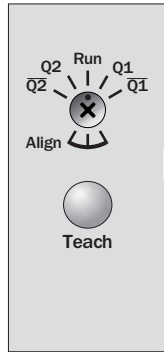
**Dimension illustration**



**Setting options**

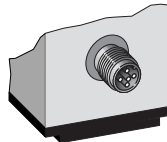
DS 60-P/-N31111
DS 60-P/-N31311
DS 60-P/-N51111
DS 60-P/-N51311

- 1 Mounting hole  $\varnothing$  5.2 mm
- 2 Optical axis – sender
- 3 Optical axis – receiver
- 4 Status indicator
- 5 M 12 plug, 5-pin
- 6 Control panel

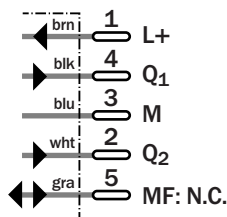


**Connection type**

DS 60-P/-N31111	DS 60-P/-N51111
DS 60-P/-N31311	DS 60-P/-N51311



**5-pin, M 12**





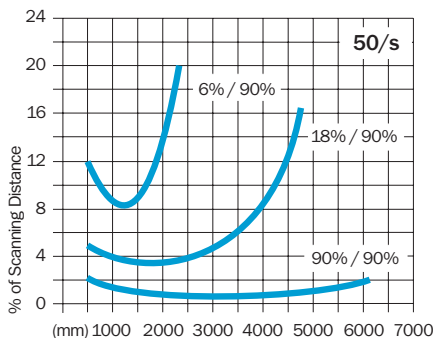
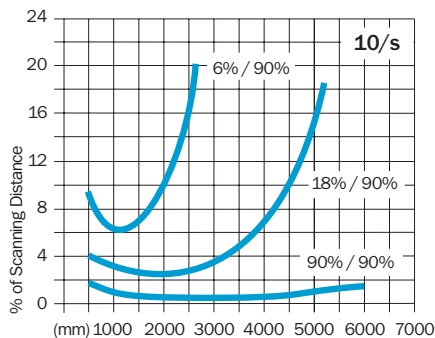
Technical data		DS 60		-P	-N	-P	-N	-P	-N	-P	-N		
				31111	31111	31311	31311	51111	51111	51311	51311		
Type of connection	M 12 plug, 5-pin												
Scanning distance, adjustable	200 mm to 6000 mm												
Object with 3% remission	80 mm to 1400 mm												
	80 mm to 1600 mm												
Object with 6% remission	80 mm to 2400 mm												
	80 mm to 2600 mm												
Object with 18% remission	80 mm to 4600 mm												
	80 mm to 5000 mm												
Object with 90% remission <sup>1)</sup>	80 mm to 6000 mm												
Light source <sup>2)</sup>	Laser diode, infrared/ Laser diode, red light on request												
Light spot at 6 m distance	∅ 60 mm ∅ 12 mm												
Supply voltage $V_s$ <sup>3)</sup>	18 to 30 V DC												
Power consumption <sup>4)</sup>	< 3 W												
Ripple <sup>5)</sup>	≤ 5 V <sub>pp</sub>												
Switching outputs (invertable)	Q <sub>1</sub> , Q <sub>2</sub>												
DS 60-P: PNP	HIGH = V <sub>s</sub> - (< 2 V)/LOW = 0 V												
DS 60-N: NPN	HIGH = V <sub>s</sub> /LOW ≤ 2 V												
Output current <sup>6)</sup>	100 mA												
Switching frequency	50/s 10/s												
Switching limit Q <sub>1</sub> /Q <sub>2</sub>	adjustable (Teach-in)												
Time delay	on request												
Multifunction MF	N.C./External Teach on request												
VDE protection class <sup>7)</sup>	II												
Laser protection class	1 (EN 60 825-1)												
Enclosure rating	IP 67												
Ambient temperature <sup>8)</sup>	Operation - 25 to + 50 °C Storage - 25 to + 75 °C												
Weight	202 g												

<sup>1)</sup> Also shiny  
<sup>2)</sup> Average service life 100 000 h, at room temperature = + 25 °C  
<sup>3)</sup> Limit values, reverse polarity protected

<sup>4)</sup> Without load  
<sup>5)</sup> Must be within V<sub>s</sub> tolerances  
<sup>6)</sup> Outputs Q<sub>1</sub> and Q<sub>2</sub> short-circuit protected


<sup>7)</sup> Withstand voltage 50 V DC  
<sup>8)</sup> Do not distort cable below 0 °C

