

JUMO DELOS SI

Precision pressure transmitter
with switching contacts and display



Operating Manual

40505200T90Z003K000

V4.00/EN/00526948/2021-03-05



Further information and downloads



qr-405052-en.jumo.info

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1 Safety information

General

This manual contains information that must be observed in the interest of your own safety and to avoid material damage. This information is supported by symbols which are used in this manual as indicated.

Please read this manual before starting up the device. Store this manual in a place that is accessible to all users at all times.

If difficulties occur during startup, please do not intervene in any way that could jeopardize your warranty rights!

Warning symbols



DANGER!

This symbol indicates that **personal injury from electrocution** may occur if the appropriate precautionary measures are not taken.



CAUTION!

This symbol in connection with the signal word indicates that **material damage 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.

Note symbols



NOTE!

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



DISPOSAL!

At the end of its service life, the device and any batteries present do not belong in the trash! Please ensure that they are **disposed of** properly and in an **environmentally friendly** manner.

2 Introduction

The JUMO DELOS SI high-precision, electronic pressure switch with analog output meets technical requirements relevant to hygiene. In a readily cleanable design and with a front-flush, seal-free measuring system, it is specifically geared to hygienic process safety standards. The nominal measuring ranges set at the factory extend from 400 mbar to 60 bar. They can be rescaled in the ratio 1:4, allowing the user to perform several measurement tasks with just one measuring instrument.

The following output variants are available, depending on the application: 1× PNP or 2× PNP switching outputs or 1× PNP switching output and an analog output signal.

The process pressure is visualized by a large, positively lit LC display.

Configuration can simply be performed on the measuring instrument, or by using the more convenient setup program. The enclosure can be rotated $\pm 160^\circ$ to make it easier to read, and the display can be rotated 180° for overhead mounting.

A high-temperature variant is available for hot media up to 200°C (CIP and SIP cleaning systems).

The device is certified according to EHEDG in the versions with process connections (clamp) DN 25, 32, 40, and 50 as well as JUMO PEKA.



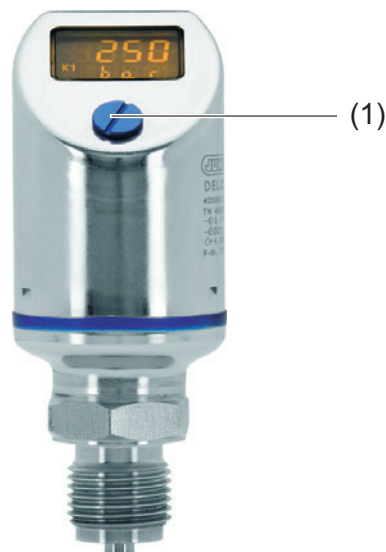
CAUTION!

The pressure transmitter is used for pressure measurement in gases and liquids. It can be a source of risk if not used as intended.

The device may only be installed, connected and started up by qualified and authorized personnel observing these operating instructions, the applicable standards, and the legal requirements (depending on the application).

The device does not meet the requirements "Equipment with safety function" as per the Pressure Vessel Directive 2014/68/EU; see Technical Data.

► If you experience difficulties during startup, please contact the manufacturer.



(1) Sealing screw, access for operation

Depending on its design, the device measures the relative or absolute pressure in liquid and gaseous media.

The pressure is displayed digitally.

2 Introduction

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 mA¹
- 1 PNP switching output + 1 analog output 0 to 20 mA¹
- 1 PNP switching output + 1 analog output 0 to 10 V¹

The device is also available in a design for use at elevated medium temperatures.

