

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

Application

Level and filling level measurement in¹

- water and sewage water management
- aggressive mediums, acids, lyes
- in electroplating baths

Brief description

The JUMO MAERA F27 level probe is used for the continuous hydrostatic level measurement of liquids. Filling heights between 0.5 mWS and 16 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 transferred 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.

A variant with integrated overvoltage protection is available for outdoor installations, which protects the level probe against damage in the event of lightning strikes in surrounding water. The version with a PTFE case is suitable for applications in aggressive mediums. 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 is then used to compensate.

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 capacitive ceramic measuring cell impresses with an overload resistance of up to 80 times. The measuring method ensures the highest requirements for resolution and reproducibility are met. The combination of a mechanically highly stress-resistant membrane with a stainless steel or PTFE case offers excellent chemical resistance against aggressive mediums. A reverse-polarity protection mechanism protects the measuring instrument against damage, ensuring maximum safety during startup.
- **versatile and uncomplicated**
The simultaneous measurement of level and temperature may be optionally achieved with a Pt100 temperature sensor. As the measuring range already starts from 50 mbar (0.5 mWS), even low level filling heights can be reliably monitored. A further temperature range of 80 K enables the use of many applications.



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

Special features

- level probe for continuous level measurement in liquids
- measuring ranges: 50 mbar to 1.6 bar (-20 to +60 °C)
- medium temperature: -20 to +60 °C
- capacitive ceramic sensor
- accuracy: 0.2 % MSP (linearity)
- ultra-precise measuring cell
- excellent long-term stability
- membrane withstands high mechanical loading
- high chemical resistance
- high overload resistance (up to 80 times)
- integrated overvoltage protection for stainless steel version
- reverse-polarity protection mechanism
- optionally available with integrated temperature probe Pt100
- suitable for indoor and outdoor installations

¹ 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.

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Technical data

General information

Reference conditions	DIN 16086 and DIN EN 60770
Sensor system	Capacitive ceramic sensor
Mounting position	Vertical/hanging from the cable

Measuring range

Relative pressure	The measuring ranges begin at 0 bar. Case: 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
Burst pressure	150 bar								
Relative pressure	The measuring ranges begin at 0 bar. Case: 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
Burst pressure	150 bar								

Output

Analog output	4 to 20 mA, two-wire DC 0.5 to 4.5 V, three-wire, ratiometric 10 to 90 % of the voltage supply
Current	
Voltage	
Step response	≤ 10 ms
T ₉₀	
Burden	R _L ≤ (U _B -12 V) ÷ 0.02 A (Ω) R _L ≥ 10 kΩ
Current	
4 to 20 mA, two-wire	
Voltage	
DC 0.5 to 4.5 V, three-wire	

Mechanical features

Ensure the medium durability of the material!

Process connection	Stainless steel 316 Ti
Material	
Sensor	Ceramic Al ₂ O ₃ (99.9 %)
Material	
Case	Stainless steel 316 Ti PTFE FPM, standard EPDM, NTS 917 PVDF
Material	
Standard	
With basic type extension 022	
Seals	
Protective cap (658)	
Weight	200 g (without cable)
Diameter	41 mm 50 mm
Stainless steel version	
PTFE version	

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Environmental conditions

Admissible temperatures Medium/environment	-20 to +60 °C The device must not freeze in the medium! A restriction may be required depending on the medium.
With basic type extension 022	0 to 40 °C The device must not freeze in the medium! A restriction may be required depending on the medium.
Storage	-20 to +100 °C, dry
Electromagnetic compatibility Interference emission ^a Interference immunity ^b	Class B Industrial requirements
Protection type ^c	IP68, submersible to 16 m

