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# JUMO MAERA S28

## Level probe

### Applications

#### Level and filling level measurement in<sup>1</sup>

- Water and sewage water management
- Hydroelectric power stations
- Well and surface water

### Brief description

The JUMO MAERA S28 level probe is used for the continuous hydrostatic level measurement of liquids. Filling heights between 2.50 mWS and 100 mWS (water column) can be achieved in ventilated tanks.

When the level probe is immersed into a liquid, a liquid column emerges above the probe. The liquid column increases as the probe is immersed deeper into the liquid and creates a hydrostatic pressure on the measuring system by the force of its weight. The measured pressure is transmitted as a standard signal. The signal is linearly proportional to the rising liquid column.

The surrounding pressure is realized using a special cable with an integrated pressure equalization hose. Any variations in air pressure are therefore automatically compensated for and the surrounding pressure is taken into account. The installation can be performed in both indoor and outdoor areas.

The level probe is equipped as standard with an integrated overvoltage protection, which protects the level probe against damage in the event of lightning strikes in surrounding water. With regard to the temperature-dependent density of a liquid, the medium temperature can be recorded with an integrated temperature sensor Pt100 during level measurement. This temperature value can then be used to compensate.

The level probe is approved for use in drinking water.

Further information on our level probes from the JUMO MAERA series can be found in the brochure "Level probes – Hydrostatic level and level measurement" under Documentation.

### Customer benefits

- **Process-reliable**  
The core of the level probe is a piezoresistive measuring cell, which features high overload resistance, and is particularly stable in the long term, reliable, and temperature-resistant. An integrated overvoltage protection prevents the effects of lightning that could lead to destruction of the level probe, thereby offering maximum process reliability. A reverse-polarity protection mechanism protects the measuring instrument against damage, ensuring maximum safety during startup.
- **Versatile**  
The simultaneous measurement of level and temperature may be optionally achieved with a Pt100 temperature sensor. Costs are minimized as a result of very simple installation and startup. An optimized variant of the level probe is available for use in "deep wells".

<sup>1</sup> These recommendations are based on many years of experience; however, in individual cases they may not be fully applicable. We would be happy to provide further information, including regarding additional applications.



Type 404392/... with process connection 658

### Special features

- Level probe for continuous level measurement in liquids
- Measuring ranges: 0.25 bar to 10 bar (2.5 to 100 mWS)
- Medium temperature: 0 °C to 50 °C
- Piezoresistive silicon sensor
- Accuracy: 0.3% MSP<sup>2</sup> (linearity)
- Excellent long-term stability
- High overload resistance
- Integrated overvoltage protection
- Reverse-polarity protection mechanism
- Optionally available with integrated temperature sensor Pt100
- Suitable for indoor and outdoor installations

<sup>2</sup> MSP = measuring span

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## Technical data

### General Information

Reference conditions	DIN 16086 and DIN EN 60770
Measuring principle	Piezoresistive sensor with stainless steel separating membrane
Pressure transfer means	Synthetic oil
Admissible load changes	> 10 million, 0 to 100 % measuring range
Mounting position	Vertical/hanging from the cable

### Measuring range and accuracy

Measuring range bar	Linearity <sup>a</sup> % MSP <sup>e</sup>	Accuracy at		Long-term stability <sup>b</sup> % MSP per year	Overload capability bar	Burst pressure bar
		20 °C <sup>c</sup> % MSP	0 to 50 °C <sup>d</sup> % MSP			
0 to 0.25 bar relative pressure	0.3	0.5	1.6	≤ 0.2	0.75	1
0 to 0.4 bar relative pressure	0.3	0.5	1.6		1.2	1.6
0 to 0.6 bar relative pressure	0.3	0.5	1.3		1.8	2.4
0 to 1 bar relative pressure	0.3	0.5	1.1		3	4
0 to 1.6 bar relative pressure	0.3	0.5	1.1		4.8	6.4
0 to 2.5 bar relative pressure	0.3	0.5	1.1		7.5	10
0 to 4 bar relative pressure	0.2	0.3	0.8		12	16
0 to 6 bar relative pressure	0.2	0.3	0.8		18	24
0 to 10 bar relative pressure	0.2	0.3	0.8		30	40