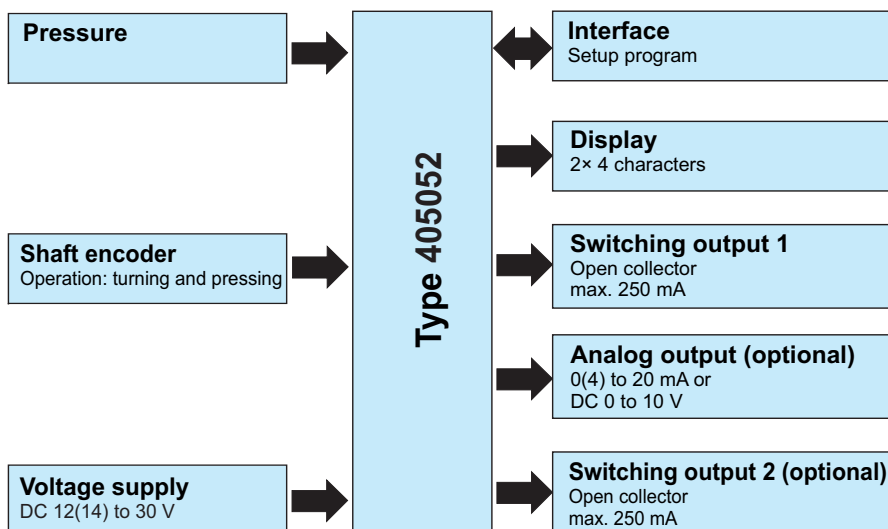
The device can be adjusted directly on site or can be configured via PC with a setup program.



CAUTION!

The protection type specified for the device (chapter 11 "Technical data", Page 49) can only be achieved with the control opening (1) closed.

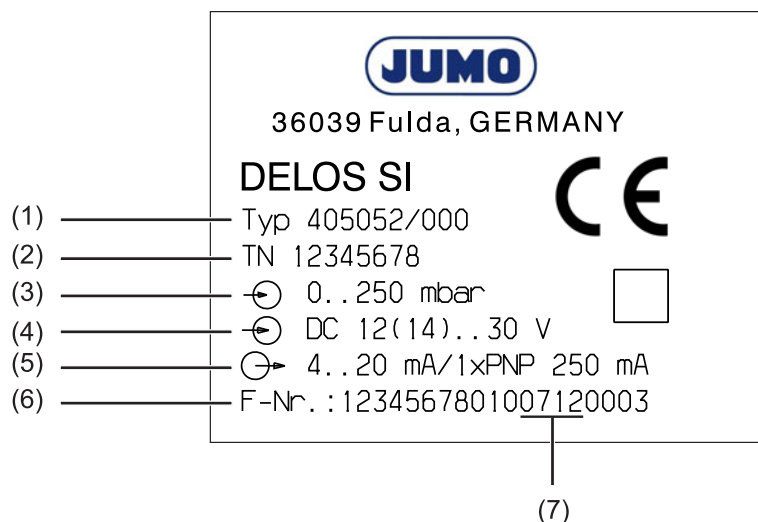
2.1 Block diagram



¹ The output is freely configurable.

3 Identifying the device version

3.1 Nameplate



- | | |
|--|------------------------|
| (1) Type | (2) Part no. |
| (3) Measuring range | (4) Voltage supply |
| (5) Output | (6) Fabrication number |
| (7) Date of manufacture (year and calendar week) | |

3.2 Order details

(1) Basic type	
405052/000	JUMO DELOS SI – Precision pressure transmitter with switching contacts and display ^a
405052/004	JUMO DELOS SI – Precision pressure transmitter with switching contacts and display for increased measuring material temperatures up to 200 °C ^b
405052/999	JUMO DELOS SI – Precision pressure transmitter with switching contacts and display, special version
(2) Input	
452	0 to 0.4 bar 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
447	-400 to +400 mbar relative pressure
449	-1 to +1 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
506	0 to 60 bar absolute pressure

