

JUMO GmbH & Co. KG

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JUMO Instrument Co. Ltd.

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JUMO Process Control, Inc.

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JUMO MAERA F27

Level Probe

Applications

Level and liquid level measurement in¹

- water and wastewater management
- well water and surface water
- bore holes
- aggressive media (e.g. plating baths, acids)
- disinfection system with chlorine, chlorine dioxide

Brief description

level probes are used for hydrostatic liquid level measurement in tanks or for determining the level in open waters, for example.

In electrical terms, the capacitive ceramic sensor measurement principle represents a plate capacitor with two highly-resistant ceramic plates (Al_2O_3) that are isolated from each other. The change in capacitance is a measure of the change in pressure, and thereby, of the level. The level probe can be used for levels from 0 to 0.5 m to 0 to 16 mWC (water column).

The PTFE housing version is suitable for applications where the medium to be measured is aggressive to stainless steel. With regard to temperature-dependent density, an integrated Pt100 sensor can be used to record the temperature of the liquid while the level is being measured.

For additional, interesting information, see the "level probes - hydrostatic level and liquid level measurement" brochure.

Customer benefits

• Process safety

The capacitive ceramic measuring cell is made from aluminum oxide (99.9 %), and not only has good long-term stability, but also an overload resistance that is up to eighty times higher, thanks to the chosen electrode material and special coating process. The chosen measurement method meets the most demanding requirements for resolution and reproducibility. The combination of a membrane that can withstand a high mechanical loading and a stainless steel (mat. no. 1.4571) or PTFE housing, offers extremely good chemical resistance to many aggressive media. The output signal emits a minimum current of 4 mA, which can indirectly monitor the circuit for a break in the cable.

• Diversity and economy

A vast selection of measuring ranges and electrical outputs, as well as numerous process connections, ensure great variety, which can be individually adapted to suit every application. Simultaneous measurement of liquid level and temperature can be implemented with a Pt100 temperature sensor option. Costs are reduced to a minimum by reduced installation and commissioning expenditure.



Type 404391/000..., type 404391/022...

Key features

- Measuring ranges from 0 to 50 mbar to 0 to 1.6 bar (-20 to +60 °C)
- Capacitive ceramic sensor
- Ultra-high precision measuring cell
- Extremely good long-term stability
- A membrane that can withstand a high mechanical loading (cleaning, abrasive substances)
- High chemical resistance
- High overload resistance (up to eighty times higher)
- Sturdy level probe for internal and external assembly
- Integrated Pt100 temperature sensor option

¹ Although these recommendations are based on many years of experience, deviation is possible in some cases. We would be happy to provide you with additional information or details of other applications.

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Technical data

General

Reference conditions	DIN 16086 and EN 60770
Sensor system	capacitive ceramic sensor
Mounting location	vertical/suspended on the cable

Measuring range

Relative pressure	The measuring ranges start at 0 bar.									Housing: Stainless steel (standard)	
Measuring range	0.05	0.1	0.16	0.25	0.4	0.6	1	1.6	bar		
Overload limit	-0.3/4	-0.3/4	5	6	6	10	10	10	bar		
Bursting pressure	150 bar										
Relative pressure	The measuring ranges start at 0 bar.									Housing: PTFE (basic type extension 022)	
Measuring range	0.05	0.1	0.16	0.25	0.4	0.6	1	1.6	bar		
Overload limit	-0.3/2	-0.3/2	2	2	2	2	2	2	bar		
Bursting pressure	150 bar										

Outputs

Analogue output	
Current	4 to 20 mA, two wires
Voltage	DC 0.5 to 4.5 V, 3-wires, ratiometric, 10 to 90 % of the voltage supply
Jump response	
T ₉₀	≤ 10 ms
Burden	
Current	
4 to 20 mA, 2-wires	$R_L \leq [(U_B - 12 \text{ V}) \div 0.02 \text{ A}] (\Omega)$
Voltage	
DC 0.5 to 4.5 V, 3-wires	$R_L \geq 10 \text{ k}\Omega$

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Mechanical properties

It is vital to note the resistance of the materials to the medium!

Process connection Material	Stainless steel 316 Ti
Sensor Material	Ceramic Al ₂ O ₃ (99.9 %)
Housing Material Standard For basic type extension 022 Seals ^a	Stainless steel 316 Ti PTFE FPM, standard EPDM, on request
Protective cap (658)	PVDF
Weight	200 g (without cable)
Diameter Stainless steel version PTFE version	25 mm Max. 41 mm Max. 50 mm

^a Other seals are available on request.

