

pH / ORP

**THORNTON**

Leading Pure Water Analytics

- Two channels of pH and/or ORP
- Preamplifiers with VP connectors
- Two analog outputs
- Up to 4 relays



## 200pH Two-Channel pH/ORP Measurement System

**METTLER TOLEDO**

## Key Features

- Two channels, allowing two measurements of pH plus temperature, and/or ORP (Oxidation-Reduction/Redox Potential)
- Combination sensors include measuring and reference electrodes plus RTD with:
  - Dual threads for insertion or submersion mounting
  - No-maintenance, double-junction reference electrode
  - Stainless steel flow-through design for high purity water
- Detachable preamplifiers accept virtually any pH electrode with VP, BNC or S8 connection
- Conventional electrode temperature compensation plus adjustable solution temperature compensation for high purity water ionization effects
- 200 foot sensor-to-instrument cable length
- Backlit LCD alphanumeric display
- Two optional powered current outputs plus RS232
- Up to 4 relays with individually selectable parameter, setpoint, hysteresis and delay
- Selectable function security
- NEMA 4X panel or wall mounting
- Meets CSA/NRTL and CE requirements, UL listed

## Benefits

- Single instrument model for for pure water, industrial process and wastewater measurements with appropriate sensors
- Low cost, easily replaced electrode design
- Rapid startup with pre-calibrated, low maintenance sensors
- Complimentary to Thornton 200 Series conductivity, resistivity and flow instrumentation

## Applications

**Reverse osmosis systems** often require pH adjustment for membrane protection, scale prevention or optimized bicarbonate removal. Additional protection for membranes and ion exchange resins is provided by ORP control of dechlorination. Both can be monitored simultaneously with the dual-channel 200pH instrument.

**Power plant cycle chemistry** uses pH along with specific conductivity to ensure that the proper levels of phosphate, ammonia and/or amine treatment are actually maintained, to minimize corrosion.

**Wastewater neutralization** depends on pH for control of deionizer regeneration waste, various cleaning and rinse operations, precipitation processes, boiler blowdown, etc. ORP can be used to treat plating rinse waters containing chrome or cyanide.

**Pure water pH monitoring** is used as a diagnostic tool. Whenever conductivity or resistivity indicates contamination, a pH value can give more specific information about the nature of the impurity.

**pH control** is provided using the analog output to activate acid or caustic pumps. Alarm limits can be independently signalled with setpoints and relays. On large waste treatment systems, the analog or serial digital outputs can go to a control system to provide proportional control action.

## Temperature Compensation

The Thornton 200pH provides conventional Nernst electrode temperature compensation for the changing output of the measuring electrode with temperature. This is functional all the time (unless measurement is selected in millivolts).

In addition, for high purity water measurements, solution temperature compensation is provided by entering the temperature coefficient of the particular sample composition. This corrects for the changing ionization of high purity water and provides pH referenced to 25°C. Coefficients are provided in the instruction manual for selected applications in pure water and power plant cycle chemistry monitoring.

**Functional**

Ranges:	pH: -1.00 to 15.00 pH ORP: $\pm 1250$ mV Temperature: -40 to 140 °C (-40 to 284 °F)
Resolution:	0.01 pH, 0.1 mV, 0.1 °C
pH Inputs:	From pH and/or ORP electrodes with Thornton preamp and Pt1000 RTD, via accessory patch cords
pH Temp. Compensation:	Conventional (Nernst) electrode temperature compensation plus adjustable solution temperature compensation for high purity water. Manual temperature setting also available.

**Outputs**

Setpoints/Alarms:	Four controlled setpoints can be set as high or low limits. Any relay can be activated by multiple setpoints.
Relays:	Standard: 2 mechanical SPDT, 5 amp at 250 VAC or 30 VDC resistive load Optional, additional: 2 AC-only, solid state, SPST, 1.5 amp, 250 VAC resistive load, 10 mA minimum. All relays are potential-free and have individually adjustable delay and hysteresis (deadband).
Analog Output Signals:	Two optional powered 4-20 mA outputs (recalibratable to 0-20 mA), 500 ohm load maximum, freely scalable to any parameter and range; isolated from input and from ground. Not for use with externally powered circuits.
Serial Output:	RS232, maximum distance of 50 ft (15 m); RS422, maximum distance of 4000 ft (1220 m); field selectable up to 19.2 kbaud (external isolation required).