<sup>a</sup> Linearity according to limit point setting

<sup>b</sup> Reference conditions EN 61298-1

<sup>c</sup> Includes: linearity, hysteresis, repeatability, deviation of measuring range initial value and measuring range end value

<sup>d</sup> Includes: linearity, hysteresis, repeatability, deviation of measuring range initial value and measuring range end value, thermal effect on measuring range start and measuring span

<sup>e</sup> MSP = measuring span

### Output

Analog output Current Output 405	4 to 20 mA, two-wire
Step response T <sub>90</sub>	≤ 10 ms
Burden Current 4 to 20 mA, two-wire (output 405)	$R_L \leq (U_B - 10 \text{ V}) \div 0.02 \text{ A} (\Omega)$

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## Mechanical features

Ensure the medium durability of the material!

Process connection	
Material	Stainless steel 316 Ti
Measuring membrane	
Material	Stainless steel 316 L
Case	
Material	Stainless steel 316 Ti
Seals	
Material	FPM EPDM (extra code 917)
Cable	
Material	PUR (electrical connection 14) PE (electrical connection 15) FEP (electrical connection 25) EPR (electrical connection 26)
Weight	400 g (without cable)
Diameter	25 mm

## Environmental influences

Admissible temperatures	
Medium/environment	0 to 50 °C The device must <b>not</b> freeze in the medium! A restriction may be required depending on the medium.
Storage	-20 to +80 °C, dry
Electromagnetic compatibility	
Interference emission <sup>a</sup>	Class B <sup>b</sup>
Interference immunity <sup>c</sup>	Industrial requirements
Overvoltage protection <sup>d</sup>	Integrated overvoltage protection Rated leakage current: 1 kA
Protection type <sup>e</sup>	IP68, submersible to 100 m

<sup>a</sup> According to EN 61326-2-3

<sup>b</sup> The product is suitable for industrial use as well as for households and small businesses.

<sup>c</sup> According to EN 61326-1

<sup>d</sup> According to EN 61000-4-5

<sup>e</sup> According to EN 60529

## Auxiliary power

Voltage supply $U_B^a$	DC 10 V to 30 V, nominal voltage DC 24 V
------------------------	--

<sup>a</sup> Residual ripple: the voltage peaks must not exceed or fall below the specified voltage supply values!

Reverse voltage protection	Yes
Max. current consumption	30 mA
Electrical circuit	SELV
Requirements	The device must be equipped with an electrical circuit that meets the requirements of EN 61010-1 with regard to "Limited-energy circuits".

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## Electrical connection

### for level probe (basic type 404392/000)

6-core, shielded cable with integrated pressure compensation hose, AWG 24 with ferrules

Material	
Outer sheath	PE, PUR, FEP <sup>a</sup>
Pressure compensation hose	PA
Color	
PE, FEP cable	Black
PUR cable	Pebble gray
Outer diameter	Approx. 8.4 mm
Conductor cross section	0.25 mm <sup>2</sup>
Bending radius	
Moving	160 mm
Fixed	120 mm
	It is vital to take into account that if the protective hose is kinked or pinched, this will prevent ambient pressure compensation.
Tensile force	Up to 400 N
Weight	
PE, PUR cable	Approx. 115 g/m
FEP cable	Approx. 90 g/m
Admissible medium temperatures	-40 to +70 °C (depending on the medium)
UV resistance	PE and PUR cable according to VDE 0207, test method EN 60811 part 2-1, section 8 FEP cable according to DIN ISO 4892-2

<sup>a</sup> Depending on the version ordered

### for level probe in the deep well version (basic type 404392/025)

2-core cable without pressure compensation with ferrules

Material	
Outer sheath	EPR
Color	
EPR cable	Blue
Outer diameter	Approx. 8.3 mm
Conductor cross section	1 mm <sup>2</sup>
Bending radius	
Moving	40 mm
Fixed	30 mm
Tensile force	Up to 400 N
Weight	
EPR cable	Approx. 92 g/m
Admissible medium temperatures	-40 to +60 °C