^a According to EN 61326-2-3

^b According to EN 61326-1

^c According to EN 60529

Accuracy

Relative pressure Measuring range	The measuring ranges begin 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	% MSP
Accuracy at 20 °C ^b	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	% MSP
Accuracy at 0 to 40 °C ^c	0.9	0.9	0.9	0.9	0.9	0.9	0.4	0.4	% MSP
Accuracy at -20 to +60 °C ^c	1.3	1.3	1.3	1.3	1.3	1.3	0.6	0.6	% MSP
Long-term stability ^d	≤ 0.2 % MSP								

^a Linearity according to limit point setting

^b Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end

^c Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end, thermal influence on measuring range start, and measuring span

^d According to EN 61298-1

Auxiliary energy

Voltage supply U _B ^a 4 to 20 mA, two-wire (output 405) DC 0.5 to 4.5 V, three-wire (output 412)	DC 12 to 30 V, nominal voltage DC 24 V DC 5 V
---	--

^a Residual ripple: the voltage peaks must not exceed or fall below the specified voltage supply values!

Reverse voltage protection	Yes (except output 412)
Max. current consumption	For DC 24 V ≤ 25 mA For DC 5 V ≤ 2 mA
Electrical circuit	SELV

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**Electrical connection**

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

Material	
Outer sheath	PE, PUR, FEP ^a
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 ²
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

^a Depending on the version ordered

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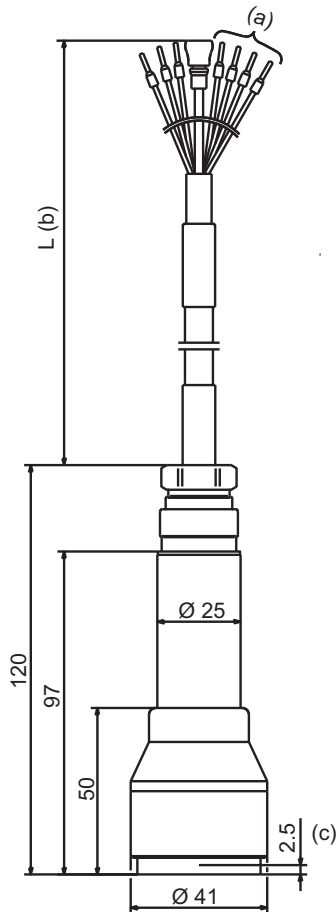
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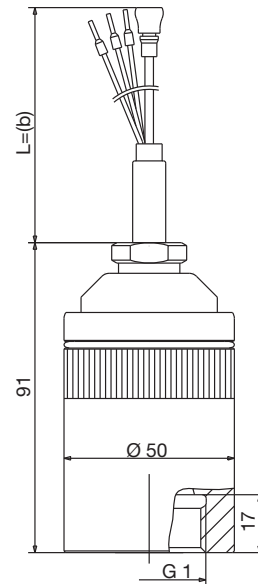


Dimensions

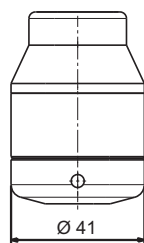
Type 404391/000-... or 404391/007-...
 With process connection 659



Type 404391/022-...
 With process connection 568



Type 404391/000-... or 404391/007-...
 With process connection 658



- (a) Only with basic type extension 007 (integrated temperature probe Pt100)
- (b) Cable length according to customer preference
- (c) Measurement to the surface of sensor

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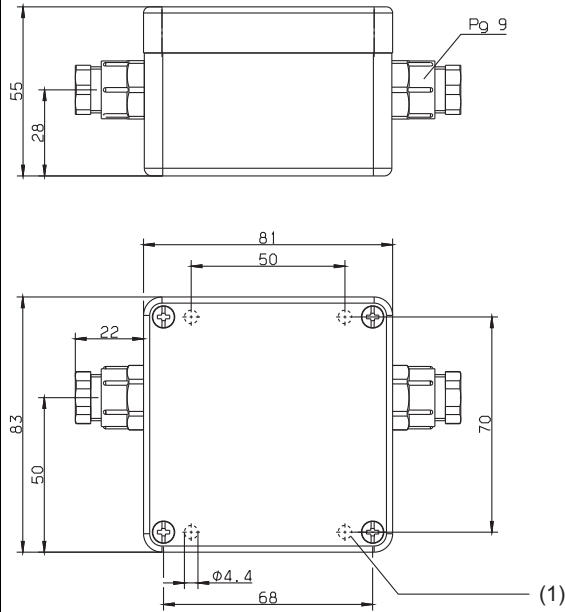
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Accessory dimensions

