

# JUMO DELOS SI

Precision pressure transmitter  
with switching contacts and display



**B 405052.0**  
Operating Manual





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## 1.1 Warning symbol



### **DANGER!**

This symbol indicates that personal injury **caused by electrical shock** may occur, if the respective precautionary measures are not carried out.



### **CAUTION!**

This symbol in connection with the signal word indicates that **damage to assets or data loss** will occur if the respective precautionary measures are not taken.



### **CAUTION!**

This symbol indicates that **components could be destroyed** by electrostatic discharge (ESD = Electro Static Discharge) if the respective cautionary measures are not taken.

Only use the ESD packages intended for this purpose to return device inserts, assembly groups, or assembly components.

## 1.2 Note symbols



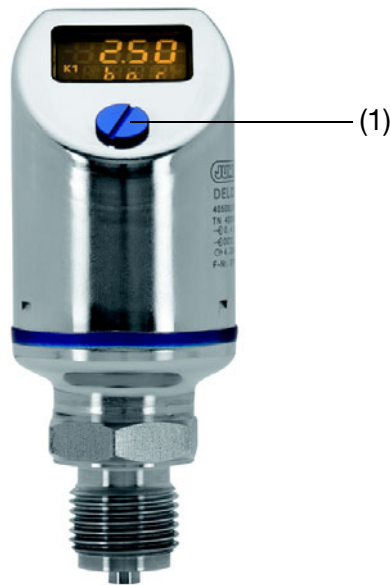
### **NOTE!**

This symbol refers to **important information** about the product, its handling, or additional use.

# 1 Safety information

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### 2.1 General



- Depending on its design, the instrument measures relative or absolute pressure in liquid and gaseous media.
- The pressure is displayed digitally.
- Depending on the design, the following outputs are available:
  - 1 PNP switching output
  - 2 PNP switching outputs
  - 1 PNP switching output + 1 analog output 4 to 20 mA<sup>1</sup>
  - 1 PNP switching output + 1 analog output 0 to 20 mA<sup>1</sup>
  - 1 PNP switching output + 1 analog output 0 to 10 V<sup>1</sup>
- The instrument is also available in a design for use at elevated medium temperatures.
- The instrument can be adjusted directly on site or can be configured via PC with a setup program.



#### CAUTION!

The protection type specified for the device (see chapter 11 „Technical data“, page 59) can only be achieved with the control opening (1) closed.

<sup>1</sup> The output is freely configurable.

## 2 Description

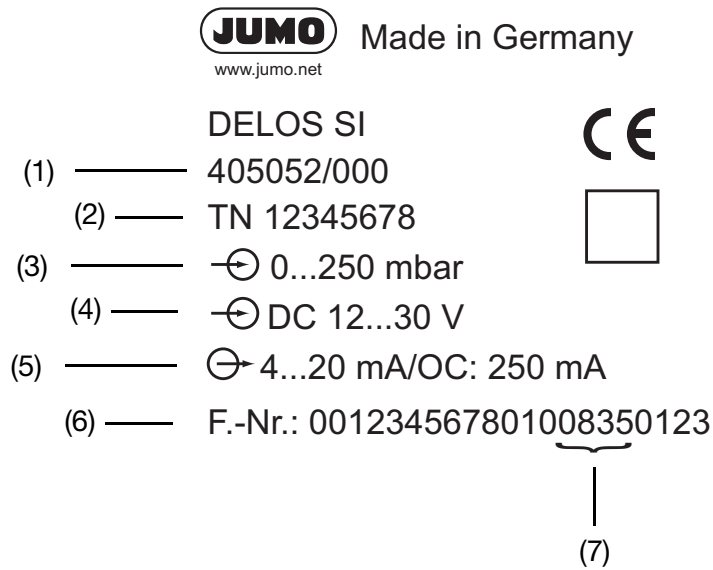
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# 3 Identifying the instrument version

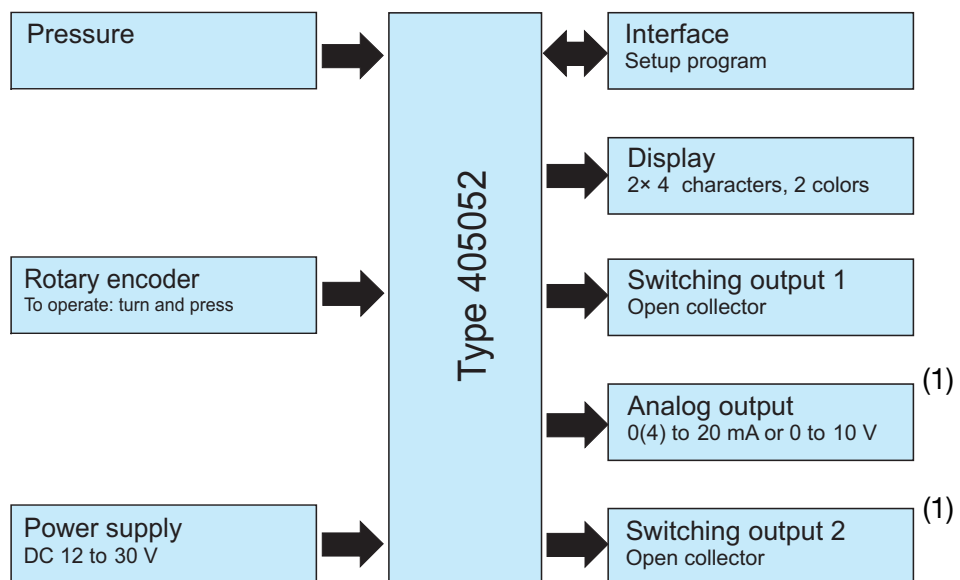
## 3.1 Nameplate

on the pressure switch



- |                     |   |
|---------------------|---|
| (1) Type            | (5) Output signal                                   |
| (2) Sales no.       | (6) Manufacturing number                            |
| (3) Measuring range | (7) Date of manufacture<br>(year and calendar week) |
| (4) Voltage supply  |   |

## 3.2 Block diagram



<sup>1</sup> optional

## 3 Identifying the instrument version

### 3.3 Order details

<b>(1) Basic type</b>	
405052/000	JUMO DELOS SI - Precision pressure transmitter with switching contacts and display <sup>a</sup>
405052/004	JUMO DELOS SI - Precision pressure transmitter with switching contacts and display for increased measuring material temperatures up to 200 °C <sup>b</sup>
405052/999	JUMO DELOS SI - Precision pressure transmitter with switching contacts and display, special version
<b>(2) Input</b>	
447	-400 to +400 mbar relative pressure
449	-1 to +1 bar relative pressure
452	0 to 400 mbar relative pressure
454	0 to 1 bar relative pressure
457	0 to 4 bar relative pressure
459	0 to 10 bar relative pressure
461	0 to 25 bar relative pressure
463	0 to 60 bar relative pressure
481	-1 to +3 bar relative pressure
483	-1 to +9 bar relative pressure
485	-1 to +24 bar relative pressure
486	0 to 400 mbar absolute pressure
488	0 to 1 bar absolute pressure
491	0 to 4 bar absolute pressure
493	0 to 10 bar absolute pressure
495	0 to 25 bar absolute pressure
<b>(3) Output</b>	
470	1× PNP switching output
471	2× PNP switching output
475	1× PNP switching output and 1× analog output 4 to 20 mA <sup>c</sup>
476	1× PNP switching output and 1× analog output 0 to 20 mA <sup>c</sup>
477	1× PNP switching output and 1× analog output 0 to 10 V <sup>c</sup>
<b>(4) Process connection</b>	
504	G 1/2 EN 837
511	1/4-18 NPT EN 837
521	G 1/4 DIN 3852-11
523	G 1/2 DIN 3852-11
571	G 3/4 front-flush EN ISO 228-1
575	G 3/4 front-flush with 2-way seal
576	G 1 front-flush with 2-way seal
603	Taper socket with union nut DN 20 DIN 11851 (dairy screw connection) <sup>d</sup>
604	Taper socket with union nut DN 25 DIN 11851 (dairy screw connection) <sup>d</sup>
606	Taper socket with union nut DN 40 DIN 11851 (dairy screw connection) <sup>d</sup>
607	Taper socket with union nut DN 50 DIN 11851 (dairy screw connection) <sup>d</sup>
612	Clamp DN 10, 15, 20 DIN 32676

### 3 Identifying the instrument version

613	Clamp DN 25, 32, 40 DIN 32676
616	Clamp DN 50 DIN 32676, 2" ISO 2852
619	Clamp DN 15 DIN 32676, 3/4" ISO 2852
623	Small flange DN 25 DIN 28403
652	Tank connection with grooved union nut DN 25 <sup>e</sup>
997	JUMO PEKA with EHEDG approval <sup>f</sup>
998	Suitable for connection to diaphragm seal
<b>(5) Process connection material</b>	
20	CrNi (stainless steel)
<b>(6) Electrical connection</b>	
36	Round plug M12 × 1
<b>(7) Measuring system filling medium</b>	
01	Silicon oil
12	FDA-compliant oil
<b>(8) Extra codes</b>	
000	None
100	Customized setting (specify required setting in plain text)
452	Parts in contact with the medium are electropolished, surface roughness Ra ≤ 0.8 μm
591	Throttle in pressure channel
624	Free of oil and grease
691	Improved humidity/vibration protection

<sup>a</sup> This JUMO product is licensed under United States and Canadian patents. Purchasers of the JUMO product outside of the United States and Canada should advise JUMO of any planned sales of products incorporating the JUMO product into the United States and Canada.