Ambient conditions

Permissible temperatures Medium/environment For basic type extension 022 Storage	-20 to +60 °C The instrument must not be allowed to freeze in the medium! The medium may make it necessary to impose a restriction. 0 to 40 °C The instrument must not be allowed to freeze in the medium! The medium may make it necessary to impose a restriction. -20 to +100 °C, dry
Electromagnetic compatibility Interference emission ^a Interference immunity ^b	Class B Industrial requirements
Protection Standard For basic type extension 022 ^c	IP68, immersible to 16 m IP68, immersible to 16 m

^a As defined by EN 61326-2-3

^b As defined by EN 61326-1

^c As defined by EN 60529

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Accuracy

Relative pressure Measuring range	The measuring ranges start at 0 bar.								
	0.05	0.1	0.16	0.25	0.4	0.6	1	1.6	bar
Linearity ^a	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	% of FS
Accuracy at 20 °C ^b	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	% of FS
Accuracy at 0 to 40 °C ^c	0.9	0.9	0.9	0.9	0.9	0.9	0.4	0.4	% of FS
Accuracy at -20 to +60 °C ^c	1.3	1.3	1.3	1.3	1.3	1.3	0.6	0.6	% of FS
Long-term stability ^d	≤ 0.2 % of FS								

^a Linearity based on limit point setting

^b Includes: linearity, hysteresis, repeatability, deviation from initial (offset) and final values of measuring range

^c Includes: linearity, hysteresis, repeatability, deviation from initial (offset) and final values of measuring range, thermal effect on initial value of measuring range and span.

^d As defined by EN 61298-1

Auxiliary power

Voltage supply U_B ^a 4 to 20 mA, 2-wires (output 405) DC 0.5 to 4.5 V, 3-wires (output 412)	DC 12 to 30 V, nominal voltage DC 24 V DC 5 V
Max. power consumption	At DC 24 V ≤ 25 mA At DC 5 V ≤ 2 mA
Circuit	SELV

^a Residual ripple: Peak voltages must not exceed or fall below the values specified for the power supply!

Electrical connection

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

Material	
Outer sheath	PE, PUR, FEP
Pressure compensation tube	PA
Color	
PE and FEP cables	Black
PUR cable	Pebble-gray
External diameter	Approx. 8.4 mm
Conductor cross-section	0.25 mm ²
Bending radius	
Moveable	160 mm
Fixed	120 mm
	Please note that a bend in the cable prevents ambient pressure compensation.
Tensile force	Up to 400 N
Weight	
PE and PUR cables	Approx. 115 g/m
FEP cable	Approx. 90 g/m
Permissible medium temperatures	-40 to +70 °C (subject to the medium)
UV resistance	PE and PUR cables as defined by VDE 0207, test method EN 60811 part 2-1, section 8 FEP cable as defined by EN ISO 4982-2


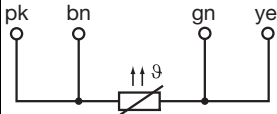
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Connection diagram

Connection		Pin assignment
		
		Cable
4 to 20 mA, 2-wires (output 405)		
Voltage supply DC 12 to 30 V Nominal voltage supply DC 24 V	$U_{B/S}^{+a}$ 0 V/S-	white gray
DC 0.5 to 4.5 V, ratiometric (output 412)		
Supply voltage DC 5 V DC Nominal voltage supply DC 5 V	U_B 0 V/S- S+	white gray yellow
Screen		
Caution: Ground the instrument! Ground all connected devices (e.g. pumps, valves) to the same potential!		black
Integrated temperature sensor (basic type extension 007)		
		pink (pk) brown (bn) green (gn) yellow (ye)

^a The voltage spikes may not exceed or fall below the specified values of the voltage supply!

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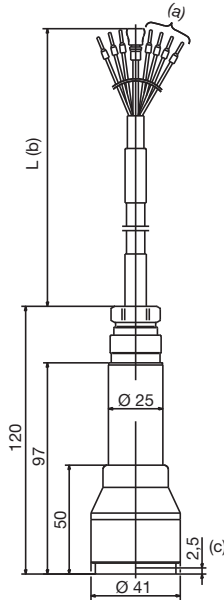
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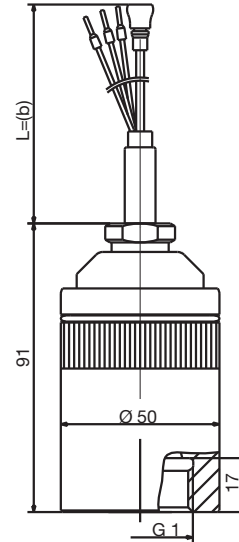
Dimensions

Type 404391/000-... or 404391/007-...



