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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 "Limit Level Measurement and Level Measurement" in the documentation.

Customer benefits

- **Process-reliable**
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.

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.

Approvals and approval marks (see technical data)



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

Special features

- Measuring ranges: 50 mbar to 1.6 bar (-20 to +60 °C)
- Medium temperature: -20 to +60 °C
- Capacitive ceramic sensor
- Accuracy: 0.2 % MSP² (linearity)
- Ultra-precise measuring cell
- Excellent long-term stability
- Membrane withstands high mechanical loading
- High chemical resistance
- Integrated overvoltage protection for stainless steel version
- Reverse-polarity protection mechanism
- Optionally available with integrated temperature probe Pt100
- Suitable for indoor and outdoor installations

² MSP = measuring span

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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 and accuracy

Case: stainless steel (standard)

Measuring range bar	Linearity ^a % MSP ^e	Accuracy at			Long term stability ^b % MSP per year	Overload capability bar	Burst pressure bar
		20 °C ^c % MSP	0 to 40 °C ^d % MSP	-20 to +60 °C ^d % MSP			
0 to 0.05 bar relative pressure	0.2	0.4	0.9	1.3	≤ 0.2	-0.3/4	150
0 to 0.1 bar relative pressure	0.2	0.4	0.9	1.3		-0.3/4	
0 to 0.16 bar relative pressure	0.2	0.4	0.9	1.3		5	
0 to 0.25 bar relative pressure	0.2	0.4	0.9	1.3		6	
0 to 0.4 bar relative pressure	0.2	0.4	0.9	1.3		6	
0 to 0.6 bar relative pressure	0.2	0.4	0.9	1.3		10	
0 to 1 bar relative pressure	0.2	0.4	0.4	0.6		10	
0 to 1.6 bar relative pressure	0.2	0.4	0.4	0.6		10	

Case: PTFE (basic type extension 022)

0 to 0.05 bar relative pressure	0.2	0.4	0.9	1.3	≤ 0.2	-0.3/2	150
0 to 0.1 bar relative pressure	0.2	0.4	0.9	1.3		-0.3/2	
0 to 0.16 bar relative pressure	0.2	0.4	0.9	1.3		2	
0 to 0.25 bar relative pressure	0.2	0.4	0.9	1.3		2	
0 to 0.4 bar relative pressure	0.2	0.4	0.9	1.3		2	
0 to 0.6 bar relative pressure	0.2	0.4	0.9	1.3		2	
0 to 1 bar relative pressure	0.2	0.4	0.4	0.6		2	
0 to 1.6 bar relative pressure	0.2	0.4	0.4	0.6		2	

^a Linearity according to limit point setting

^b Reference conditions EN 61298-1

^c Includes: linearity, hysteresis, repeatability, deviation of measuring range initial value and measuring range end value

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

^e MSP = measuring span

Output

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

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Electrical data

Voltage supply U_B^a 4 to 20 mA, two-wire DC 0.5 to 4.5 V, three-wire Nominal voltage	DC 12 to 30 V DC 5 V DC 24 V
Reverse voltage protection	Yes (except DC 0.5 to 4.5 V, three-wire)
Max. current consumption	For DC 24 V \leq 25 mA For DC 5 V \leq 2 mA
Electrical circuit Requirements	SELV The device must be equipped with an electrical circuit that meets the requirements of EN 61010-1 with regard to "Limited-energy circuits".

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

Electrical connection

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

Outer diameter	Approx. 8.4 mm
Conductor cross section	0.25 mm ²
Bending radius Moving Fixed	160 mm 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
Admissible medium temperatures	-40 to +70 °C (depending on the medium)

Mechanical features

Ensure the medium durability of the material!

Materials Process connection Sensor Case, standard Case made of plastic Seals Protective cap Outer sheath Pressure compensation hose	Stainless steel 316 Ti Ceramic Al ₂ O ₃ (99.9 %) Stainless steel 316 Ti PTFE FPM (standard), EPDM PA PE (black), PUR (pepple gray), FEP (black) PA
Weight PE cable PUR cable FEP cable	200 g (without cable) Approx. 63 g/m, 115 g/m with additional temperature sensor (extra code 007) Approx. 115 g/m Approx. 90 g/m
UV resistance PE, PUR cable FEP cable	according to VDE 0207, test method EN 60811 part 2-1, section 8 cable according to DIN ISO 4892-2
Diameter Stainless steel version PTFE version	41 mm 50 mm

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Environmental influences

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 case made of plastic	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 (EC)	According to DIN EN 61326-1, DIN EN 61326-2-3
Interference emission	Class B ^a
Interference immunity	Industrial requirements
Overvoltage protection	Integrated overvoltage protection, according to DIN EN 61000-4-5
Rated leakage current	1 kA
Protection type	IP68, according to DIN EN 60529, submersible to 16 m

^a The product is suitable for industrial use as well as for households and small businesses.