## Approvals/approval marks

Approval mark	Testing agency	Certificate/certification number	Inspection basis	Valid for
ACS	Eurofins	16 ACC NY 235	DGS/SD7A No 2002-571	Extra code 881

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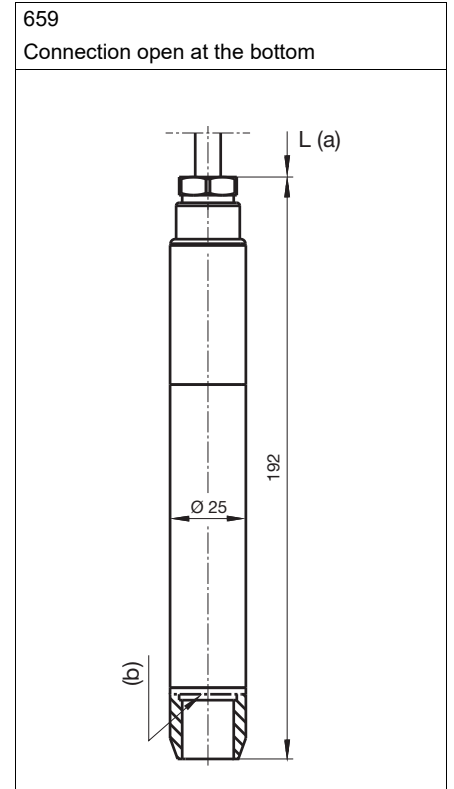
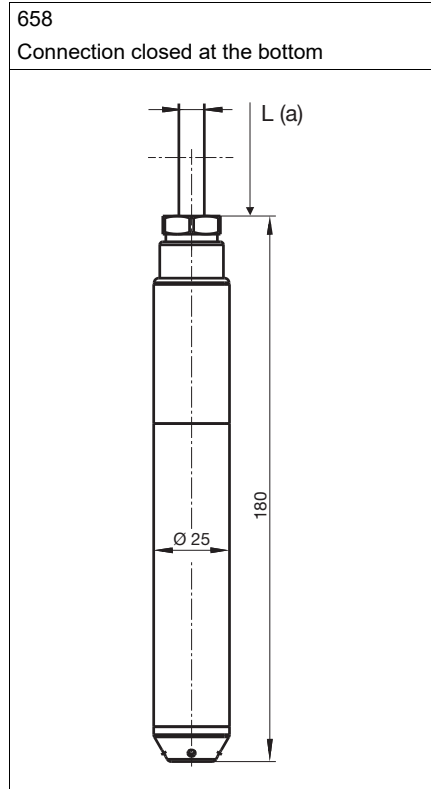
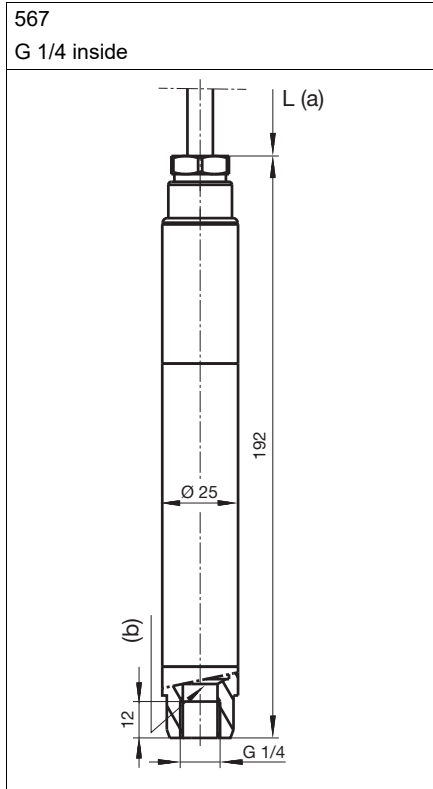
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## Dimensions