**Performance**

Accuracy:	$\pm 0.02$ pH, $\pm 2$ mV, $\pm 0.3$ °C
Repeatability:	$\pm 0.01$ pH, $\pm 1$ mV, $\pm 0.2$ °C
Update Rate:	All measurements and outputs, once per second
Ratings/Approvals:	Meets CSA/NRTL and CE requirements; UL Listed
Analog Output Accuracy:	$\pm 0.05$ mA within 15-35°C ambient

**Environmental**

Storage Temp.:	-40 to 70 °C (-40 to 158 °F)
Operating Temp.:	-10 to 55 °C (14 to 131 °F)
Humidity:	0 to 95% RH, non-condensing
General:	If the equipment is used in a manner not specified by Mettler-Toledo Thornton, the protection provided by the equipment may be impaired. For indoor use, Pollution Degree 1.
UL Electrical Environment:	Installation (overvoltage) Category II

**Enclosure**

Display:	16 character backlit LCD (4.8 x 9.6 mm), one or two measurements
Keypad:	11 flush, tactile feedback keys
Material:	ABS-PC polymer alloy
Panel Cutout:	3.78 x 7.56" (96 x 192 mm) DIN
Wall Mount:	Available with accessory back cover
Pipe Mount:	For 1-1/2 to 4" vertical pipe, available with accessory kit and back cover
Weight:	1.9 lb. (0.9 kg)
Rating:	NEMA 4X, IP65 panel mount and accessory back cover
Patch Cord Length:	200 ft (61 m) maximum

**Power**

Line:	90-130 VAC or 180-250 VAC, 50-60 Hz, 12W maximum or nominal 12-30 VDC, 300 mA steady state, 600 mA inrush. 24 VDC power must be isolated from earth ground and from other instruments.
Memory Retention:	On power loss all configuration is retained in non-volatile memory without batteries.

Thornton offers detachable sensors with an electrical connector directly on the electrode body to allow flexible and low cost electrode replacement, separate from the preamplifier. A variety of housings, including retractable models are available.

Measuring Electrode: Glass pH, platinum ORP  
 Reference Electrode: Silver-silver chloride with double junction or equivalent  
 Temperature Compensator: Pt1000 included in all pH sensors; not in ORP sensors  
 pH Range: 0-14, except 52 000 512 which is 2-12  
 Maximum Flow: 10 ft/s (3 m/s)  
 Maximum Cable Lengths: 200 ft (61 m) patch cord, 33 ft. (10 m) preamp cable

### 200pH Detachable pH and ORP Sensors

A complete pH or ORP installation requires **1** an electrode, **2** a housing and **3** a preamp from each of the tables below. In addition, each installation requires a patch cord and instrument. Double lines divide groups of compatible electrodes and housings.