Terminal box with pressure compensation

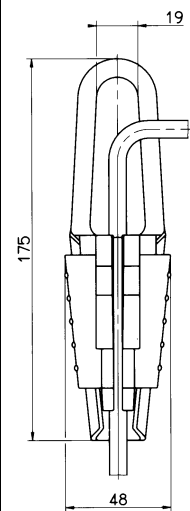
Part no. 00061206



(1) Fastening hole

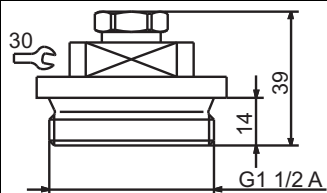
Cable clamp

Part no. 00061389



Sealing screw

Part no. 00333329



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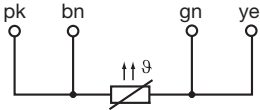
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Connection diagram

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 execution of the safety information/instructions contained in these documents are mandatory for installation, electrical connection, startup, and for safety during operation.

Connection		Terminal assignment
		
		Cable ^a
4 to 20 mA, two-wire (output 405)		
Voltage supply DC 12 to 30 V Rated voltage supply DC 24 V	$U_{B/S+}^b$ 0 V/S-	White Gray
DC 0.5 to 4.5 V, ratiometric (output 412)		
Voltage supply DC 5 V Rated voltage supply DC 5 V	U_B 0 V/S- S+	White Gray Yellow
Shielding		
Caution: Ground the device! Ground all connected devices (such as pumps and valves) to the same potential!		Black
Integrated temperature probe (with basic type extension 007)^c		
		Pink (pk) Brown (bn) Green (gn) Yellow (ye)

^a For cable specifications, see installation instructions B 401015.4, chapter 6 "Installation and mounting".

^b The voltage peaks must not exceed or fall below the specified voltage supply value!

^c Level probes in free-field applications without integrated overvoltage protection must be protected against electrical discharge. In addition, it is recommended that external overvoltage protection is used upstream and downstream of the display or processing unit.