<sup>b</sup> Measuring devices for increased measuring material temperatures can only be delivered with process connection 571, 575, 576, 603, 604, 606, 607, 612, 613, 623, 652, 997.

<sup>c</sup> Factory setting – the analog output can be freely configured.

<sup>d</sup> Union nut is included in delivery.

<sup>e</sup> Welding socket, seal and groove union nut are included in delivery.

<sup>f</sup> For suitable process connection adapters, see data sheet 409711.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)							
<b>Order code</b>	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	/	<input type="text"/>				
<b>Order example</b>	405052/000	-	459	-	471	-	504	-	20	-	36	-	01	/	000

## 3 Identifying the instrument version

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### 3.4 Accessories

Article	Sales no.
PC interface cable including USB/TTL converter <sup>a</sup>	00456352
Y transmitter cable, 5 pole <sup>a</sup>	00507861
Combination tool	00526614
Cable connector, straight, 4 pole, M12 × 1, 2 m PVC cable	00404585
Cable connector, angled, 4 pole, M12 × 1, 2 m PVC cable	00409334
Cable socket, 5 pole, M12 × 1, straight, without connecting cable, assembly by customer	00419130
Measuring device holder for wall and 2" pipe	00597711
CD-setup program <sup>a</sup>	00522384

<sup>a</sup> The setup program can only be used for configuration in conjunction with these accessories.

### 4.1 Installation instructions

**DANGER!**

The electrical connection must only be performed by qualified personnel!

The load circuits must be fused for the maximum load currents in each case to prevent the instrument from being destroyed.

Electromagnetic compatibility meets the requirements of EN 61326.

No other consumers can be connected to the voltage supply of the instrument.

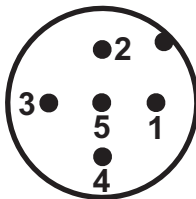
The device is not suitable for installation in areas with an explosion hazard.

Apart from faulty installation, incorrect settings on the instrument may also affect the proper functioning of the subsequent process or lead to damage. You should therefore always provide safety equipment that is independent of the instrument and it should only be possible for qualified personnel to make settings.

### 4.2 Color assignment of M12 x 1 round plug

**CAUTION!**

The following color assignment applies only to A-coded standard cables!



- 1 Brown
- 2 White
- 3 Blue
- 4 Black
- 5 Gray

## 4 Electrical connection

### 4.3 Terminal assignment for output 470

One PNP switching output	
Voltage supply	
1 L+	DC 12 to 30 V
3 L-	GND
Output	
4 K1	Highside Open Collector maximum 0.25 A
2	nc
5	Interface

### 4.4 Terminal assignment for output 471

Two PNP switching outputs	
Voltage supply	
1 L+	DC 12 to 30 V
3 L-	GND
Output	
4 K1	Highside Open Collector maximum 0.25 A
2 K2	
5	Interface

### 4.5 Terminal assignment for outputs 475, 476, and 477

One PNP switching output + one analog output	
Voltage supply	
1 L+	DC 12 to 30 V
3 L-	GND
Output	
4 K1	Highside Open Collector maximum 0.25 A
2 Analog	0(4) to 20 mA/0 to 10 V
5	Interface

## 4 Electrical connection

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### 5.1 General information



#### CAUTION!

The compatibility of the instrument with the measuring medium must be tested, see chapter 11 „Technical data“, page 59.

#### Mounting location

- Find a location that ensures easy accessibility for later operation.
- The fastening must be secure and must ensure low vibration for the instrument.
- Avoid direct sunlight!
- Permissible ambient temperature at the installation location chapter 11 „Technical data“, page 59.

#### Installation position

The instrument can be mounted in any position.

The "vertical" installation position is recommended, see illustration.



## 5 Mounting

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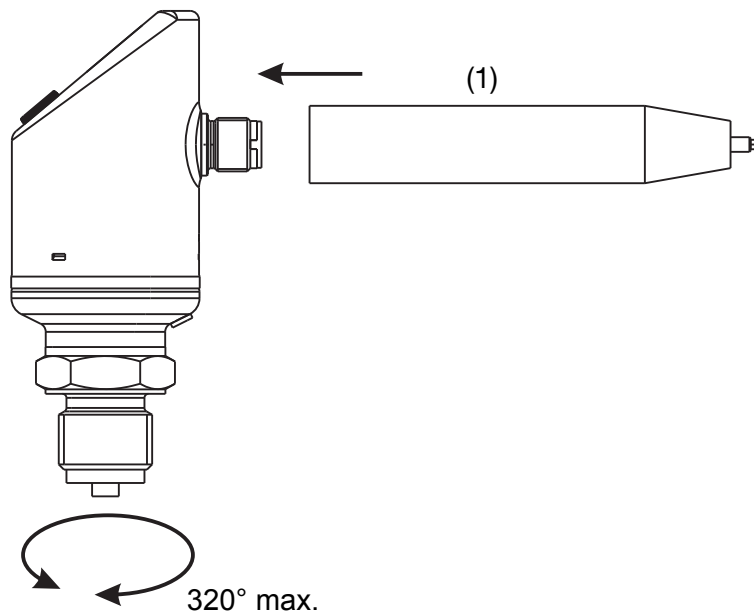
### 5.1.1 Rotating the display

The display image can be rotated 180° in the software, siehe „Display position“, page 29. This may make it easier to read when the instrument is installed overhead, for example.

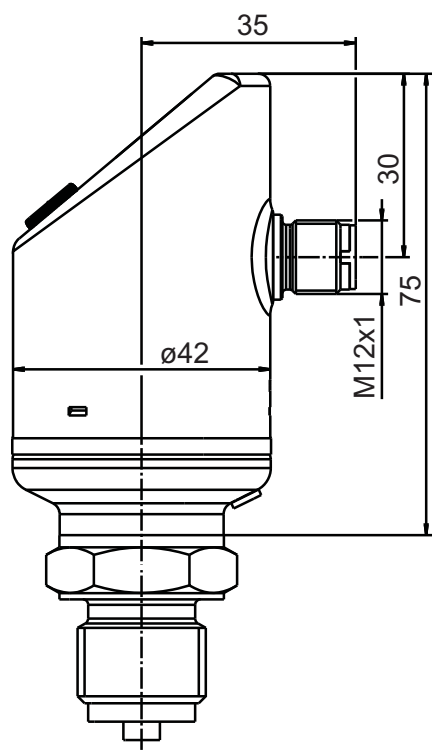


### 5.1.2 Rotating the housing

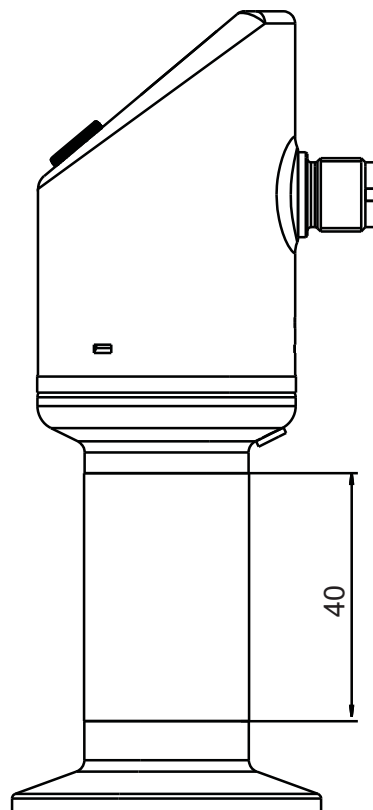
The instrument housing can be rotated a maximum of 320° with the combination tool (1).



### 5.2 Dimensions of electronic pressure switches



Type 405052/000-...



Type 405052/004-...



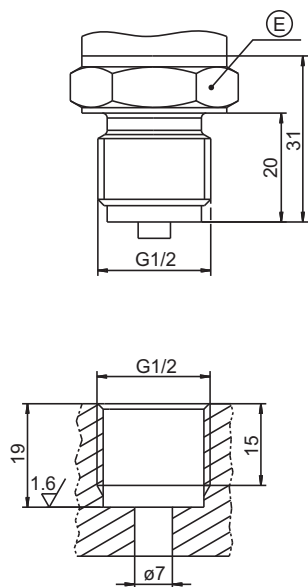
#### NOTE!