#### Electrode (1)

#### Housing (2)

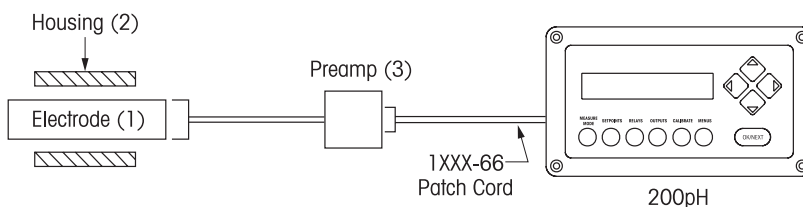
Application	Rating	Fitting / Material / Connection	Part No. Ref. No.	Connection / Material / Rating	Part No.
pH, general purpose, low cost	0-60 °C 30 psi (2 bar) at 60 °C & 75 psi (5 bar) at 45 °C	Pg 13.5 / polysulfone & glass / VP	<b>52 000 512</b> 4010-120-Pt1000	3/4" NPT insertion or submersion** / CPVC 100 psi (7 bar) at 20 °C & 30 psi (2 bar) at 80 °C	<b>53 300 021</b>
pH, general purpose, high pressure	See housing limits	Pg 13.5 / glass / VP	<b>52 001 146</b> 4250-120-Pt1000		
pH, general purpose, & moderately pure water*	0-100 °C 60 psi (4 bar)	Pg 13.5 / glass / VP	<b>52 002 559</b> 3250SG-120-Pt1000	3/4" NPT insertion or submersion** / PVDF 87 psi (6 bar) at 20 °C & 15 psi (1 bar) at 100 °C	<b>52 401 520</b>
pH, HF-Resistant	See housing limits	Pg 13.5 / glass / VP	<b>52 005 353</b> 4252-120-Pt1000-VP		
ORP, general purpose, & moderately pure water	0-100 °C 36 psi (2.5 bar)	Pg 13.5 / glass & Pt / S8	<b>10 505 3339</b> Pt4805-DPA-S8-120	1" weld tee / PVC / 50 psi (3.5 bar) at 60 °C	<b>41 722 3001</b>
ORP, general purpose, high pressure	See housing limits	Pg 13.5 / glass & Pt / S8	<b>10 505 3288</b> Pt4805-DXK-S8-120		
pH, general purpose, high chemical resistance	0-100 °C 100 psi (7 bar) at 65 °C & 50 psi (3.5 bar) at 100 °C	1" NPT insertion or 1" NPT submersion / PVDF & glass / VP	<b>41 453 3102</b> 4501-VP-Pt1000-SG	User's 1-1/2" tee & reducing bushing for insertion, or 1" coupling & pipe for submersion	<b>none required</b>
pH, Retractable	See housing limits	Pg 13.5 retractable / glass / VP	<b>52 002 147</b> 4250-225-Pt1000	Retractable 1-1/2" NPT / CPVC / 75 psi (5 bar), 80 °C	<b>1000-40</b>
ORP, Retractable	See housing limits	Pg 13.5 retractable / glass & Pt / S8	<b>10 505 3255</b> Pt4805-DXK-S8-225	Retractable 1-1/2" NPT / PVDF / 75 psi (5 bar), 100 °C	<b>1000-41</b>
				Retractable 1" NPT / 316 SS / 100 psi (7 bar), 100 °C	<b>1000-42</b>

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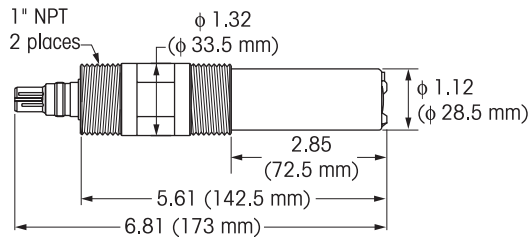
\* For use with moderately pure waters (conductivity 5-50 µS/cm) use 53 300 021 housing in 3/4" NPT earth-grounded metal pipe tee with flow <100 mL/min and discharge to open drain. For higher purity and/or higher accuracy in pure water see the pHure Sensor™, pages 6-7.  
 \*\* For insertion in plastic pipe, use 3/4 x 1" reducing bushing and 1" pipe tee. For submersion w/plastic pipe, use 3/4 x 1" reducing coupling and 1" pipe.

#### Preamp (3)

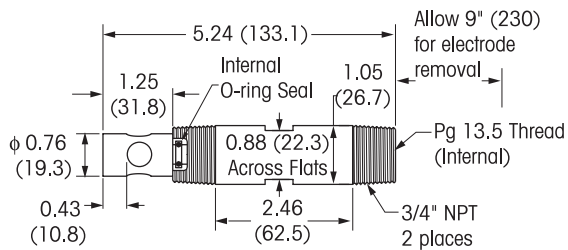
	Connector	Cable Length	Part No.
pH	VP	3 ft (1 m)	<b>1200-01</b>
	VP	10 ft (3 m)	<b>1200-02</b>
	VP	16 ft (5 m)	<b>1200-03</b>
	VP	33 ft (10 m)	<b>1200-04</b>
ORP	AS9	3 ft (1 m)	<b>1200-05</b>
	AS9	10 ft (3 m)	<b>1200-06</b>
	AS9	16 ft (5 m)	<b>1200-07</b>
	AS9	33 ft (10 m)	<b>1200-08</b>



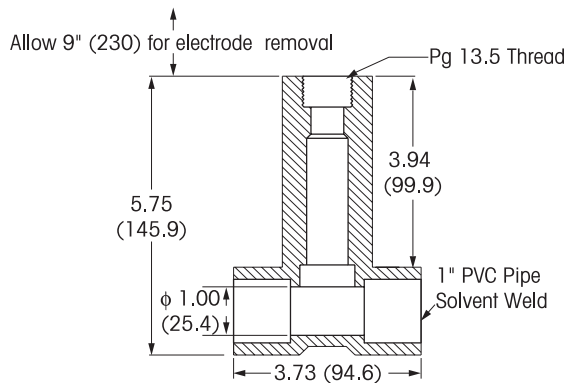
AS9 preamp connector mates with S8 electrode connector.



