

JUMO MAERA

Level measuring probes

Types 401015, 402090, 404391 and 404392



B 401015.4
Installation Instructions



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1 Typographical conventions

1.1 Warning signs



Caution

This sign is used when there may be **danger to personnel** if the instructions are ignored or not followed correctly!



Attention

This sign is used when there may be **damage to equipment or data** if the instructions are ignored or not followed correctly!

1.2 Note signs



Note

This symbol is used to draw your attention to something **of special importance**.

abc¹

Footnote

Footnotes are notes that **refer to specific passages** in the text. Footnotes consist of two parts:

Identification marking in the text and the footnote text.

The identification markings in the text are arranged as sequential superscript numbers.

1.

Action instruction

2.

This sign indicates the description of an **action to be performed**.

3.

The individual steps are marked by this asterisk.

Example:

1. Press key.

2 General safety instructions

2.1 Intended use of the product



Note

Intended use of the product:

Level measurement probes are used for hydrostatic filling level measurements of **ventilated** tanks or to measure the level in open waters.

The **correct level measuring probe** must be selected in terms of the measuring range, version and specific on-site measuring conditions before mounting, installation and startup! Details provided by the manufacturer, with the exception of those derived from test series, constitute advice. The operator is responsible for the decision!

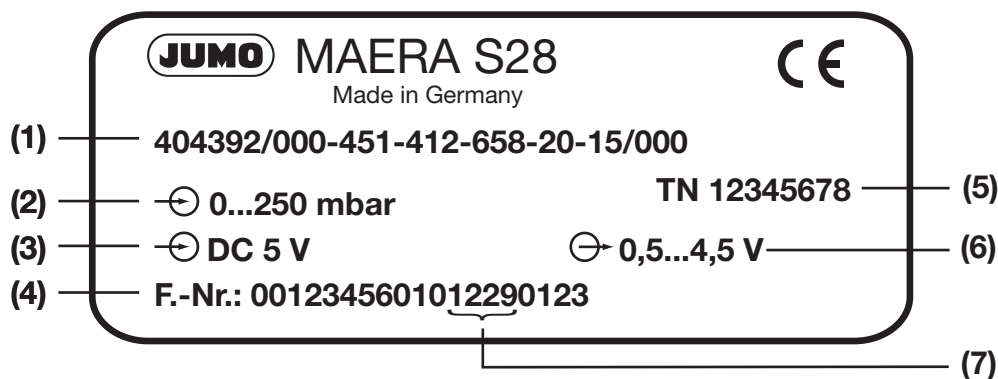
The manufacturer shall not be liable for damage resulting from improper or unintended use.

To prevent damage to the level measuring probe and protect your process, only **qualified specialists** are permitted to perform mounting, installation and startup. They must be familiar with the relevant national regulations as well as standards and directives related to the application to prevent injuries to persons and physical damage. The qualified specialists must have read the operating manual, made note of the nameplate and understood both so they will be able to follow the instructions. Changes and repairs may only be made if the operating manual allows it.

Please note that the manufacturer will not be liable for damage resulting from improper or unintended use.

3 Instrument identification

3.1 Nameplate



- (1) Type code
- (2) Measuring range
- (3) Voltage supply
- (4) Manufacturing number
- (5) Part no.
- (6) Output signal
- (7) Date of manufacture

2912 = 2012/29

(year/week)

3.2 Order details

The type code consists of features. They are described in the technical data for the device:

- MAERA S25, starting at Section 10.1 "JUMO MAERA S25, type 401015", page 21,
- MAERA S26, starting at Section 10.2 "JUMO MAERA S26, type 402090", page 26,
- MAERA F27, starting at Section 10.3 "JUMO MAERA F27, type 404391", page 31,
- MAERA S28, starting at Section 10.4 "JUMO MAERA S28, type 404392", page 36,

3.3 Scope of delivery

The scope of delivery consists of:

- Level measuring probe
- Operating manual
- Optional certificates
- Optional accessories (see Section 11 "Accessories", page 43 and following)

3.4 Goods receiving

- Check whether the packaging is damaged.
- Check whether the scope of delivery is complete and matches your order.
- Check whether the level measuring probe shows any signs of transport damage that may have occurred.

Please note that the membrane on the process connection of the level measuring probe must not be damaged. If it is, measurement errors may occur or medium may even escape. Therefore it must not be touched with pointed or hard objects.