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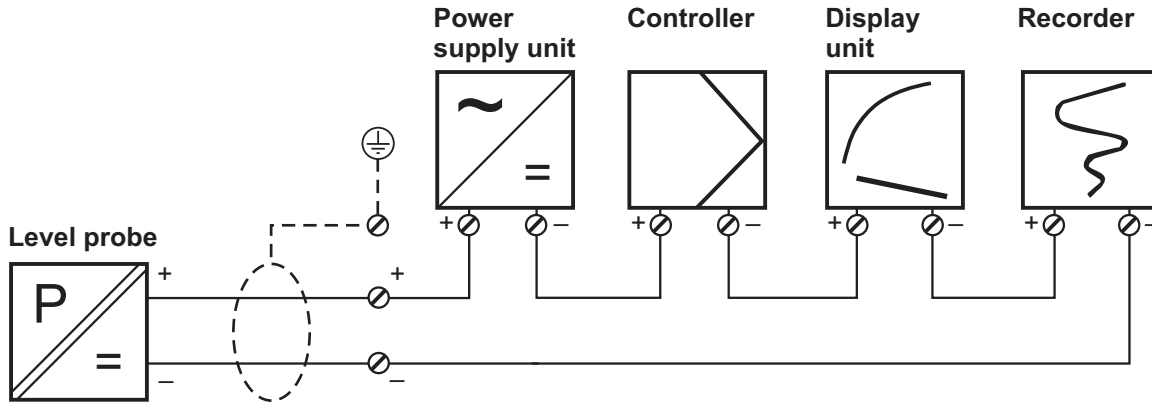
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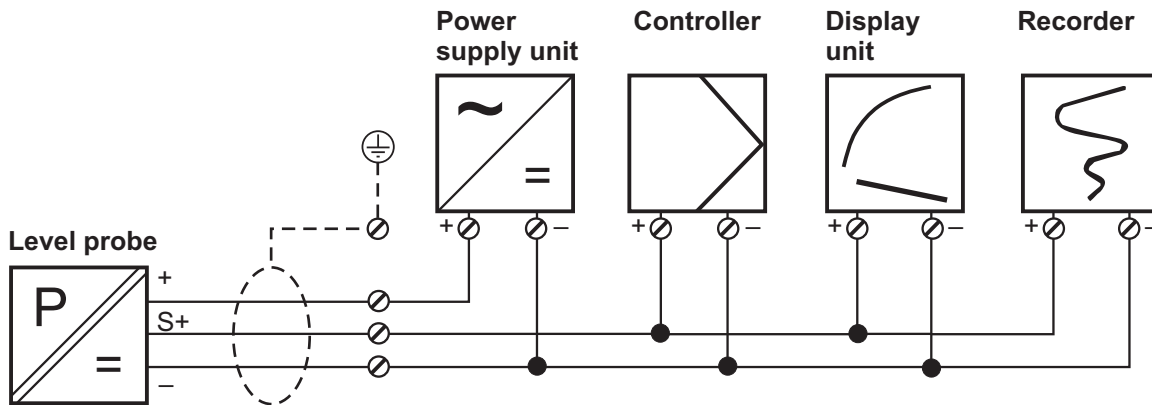


Connection example

Current output



Voltage output



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Order details

(1) Basic type	
404391	JUMO MAERA F27 - Level probe with ceramic measuring cell
(2) Basic type extension	
000	None
007	With integrated temperature probe Pt100 ^a
022	With case made of plastic PTFE ^b
999	Special version
(3) 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
(4) Output	
405	4 to 20 mA, two-wire
412	0.5 to 4.5 V, three-wire
(5) Process connection	
568	G 1 inside ^c
658	Connection closed at the bottom
659	Connection open at the bottom
(6) Electrical connection type	
14	PUR cable, as suitable for use in water (lake, water well, and mine water), as well as coolant and lubricant (UV-resistant)
15	PE-LD cable, as suitable for use in water (lake, water well, mine water, UV-resistant)
25	FEP cable as suitable for use in water (sea, lake, water well, and mine water), and in different oils, fuels, and solvents (UV-resistant)
(7) Cable length of the connecting cable	
005	5 m
010	10 m
...	...
100	100 m
999	Special length
(8) Extra codes	
000	None
593	Cutting ring fitting (preparation for protection tube) ^d
917	With EPDM seal

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

^b Only with process connection 568.

^c Only with basic type extension 022.

^d Only with basic type extensions 000, 007 and 999.

Order code (1) (2) (3) (4) (5) (6) (7) (8)
 [] / [] - [] - [] - [] - [] - [] - [] / []
Order example 404391 / 000 - 452 - 405 - 659 - 15 - 010 / 000

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Accessories

Item	Description	Part no.
Terminal box with pressure compensation element 	<p>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.</p> <p>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.</p>	00061206
Cable clamp 	<p>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.</p> <p>The cable clamp is compatible with all JUMO level probes.</p> <p>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.</p>	00061389
Sealing screw 	<p>For closed containers or water wells with a well head, the cable should be guided through and fastened by a sealing screw.</p> <p>The sealing screw is made up of a G 1 1/2" thread and is used to route the cable.</p>	00333329

Scope of delivery

Item	Part no.
Pressure compensation filter for cable	00382632