Approvals and approval marks

EAC	
Testing agency	«Промтехконтроль»
Certificates/certification numbers	EAЭС N RU Д-DE.PA01.B.80830/21
Inspection basis	TR TS 020/2011
Valid for	Type 404391

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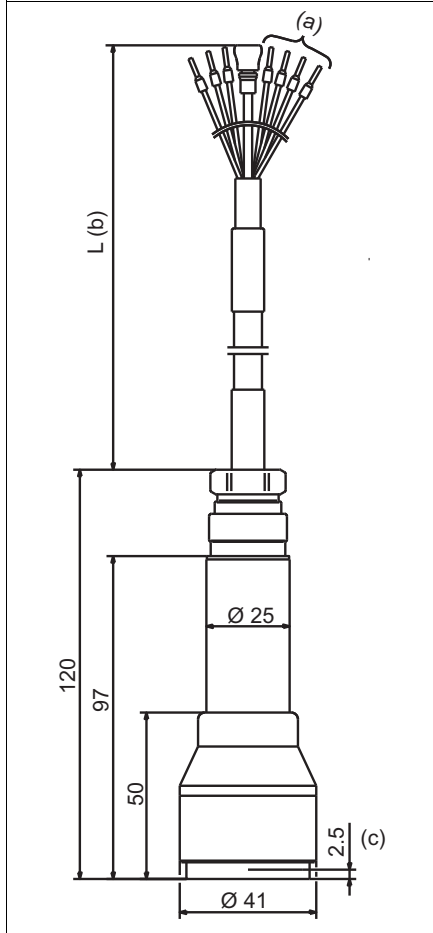
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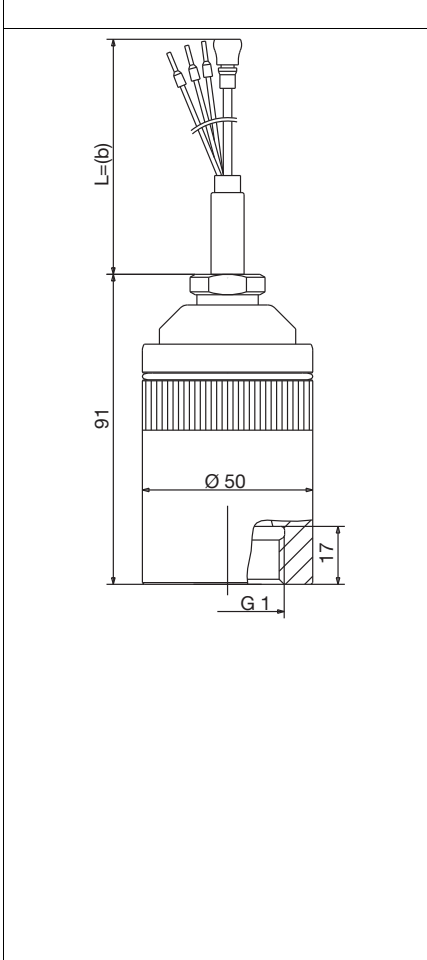
Dimensions

Type 404391/000-... or
 type 404391/007-...
 with process connection 659



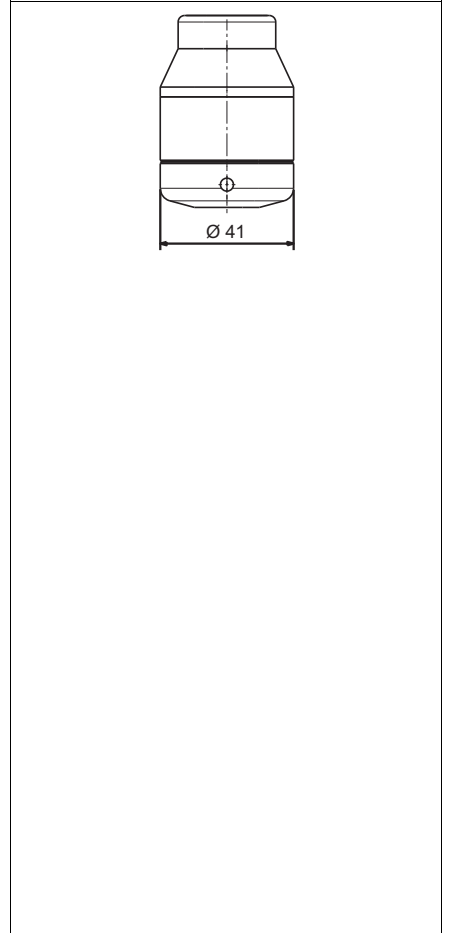
- (a) Only for version with integrated temperature probe Pt100
- (b) Cable length according to customer preference
- (c) Dimension up to surface sensor