The overall height is 40 mm greater for instruments with basic type extension 004 (for increased medium temperature up to 200 °C). See drawing

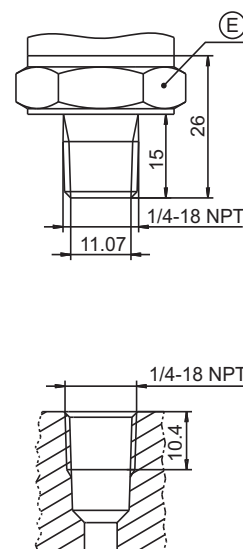
# 5 Mounting

## 5.3 Dimensions of process connections, not front-flush

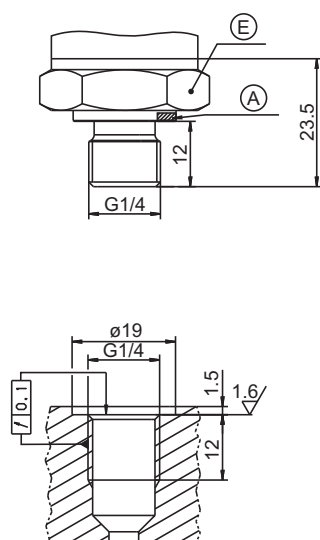
504



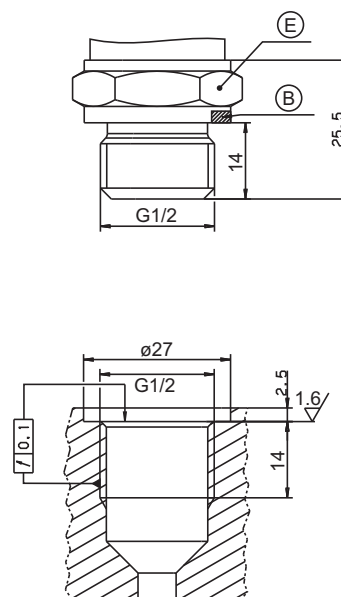
511



521



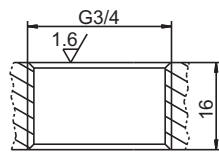
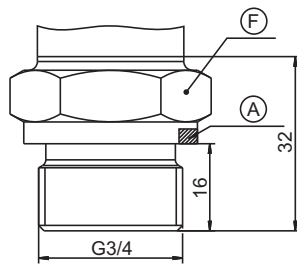
523



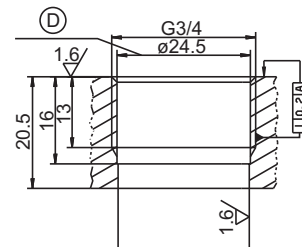
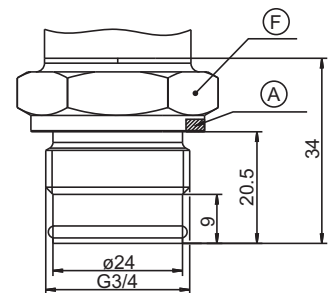
- A = Profile seal DN G 3/4
- B = Profile seal DN G 1/2
- E = SW 27
- F = SW 32

## 5.4 Dimensions of process connections, front-flush

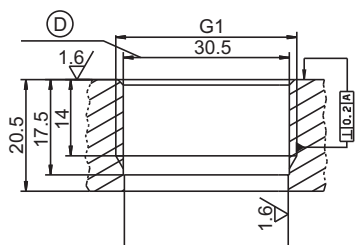
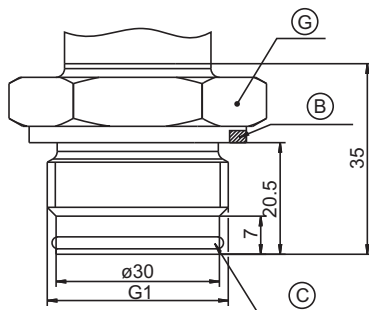
571



575



576

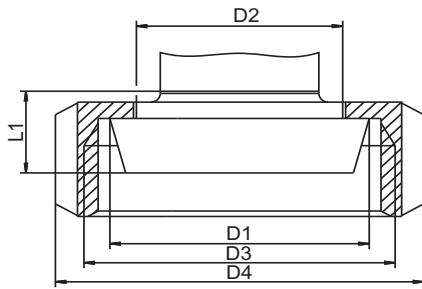


- A = Profile seal DN G 3/4
- B = Profile seal DN G 1/2
- C = O-ring 26.7 × 1.78

- D = Drill out after tapping
- F = SW 32
- G = SW 41

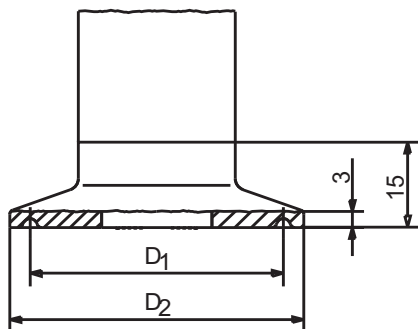
## 5 Mounting

603 to 607



Process connection	DN	ø D1	ø D2	ø D3	ø D4	L1
603	20	36.5	30	RD 44 x 1/6	54	13
604	25	44	35	RD 52 x 1/6	63	15
606	40	56	48	RD 65 x 1/6	78	
607	50	68.5	61	RD 78 x 1/6	92	16

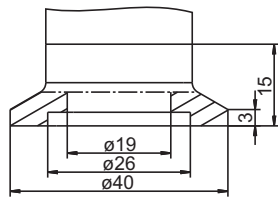
612 to 616



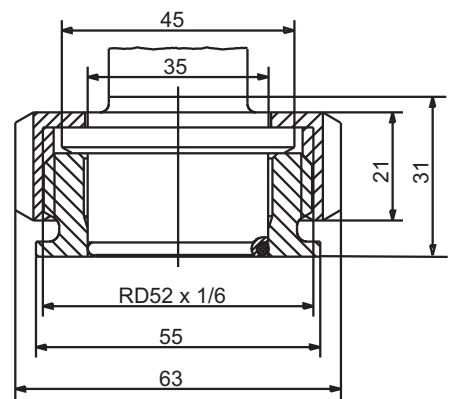
Process connection	DN DIN 32676	DN (inches)	Nominal Size ISO 2852	ø D1	ø D2
612	20		12	27.5	34
	15		12.7		
			17.2		
			21.3		
613	25	1"	25	43.5	50.5
	32	1.5"	33.7		
	40		38		
616	50	2"	40 51	56.5	64

## 5 Mounting

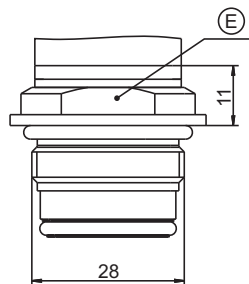
623



652



997



E = SW 27



### NOTE!

Process connection 997 is EHEDG-certified.

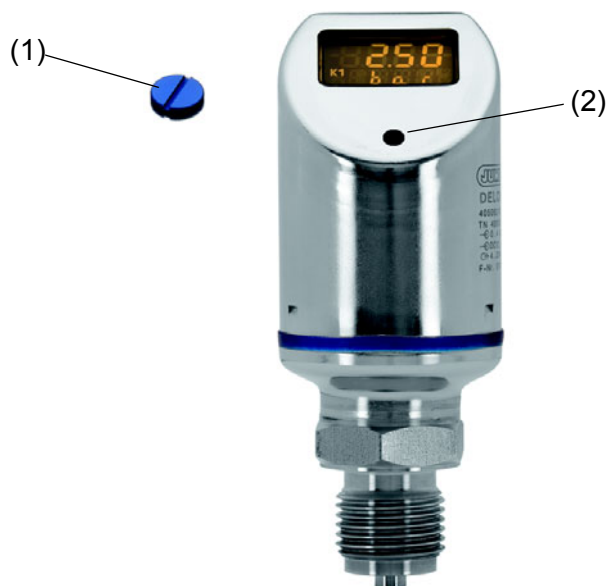
For detailed information about this process connection system, see data sheet 409711.

## 5 Mounting

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### 6.1 Controls



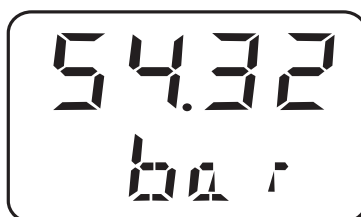
- (1) Protective screw
- (2) Hexagon socket

- Unscrew the protective screw (1).
- "Turn/push" the control element (2) with the enclosed combination tool (or a 0.5 × 3 screwdriver).

### 6.2 LC display

#### 6.2.1 Measurement mode

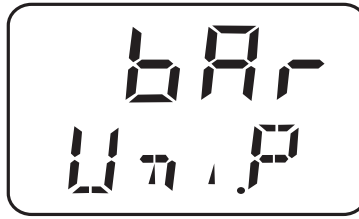
Normal display



Example:  
The display is lit yellow.

# 6 Operation

## 6.2.2 Settingmode



Example:  
The display is lit red.