Scanning distance



Ordering information

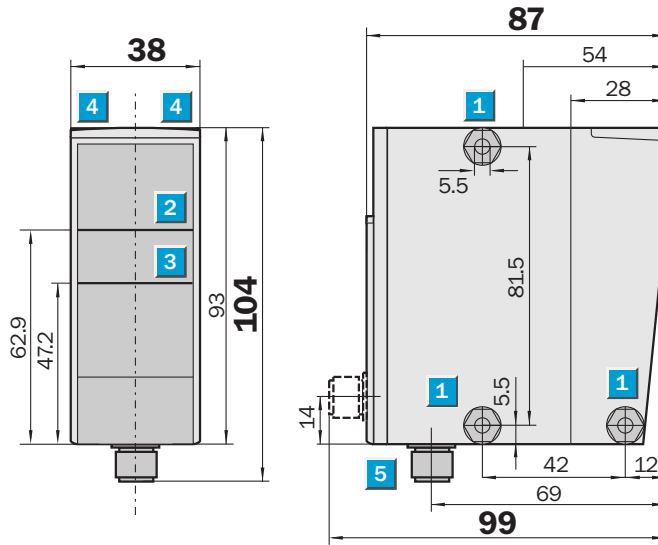
Type	Part no.
DS 60-P31111	1 016 493
DS 60-P31311	1 016 693
DS 60-P51111	1 016 695
DS 60-P51311	1 016 697
DS 60-N31111	1 016 494
DS 60-N31311	1 016 694
DS 60-N51111	1 016 696
DS 60-N51311	1 016 698

	<b>Scanning Range</b> 80 to 20 000 mm
<b>Distance Sensor</b>	

- Distance to reflective tape diamond grade
- Two switching outputs
- Two function LED
- Red Pilot Light
- Teach-in setup of switching outputs according to the distance of reflective tape



**Dimension illustration**



**Setting options**

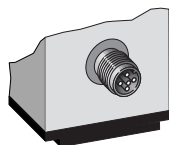
DS 60-P/-N11121



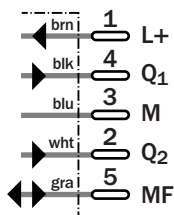
- 1 Mounting hole  $\varnothing$  5.2 mm
- 2 Optical axis – sender
- 3 Optical axis – receiver
- 4 Status indicator
- 5 M 12 plug, 5-pin
- 6 Control panel

**Connection type**

DS 60-P/-N11121



5-pin, M 12



Technical data		DS 60		-P	-N								
				11121	11121								
<b>Type of connection</b>	M 12 plug, 5-pin												
<b>Scanning range, adjustable</b>	80 mm to 20 000 mm												
Reflective tape	Diamond Grade												
<b>Light source</b> <sup>1)</sup>	Laser diode, infrared												
Light spot at 20 000 mm distance	Ø 200 mm												
<b>Supply voltage V<sub>S</sub></b> <sup>2)</sup>	18 to 30 V DC												
<b>Power consumption</b> <sup>3)</sup>	< 3 W												
<b>Ripple</b> <sup>4)</sup>	≤ 5 V <sub>pp</sub>												
<b>Switching outputs (invertable)</b>	Q <sub>1</sub> , Q <sub>2</sub>												
DS 60-P: PNP	HIGH = V <sub>S</sub> - (< 2 V)/LOW = 0 V												
DS 60-N: NPN	HIGH = V <sub>S</sub> /LOW ≤ 2 V												
<b>Output current</b> <sup>5)</sup>	100 mA												
<b>Switching frequency</b>	50/s												
Switching limit Q <sub>1</sub> /Q <sub>2</sub>	adjustable (Teach-in)												
Time delay	on request												
<b>Multifunction MF</b>	Test-input/External Teach on request												
Sender on	< 2 V or open-circuit												
	V <sub>S</sub> - (< 2 V) or open-circuit												
Sender off	> 12 V to < V <sub>S</sub>												
	0 V to V <sub>S</sub> - (> 12 V)												
<b>VDE protection class</b> <sup>6)</sup>	II												
<b>Laser protection class</b>	1 (EN 60 825-1)												
<b>Enclosure rating</b>	IP 67												
<b>Ambient temperature</b> <sup>7)</sup>	Operation - 25 to + 50 °C												
	Storage - 25 to + 75 °C												
<b>Weight</b>	202 g												