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



- (b) Cable length according to customer preference

Type 404391/000-... or
 type 404391/007-...
 with process connection 658



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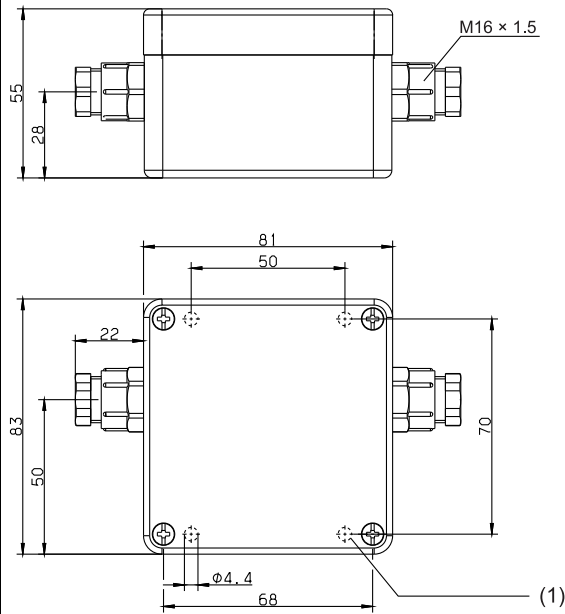
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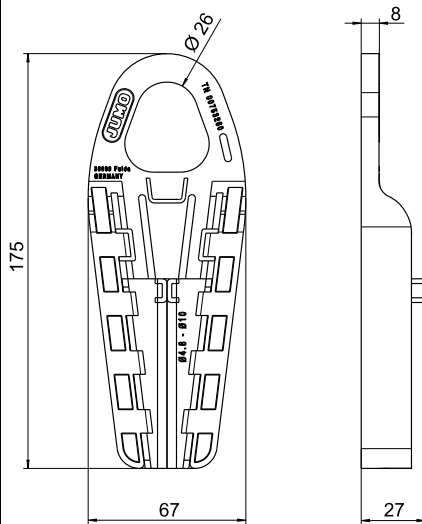
Accessories

Terminal box with pressure compensation
 Part no. 00061206

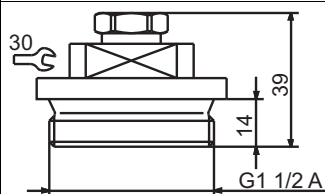


(1) Fastening hole

Cable clamp
 Part no. 00753260



Sealing screw
 Part no. 00333329



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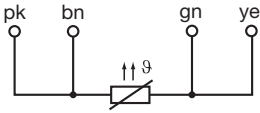
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Connection diagram

The connection diagram in the data sheet provides information on product selection.

For the electrical connection, only use the installation instructions or the operating manual.