3 Identifying the device version

	(3) Output
470	1× PNP switching output
471	2× PNP switching outputs
475	1× PNP switching output and 1× analog output 4 to 20 mA ^c
476	1× PNP switching output and 1× analog output 0 to 20 mA ^c
477	1× PNP switching output and 1× analog output 0 to 10 V ^c
	(4) Process connection
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) ^d
604	Taper socket with union nut DN 25 DIN 11851 (dairy screw connection) ^d
606	Taper socket with union nut DN 40 DIN 11851 (dairy screw connection) ^d
607	Taper socket with union nut DN 50 DIN 11851 (dairy screw connection) ^d
612	Clamp DN 10, 15, 20 DIN 32676
613	Clamp DN 25, 32, 40 DIN 32676 ^e
616	Clamp DN 50 DIN 32676, 2" ISO 2852 ^e
623	Small flange DN 25 DIN 28403
652	Tank connection with grooved union nut DN 25 ^f
653	Tank connection with grooved union nut DN 40
997	JUMO PEKA hygienic process connection ^{e, g}
998	Diaphragm seal, version with screw connection
	(5) Process connection material
20	CrNi (stainless steel)
	(6) Electrical connection
36	Round plug M12 × 1
	(7) Measuring system filling medium
01	Silicon oil
12	FDA-compliant oil

3 Identifying the device version

(8) Extra codes	
000	None
100	Customized setting (specify required setting in plain text)
374	Inspection certificate 3.1 Material DIN EN 10204
452	Parts in contact with the medium are electropolished
591	Throttle in pressure channel
624	Free of oil and grease
634	TAG-number
691	Improved humidity/vibration protection
769	Calibration certificate
871	Inspection certificate 3.1 Accuracy DIN EN 10204

^a 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.

^b 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.

^c Per default: The analog output is freely configurable.

^d The grooved union nut is included in scope of delivery.

^e Certified according to EHEDG.

^f Welding socket, seal and grooved union nut are included in scope of delivery.

^g Suitable adapter for process connection see data sheet 409711.

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

3.3 Accessories

Article	Part no.
PC interface cable including USB/TTL converter ^a	00456352
Y transmitter cable, 5 pole ^a	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 ^a	00522384

^a The setup program can only be used for configuration in conjunction with these accessories.

3.4 Software

Designation	Part no.
Setup JUMO DELOS 405050 ^a	00522384

^a The setup program can only be used for configuration in conjunction with these accessories.

4 Electrical connection

4.1 Installation notes



DANGER!

Injury to persons caused by electric shock

- ▶ The electrical connection must only be carried out by qualified personnel!

Ensure that the fuses of the load circuits are suitable for the maximum load currents to avoid damage to the device.

The electromagnetic compatibility meets standard EN 61326.

Do not connect any additional loads to the voltage supply of the device.

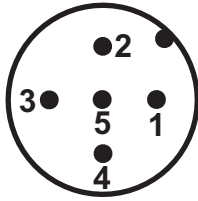
The device is not suitable for installation in potentially explosive areas.

In addition to a faulty installation, incorrectly set values could also impair the orderly function of the downstream process or lead to other damage. Access to settings should only be given to qualified personnel. Please observe the corresponding safety regulations in this context.

4.2 Connection diagram

Output 470		Output 471		Output 475 - 477	
1 PNP switching output		2 PNP switching outputs		1 PNP switching output + 1 analog output	
Voltage supply		Voltage supply		Voltage supply	
1 L+	DC 12(14) to 30 V	1 L+	DC 12(14) to 30 V	1 L+	DC 12(14) to 30 V
3 L-	(GND)	3 L-	(GND)	3 L-	(GND)
Output		Output		Output	
4 K1	Highside open collector max. 250 mA	2 K2	Highside open collector max. 250 mA	2 analog	0(4) to 20 mA/0 to 10 V
2	nc	4 K1		4 K1	Highside open collector max. 250 mA
5	Interface	5	Interface	5	Interface

4 Electrical connection



Color coding: connecting cable round plug M12 × 1

1 BN	Brown
2 WH	White
3 BU	Blue
4 BK	Black
5 GY	Grey

The color coding is **only** for A-coded standard cables!

5 Mounting

5.1 General information



CAUTION!