### Process connection



- (a) Cable length according to customer preference
- (b) Sensitive membrane

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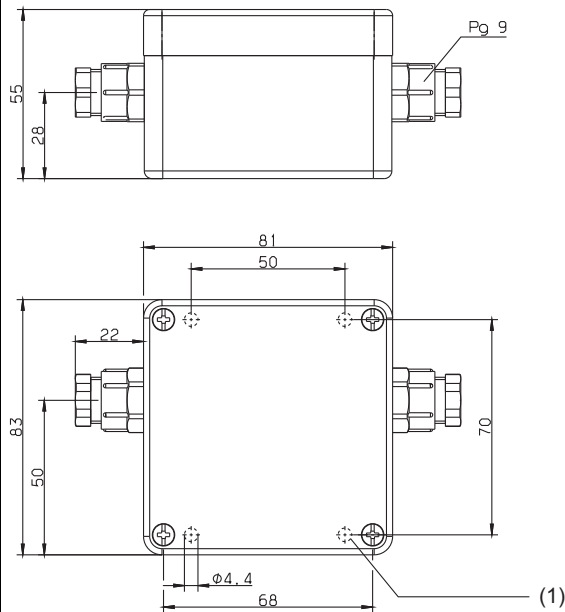
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## Accessories

Terminal box with pressure compensation

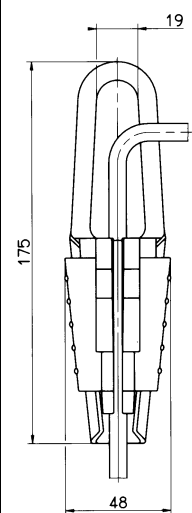
Part no. 00061206



(1) Fastening hole

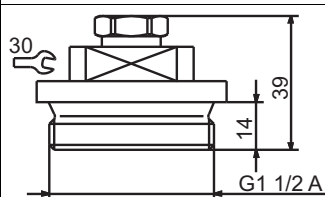
Cable clamp

Part no. 00061389



Sealing screw

Part no. 00333329



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## Connection diagram

The connection diagram in the data sheet provides preliminary information about the connection options. For the electrical connection, only use the installation instructions or the operating manual. The knowledge and the correct technical compliance with the safety information and warnings contained in these documents are mandatory for mounting, electrical connection, and startup as well as for safety during operation.

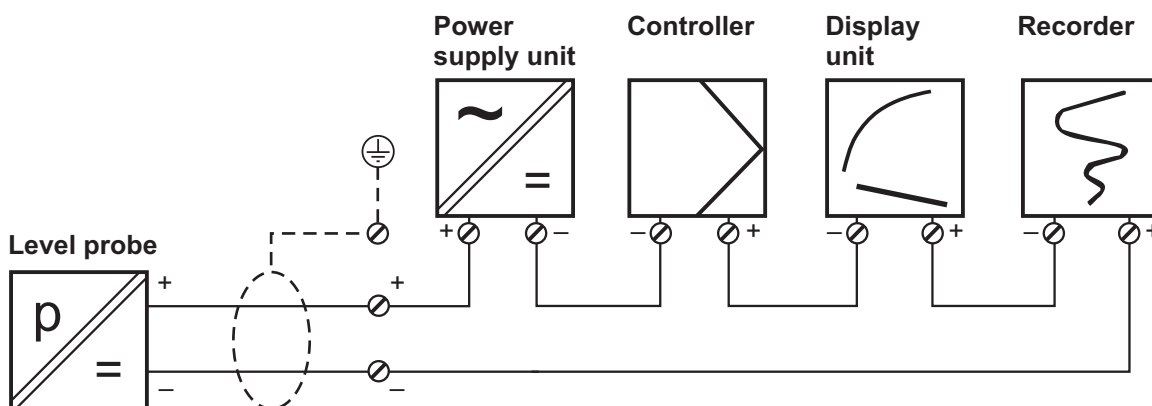
Connection		Terminal assignment
		Cable <sup>a</sup>
<b>4 to 20 mA, two-wire (output 405 and basic type 404392/000)</b>		
Voltage supply DC 10 to 30 V	$U_B/S+^b$	White
Rated voltage supply DC 24 V	0 V/S-	Gray
<b>Shielding</b>		
Caution: Ground the device! Ground all connected devices (such as pumps and valves) to the same potential!		Black
<b>4 to 20 mA, two-wire (output 405 and basic type 404392/025)</b>		
Voltage supply DC 10 to 30 V	$U_B/S+^b$	Brown
Rated voltage supply DC 24 V	0 V/S-	Blue
<b>Integrated temperature probe (with basic type extension 007)</b>		
		Pink (pk) Brown (bn) Green (gn) Yellow (ye)

<sup>a</sup> For cable specifications, see installation instructions B 401015.4, chapter 6 "Installation and mounting".