Connection		Terminal assignment
		
		Cable ^a
4 to 20 mA, two-wire		
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		
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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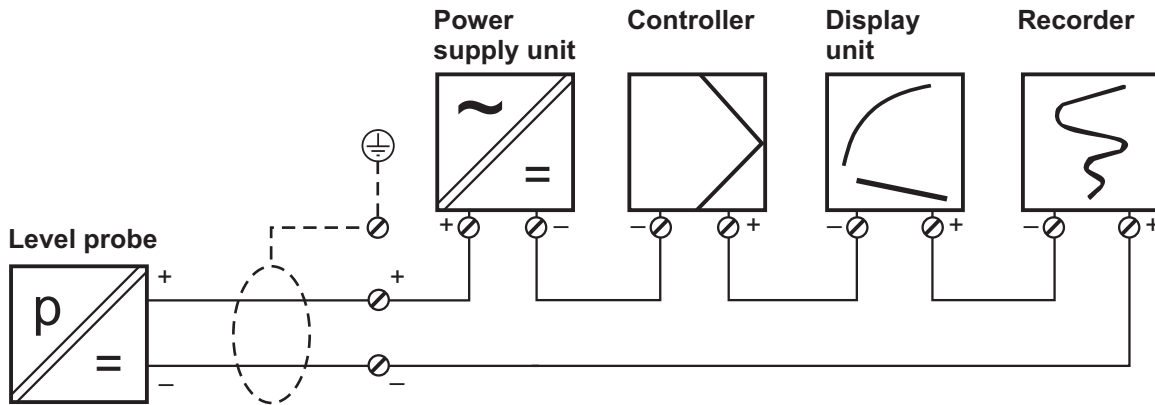
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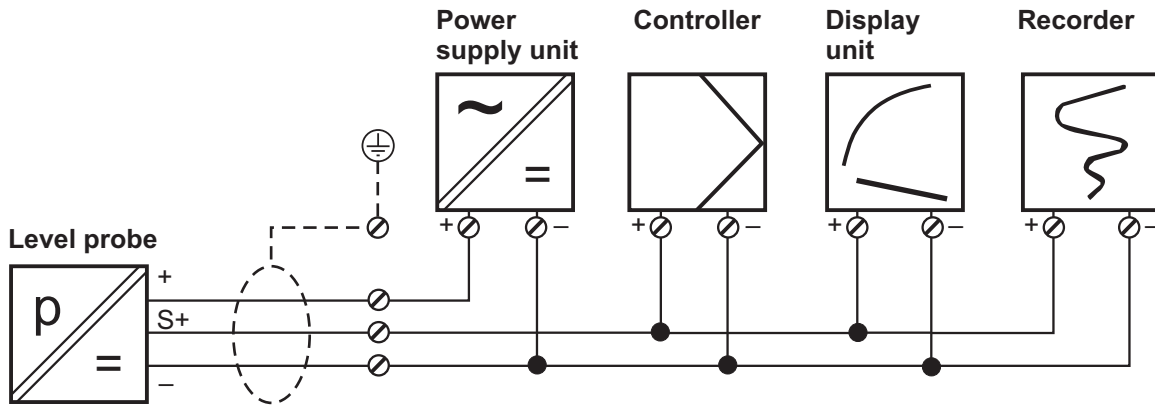


Connection example

Current output



Voltage output



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Order details

(1) Basic type	
404391/000	JUMO MAERA F27 – Level probe with ceramic measuring cell ^a
404391/007	JUMO MAERA F27 – Level probe with ceramic measuring cell with integrated temperature probe Pt100 ^{b, a}
404391/022	JUMO MAERA F27 – Level probe with ceramic measuring cell with case made of plastic PTFE ^c
(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 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
999	Special measuring range
(3) Output	
405	4 to 20 mA, two-wire
412	0.5 to 4.5 V, three-wire
(4) Process connection	
568	G 1" inside ^d
658	Connection closed at the bottom
659	Connection open at the bottom
(5) Electrical connection	
14	PUR cable, pebble gray, shielded, UV-resistant
15	PE-LD cable, black, shielded, UV-resistant
25	FEP cable, black, shielded, UV-resistant
(6) Length of the connecting cable	
005	5 m
010	10 m
...	...
100	100 m
999	Special length
(7) Extra codes	
000	None
593	Cutting ring fitting (preparation for protection tube) ^e
917	EPDM seal

^a Integrated overvoltage protection only possible in connection with output 4 to 20 mA.

^b The basic type 404391/007 is only available with output 4 to 20 mA, and process connection closed or open at the bottom.

^c The basic type 404391/022 is only available with process connection G 1 inside.

^d The process connection G 1 inside is only available with basic type 404391/022.

^e The extra code cutting ring fitting is only available in connection with basic type 404391/000 or 404391/007.

Order code	(1)	(2)	(3)	(4)	(5)	(6)	(7)
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 4.8 mm to 10 mm. The maximum tensile strength is 390 N. The cable clamp is made of UV-resistant, corrosion-free and fiberglass-reinforced polyamide. The central elongated holes are provided for optional, application-dependent fixing of the cable to prevent the clamping jaws from sliding upwards. The side elongated hole is provided for fixing additional cable length.</p>	00753260
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
Pressure compensation filter for cable	<p>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.</p>	00382632