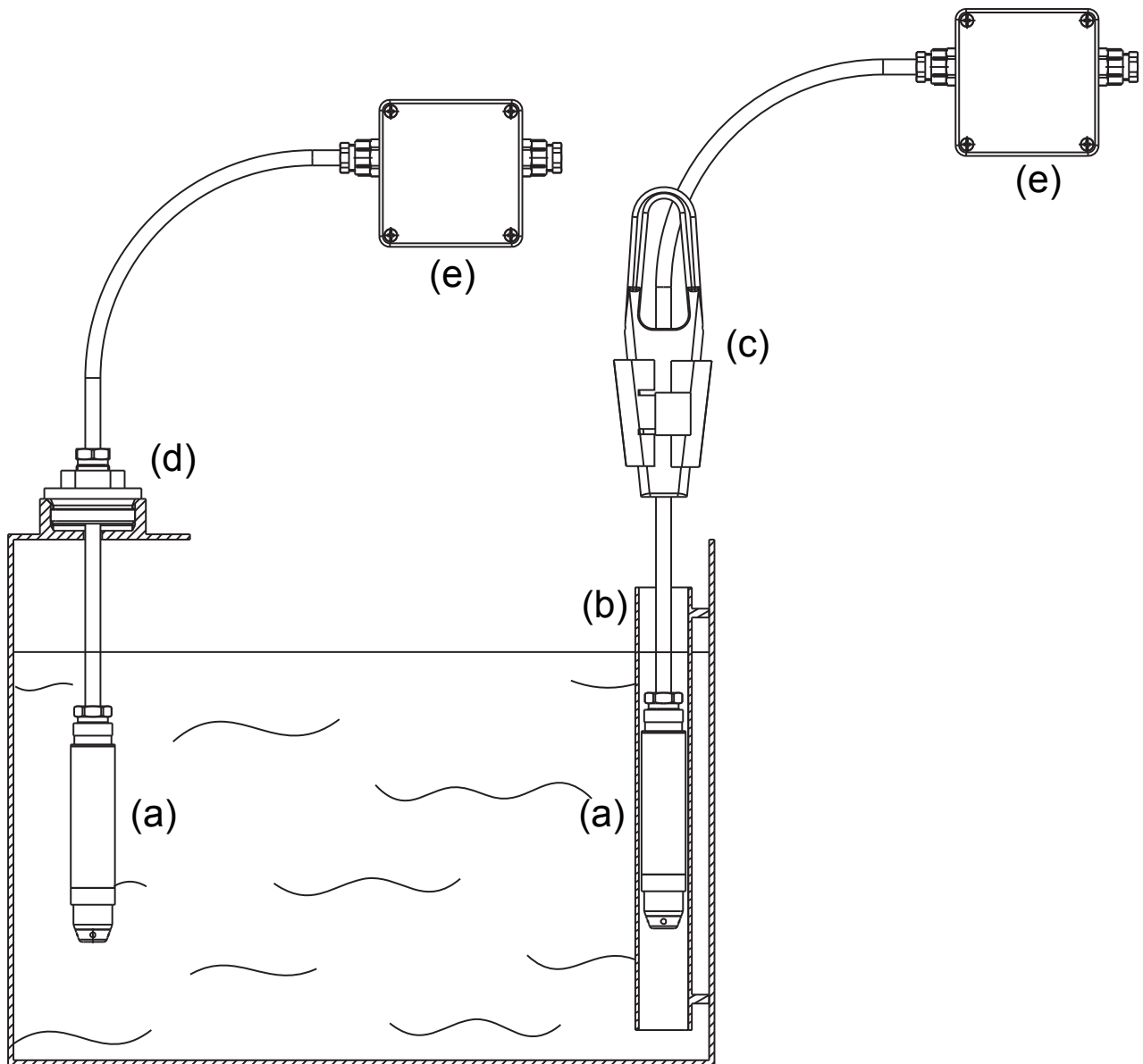
4 Storage

The device must be stored in dry, clean conditions and must be protected against external mechanical damage!

The admissible temperatures for storage are listed in the technical data for the device:

- MAERA S25, Section 10.1.5 "Ambient conditions", page 22,
- MAERA S26, Section 10.2.5 "Ambient conditions", page 27,
- MAERA F27, Section 10.3.5 "Ambient conditions", page 32,
- MAERA S28, Section 10.4.5 "Ambient conditions", page 37.

5 Mounting



- (a) Level measuring probe, suspended vertically in the measuring material
- (b) Guide tube for level measuring probe
- (c) Cable holder (accessory, part no.: 00061389)
- (d) Sealing screw (accessory, part no.: 00333329)
- (e) Terminal box with pressure compensation element (accessory, part no.: 00061206)



Attention

Always mount the device in an unpressurized and currentless state.



Note

The **membrane** on the process connection of the level measuring probe must not be damaged. If it is, measurement errors may occur or medium may even escape. Therefore it must not be touched with pointed or hard objects.



Note regarding the cable module

The **cable** of the level measuring probe should be fastened so that the pressure compensation element is not crushed in the cable module. The end of the cable must be in a dry space or in a suitable terminal box so that no moisture can penetrate. The cable should also not be routed through places subject to moist conditions.

If there are fluctuations in the measuring material, a guide tube should be used to prevent measurement errors in flows due to lateral motion and the level measuring probe striking against the container wall.

If the cable needs to be extended, we recommend using a terminal box with a pressure compensation element (see Section 11.3 "Terminal box with pressure compensation element", page 45).

JUMO MAERA S25 (type 401015)

In this design a stranded core PVC cable is encased in an application-oriented PE-LD or PA protective tube. To prevent moisture from getting into the protective tube (in this case the pressure compensation tube) a hose endpiece (see Section 11.5 "Hose endpiece", page 46) is included with delivery in the mounting material.

Protective tube	
Material	LD-PE, PA
Color	Natural
External diameter	8 mm
Bending radius	approx. 120 mm It is vital to note that if the protective tube is kinked or pinched, this will prevent ambient pressure compensation.
Admissible medium temperatures	-5 to +80 °C (depending on the measuring material and level measuring probe)
Yield stress	
PE protective tube	10 M Pa
PA protective tube	22 M Pa

**JUMO MAERA S26 (type 402090), MAERA F27 (type 404391),
MAERA S28 (type 404392)**

Cable	
Version	6-core, shielded cable with integrated pressure compensation tube; AWG 24 with ferrules
Material Sheathing Pressure compensation tube	PE, PUR, FEP PA
Color PE, FEP cable PUR cable	Black Pebble gray
External diameter	approx. 8.4 mm
Conductor cross section	0.25 mm ² .
Bending radius Movable Fixed	160 mm 120 mm Note that if the protective tube is kinked or pinched, this will prevent ambient pressure compensation.
Tensile strength	20 kg
Weight PE, PUR cable FEP cable	approx. 115 g/m approx. 90 g/m
Admissible medium temperatures	-40 to +70 °C (depending on the measuring material)
UV resistance	PE and PUR cable acc. to VDE 0207, test procedure EN 60811 part 2-1 section 8 FEP cable acc. to DIN ISO 4892-2

6 Installation and startup



Attention

Install the device in a currentless state.




Note

The level measuring probe must be grounded. To prevent **electrolysis**, the screen of the level measuring probe must be set to the same potential as the other devices in the measuring material such as the pump, agitator, etc.

JUMO MAERA S25 (type 401015)


Connection		Terminal assignment
		Cable ^a
4 to 20 mA, two wires, output 405		
Supply voltage 10 to 30 V DC, nominal supply voltage 24 V DC	U _B ⁺ ^b 0 V/S-	White Brown
0.5 to 4.5 V DC ratiometric, output 412		
Supply voltage 5 V DC, nominal supply voltage 5 V DC	U _B ^b 0 V/S- S+	White Brown Green
0 to 10 V DC three wires, output 415		
Supply voltage 11.5 to 30 V DC, nominal supply voltage 24 V DC	U _B ^b 0 V/S- S+	White Brown Green

Connection		Terminal assignment
		
1 to 5 V DC three wires, output 418 1 to 6 V DC three wires, output 420		
Supply voltage 10 to 30 V DC, nominal supply voltage 24 V DC ^b	U_B 0 V/S- S+	White Brown Green

- a For cable specifications see page 12.
- b Peak voltages must not exceed or fall below the values specified for the voltage supply!

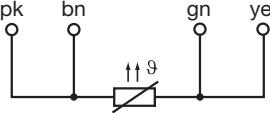
Reverse voltage protection	Yes (two wires)
Max. current consumption	25 mA
Circuit	SELV

**JUMO MAERA S26 (type 402090), MAERA F27 (type 404391),
MAERA S28 (type 404392)**

Connection		Terminal assignment
		
		Cable ^a
4 to 20 mA, three wires, output 402		
Supply voltage 11.5 to 30 V DC, nominal supply voltage 24 V DC	U_B ^b 0 V/S- S+	White Gray Yellow
4 to 20 mA, two wires, output 405		
Supply voltage 10 to 30 V DC, type 404391: 12 to 30 V DC, nominal supply voltage 24 V DC	$U_B/S+$ ^b 0 V/S-	White Gray
4 to 20 mA, three wires, output 406		
Supply voltage 11.5 to 30 V DC, nominal supply voltage 24 V DC	U_B ^b 0 V/S- S+	White Gray Yellow
0.5 to 4.5 V DC ratiometric, output 412		
Supply voltage 5 V DC, nominal supply voltage 5 V DC	U_B ^b 0 V/S- S+	White Gray Yellow
0 to 10 V DC three wires, output 415		
Supply voltage 11.5 to 30 V DC, nominal supply voltage 24 V DC	U_B ^b 0 V/S- S+	White Gray Yellow

Connection		Terminal assignment
1 to 5 V DC three wires, output 418		
1 to 6 V DC three wires, output 420		
Supply voltage 10 to 30 V DC, nominal supply voltage 24 V DC	U _B ^b 0 V/S- S+	White Gray Yellow
Screen		
Attention: Ground the device! Ground all connected devices (such as pumps and valves) to the same potential!		Black

- a For cable specifications see page 13.
- b Peak voltages must not exceed or fall below the values specified for the voltage supply!