Damage to property

- ▶ Check that the device is compatible with the measurement medium, see chapter 11 "Technical data", Page 49.
-

Mounting site

- Ensure that the device is easily accessible for the later operation
- It must be fastened securely and with minimum exposure to vibration.
- Avoid direct insolation
- Observe the admissible ambient temperature at the installation site; see chapter 10 "Overcoming errors and malfunctions", Page 48

Installation position

The device can be installed in any position. We recommend the "vertical" installation position; see figure:



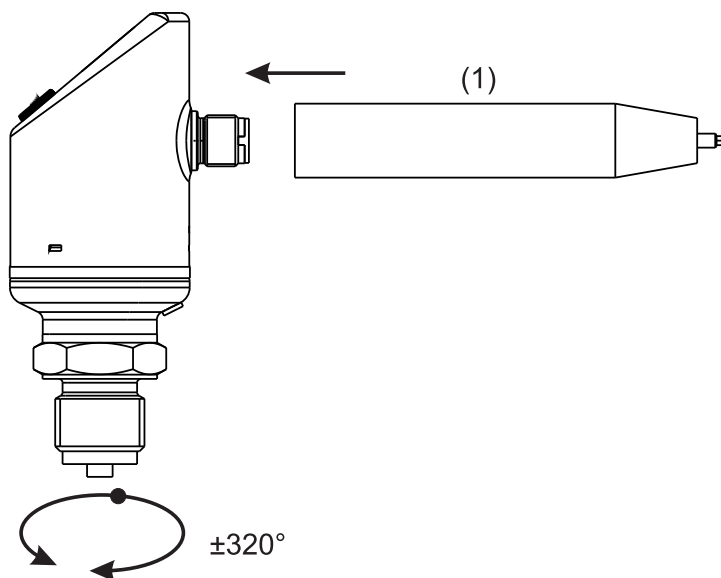
5.1.1 Rotating the display

The display can be rotated through 180° in the software; see "Display and operation", Page 25. This makes it the device easier to read when installed "overhead," for example.



5.1.2 Rotating the housing

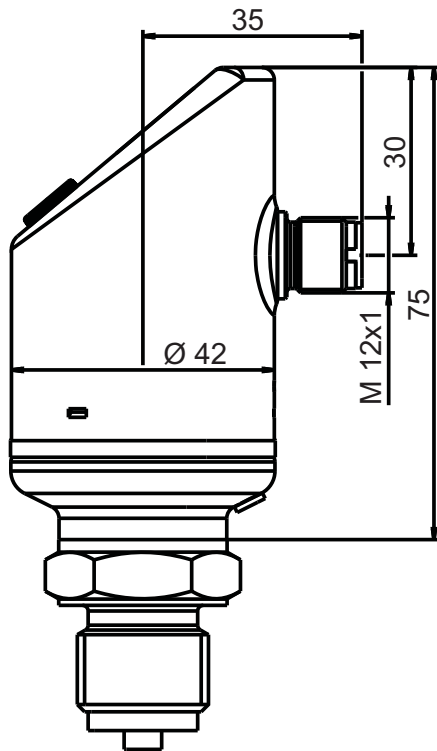
The device housing can be turned through $\pm 320^\circ$ using the supplied combination tool (1).



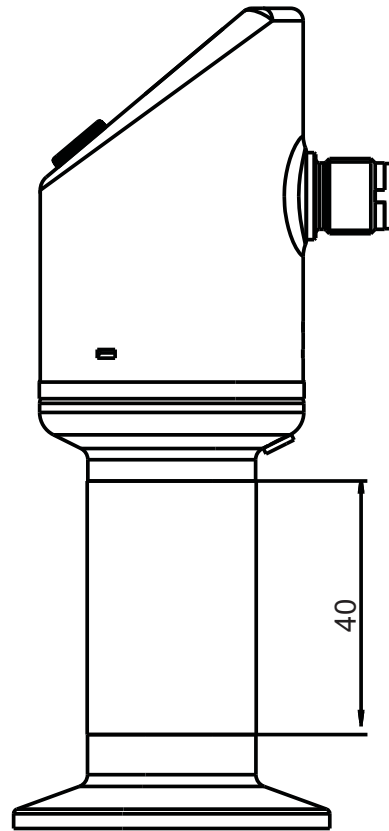
5 Mounting

5.2 Dimensions

Type 405052/000-...