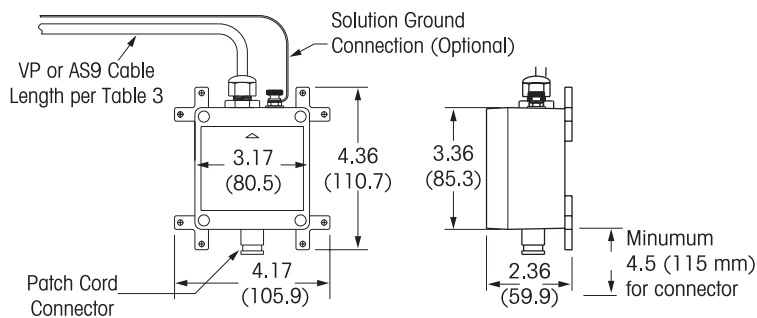
**41 453 3102**



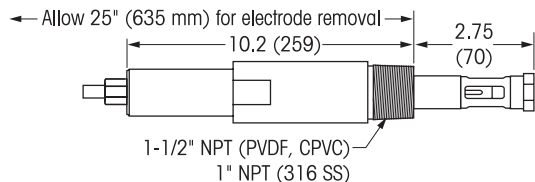
**53 300 021 & 52 401 520**



**41 722 3001**



**1200-0X**



**1000-4X**

**Electrodes**



**Housings**



53 300 021



41 722 3001



1200-01



1000-41

Dimensions: inches (mm).

## Applications for pure water pH measurement

**Reverse osmosis** – pH adjustment of clean recycle water or between membranes in two pass systems to optimize rejection rates.

**Power plant cycle chemistry** – monitoring and controlling pH levels to comply with guidelines and minimize corrosion and scaling.

pH measurement in low conductivity waters requires special precautions. It must be made on a side-stream sample in a closed, metal, flow-through chamber with low flowrate and discharge to open drain. This assures a sample uncontaminated by carbon dioxide from the air, low and constant sample pressure at the reference electrode, and electrical shielding to promote stability. The sample line should be short and small in diameter to minimize sample delays and to minimize waste of pure water. Additional stability is obtained with a dual high-impedance measuring circuit that includes a solution ground.

Key to pure water pH measurements has been the use of a flowing-junction type of reference electrode which forces electrolyte through the reference junction to provide the same conditions in various samples. The flowing junction produces nearly the same potential in pure water as in the much more conductive calibrating buffer solutions. However, a flowing junction requires some form of electrolyte reservoir that can make installation, service and calibration more cumbersome and increases cost.

The Mettler-Toledo Thornton pHure Sensor™ uses a special internally-pressurized gel electrolyte reference electrode to produce similar results to a flowing junction but with much more convenient installation and maintenance. The electrode also includes a low resistance pH glass membrane, an integral, fast-responding RTD, and VP connection. The mating preamplifier provides a dual high-input impedance measuring circuit with solution ground to maximize stability. The flow housing provides a controlled flow path with minimum volume to encourage power plant corrosion particles to flush through instead of accumulating as with a large flow bowl.

All components of the pHure Sensor™ have been optimized for performance and value and conform to ASTM Standard D5128. Various lengths of preamp cable and patch cord (ordered separately) are available to provide flexibility in locating the preamp.