Integrated temperature probe (with basic type extension 007)	
	Pink (pk)
	Brown (bn)
	Green (gn)
	Yellow (ye)
Max. current consumption	
JUMO MAERA S26, type 402090	25 mA
JUMO MAERA F27, type 404391 with 24 V DC with 5 V DC	25 mA 2 mA
JUMO MAERA S28, type 404392	30 mA



Note

Level measuring probes in open air applications without integrated overvoltage protection must be protected against electrical discharge. Use of external overvoltage protection is also recommended upstream and downstream from the display or evaluation unit.

7 Operation



Attention

Comply with the technical data in the installation instructions in general.

Special care is required when the level measuring probe is in operation to ensure that the actual temperature does not exceed or fall below the admissible medium temperature and that the level measuring probe does not freeze in the measuring material. In addition, the admissible overpressure must not be exceeded.



Caution

Potentially explosive atmosphere:

The devices described in these installation instructions are **not** designed for use in a potentially explosive atmosphere.



Note

Continuously fluctuating measuring material temperatures may result in a zero point offset. Extreme fluctuations may even cause the device to fail.

8 Cleaning



Note

The cleaning agents that are used must not corrode the material of the probe body and seals.

Mechanical damage to the membrane and cable must be prevented.

9 Maintenance and returns



Note

JUMO level measuring probes are maintenance-free. If irregularities are noted, please send the level measuring probe to the manufacturer with a filled in decontamination declaration and information about the application and the measuring material. The decontamination declaration can be found at our home page under

http://www.jumo.de/de_DE/support/produktservice/reparaturdienst.html .

Please remove the level measuring probe only in an unpressurized and currentless state.

Since further damage may occur during dismounting, make certain no mechanical damage occurs to the probe body and membrane or the cable.

Terminal box with pressure compensation (accessory part no. 00061206): Always keep the filter free of contamination!

10 Technical data

10.1 JUMO MAERA S25, type 401015

10.1.1 General information

Reference conditions	DIN 16086 and EN 60770
Sensor	
Principle of measurement	Silicon sensor with stainless steel separating membrane (piezoresistive)
Pressure transfer medium	Synthetic oil
Admissible load changes	> 10 million, 0 to 100 % measuring range
Mounting position	Vertical/suspended on the cable

10.1.2 Measuring range

Relative and absolute pressure	Measuring ranges start at 0 bar.				
Measuring range	0.25	0.4	0.6	1	bar
Overload capacity	0.75	1.2	1.8	3	bar
Burst pressure	1	1.6	2.4	4	bar

10.1.3 Output

Analog output	
Current	
Output 405	4 to 20 mA, two wires
Voltage	
Output 412	0.5 to 4.5 V DC, three wires, ratiometrically 10 to 90 % of the supply voltage
Output 415	0 to 10 V DC, three wires
Output 418	1 to 5 V DC, three wires
Output 420	1 to 6V DC, three wires
Step response	
T_{90}	≤ 10 ms
Burden	
Current	
4 to 20 mA, two wires	$R_L \leq (U_B - 10 \text{ V})/0.02 \text{ A} (\Omega)$
Voltage	
0.5 to 4.5 V DC, three wires	$R_L \not\leq 20 \text{ k}\Omega$
0 to 10 V DC, three wires	$R_L \not\leq 10 \text{ k}\Omega$
1 to 5 V DC, three wires	$R_L \not\leq 10 \text{ k}\Omega$
1 to 6 V DC, three wires	$R_L \not\leq 10 \text{ k}\Omega$

10.1.4 Mechanical properties

Note the resistance of the materials!

Process connection	
Material	
Process connection 567	Stainless steel 316L
Process connection 707	Stainless steel 316 Ti
Measuring membrane	
Material	Stainless steel 316L
Case	
Material	Stainless steel 304
Protective cap	
Material	Rigid PVC
Weight	90 g (without cable)
Diameter	27 mm

10.1.5 Ambient conditions

Admissible temperatures	
Measuring material	0 to 50 °C The device must not be allowed to freeze in the measuring material! Depending on the measuring material it may be necessary to impose a restriction.
Storage	-20 to +80 °C, dry
Electromagnetic compatibility	
Interference emission ¹	Class B
Interference immunity ²	Industrial requirements
Protection type³	IP68, immersible to 20 m

¹ according to EN 61326-1

² according to EN 61326-2-3

³ according to EN 60529

10.1.6 Accuracy

Relative pressure					
Measuring range	0.25	0.4	0.6	1	bar
Linearity¹	0.3	0.3	0.3	0.3	% of FS
Accuracy at 20 °C ²	0.5	0.5	0.5	0.5	% of FS
Overall accuracy at 0 to 50 °C ³	1	1	1	1	% of FS
Long-term stability⁴	0.3 % of FS per year				

¹ Linearity based on limit point setting

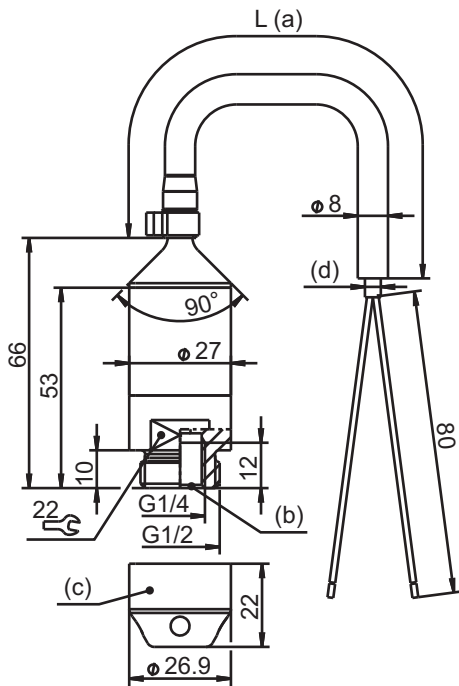
² Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end

³ Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end, thermal effect on measuring range start (offset) and measuring span