- (a) Basic type extension 007 only (integrated Pt100 temperature sensor)
- (b) Cable length as required by customer
- (c) Dimension to surface of sensor

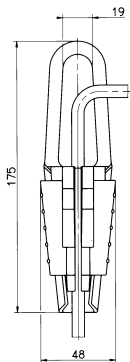
Type 404391/022-...



Dimensions of accessories

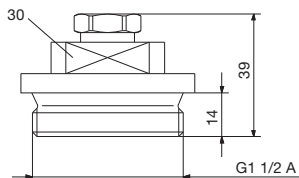
Cable clamp assembly

Part no. 00061389



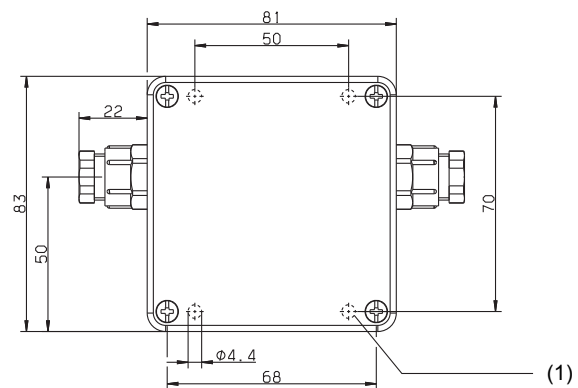
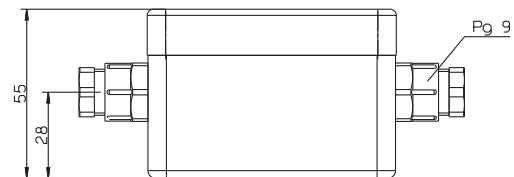
Screw plug (cover mounting)

Part no. 00333329



Terminal box with pressure compensation

Part no. 00061206



(1) Mounting hole

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Order details

(1) Basic type	
404391/000	JUMO MAERA F27 - Level probe with ceramic measuring cell
404391/007	JUMO MAERA F27 - Level probe with integrated Pt100 temperature sensor ^a
404391/022	JUMO MAERA F27 - Level probe with PTFE plastic housing ^b
404391/999	JUMO MAERA F27 - Level probe, special design
(2) Input	
412	0 to 50 mbar relative pressure
414	0 to 100 mbar relative pressure
415	0 to 160 mbar relative pressure
451	0 to 250 mbar relative pressure
452	0 to 400 mbar relative pressure
453	0 to 600 mbar relative pressure
454	0 to 1 bar relative pressure
455	0 to 1.6 bar relative pressure
999	Special measuring range
(3) Output	
405	4 to 20 mA, 2-wires
412	0.5 to 4.5 V, 3-wires
(4) Process connection	
568	G 1 internal ^c
658	Connection closed underneath
659	Connection open underneath
(5) Electrical connection	
14	PUR cable, e.g. suitable for use in water (seawater, well water, brine), as well as in coolant and lubricant (UV-resistant)
15	PE-LD cable, e.g. suitable for use in water (seawater, well water, brine, UV-resistant)
25	FEB cable, e.g. suitable for use in water (seawater, saltwater, well water, and mine water) as well as in different oils, fuels, and solvents (UV-resistant)
(6) Cable length	
005	5 m
010	10 m
...	...
100	100 m
999	Special lengths
(7) Extra codes	
000	None
593	Cutting ring screw connection (preparation for protection tube) ^d

^a With output 405 only, not with basic type extension 022.

^b With process connection 568 only.

^c With basic type extension 022 only.

^d With basic type extension 000, 007 and 999 only.

	(1)	-	(2)	-	(3)	-	(4)	-	(5)	-	(6)	/	(7)
Order code	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	/	<input type="text"/>
Order example	404391/000	-	452	-	405	-	659	-	15	-	010	/	000

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Accessories

Article	Part no.
Terminal box with pressure compensation	00061206
Cable clamp assembly ^a	00061389
Screw plug	00333329
Pressure compensating filter for cable	00382632

^a The hot-dip galvanized housing is made of sheet steel. The clamping jaws and guide chambers are made of fiberglass-reinforced PA molding compound.