<sup>1)</sup> Average service life 100 000 h, at room temperature = + 25 °C

<sup>2)</sup> Limit values, reverse polarity protected

<sup>3)</sup> Without load

<sup>4)</sup> Must be within V<sub>S</sub> tolerances

<sup>5)</sup> Outputs Q<sub>1</sub> and Q<sub>2</sub> short-circuit protected

<sup>6)</sup> Withstand voltage 50 V DC

<sup>7)</sup> Do not distort cable below 0 °C

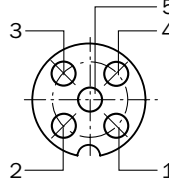
#### Ordering information

Type	Part no.
DS 60-P11121	1 016 397
DS 60-N11121	1 016 492

## Dimensional drawings and order information

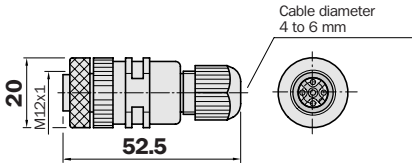
- Contact assignments according to EN 50044
- DC coding

Pin assignments  
 Pin 1 = brown  
 Pin 2 = white  
 Pin 3 = blue  
 Pin 4 = black  
 Pin 5 = grey



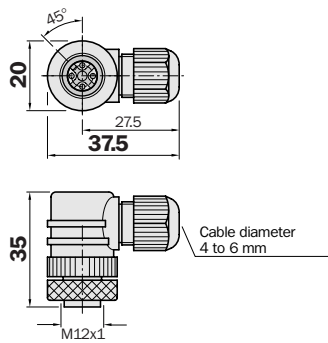
### Female connector M 12, 5-pin, straight

Type	Part no.	Contacts
DOS-1205-G	6 009 719	5



### Female connector M 12, 5-pin, right angle

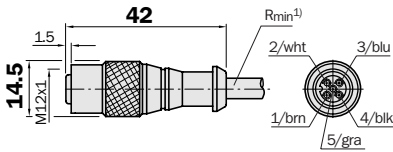
Type	Part no.	Contacts
DOS-1205-W	6 009 720	5



### Female connector M 12, 5-pin, straight

Cable Ø 5/6 mm, 5 x 0.25 mm<sup>2</sup>, sheath PVC

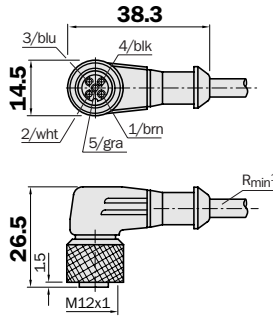
Type	Part no.	Contacts	Cable length
DOL-1205-G02M	6 008 899	5	2 m
DOL-1205-G05M	6 009 868	5	5 m
DOL-1205-G10M	6 010 544	5	10 m



### Female connector M 12, 5-pin, right angle

Cable Ø 5/6 mm, 5 x 0.25 mm<sup>2</sup>, sheath PVC

Type	Part no.	Contacts	Cable length
DOL-1205-W02M	6 008 900	5	2 m
DOL-1205-W05M	6 009 869	5	5 m
DOL-1205-W10M	6 010 542	5	10 m

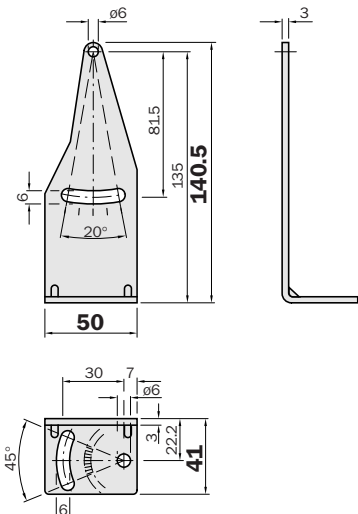


<sup>1)</sup> Minimum bend radius in dynamic use  
 $R_{min} = 20 \times \text{cable diameter}$

<sup>1)</sup> Minimum bend radius in dynamic use  
 $R_{min} = 20 \times \text{cable diameter}$

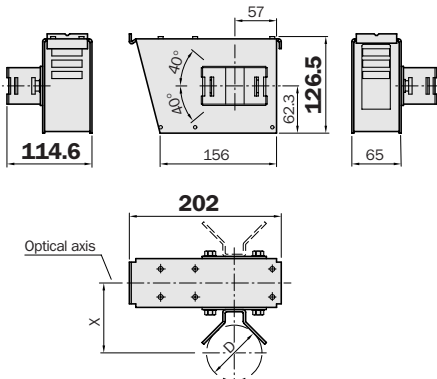
### Mounting bracket

Type	Part no.
BEF-WN-DS60	4 032 937



### Weather hood housing

Type	Part no.*
WSG1-01	1 018 470



\* Mounting materials included

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