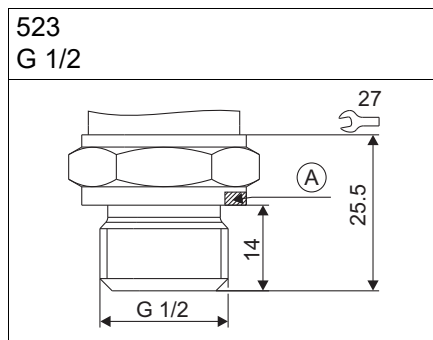
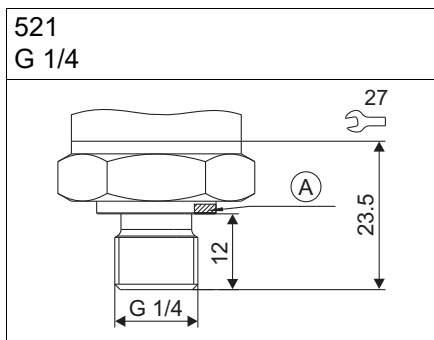
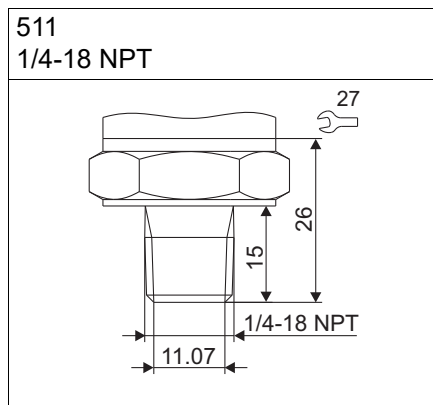
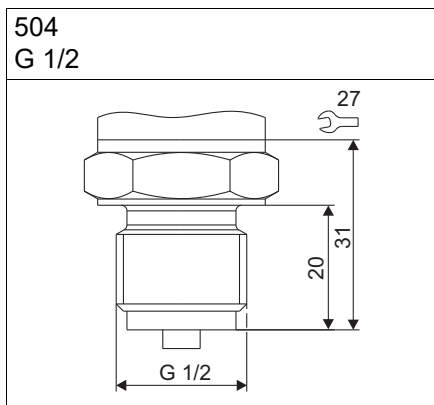
Type 405052/004-...
for increased measuring material temperatures



NOTE!

For devices with basic type extension 004 (for increased medium temperature up to 200 °C), the total height of the device increases by 40 mm, see drawing.

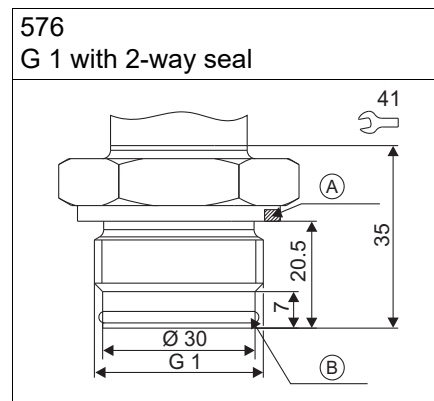
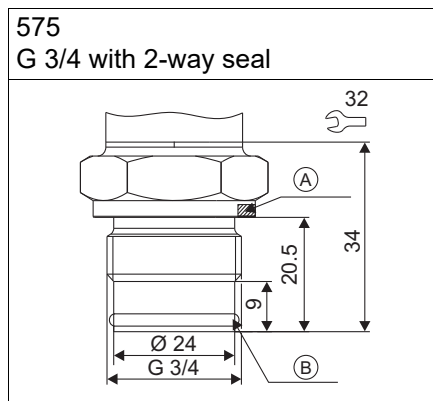
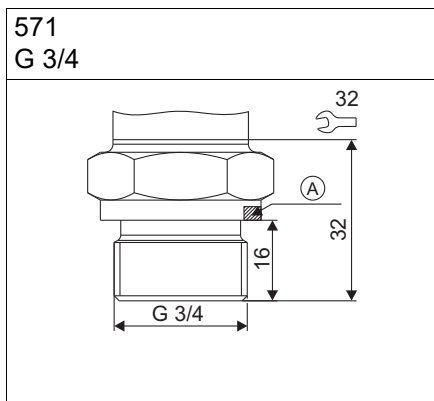
5.2.1 Process connections, not front-flush