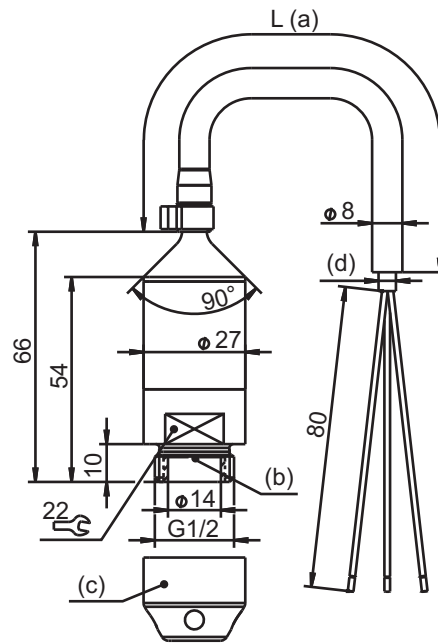
⁴ Reference conditions according to EN 61298-1

10.1.7 Dimensions

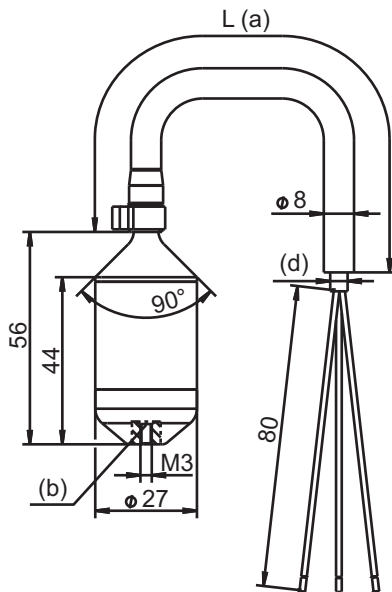
Process connection 567



Process connection 659



Process connection 707



- a Cable length to customer specification
- b Sensitive membrane (do not damage with pointed or hard objects!)

-
- c The protective cap has three holes (\varnothing 3 mm). It protects the case against contact corrosion and protects the sensitive separating membrane
 - d \varnothing 4.2 mm for two-wire output
 \varnothing 4.6 mm for three-wire output

10.1.8 Order details

(1) Basic type

401015/000	JUMO MAERA S25
401015/999	JUMO MAERA S25 special design

(2) Input

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

(3) Output

405	4 to 20 mA, two wires
412	0.5 to 4.5 V three wires
415	0 to 10 V three wires
418	1 to 5 V three wires
420	1 to 6 V three wires

(4) Process connection (not front-flush)

567	G 1/4 internal
659	Connection open underneath
707	M3 (x0.5) internal

(5) Material of process connection

20	CrNi (stainless steel)
----	------------------------

(6) Electrical connection type

11	Attached cable
----	----------------

(7) Protective tube

1	PE protective tube
2	PA protective tube

(8) Length of connecting cable

005	5 m
010	10 m
025	25 m

(9) Extra codes

000	No extra code
-----	---------------

Example: 401015/000-452-405-707-20-11-1-005/000

10.1.9 Accessories

Item

Part no.

Terminal box with pressure compensation (can only be used with the hose endpiece, Section 11.5 "Hose endpiece", page 46) 00061206

10.2 JUMO MAERA S26, type 402090

10.2.1 General information

Reference conditions	DIN 16086 and EN 60770
Sensor system	
Principle of measurement	Silicon sensor with stainless steel separating membrane
Pressure transfer medium	Synthetic oil
Admissible load changes	> 10 million, 0 to 100 % measuring range
Mounting position	Vertical/suspended on the cable

10.2.2 Measuring range

Relative pressure	Measuring ranges start at 0 bar.									
Measuring range	0.25	0.4	0.6	1	1.6	2.5	4	6	bar	
Overload capacity	0.75	1.2	1.8	3	4.8	7.5	12	18	bar	
Burst pressure	1	1.6	2.4	4	6.4	10	16	24	bar	

10.2.3 Output

Analog output¹	
Current	
Output 402	0 to 20 mA, three wires
Output 405	4 to 20 mA, two wires
Output 406	4 to 20 mA, three wires
Voltage	
Output 412	0.5 to 4.5 V DC, three wires, ratiometrically 10 to 90 % of the supply voltage
Output 415	0 to 10 V DC, three wires
Output 418	1 to 5 V DC, three wires
Output 420	1 to 6V DC, three wires
Step response	
T_{90}	≤ 10 ms
Burden	
Current	
0 to 20 mA, three wires	$R_L \leq (U_B - 12 \text{ V})/0.02 \text{ A} (\Omega)$
4 to 20 mA, two wires	$R_L \leq (U_B - 10 \text{ V})/0.02 \text{ A} (\Omega)$
4 to 20 mA, three wires	$R_L \leq (U_B - 12 \text{ V})/0.02 \text{ A} (\Omega)$
Voltage	
0.5 to 4.5 V DC, three wires	$R_L \neq 50 \text{ k}\Omega$
0 to 10 V DC, three wires	$R_L \neq 10 \text{ k}\Omega$
1 to 5 V DC, three wires	$R_L \neq 10 \text{ k}\Omega$
1 to 6 V DC, three wires	$R_L \neq 10 \text{ k}\Omega$

¹ Additional outputs available on request.

10.2.4 Mechanical properties

Note the resistance of the materials!

Process connection	
Material	Stainless steel 316 Ti
Measuring membrane	
Material	Stainless steel 316 Ti
Case	
Material	Stainless steel 316 Ti
Weight	200 g (without cable)
Diameter	25 mm

10.2.5 Ambient conditions

Admissible temperatures	
Measuring material/environment	0 to 50 °C The device must not be allowed to freeze in the measuring material!
Storage	Depending on the measuring material it may be necessary to impose a restriction. -20 to +80 °C, dry
Electromagnetic compatibility	
Interference emission ¹	Class B
Interference immunity ²	Industrial requirements
Protection type³	IP68, immersible to 60 m

¹ according to EN 61326-1

² according to EN 61326-2-3

³ according to EN 60529

10.2.6 Accuracy

Relative pressure									
Measuring range	0.25	0.4	0.6	1	1.6	2.5	4	6	bar
Linearity¹	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	% of FS
Accuracy at 20 °C ²	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.3	% of FS
Overall accuracy at 0 to 50 °C ³	1.6	1.6	1.3	1.1	1.1	1.1	0.8	0.8	% of FS
Long-term stability⁴	0.2 % of FS per year								