### Operation

Continue	Press the combination tool less than 1 second (< 1 s)
Yes (accept)	Press the combination tool less than 1 second (< 1 s)
No (Cancel)	Press the combination tool more than 3 seconds (> 3 s)
Timeout	No activity for more than 60 seconds (> 60 s)

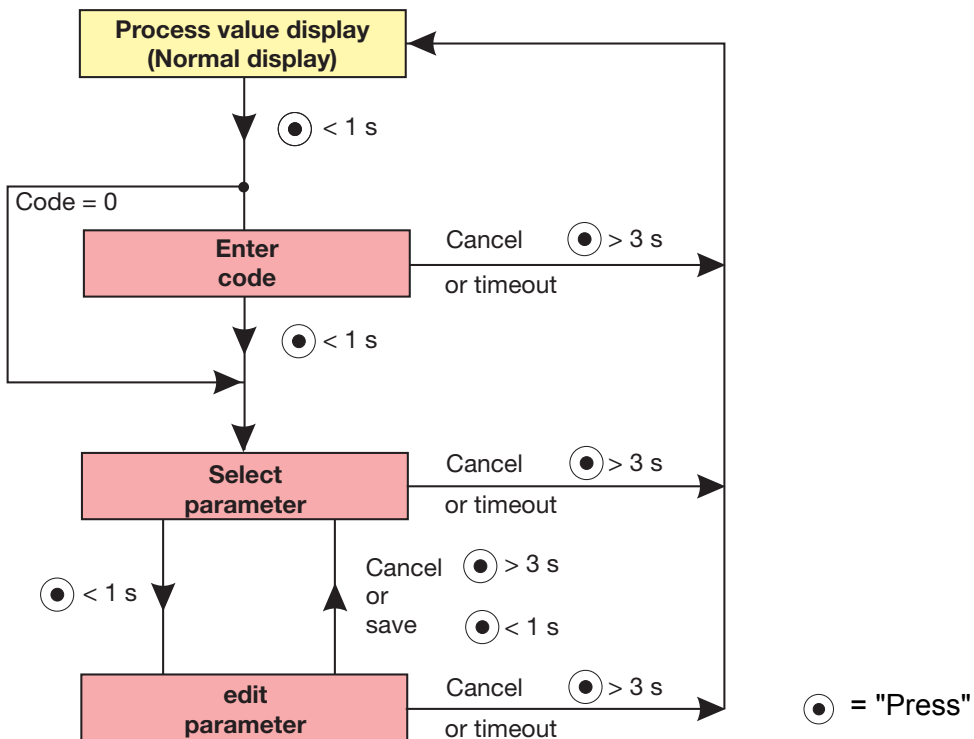


#### NOTE!

To return to measuring mode:

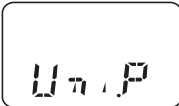
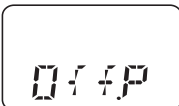

- "No (Cancel)" or
- Wait for timeout = no activity performed for 60 seconds.

## 6.3 Levels



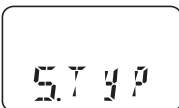

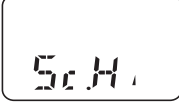

## 6.4 Parameter

### 6.4.1 Input

Parameter	Display	Setting range <sup>a</sup>
Pressure unit		bar kPa MPa psi mbar <b>Note:</b> The units kPa and mbar cannot be configured for all measuring ranges.
Offset (zero-point correction)		-20.00 to <b>0.00</b> to +20.00 % of the measuring range <b>Note:</b> Automatic offset correction see chapter 7.5 "Setting the zero point (offset) (Off.P)", page 36.
Damping (filter time constant)		<b>0.00</b> to 99.99 s

<sup>a</sup> The default setting is marked in **bold**.

### 6.4.2 Analog output

Parameter	Display	Setting range <sup>a</sup>
Signal type (for analog output)		<b>4 to 20 mA</b> 0 to 20 mA 0 to 10 V
Scaling start (for analog output)		<b>0.00</b> to 75.00 % of nominal measuring range
Scaling end (for analog output)		25.00 to <b>100</b> % of nominal measuring range
Signal for error (for analog output)		3.4 mA or 22 mA for output signal 4 to 20 mA 0 mA or 22 mA for output signal 0 to 20 mA 0 V or 10.7 V for output signal 0 to 10 V <b>Note:</b> Depending on the configured output signal.

<sup>a</sup> The default setting is marked in **bold**.

## 6 Operation

### 6.4.3 Binary output 1

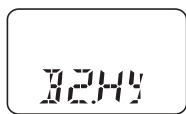

Parameter	Display	Setting range <sup>a</sup>
Switching function (for switching output only)		<b>Hysteresis, make contact</b> Hysteresis, break contact Window, make contact Window, break contact see chapter 7.10 "Setting the switching function (B.Fct)", page 42.
Switching point (for switching output only)		<b>0.00</b> to 100.00 % of nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", page 42.
Reset point (for switching output only)		<b>0.00</b> to 100.00 % of nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", page 42.
Hysteresis (for switching output and configured switching point or reset point only)		<b>0.00</b> to 100.00 % of nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", page 42. <b>Note:</b> Used only with window switching functions.
Switching delay (for switching output only)		<b>0.00</b> to 99.99 s see chapter 7.10 "Setting the switching function (B.Fct)", page 42.

<sup>a</sup> The default setting is marked in **bold**.

### 6.4.4 Binary output 2






Parameter	Display	Setting range <sup>a</sup>
Switching function (for second switching output only)		<b>Hysteresis, make contact</b> Hysteresis, break contact Window, make contact Window, break contact see chapter 7.10 "Setting the switching function (B.Fct)", page 42.
Switching point (for second switching output only)		<b>0.00</b> to 100.00 % of nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", page 42.
Reset point (for switching output only)		<b>0.00</b> to 100.00% of nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", page 42.

## 6 Operation

Parameter	Display	Setting range <sup>a</sup>
Hysteresis (for second switching output and configured switching point or reset point only)		<b>0.00</b> to 100.00 % of nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", page 42. <b>Note:</b> Used only with window switching functions.
Switching delay (for second switching output only)		<b>0.00</b> to 99.99 s see chapter 7.10 "Setting the switching function (B.Fct)", page 42.

<sup>a</sup> The default setting is marked in **bold**.

### 6.4.5 Display and operation

Parameter	Display	Setting range <sup>a</sup>
Display position		Normal (for normal operation) Rotated (for overhead operation) see chapter 7.15 "Setting the display alignment (D.Dir)", page 47.
Unit of actual value display (for analog output only)		Pressure unit (see parameter "Uni.P") Percentage of the scaled range see chapter 7.16 "Setting the display unit (D.Uni)", page 48.
Version D		Software version of the operating device see chapter 7.17 "Displaying the version of the operating device software (SW.Di)", page 49.
Version S		Software version of the signal stage see chapter 7.18 "Displaying the version of the signal stage software (SW.Si)", page 49.
Code (can only be edited via setup program)		0000 to <b>0072</b> to 9999 see chapter 7.2 "Unlocking the instrument (code entry)", page 32.

<sup>a</sup> The default setting is marked in **bold**.

## 6 Operation

---

## 7.1 Getting started



### NOTE!

This is a suggestion for configuring the instrument reliably in little time.

By checking the setting options of this list before starting the configuration, you can avoid timeouts during the configuration.

- Mounting the instrument, see chapter 5 "Mounting", page 17.
- Installing the instrument, see chapter 4 "Electrical connection", page 13.
- Unlocking the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- Selecting the unit of the measured value, see chapter 7.4 "Selecting the unit of the measured value (Uni.P)", page 33.
- Adjusting the output signal, see chapter 7.7 "Setting the output signal (S.TyP)", page 37.
- Adjusting the scaling of the output signal (restricting the measuring range), see chapter 7.8 "Setting scaling", page 38.
- Setting the switching function, see chapter 7.10 "Setting the switching function (B.Fct)", page 42.
- Setting the switching point, see chapter 7.11 "Setting the switching point (B.SP)", page 45.

# 7 Commissioning

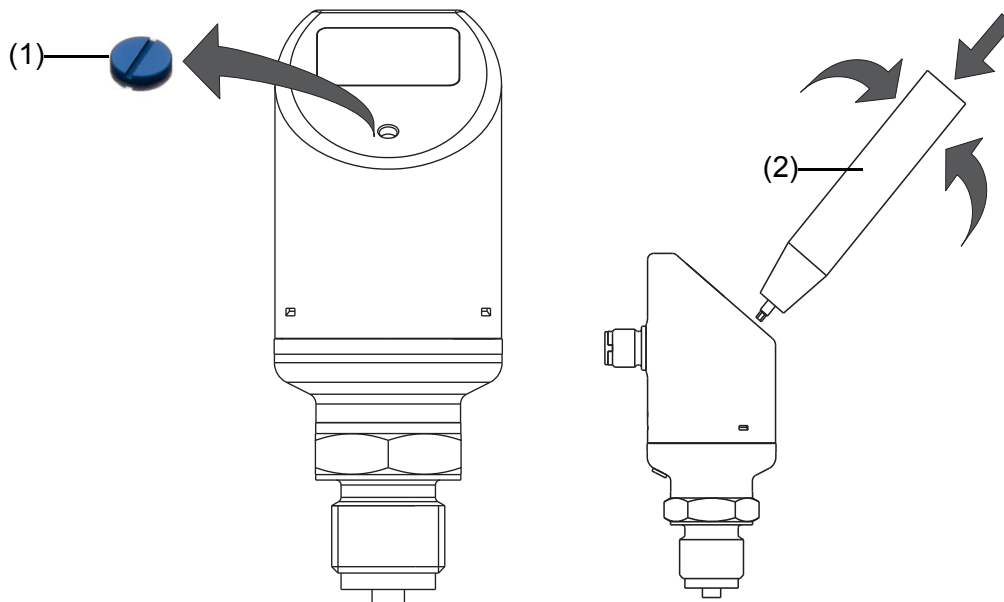
---

## 7.2 Unlocking the instrument (code entry)

The instrument is protected by a code to prevent unauthorized operation.

The code is set to 0072 in the factory. It can only be changed with the setup program. If the code is set to 0000 with the setup program, the instrument is unprotected.

### Unlocking



- (1) Protective screw
- (2) Combination tool

- Unscrew the protective screw (1).
- Continue briefly pressing the combination tool (2) until the third "0" from the left is flashing. The color of the display also changes to "red."
- Turn the combination tool until "7" is displayed.
- Continue briefly pressing the combination tool until the fourth "0" from the left is flashing.
- Turn the combination tool until "2" is displayed.