Description	Part No.
pHure Sensor™ with 3 ft (1 m) VP cable	<b>363-211</b>
pHure Sensor™ with 10 ft (3 m) VP cable	<b>363-212</b>
pHure Sensor™ with 16 ft (5 m) VP cable	<b>363-213</b>
pHure Sensor™ with 33 ft (10 m) VP cable	<b>363-214</b>
Replacement combination electrode with RTD	<b>52 002 447</b>

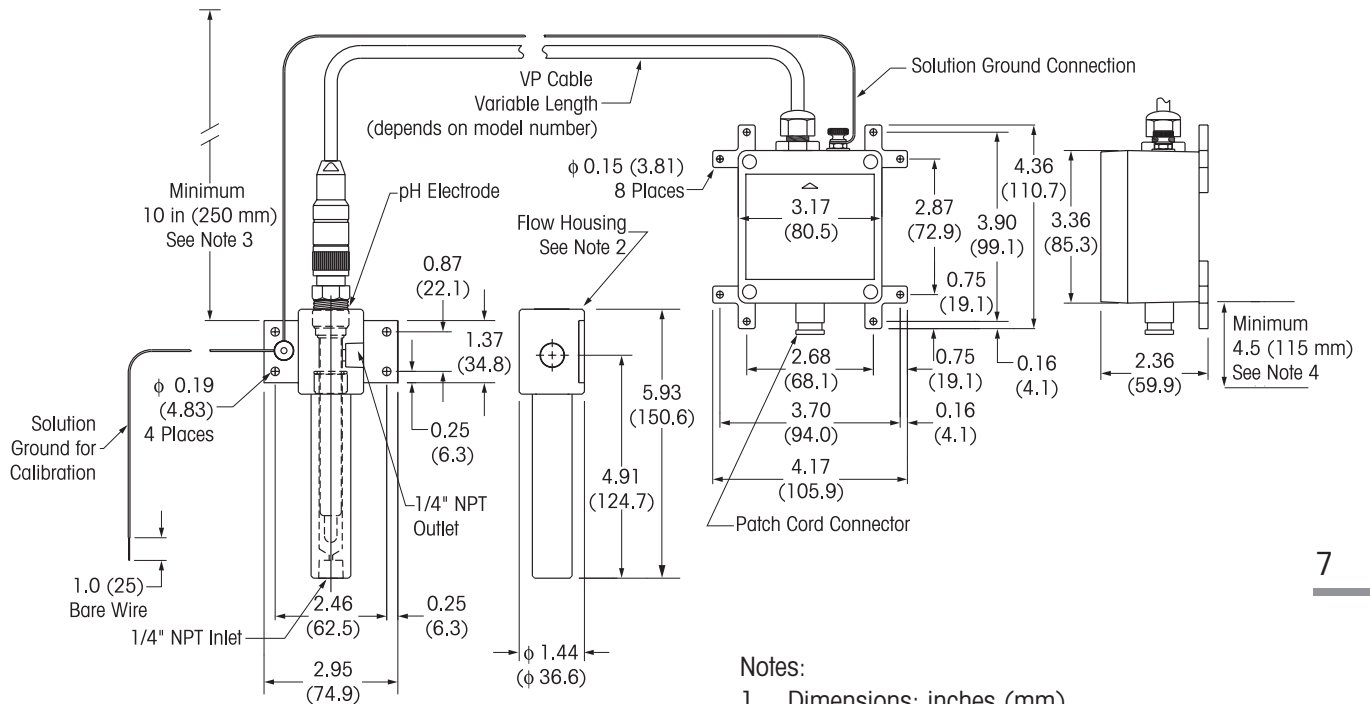
## Specifications

Wetted Materials:	316 SS, glass, silicone rubber
Process Connections:	1/4" NPTF in/out
Flow Housing Volume:	5 mL with electrode in place
Maximum Pressure:	Atmospheric pressure for optimum stability; operational 0-35 psig (0-2.5 bar); can safely withstand 100 psig (7 bar)
Sample Temperature:	32-176 °F (0-80 °C), short term to 212 °F (100 °C)
Sample pH:	1-11
Sample Flowrate:	50-150 mL/min
Sample Conductivity:	> 0.8 µS/cm for highest accuracy
Preamplifier Enclosure:	ABS, sealed
Preamp Connections:	VP cable to sensor, included, length dependent on part number; standard patch cord to instrument, ordered separately.
Components Included:	52 002 447 combination pH electrode, 02385 flow housing & 1200-OX preamp with VP cable

### pHure Sensor™ Features



### pHure™ Sensor Dimensions



Notes:

1. Dimensions: inches (mm)
2. Electrode/Flow housing assembly must be in upright position as shown.
3. Allow at least 10 in. (250 mm) clearance to remove sensor.
4. Allow at least 4.5 in. (115 mm) clearance for patch cord connection.
5. Orient preamplifier box with VP cable at top. Mounting feet are removable.