¹ Linearity based on limit point setting

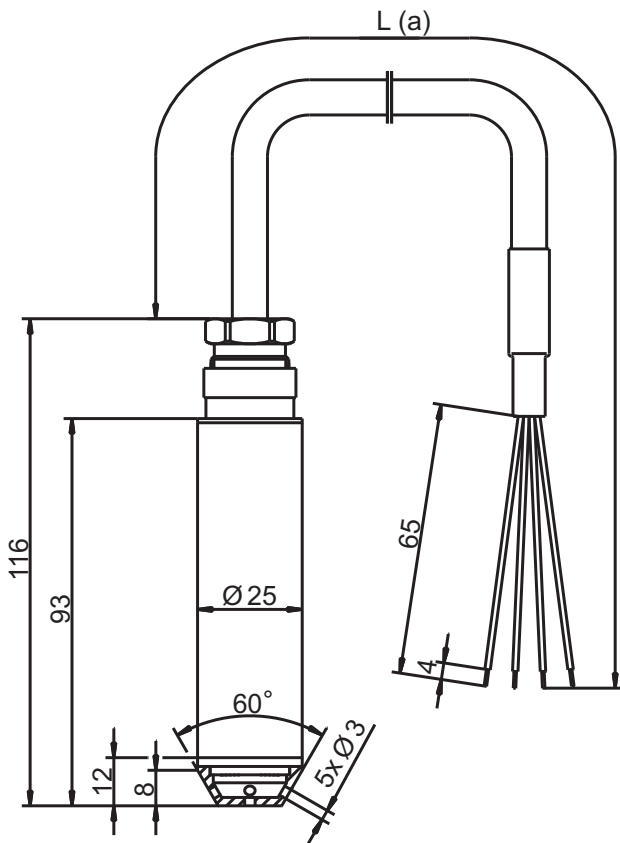
² Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end

³ Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end, thermal effect on measuring range start (offset) and measuring span

⁴ Reference conditions according to EN 61298-1

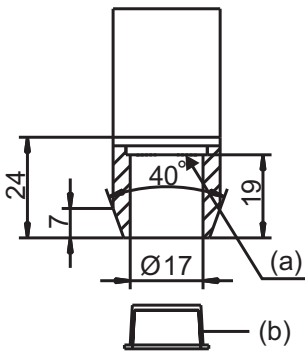
10.2.7 Dimensions

Process connection 658



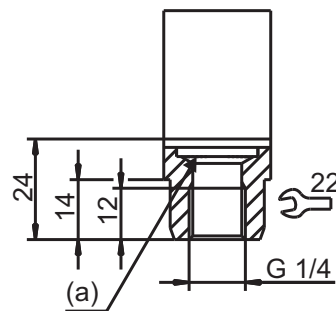
a Cable length to customer specification

Process connection 659



a Sensitive membrane
b Protective cap

Process connection 567



10.2.8 Order details

(1) Basic type

402090/000	JUMO MAERA S26
402090/023	JUMO MAERA S26 improved accuracy
402090/999	JUMO MAERA S26 special design

(2) Input

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
456	0 to 2.5 bar relative pressure
457	0 to 4 bar relative pressure
458	0 to 6 bar relative pressure
999	Special measuring range for relative pressure

(3) Output

402	0 to 20 mA three wires
405	4 to 20 mA, two wires
406	4 to 20 mA three wires
412	0.5 to 4.5 V three wires
415	0 to 10 V three wires
418	1 to 5 V three wires
420	1 to 6 V three wires

(4) Process connection

567	G 1/4 internal
658	Connection closed underneath
659	Connection open underneath

(5) Material of process connection

20	CrNi (stainless steel)
----	------------------------

(6) Electrical connection type

14	Attached, shielded cable PUR gray
15	Attached, shielded cable PE-LD black
25	Attached, shielded cable FEP black

(7) Length of connecting cable

005	5 m
010	10 m
020	20 m
030	30 m
040	40 m
050	50 m
060	60 m
070	70 m
080	80 m
090	90 m
100	100 m

(8) Extra codes

000	No extra code
593	Tube fitting (preparation for protection tube)
631	Full encapsulation

Example: 402090/000-454-405-659-20-15-010-000

10.2.9 Accessories

Item	Part no.
Cable holder (Hot-dip galvanized steel sheet case; clamping jaws and guide terminals made of fiberglass- reinforced PA moulding compound)	00061389
Terminal box with pressure compensation	00061206
Sealing screw	00333329

10.3 JUMO MAERA F27, type 404391

10.3.1 General information

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

10.3.2 Measuring range

For basic type extension /000 Stainless steel case										
Relative pressure	Measuring ranges start at 0 bar.									
Measuring range	0.05	0.1	0.16	0.25	0.4	0.6	1	1.6	bar	
Overload capacity	-0.3/4	-0.3/4	5	6	6	10	10	10	bar	bar
Burst pressure	150									bar
For basic type extension /022 PFTE plastic case										
Relative pressure	Measuring ranges start at 0 bar.									
Measuring range	0.05	0.1	0.16	0.25	0.4	0.6	1	1.6	bar	
Overload capacity	-0.3/2	-0.3/2	2	2	2	2	2	2	bar	bar
Burst pressure	150									bar

10.3.3 Output

Analog output	
Current	
Output 405	4 to 20 mA, two wires
Voltage	
Output 412	0.5 to 4.5 V DC, three wires, ratiometrically 10 to 90 % of the supply voltage
Step response	
T_{90}	≤ 10 ms
Burden	
Current	
4 to 20 mA, two wires	$R_L \leq (U_B - 12 \text{ V})/0.02 \text{ A} (\Omega)$
Voltage	
0.5 to 4.5 V DC, three wires	$R_L \neq 10 \text{ k}\Omega$

10.3.4 Mechanical properties

Note the resistance of the materials!

Process connection	
Material	Stainless steel 316 Ti
Measuring membrane	
Material	Ceramic Al ₂ O ₃ (99.9%)
Case	
Material	
Standard	Stainless steel 316 Ti
For basic type extension 022	PTFE
Seal ¹	FPM
Protective cap (658)	Polyamide
Weight	200 g (without cable)
Diameter	25 mm

¹ Additional seals are available on request.

10.3.5 Ambient conditions

Admissible temperatures	
Measuring material/environment	-20 to +60 °C The device must not be allowed to freeze in the measuring material! Depending on the measuring material it may be necessary to impose a restriction.
For basic type extension 022	0 to 40 °C The device must not be allowed to freeze in the measuring material! Depending on the measuring material it may be necessary to impose a restriction.
Storage	-20 to +100 °C, dry
Electromagnetic compatibility	
Interference emission ¹	Class B
Interference immunity ²	Industrial requirements
Protection type³	IP68, immersible to 60 m

¹ according to EN 61326-1

² according to EN 61326-2-3

³ according to EN 60529

10.3.6 Accuracy

Relative pressure	The measurement ranges start at 0 bar								
Measuring range	0.05	0.1	0.16	0.25	0.4	0.6	1	1.6	bar
Linearity¹	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	% of FS
Accuracy at 20 °C ²	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	% of FS
Accuracy for 0 to +40 °C ³	0.9	0.9	0.9	0.9	0.9	0.9	0.4	0.4	% of FS
Accuracy for -20 to +60 °C ⁴	1.3	1.3	1.3	1.3	1.3	1.3	0.6	0.6	% of FS
Long-term stability⁴	0.2 % of FS per year								