<sup>b</sup> The voltage peaks must not exceed or fall below the specified voltage supply values!

## Connection example

Current output



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## Order details

	<b>(1) Basic type</b>
404392	JUMO MAERA S28 – Level probe
	<b>(2) Basic type extension</b>
000	None
025	Deep well version <sup>a</sup>
999	Special version
	<b>(3) Input</b>
451	0 to 0.25 bar relative pressure
452	0 to 0.4 bar relative pressure
453	0 to 0.6 bar relative pressure
454	0 to 1 bar relative pressure
455	0 to 1.6 bar relative pressure
456	0 to 2.5 bar relative pressure
457	0 to 4 bar sealed gauge
458	0 to 6 bar sealed gauge
459	0 to 10 bar sealed gauge
999	Special measuring range for relative pressure
	<b>(4) Output</b>
405	4 to 20 mA, two-wire
	<b>(5) Process connection</b>
567	G 1/4 inside
658	Connection closed at the bottom
659	Connection open at the bottom
	<b>(6) Process connection material</b>
20	CrNi (stainless steel)
	<b>(7) Electrical connection</b>
14	PUR cable, gray, shielded, UV-resistant
15	PE-LD cable, black, shielded, UV-resistant
25	FEP cable, black, shielded, UV-resistant
26	Submersible motor cable, EPR cable, blue
99	Special version
	<b>(8) Cable length of the connecting cable</b>
005	5 m
010	10 m
...	...
100	100 m
	<b>(9) Extra codes</b>
000	None
007	Integrated temperature probe Pt100
593	Cutting ring fitting (preparation for protection tube)
631	Improved moisture and vibration protection
881	With drinking water approval <sup>b</sup>
917	With EPDM seal

<sup>a</sup> The deep-well version was designed for use in measuring ranges from 0 to 4 bar up to 0 to 10 bar with a free-hanging cable length of up to 100 m. With regard to the area of application, the version is only available with a closed process connection, and an EPR cable without pressure compensation and without a temperature probe. Another benefit is the improved moisture and vibration protection. The user must always bear in mind that a stainless-steel version is not suitable for use in media containing chlorine, such as seawater.

<sup>b</sup> Only with EPDM seal (extra code 917), PE-LED cable (electrical connection 15) and submersible motor cable, EPR cable (electrical connection 26)



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Order code (1) (2) (3) (4) (5) (6) (7) (8) (9)  
 Order example 404392 / 000 - 454 - 405 - 659 - 20 - 15 - 020 / 007, 631

## Accessories

Item	Description	Part no.
Terminal box with pressure compensation element 	The terminal box is used for secure installation of the level probe cable. The end of the pressure equalization hose is always protected from precipitate and condensation (IP65). The remaining distribution can be performed with a cable without a pressure equalization hose.  The terminal case should be mounted as close as possible to the medium surface while still outside the medium to ensure the system is implemented cost-effectively and in the best possible way.	00061206
Cable clamp 	The cable clamp holds the probe in the liquid at a defined depth and provides strain relief. Use of the cable clamp ensures that the cable is not deformed in an unacceptable manner.  The cable clamp is compatible with all JUMO level probes.  The clamping range is 5.5 mm to 10.5 mm. The maximum tensile strength is 2.5 kN. The case is made of hot-dip galvanized steel sheet. The clamping jaws and guide clips are made of glass fiber reinforced polyamide. A stainless steel variant is also available upon request.	00061389
Sealing screw 	For closed containers or water wells with a well head, the cable should be guided through and fastened by a sealing screw.  The sealing screw is made up of a G 1 1/2" thread and is used to route the cable.	00333329
Pressure compensation filter for cable	The pressure compensation filter is a breathable filter that ensures aeration and exhaust-air ventilation without moisture penetrating. It is fitted at the end of the special cable.	00382632