A Profile seal DN G 1/4

A Profile seal DN G 1/2

5.2.2 Process connections, front-flush



A Profile seal DN G 3/4

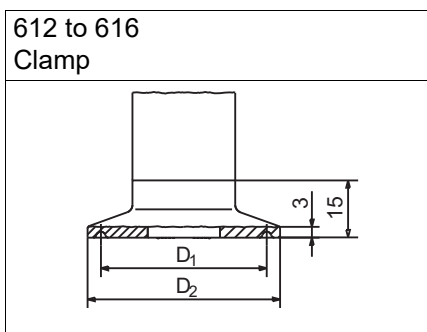
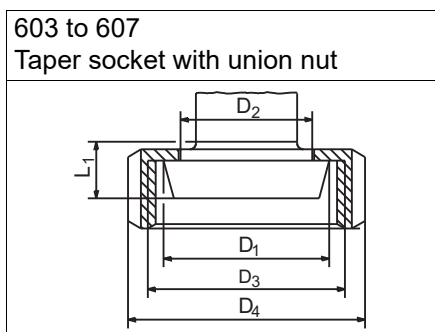
A Profile seal DN G 3/4

B O-ring 20.35 × 1.78

A Profile seal DN G 1

B O-ring 26.7 × 1.78

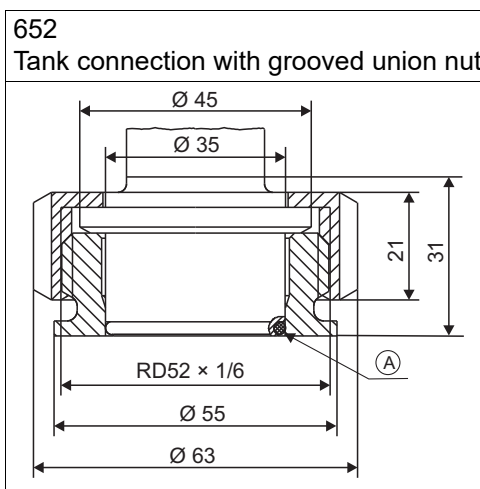
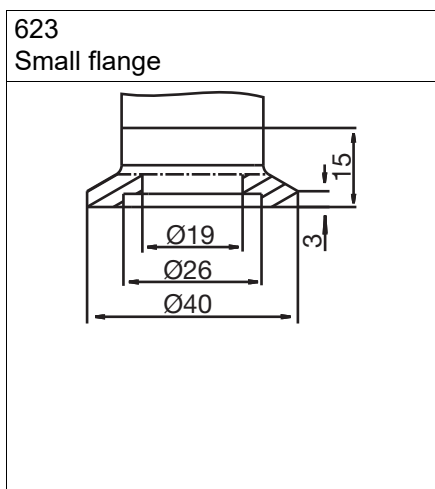
5 Mounting



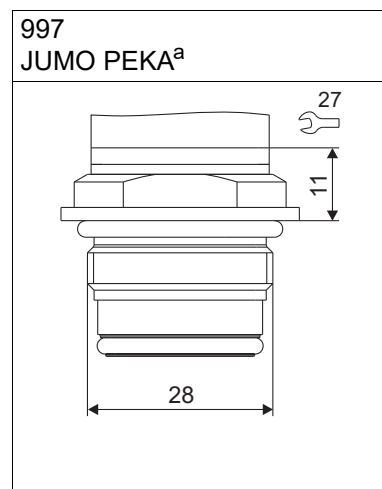
Process connection	DN	Ø D ₁	Ø D ₂	Ø D ₃	Ø D ₄	L ₁
603	20	36.5	30	RD 44 × 1/6	54	13
604	25	44	35	RD 52 × 1/6	63	15
606	40	56	48	RD 65 × 1/6	78	15
607	50	68.5	61	RD 78 × 1/6	92	16

Process connection	DN DIN 32676	DN (inch)	DN ISO 2852	Ø D ₁	Ø D ₂
612	10		8	27.5	34
	15		10		
	20		15		
613 ^a	25	1	20	43.5	50.5
	32	1.5	25		
	40		32		
616 ^a	50	2	40	56.5	64

^a certified according to EHEDG



A O-ring 29.82 × 2.62



^a certified according to EHEDG



NOTE!