¹ Linearity based on limit point setting

² Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end

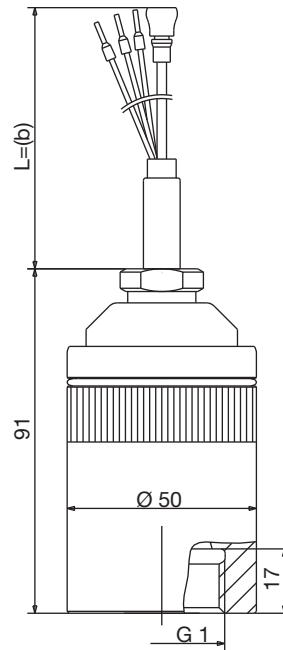
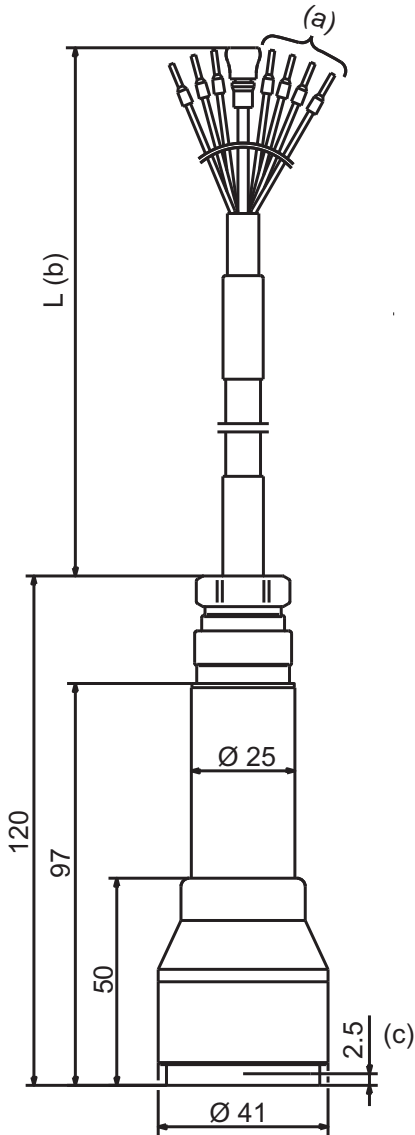
³ Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end, thermal effect on measuring range start (offset) and measuring span

⁴ Reference conditions according to EN 61298-1

10.3.7 Dimensions

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

Type 404391/022-...



- a For basic type extension 007 only (integrated Pt100 temperature probe)
- b Cable length to customer specification
- c Dimension to sensor surface

10.3.8 Order details

(1) Basic type

404391/000	Level measuring probe with ceramic measuring cell
404391/007	With integrated Pt100 temperature probe ^a
404391/022	PTFE plastic case ^b
404391/999	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 for relative pressure

(3) Output

405	4 to 20 mA, two wires
412	0.5 to 4.5 V three wires

(4) Process connection

568	G 1 internal ^c
658	Connection closed underneath
659	Connection open underneath

(5) Electrical connection type

14	Attached, shielded cable PUR gray
15	Attached, shielded cable PE-LD black
25	Attached, shielded cable FEP black

(6) Length of connecting cable

005	5 m
010	10 m
020	20 m
030	30 m
040	40 m

050	50 m
060	60 m
070	70 m
080	80 m
090	90 m
100	100 m
999	Special length

- a With output 405 only, not with basic type 404391/022.
- b With process connection 568 only.
- c With basic type 404391/022 only.

Example: 404391/007-452-405-659-15-010

10.3.9 Accessories

Item	Part no.
Cable holder	00061389
Hot-dip galvanized steel sheet case; clamping jaws and guide terminals made of fiberglass- reinforced PA moulding compound	
Terminal box with pressure compensation	00061206
Sealing screw	00333329

10.4 JUMO MAERA S28, type 404392

10.4.1 General information

Reference conditions	DIN 16086 and DIN EN 60770
Sensor	
Principle of measurement	Silicon sensor with stainless steel separating membrane
Pressure transfer medium	Synthetic oil
Admissible load changes	>10 million, 0 to 100 % measurement range
Mounting position	Vertical/suspended on the cable

10.4.2 Measuring range

Relative pressure	Measuring ranges start at 0 bar.												
Measuring range	0.25	0.4	0.6	0.1	1.6	2.5	4	6	10	16	25	bar	
Overload capacity	0.75	1.2	1.8	3	4.8	7.5	12	18	30	40	40	bar	
Burst pressure	1	1.6	2.4	4	6.4	10	16	24	40	50	50	bar	

10.4.3 Output

Analog output¹	
Current	
Output 405	4 to 20 mA, two wires
Step response	
T ₉₀	≤ 10 ms
Burden	
Current	
4 to 20 mA, two wires	$R_L \leq (U_B - 10 \text{ V})/0.02 \text{ A} (\Omega)$

¹ Additional outputs are available on request.

10.4.4 Mechanical properties

Note the resistance of the materials to the medium!

Process connection	
Material	Stainless steel 316 Ti
Measuring membrane	
Material	Stainless steel 316L
Case	
Material	Stainless steel 316 Ti
Seals	
Material	FPM
Weight	400 g (without cable)
Diameter	25 mm

10.4.5 Ambient conditions

Admissible temperatures	
Measuring material/environment	0 to 50 °C The device must not be allowed to freeze in the measuring material! Depending on the measuring material it may be necessary to impose a restriction.
Storage	-20 to +80 °C, dry
Electromagnetic compatibility	
Interference emission ¹	Class B
Interference immunity ²	Industrial requirements
Overvoltage protection³	Integrated overvoltage protection Nominal leakage current: 1 kA
Protection type⁴	IP68, immersible to 400 m

¹ according to EN 61326-2-3

² according to EN 61326-1

³ according to EN 61000-4-5

⁴ according to EN 60529

10.4.6 Accuracy

Relative pressure												
Measuring range	0.25	0.4	0.6	1	1.6	2.5	4	6	10	16	25	bar
Linearity¹	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	% of FS
Accuracy at 20 °C ²	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3	% of FS
Accuracy for 0 to +50 °C ³	1.6	1.6	1.3	1.1	1.1	1.1	0.8	0.8	0.8	0.8	0.8	% of FS
Long-term stability⁴	0.2 % of FS per year											

¹ Linearity based on limit point setting

² Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end

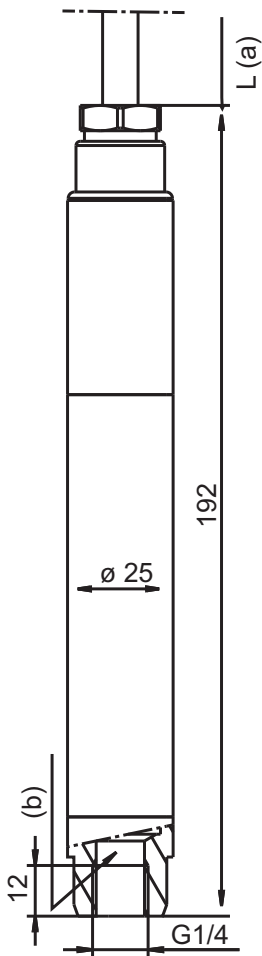
³ Includes: linearity, hysteresis, repeatability, deviation from measuring range start (offset) and measuring range end, thermal effect on measuring range start (offset) and measuring span