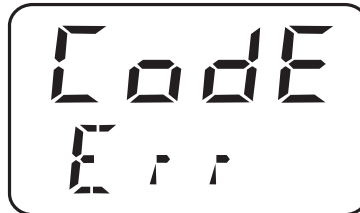


- Press the combination tool briefly - the instrument switches to the parameter level.



### NOTE!

After an incorrect code is entered:

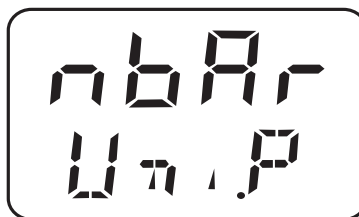


### 7.3 Cancel operation

- Press and hold the combination tool (2) longer than 3 seconds or
- wait for timeout (no activity for longer than 60 seconds).

### 7.4 Selecting the unit of the measured value (Uni.P)

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "Uni.P".
- "Press"



- The measured pressure is shown in millibar.
- "Press"

## 7 Commissioning

---



Flashing

Continuous

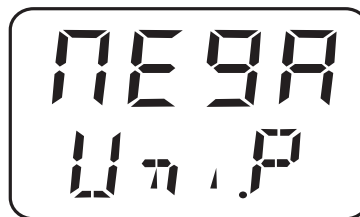
The measured pressure is shown in bar.

- "Rotate"



The measured pressure is shown in Kilopascal.

- "Rotate"



The measured pressure is shown in Megapascal (MPa).

- "Rotate"



The measured pressure is shown in psi.

To confirm setting: "Press" until the display is no longer flashing.

## 7 Commissioning

### 7.4.1 Display and setting options of the instrument

Measuring range	Unit	Display	
		Start	End
-0.4 to +0.4 bar	mbar	-400.0	400.0
	bar	-0.400	0.400
	kPa	-40.00	40.00
	MPa	-0.040	0.040
	psi	-5.802	5.802
-1 to +3 bar	mbar	-1000	3000
	bar	-1.000	3.000
	kPa	-100.0	300.0
	MPa	-0.100	0.300
	psi	-14.50	43.51
0 to 60 bar	mbar	0000	9999
	bar	00.00	60.00
	kPa	0000	6000
	MPa	0.000	6.000
	psi	000.0	870.2
-1 to +9 bar	mbar	-1000	9000
	bar	-1.000	9.000
	kPa	-100.0	900.0
	MPa	-0.100	0.900
	psi	-14.5	130.5
-1 to +24 bar	mbar	-1000	9999
	bar	-1.00	24.00
	kPa	-100	2400
	MPa	-0.100	2.400
	psi	-14.5	348.1



**NOTE!**

Gray cells are units that cannot be configured! Display overflow - values do not appear in operation or in setup!

## 7 Commissioning

---

### 7.5 Setting the zero point (offset) (Off.P)

#### 7.5.1 Automatic offset adjustment

This setting is used to accept the current measured value as the new zero point.



**NOTE!**

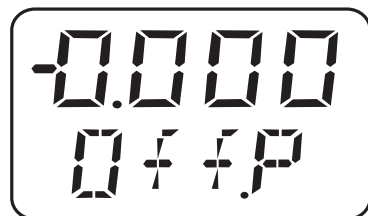
Automatic offset adjustment is only possible for instruments with a relative pressure measuring range!

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "Off.P".
- "Press" twice in quick succession.  
The current measured value is accepted as the zero point.

#### 7.5.2 Edited offset setting

This setting is used to increase or reduce the measured pressure selectively by an adjustable value.

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "Off.P".
- "Press"



"-" Flashing

Continuous



**NOTE!**

"-" means: the offset is negative - the measured pressure is reduced.  
Enter the value "digit by digit."

### 7.6 Setting the filter time constant (damping) (DamP)

The filter time constant (damping) can be used to smooth the measured value.

Small filter time constant: the display is refreshed quickly.

Large filter time constant: Display refresh is slower.

The value is entered in seconds with two places after the decimal.

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "Dam.P".
- "Press"



Example:

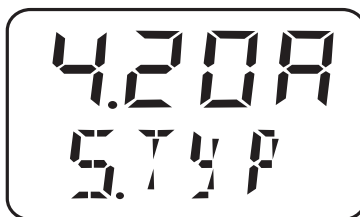
4.20A = Output signal 4 to 20 mA

0.20A = Output signal 0 to 20 mA

0.10U = Output signal 0 to 10 V

### 7.7 Setting the output signal (S.TyP)

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "S.TyP".
- "Press"



Example:

4.20A = Output signal 4 to 20 mA

0.20A = Output signal 0 to 20 mA

0.10U = Output signal 0 to 10 V

# 7 Commissioning

## 7.8 Setting scaling

### Customer-specific measuring range

The customer measuring range (2) is defined by:

- Range start (4)
- Range end (5)
- Span (MSP)

### Example

#### Actual

The instrument has a nominal measuring range (1) from 0 to 4 bar

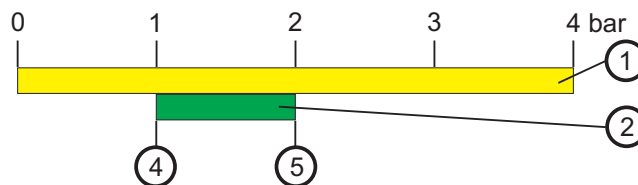
#### Target

The customer would like to measure the pressure in the range from 1 to 2 bar (25 % of the nominal measuring range).

Range start (5) is 1 bar

Range end (6) is 2 bar

Span (MSP) is 1 bar



### Scaling

The scaling of the instrument's output signal describes how the measured pressure is converted into an output signal.

### Simple example

#### Actual

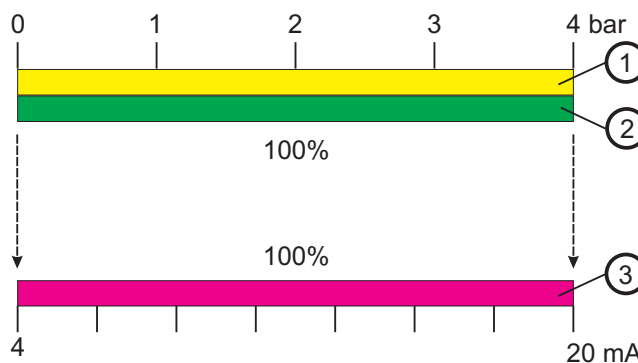
The instrument has a nominal measuring range (1) from 0 to 4 bar and the instrument has an output signal from 4 to 20 mA (3).

#### Target

The customer would like:

the "Customer measuring range" (2) from 0 to 4 bar (100 % of nominal measuring range (1) should correspond to the output signal (3) from 4 to 20 mA (100 %).

The scaling is 1: 1 (100 % to 100 %).



## Customer-specific scaling

It is often useful to scale part of the nominal measuring range to the output signal.

### Example

#### Actual

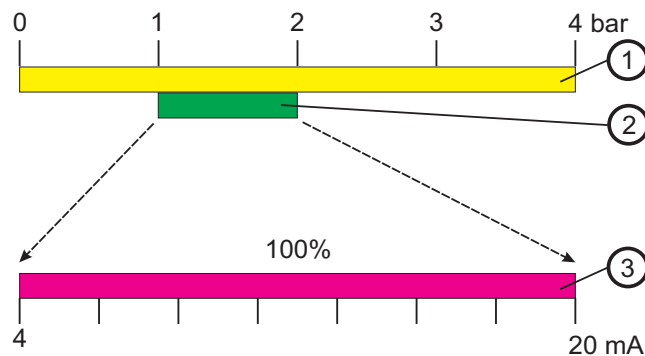
The instrument has a nominal measuring range (1) from 0 to 4 bar and the instrument has an output signal from 4 to 20 mA (3).

#### Target

The customer would like:

the "Customer measuring range" (2) from 1 to 2 bar (25 % of nominal measuring range (1) should correspond to the output signal from 4 to 20 mA (100 %).

The scaling is 1: 4 (25 % to 100 %).



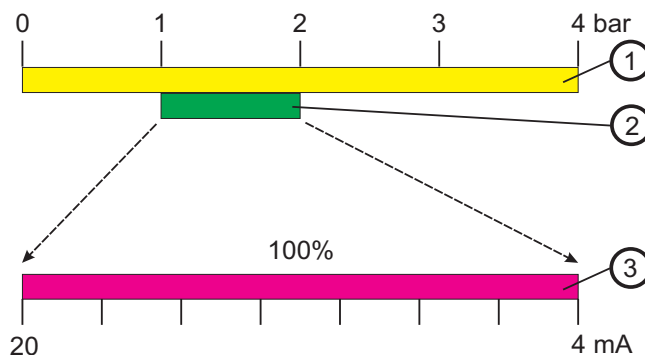
### Inversion of the output signal

The instrument provides the option of inverting the output signal (3).

The output signal

- 0 to 20 mA becomes output signal 20 to 0 mA
- 4 to 20 mA becomes output signal 20 to 4 mA
- 0 to 10 V becomes output signal 10 to 0 V

### Example 20 to 4 mA



- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| (1) Nominal measuring range (NMB) | (2) Customer measuring range (MB) |
| (3) Output signal                 | (4) Range start (MA)              |
| (5) Range end (ME)                |                                   |
| Span (MSP)                        |                                   |

# 7 Commissioning

## 7.8.1 Setting the starting value of scaling (Sc.Lo)



### HINWEIS!

The output signal can only be scaled for instruments with analog output!