200pH Two Parameter Analyzer Models

Relays	Analog Outputs	Power	Part No.
2 SPDT mechanical	0	110 VAC (24 VDC)	<b>6320-1</b>
2 SPDT mechanical	0	220 VAC (24 VDC)	<b>6320-2</b>
2 SPDT mechanical	2	110 VAC (24 VDC)	<b>6322-1</b>
2 SPDT mechanical	2	220 VAC (24 VDC)	<b>6322-2</b>
2 SPDT mechanical & 2 solid state, AC only	2	110 VAC (24 VDC)	<b>6342-1</b>
2 SPDT mechanical & 2 solid state, AC only	2	220 VAC (24 VDC)	<b>6342-2</b>

24 VDC power must be isolated from earth ground and from other instruments.  
200pH operates as a 4-wire transmitter with either AC or DC power.

Accessories

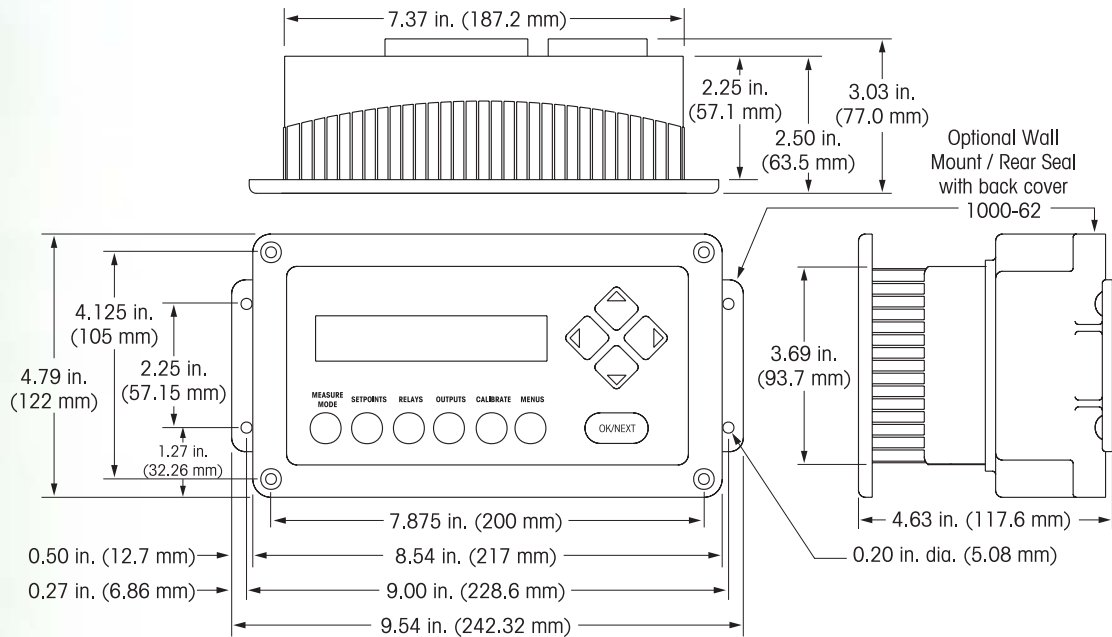
Description	Part No.
Wall Mount NEMA 4X, IP65 Back Cover	<b>1000-62</b>
Pipe Mount Bracket (1-1/2 to 4" vertical pipe)*	<b>1000-63</b>

\* Requires back cover above.

Sensor Patch Cords

Description	Part No.
1 ft (0.3 m)	<b>1001-66</b>
5 ft (1.5 m)	<b>1005-66</b>
10 ft (3 m)	<b>1010-66</b>
15 ft (4.5 m)	<b>1015-66</b>
25 ft (7.6 m)	<b>1025-66</b>
50 ft (15.2 m)	<b>1050-66</b>
100 ft (30.5 m)	<b>1110-66</b>
150 ft (45.7 m)	<b>1115-66</b>
200 ft (61 m)	<b>1120-66</b>

One cord is required for each sensor.



For the most current product information visit:  
[www.thorntoninc.com](http://www.thorntoninc.com)

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