⁴ Reference conditions according to EN 61298-1

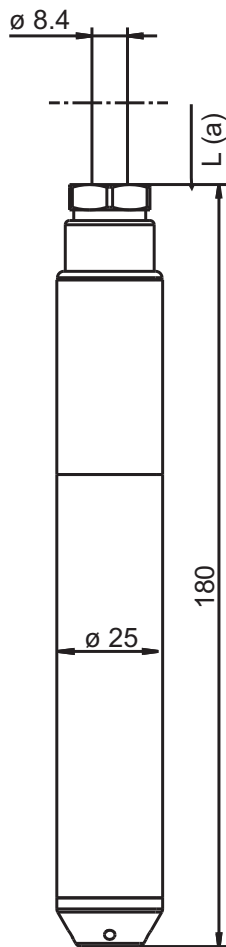
10.4.7 Dimensions

Process connection

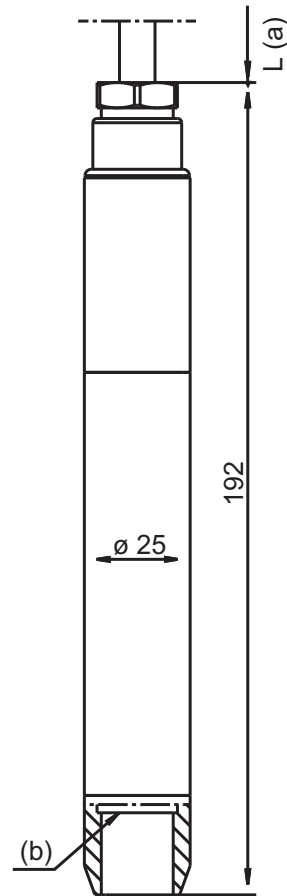
567



568



569



a Cable length to customer specification

b Sensitive membrane

10.4.8 Order details

(1) Basic type

404392/000

JUMO MAERA S28

404392/999

JUMO MAERA S28 special design

(2) Input

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
456	0 to 2.5 bar relative pressure
457	0 to 4 bar relative pressure
458	0 to 6 bar relative pressure
459	0 to 10 bar relative pressure
460	0 to 16 bar relative pressure
461	0 to 25 bar relative pressure
999	Special measuring range for relative pressure

(3) Output

405	4 to 20 mA, two wires
-----	-----------------------

(4) Process connection

567	G 1/4 internal
658	Connection closed underneath
659	Connection open underneath

(5) Material of process connection

20	CrNi (stainless steel)
----	------------------------

(6) Electrical connection type

14	Attached, shielded cable PUR gray
15	Attached, shielded cable PE-LD black
25	Attached, shielded cable FEP black

(7) Length of connecting cable

005	5 m
010	10 m
020	20 m
030	30 m
040	40 m
050	50 m
060	60 m
070	70 m
080	80 m
090	90 m
100	100 m

(8) Extra code

000	None
007	Integrated Pt100 temperature probe
631	Full encapsulation

Example: 404392/000-454-405-659-20-15-020/007

10.4.9 Accessories

Item	Part no.
Cable holder	00061389
Hot-dip galvanized steel sheet case; clamping jaws and guide terminals made of fiberglass- reinforced PA moulding compound	
Terminal box with pressure compensation	00061206
Sealing screw	00333329

10.5 Extra code 593 - tube fitting

For applications in which the outer cable sheathing is not resistant, usage can be facilitating with a protection tube suitable for the application (diameter 12 mm) and corresponding screw connections. There is a tube fitting for this purpose on the electrical output next to the cable. It can be used by the customer to fasten the protection tube.

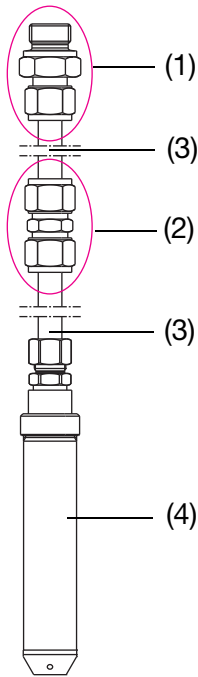
10.5.1 Mounting

In the example: stainless steel

Use of the level measuring probe (4) can be implemented as follows:

- with an electrical connection
- with a protection tube (3) (usually consisting of several tube sections)
- With straight screw connections (2) for the liquid-tight connection between the individual tube sections (3)
- With a straight screw-in connection (1) for fastening on the tank

cover (not shown here).



1. Lubricate the thread and cone of the coupling connecting piece and the thread of the union nut for the straight screw connection (two-sided tube fitting). Select a lubricating paste that is suitable for the application.
2. Push the first tube section over the cable in the direction of the electrical connection of the measuring instrument.
3. To ensure proper tube cutting, guide the tube to the stop of the pre-mounted screw connection and tighten the union nut finger-tight. Use the union nut to press the cutting ring together and cut into the tube, which creates the seal.
4. A vertical mark on the tube and straight screw connection can be used to visualize the tightening path that has already been followed.
5. For the straight screw connection made of stainless steel, tighten the union nut about 1/4 revolution beyond the point where a noticeable increase in force is required.
6. To check whether the assembly is correct, loosen the union nut again. The front cutting ring surface is covered by tube material. If not, the screw connection must be retightened.



Note

The extra code can be selected in combination with level measuring probes JUMO MAERA S26 (type 402090), MAERA F27 (type 404391) and MAERA S28 (type 404392). Only level measuring probe JUMO MAERA S26 (type 402090) can be used to implement a complete stainless steel system without the measuring material coming in contact with cable and seals.

10.6 Extra codes 631, 691 - encapsulation

Encapsulated electronics protect the device from climatic effects, which can cause measurement errors due to the condensation buildup and may also cause the level measuring probe to fail. Encapsulation should be selected especially in applications with hot measuring materials and cold ambient conditions, vice versa or greatly fluctuating temperatures. This also applies in all cases for outside mounting.

11 Accessories

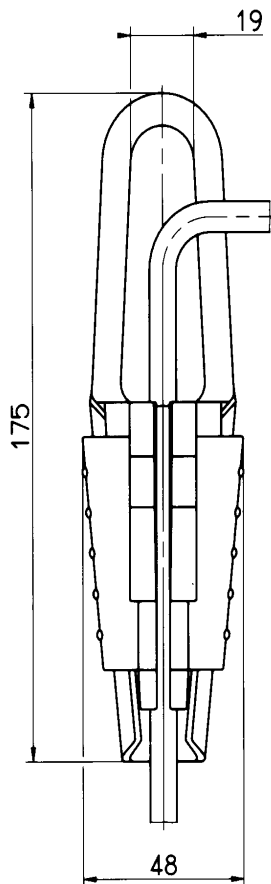
11.1 Cable holder

Part no.: 00061389

The cable holder holds the probe in the liquid at a defined depth. Using the cable holder ensures that the cable will not be inadmissibly deformed. The cable holder is compatible with all JUMO level measuring probes.