Setting range: 0 to 75 % of the nominal measuring range  
Factory setting: Initial value of measuring range

### Example

The instrument has a nominal measuring range -400 to +400 mbar  
The output signal of the instrument is 0 to 20 mA

**Objective:** The range from 0 to 200 mbar (customer's measuring range) will be represented on the output side by 0 to 20 mA.

**Setting:** The initial value of scaling (Sc.Lo) = 0.000  
The final value of scaling (Sc.Hi) = 200.0

**Result:** At a pressure of less than 0 mbar the instrument reports an error (value below lower measuring range limit) and makes the corresponding error signal (0 mA) available at the output.  
At a pressure of 0 mbar the instrument makes 0 mA available at the output.  
At a pressure of 200 mbar the instrument makes 20 mA available at the output.  
At a pressure greater than 200 mbar the instrument reports an error (measuring range exceeded) and makes the corresponding error signal (22 mA) available at the output.

### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "Sc.Lo".
- "Press"



"-" Flashing

Continuous



### NOTE!

Enter the value "digit by digit."



## 7.8.2 Setting the final value of scaling (Sc.Hi)



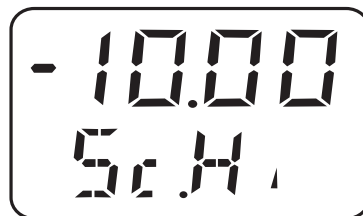
### NOTE!

The output signal can only be scaled for instruments with analog output!  
Explanation chapter 7.8.1 "Setting the starting value of scaling (Sc.Lo)", page 40.

Setting range: 25 to 100 % of the nominal measuring range  
Factory setting: Final value of measuring range

### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "Sc.Hi".
- "Press"



"-" Flashing

Continuous



### NOTE!

Enter the value "digit by digit."

## 7.9 Setting the error signal (S.Err)



### NOTE!

Only for instruments with analog output, an error signal is generated for overrange or underrange!

### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "S.Err".
- "Press"



# 7 Commissioning

---

Example:

3.40nA =

For **underrange**

error signal = 0 mA for measuring range 0 to 20 mA

error signal = 3.4 mA for measuring range 4 to 20 mA

error signal = 0 V for measuring range 0 to 10 V

22nA =

For **overrange**

error signal = 22 mA for measuring range 0 to 20 mA

error signal = 22 mA for measuring range 4 to 20 mA

error signal = 10.7 V for measuring range 0 to 10 V

## 7.10 Setting the switching function (B.Fct)

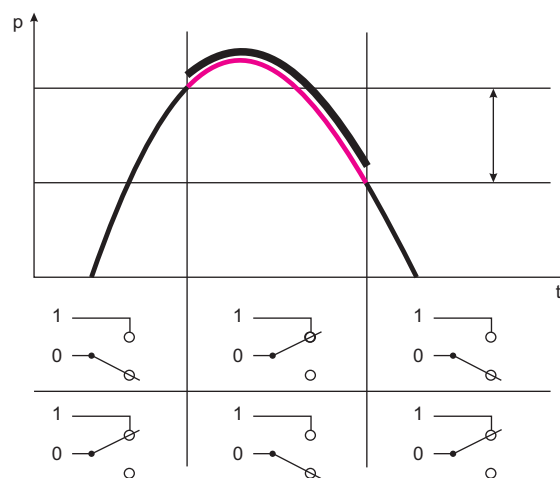
### General

The response of the instrument's switching output can be selected:

- Hysteresis make contact
- Hysteresis break contact
- Window function make contact
- Window function break contact

### 7.10.1 Hysteresis

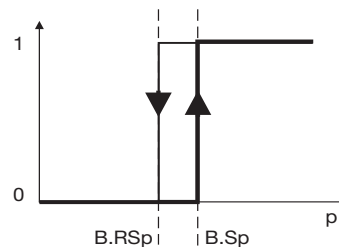
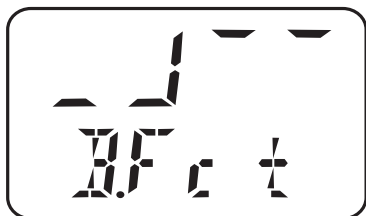
#### Relay behavior



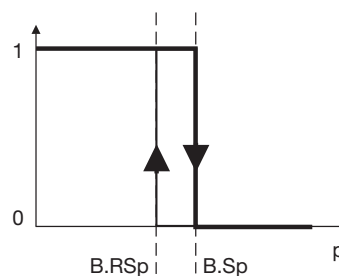
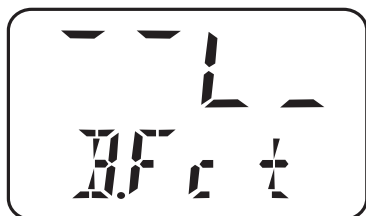
## 7 Commissioning

### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "B.Fct".
- "Press"



0 = Hysteresis of make contact (switching difference) (factory setting)

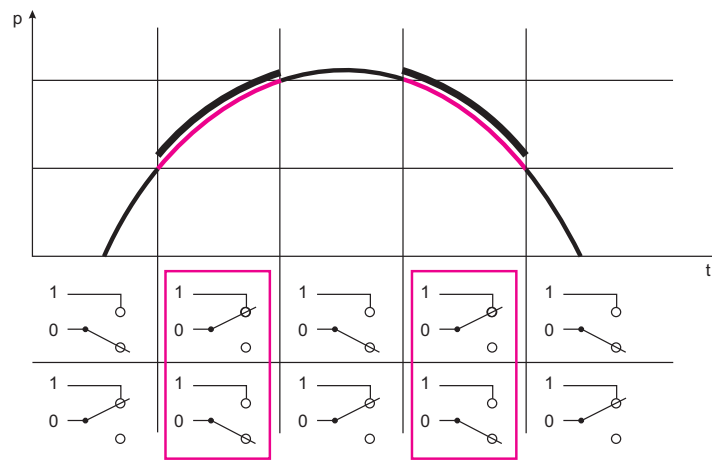


1 = Hysteresis of break contact (switching difference) = min. contact

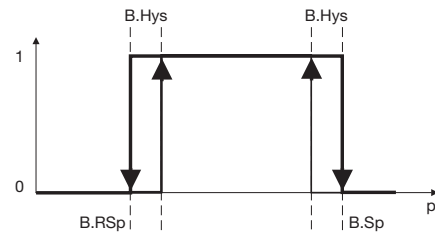
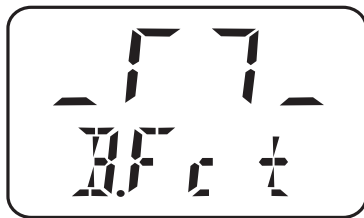
# 7 Commissioning

## 7.10.2 Window

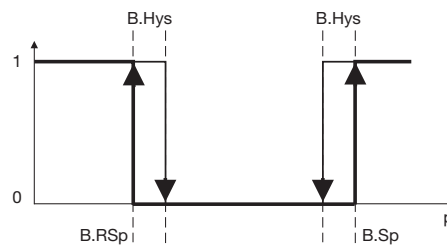
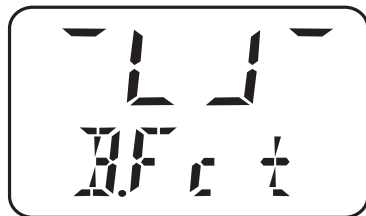
### Relay response



2 = Window function make contact



3 = Window function break contact



### 7.11 Setting the switching point (B.SP)

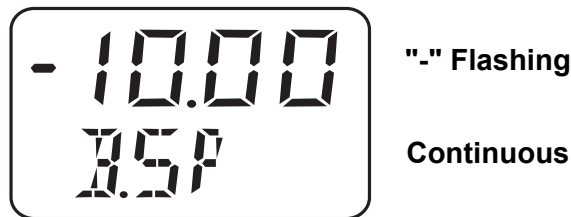
See chapter 7.10 "Setting the switching function (B.Fct)", page 42.

Setting range: 0 to 100 % of the nominal measuring range

Factory setting: 50 % of the nominal measuring range

#### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "B.SP".
- "Press"



#### NOTE!

Enter the value "digit by digit."

### 7.12 Setting the reset point (B.RSP)

See chapter 7.10 "Setting the switching function (B.Fct)", page 42.

Setting range: 0 to 100 % of the nominal measuring range

Factory setting: 40 % of the nominal measuring range

#### Setting

- Unlock the instrument, chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "B.RSP".
- "Press"



#### NOTE!

Enter the value "digit by digit."

## 7 Commissioning

### 7.13 Setting the switching difference (hysteresis) (B.HYS)

See chapter 7.10 "Setting the switching function (B.Fct)", page 42.

Setting range: 0 to 100 % of the nominal measuring range

Factory setting: 40 % of the nominal measuring range

#### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "B.HYS".
- "Press"



#### NOTE!

Enter the value "digit by digit."

### 7.14 Setting the switching delay (B.DLY)

Setting range: 0.00 to 99.99 s

Factory setting: 0.00 s

#### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "B.DLY".
- "Press"



#### NOTE!

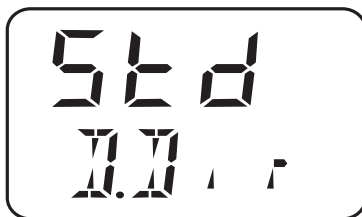
Enter the value "digit by digit."

### 7.15 Setting the display alignment (D.Dir)

Setting range:     std = standard = instrument upright  
                  turn = turned = instrument overhead  
Factory setting:    std

#### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "D.Dir".
- "Press"



or



# 7 Commissioning

---

## 7.16 Setting the display unit (D.Uni)

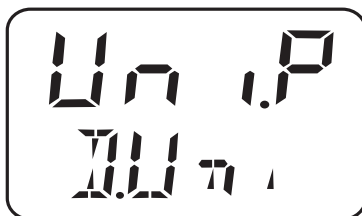
Setting range: Uni.P = pressure unit set as for "Uni.P", see chapter 7.4 "Selecting the unit of the measured value (Uni.P)", page 33.

Pro2 = percentage of scaled measuring range = "Sc.Hi" minus "Sc.Lo", see chapter 7.8.1 "Setting the starting value of scaling (Sc.Lo)", page 40 and chapter 7.8.2 "Setting the final value of scaling (Sc.Hi)", page 41.

Factory setting: std

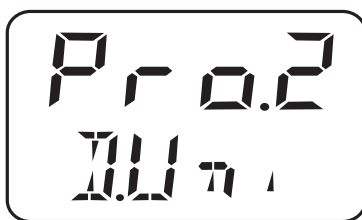
### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "D.Uni".
- "Press"



Uni.P = The measured value is displayed in the unit that was selected, see chapter 7.4 "Selecting the unit of the measured value (Uni.P)", page 33

or



Pro.2 = The measured value is displayed as a percentage of the scaled measuring range, see chapter 7.8.1 "Setting the starting value of scaling (Sc.Lo)", page 40 and chapter 7.8.2 "Setting the final value of scaling (Sc.Hi)", page 41.

### Example

The measuring range of the instrument was set to from -50 to +350 mbar and the scaled measuring range is 300 mbar.

If the instrument measures a pressure of 150 mbar, 50 % is displayed.



### 7.17 Displaying the version of the operating device software (SW.Di)

Setting range: Read only

Factory setting: -

#### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "SW.Di".
- "Press"



"Alternating"

### 7.18 Displaying the version of the signal stage software (SW.Si)

Setting range: Read only

Factory setting: -

#### Setting

- Unlock the instrument, see chapter 7.2 "Unlocking the instrument (code entry)", page 32.
- "Rotate" until the bottom line shows "SW.Sir".
- "Press"



"Alternating"

## 7 Commissioning

---

### 8.1 Setting the zero point (offset)

#### 8.1.1 Automatic offset adjustment

**NOTE!**

Automatic offset adjustment is only possible for instruments with a relative pressure measuring range!

**On the instrument**

See chapter 7.5.1 "Automatic offset adjustment", page 36.

**By setup program**

Not possible.

#### 8.1.2 Edited offset setting

**On the instrument**

See chapter 7.5.2 "Edited offset setting", page 36.

**By setup program**

Connect the instrument with the PC and start the setup program, see chapter 9 "Setup program", page 53 and following.

Input/offset.

## 8 Calibration

---

## 9.1 Function

### Configurable parameters

The optionally available PC setup software (Sales no. 00522384) can be used to operate the instrument conveniently from a PC.

Depending on the device design, the following settings are possible, for example:

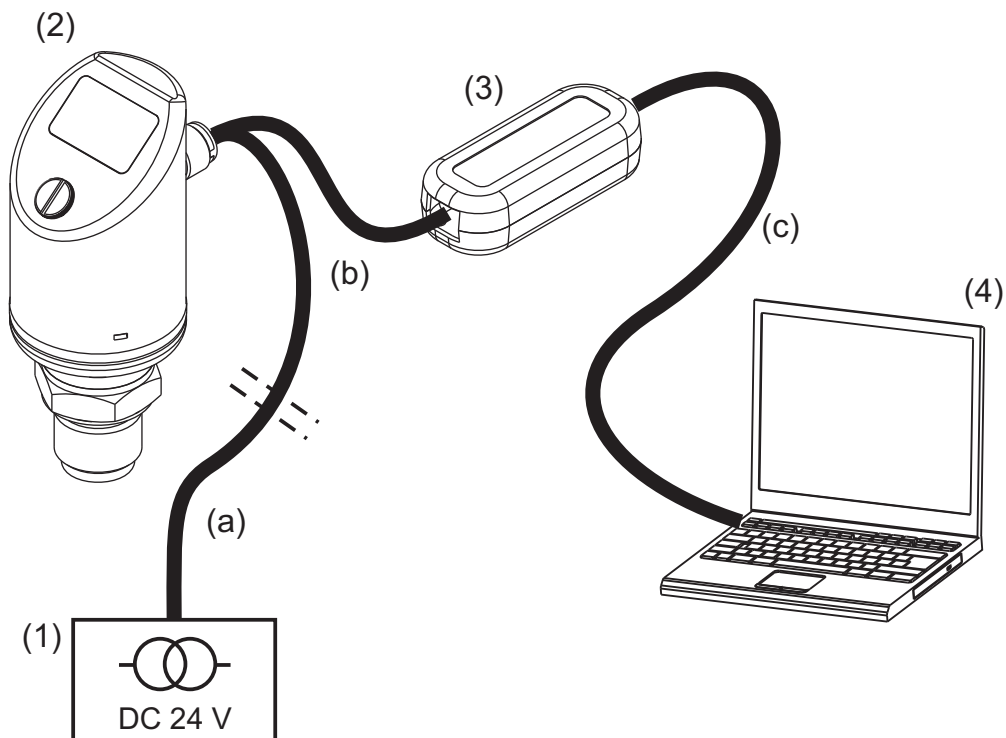
- Measuring range and limits of measuring range.
- Response of outputs when the measuring range is exceeded.
- Functions of switching outputs K1 and K2.
- Setting special functions (for example tables for special linearizations).



#### NOTE!

Data can be transferred from or to the transmitter if it is connected to the power supply; See chapter 4 "Electrical connection", page 13 and following.

### Connection



(1) Voltage supply DC 24 V

(2) Pressure switch type 405052

(3) USB/TTL converter,  
sales no. 00456352

(4) Notebook/PC

(a) 4-pin cable socket (straight) M12 × 1  
with 2-m PVC cable, sales no. 00404585  
or

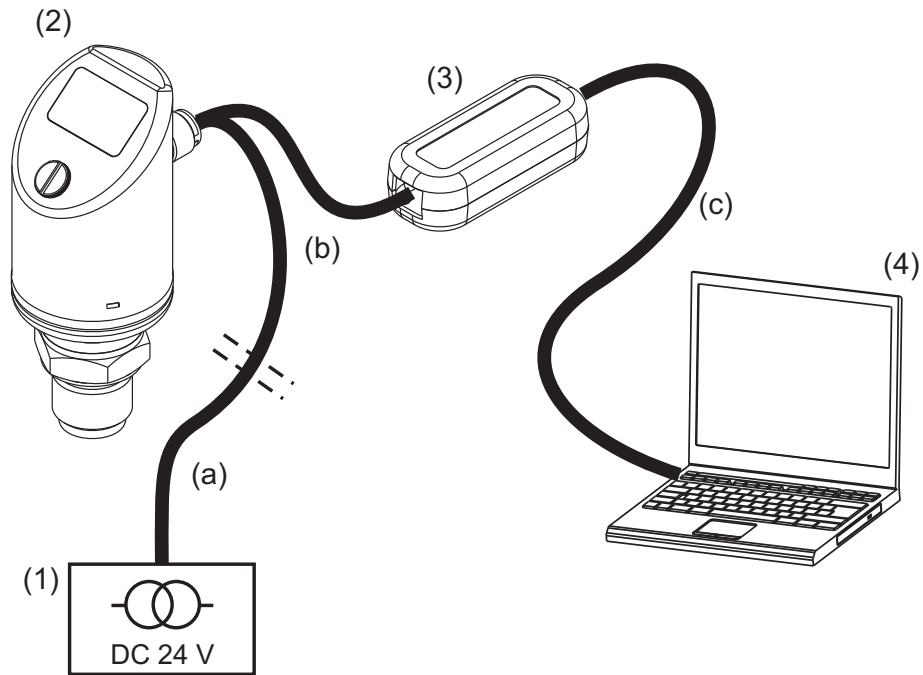
4-pin angle box M12 × 1

with 2-m PVC cable, sales no. 00409334

(b) Connecting cable,  
sales no. 00507861

(c) PC interface line (gray)  
Part of (3)

## 9 Setup program



### NOTE!

During the installation, the driver for the USB/TTL converter is also installed on the PC.

Activity	Step
1	Install the setup program software on the notebook/PC.
2	Screw the connecting cable (b) onto the plug of the pressure switch (2).
3	Connect the USB/TTL converter (3) to the connecting cable (b) and PC interface line (gray) (c).
4	Connect the PC interface line (gray) (c) to the notebook (4).
5	Connect the cable (a) to the power supply (1) and connecting cable (b).