The clamping range is 5.5 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 brackets are made of fiberglass-reinforced polyamide. A stainless steel version can be implemented on request.

Please note that a hose endpiece must be used with the JUMO MAERA S25 level measuring probe type 401015, see Section 11.5 "Hose endpiece", page 46.

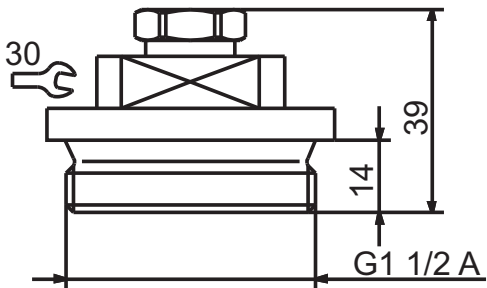


11.2 Sealing screw

Part no.: 00333329

For closed containers or wells with a well head, the cable should be guided through and fastened by a sealing screw.

Please note that a hose endpiece must be used with the JUMO MAERA S25 level measuring probe type 401015, see Section 11.5 "Hose endpiece", page 46.

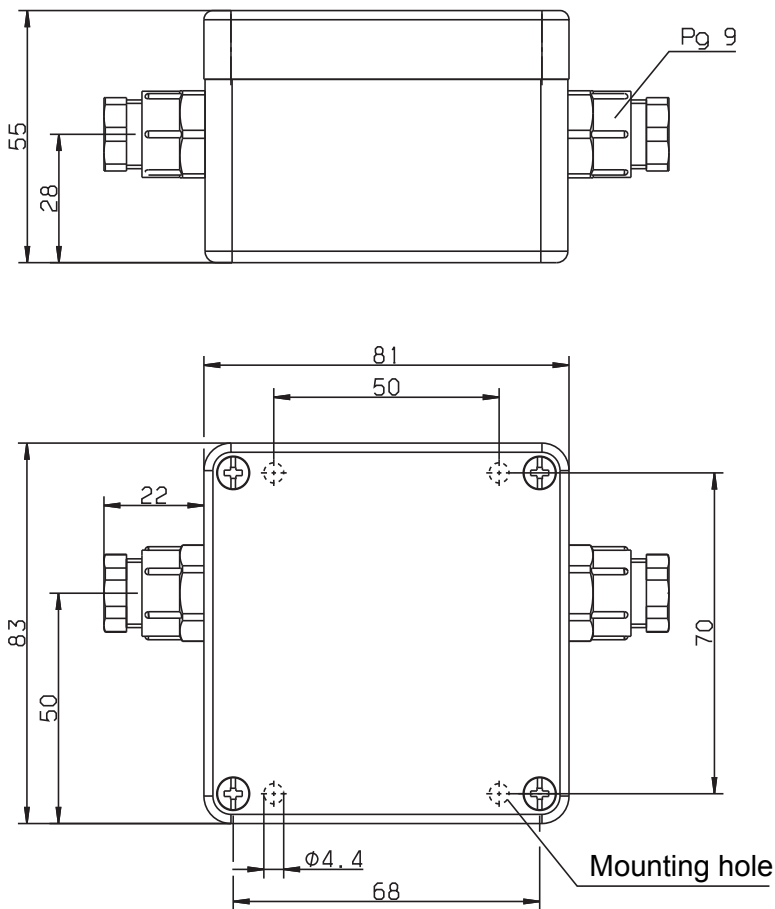


11.3 Terminal box with pressure compensation element

Part no.: 00061206

The terminal box ensures secure installation of the probe cable. The end of the pressure compensation tube is always protected from deposits and condensation (IP65). The remaining distribution can be performed with a cable, without a pressure compensation tube.

Please note that a hose endpiece must be used with the JUMO MAERA S25 level measuring probe type 401015, see Section 11.5 "Hose endpiece", page 46.



11.4 Pressure compensation filter for cable

Part no.: 00382632

The pressure compensation filter is a breathable filter that ensures aeration and ventilation without moisture penetrating. It can be used with product series JUMO MAERA S26 (type 402090), MAERA F27 (type 404391) and MAERA S28 (type 404392).

11.5 Hose endpiece

The hose endpiece is used exclusively with the JUMO MAERA S25 variant of the level measuring probe (type 401015).

In this device a standard line is encased in an application-oriented protective tube. The hose endpiece prevents the hose which serves to compensate pressure from being pinched off or kinked when it is guided through a wall. The hose endpiece may be guided through wall openings in stonework or brickwork, clamping screw connections or tube fittings in a tank, cable glands in a control cabinet or JUMO cable holder, etc. (see Section 11.1 "Cable holder", page 43). It should also be used for the JUMO terminal box with pressure compensation (see Section 11.3 "Terminal box with pressure compensation element", page 45). If you have questions about this accessory we will be pleased to assist you.

12 Faults/errors



Caution

Measuring material may be harmful to people, the environment and equipment!



Attention

Touching the membrane with pointed or hard objects will damage it irreparably!

Type of fault	Possible cause	Action
No measurement or output signal	Supply voltage too low	Check the supply voltage see Section 10 "Technical data", starting on page 21
	Lead break, false connection	Check connecting cables see Section 10 "Technical data", starting on page 21
	Mechanical, thermal or chemical damage to pressure transmitter	Send the device in to the supplier with a description of the error and a decontamination declaration
Output signal is constant even when the pressure changes	Measuring system destroyed by overpressure	
	Because of overvoltage, current limiting has distorted the output signal	Check the supply voltage see Section 10 "Technical data", starting on page 21

Type of fault	Possible cause	Action
Output signal is too high	The selected measuring range is too small	Send the device in to the supplier with a description of the error and a decontamination declaration
	Electronics faulty	
	Supply voltage is too high	
Output signal is too low	For current output signal: burden is too large For voltage output signal: burden is too small	Change burden see Section 10 "Technical data", starting on page 21
	Supply voltage is too low	Change the supply voltage, see Section 10 "Technical data", starting on page 21
	Membrane damaged by mechanical effects, aggressive measuring material, corrosion, etc.	Send the device in to the supplier with a description of the error and a decontamination declaration

Type of fault	Possible cause	Action
Deviating zero point signal	Temperature of measuring material or ambient temperature is too high or too low	Send the device in to the supplier with a description of the error and a decontamination declaration
	Membrane dirty	Carefully clean the membrane, for example with a small brush or sponge using a non-aggressive cleaning agent, see Section 8 "Cleaning", starting on page 19. The membrane must not be damaged!
	Membrane damaged by mechanical effects, aggressive measuring material, corrosion, etc.	Send the device in to the supplier with a description of the error and a decontamination declaration
	Moisture has penetrated	
Output signal characteristic is not linear	Device adjustment has been changed by inadmissible operating conditions (such as overpressure)	



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