### 9.2 Start the setup program

Start/Programs/JUMO instruments/Setup program JUMO DELOS K, SI, HP





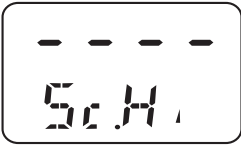
## 9 Setup program

---



# 10 Eliminating errors and faults

## 10.1 Possible errors

Display	Possible cause	Measure
	<ul style="list-style-type: none"> <li>• Overage or underrange</li> <li>• Broken sensor</li> </ul>	Configure other measuring range, see chapter 7.4 "Selecting the unit of the measured value (Uni.P)".
	Device error: <ul style="list-style-type: none"> <li>• 1 = Internal communication error</li> <li>• 2 = Error analog output</li> <li>• 3 = Short circuit Switching output 1</li> <li>• 4 = Short circuit Switching output 2</li> <li>• 5 = VCC 8 V outside of working range</li> <li>• 6 to 8 = Internal communication error</li> <li>• 9 = Invalid configuration</li> </ul>	1), 6), 7), 8): Call Customer Service; see the back of the Operating Manual. 2): Check the ambient temperature. Check output for broken line. Output burden is too high (for current output) or too low (for voltage output). 3), 4): Check the corresponding switching output. 5): Check the power supply. 9): Check the configuration.
	Display overflow: Upper display: "- - - -" Lower display: Parameter name Value is less than -9999 or greater than 9999.	Check the corresponding switching output. Check the power supply.

## 10 Eliminating errors and faults

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# 11 Technical data

## General

Reference conditions	DIN 16086 and EN 60770	
Sensor system	Silicon sensor with stainless steel separating diaphragm	
Pressure transfer means	Synthetic oil (silicon oil), FDA-compliant oil	
Permissible load change	> 10 million	
Location	Any Device standing upright, process connection on bottom	
Mounting position		
Position-dependent zero point offset		
Basic type 000 standard		≤ 1 mbar
Basic type 004 high-temperature design		≤ 10 mbar
Display	Positively lit display	
Alignment	Display can be rotated 180° via software Enclosure rotatable ±160° (use the combination tool supplied)	
Size	Display field 16 × 26 mm, font size 7 mm, 2× 4-digit	
Color	Normal operation: amber-colored	
Switching state display	K1, K2	
Measuring unit	mbar, bar, kPa, MPa, psi, %	
Operation	Via control element under the screw plug with combination tool or 0.5 × 3 screwdriver or 2AF hex key	
Local		
Setup interface		Pin 5 of the M12 × 1 round plug

## Input

Relative pressure	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
Overload capacity <sup>a</sup>	1.6	4	16	40	100	240	
Bursting pressure	2	5	20	50	125	300	
Nominal measuring range	-0.4 to +0.4	-1 to +1	-1 to +3	-1 to +9	-1 to +24		bar
Overload capacity <sup>a</sup>	1.6	4	16	40	100		
Bursting pressure	2	5	20	50	125		
Absolute pressure	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
Overload capacity <sup>a</sup>	1.6	4	16	40	100	240	
Bursting pressure	2	5	20	50	125	300	

<sup>a</sup> All measuring ranges can be overloaded to -1 bar (vacuum-proof).

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## Outputs

All analog outputs in 3-wire technology/Switching outputs: open collector, PNP switching

Analog output Current Output 475 Output 476 Voltage Output 477	4 to 20 mA (and 1× PNP switching output) 0 to 20 mA (and 1× PNP switching output) 0 to 10 V (and 1× PNP switching output)
Step response time (analog input) T <sub>90</sub>	≤ 100 ms
Switching output Output 470, 475, 476 or 477 Output 471 Switching type Switching function	1× PNP switching output 2× PNP switching outputs Break contact/make contact Window/hysteresis
Switching capacity Voltage drop from U <sub>B</sub> Contact rating Switching cycles Response time Short-circuit proof	PNP ≤ 2 V ON ≤ 250 mA/OFF ≤ 1 mA > 10 million ≤ 20 ms Yes
Current load check Pulse period Periodic protective circuit with overcurrent	2 s; T <sub>ON</sub> 40 ms f = 0.5 Hz Display: Err3 switching output K 1, Err4 switching output K 2
Setting range Analog output	Measurement range scaling (turn down) 1:4
Switching output Switching point Reset point Hysteresis Input damping Input delay	Configurable in the nominal measuring range (> reset point) Configurable in the nominal measuring range (< switching point) Configurable in the nominal measuring range 0 to 99.99 s 0 to 99.99 s
Burden Current 4 to 20 mA, three-wire 0 to 20 mA, three-wire Voltage DC 0 to 10 V, three-wire	$R_L \leq (U_B - 6.5 \text{ V}) \div 0.022 \text{ A } (\Omega)$ $R_L \leq (U_B - 6.5 \text{ V}) \div 0.022 \text{ A } (\Omega)$ $R_L \geq 10 \text{ K}\Omega$

## 11 Technical data

### Mechanical properties

Process connection Material Surface Process seal Process connection 521, 523, 571, 576, 652 Process connection 575 Process connection 997 JUMO PEKA	Stainless steel 316L Ra ≤ 0.8 µm All flange connections are welded and therefore have no seals! FPM as standard FPM as standard, O-ring at front; FDA-compliant FPM, VMQ, silicon EPDM; FDA-compliant, options see data sheet 409711
Measuring diaphragm Material Surface	Stainless steel 316L Ra ≤ 0.8 µm
Enclosure Material Surface Threaded sleeve M12 × 1 Enclosure seal Display	Stainless steel 316L Ra ≤ 0.8 µm Stainless steel 316L VMQ silicon; FDA-compliant PA (polyamide)
Control element screw plug Material Surface Seal	Aluminum 3.2315 Eloxal coating VMQ silicon; FDA-compliant
Weight	200 g with process connection 504 (G 1/2)

### Ambient conditions

Permissible temperatures Medium For basic type extension 004 Environment Ambient temperature -50 °C Storage	-25 to +100 °C (135 °C max 1 hour/day; no function here) -25 to +200 °C -25 to +75 °C Restricted function: stationary use only, danger of broken cable, display does not function -40 to +85 °C
Permissible relative humidity In operation Storage	100 % rel. humidity, including condensation of instrument outer sleeve 90 % rel. humidity, no condensation
Permissible mechanical loading Vibration resistance <sup>a</sup> Shock resistance <sup>b</sup>	20 g, 10 to 2000 Hz 50 g for 11 ms/100 g for 1 ms
Electromagnetic compatibility Interference emission <sup>c</sup> Interference immunity <sup>c</sup>	With 4-pin connecting cable and grounded enclosure only! Class B Industrial requirements
Protection <sup>d</sup>	IP67

<sup>a</sup> IEC 60068-2-6

<sup>b</sup> IEC 60068-2-27

<sup>c</sup> IEC 61326-2-3

<sup>d</sup> EN 60529 (with suitable mating piece when connected)

# 11 Technical data

## Accuracy

Relative pressure	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
<b>Linearity<sup>a</sup></b>	<b>0.15</b>	<b>0.15</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>% of FS of NMR</b>
Accuracy at +20 °C <sup>b</sup>	0.35	0.3	0.25	0.25	0.25	0.25	% of FS of NMR
Accuracy at -20 to +75 °C <sup>c</sup>	0.7	0.6	0.5	0.5	0.5	0.5	% of FS of NMR
Nominal measuring range	-0.4 to +0.4	-1 to +1	-1 to +3	-1 to +9	-1 to +24		bar
<b>Linearity<sup>a</sup></b>	<b>0.15</b>	<b>0.15</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>		<b>% of FS of NMR</b>
Accuracy at +20 °C <sup>b</sup>	0.35	0.3	0.25	0.25	0.25		% of FS of NMR
Accuracy at -20 to +75 °C <sup>c</sup>	0.7	0.6	0.5	0.5	0.5		% of FS of NMR
Absolute pressure	Nominal measuring range start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
<b>Linearity<sup>a</sup></b>	<b>0.15</b>	<b>0.15</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>% of FS of NMR</b>
Accuracy at +20 °C <sup>b</sup>	0.35	0.3	0.25	0.25	0.25	0.25	% of FS of NMR
Accuracy at -20 to +75 °C <sup>c</sup>	0.7	0.6	0.5	0.5	0.5	0.5	% of FS of NMR
Long-term stability <sup>d</sup>	0.2 % with reference conditions as per EN 61298-1						

<sup>a</sup> Linearity based on limit point setting

<sup>b</sup> Includes: linearity, hysteresis, repeatability, deviation from initial and final values of measuring range

<sup>c</sup> Includes: linearity, hysteresis, repeatability, deviation from initial and final values of measuring range, thermal effect on initial value of measuring range and span

<sup>d</sup> EN 61298-1

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### Auxiliary power

Voltage supply $U_B^a$ 0 to 20 mA, three-wire, output 476 4 to 20 mA, three-wire, output 475 0 to 10 V, three-wire, output 477 Less than the permitted voltage supply	Nominal voltage DC 24 V DC 12 to 30 V DC 12 to 30 V DC 14 to 30 V Display Err 5
More than the maximum voltage supply > DC 34 V	The specified properties are no longer met.
Reverse polarity protection	YES
Power consumption	$\leq 45$ mA without load, $\leq 545$ mA with load 2× PNP
Electrical connection	Round plug M12 × 1, 4-pin, A-coded (for assignment see "Connection diagram")
Circuit	SELV

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

### Approval/marks of conformity

Mark of conformity	Testing laboratory	Certificate/ Certification number	Test basis	Valid for
EHEDG	TUM MAK	No. 03/2006	Document No. 8	Process connection 997 JUMO PEKA

## 11 Technical data

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