Note chapter 5.3 "Important information for usage according to EHEDG", Page 19, and chapter 12.2 "Manual cleaning for maintenance or storage", Page 55.



NOTE!

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

5.3 Important information for usage according to EHEDG

The following process connections are suitable for use according to EHEDG:

- 613 and 616 (Clamp DN25/32/40/50 with Tri-Clamp seals Combifit International B.V.)
- 685 (VARIVENT in-line flange connection type B, F, und N with O-ring made of EPDM)
- 997 (JUMO PEKA with O-ring made of FKM)

The device is suitable for CIP (cleaning in place) if installed appropriately, for temperature and material resistance see chapter 11.5 "Environmental influences", Page 53.

Observe EHEDG-compliant integration into the respective systems:

Prefer installation without cavity.

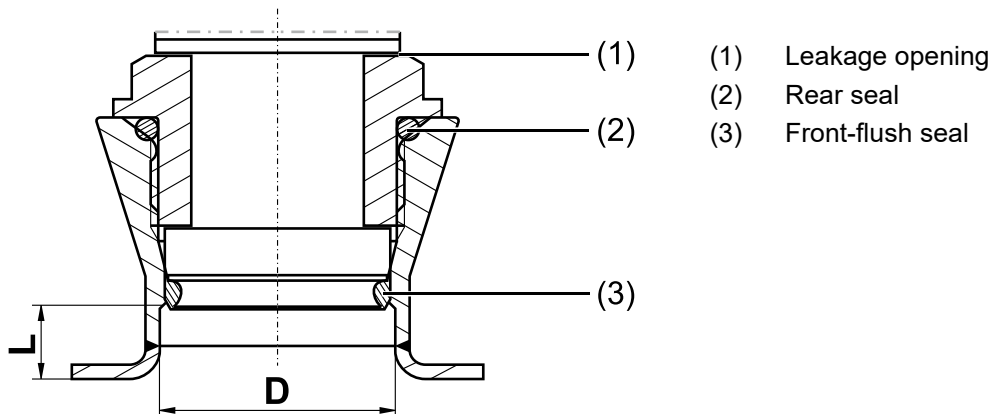
Ensure self-draining installation of the connection spigots.

Use only EHEDG approved process connections according to the current EHEDG position paper.

When used on tanks, the installation must be flush with the front. Cleaning by direct illumination must be ensured. It must be possible to detect cavity.

Install leakage opening in a clearly visible position. In the case of vertical lines, install pointing downwards.

The following drawing shows an installation example.
Observe dimensions to avoid cavity: $L < D$.



6 Operation

6.1 Control elements

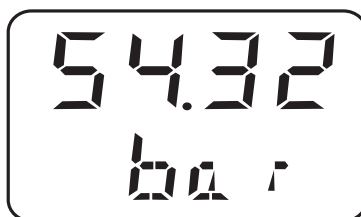


- (1) Sealing screw
- (2) Control element

1. Unscrew the sealing screw (1).
2. Use the supplied combination tool (or a 0.5 x 3 mm screwdriver or a size 2 Allen key) to "Turn/press" the operating element (2).

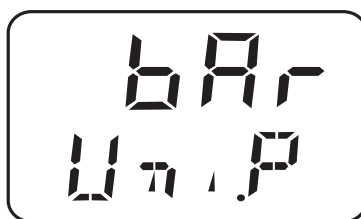
6.2 LCD display

6.2.1 Measuring mode (normal display)



Example:
The display lights up yellow.

6.2.2 Setting mode



Example:
The display lights red.

Operation

Next	Press the combination tool for less than 1 second (<1 s)
Yes (apply)	Press the combination tool for less than 1 second (<1 s)
No (cancel)	Press the combination tool for more than 3 seconds (> 3 s)
Timeout	No action for more than 60 seconds (>60 s)



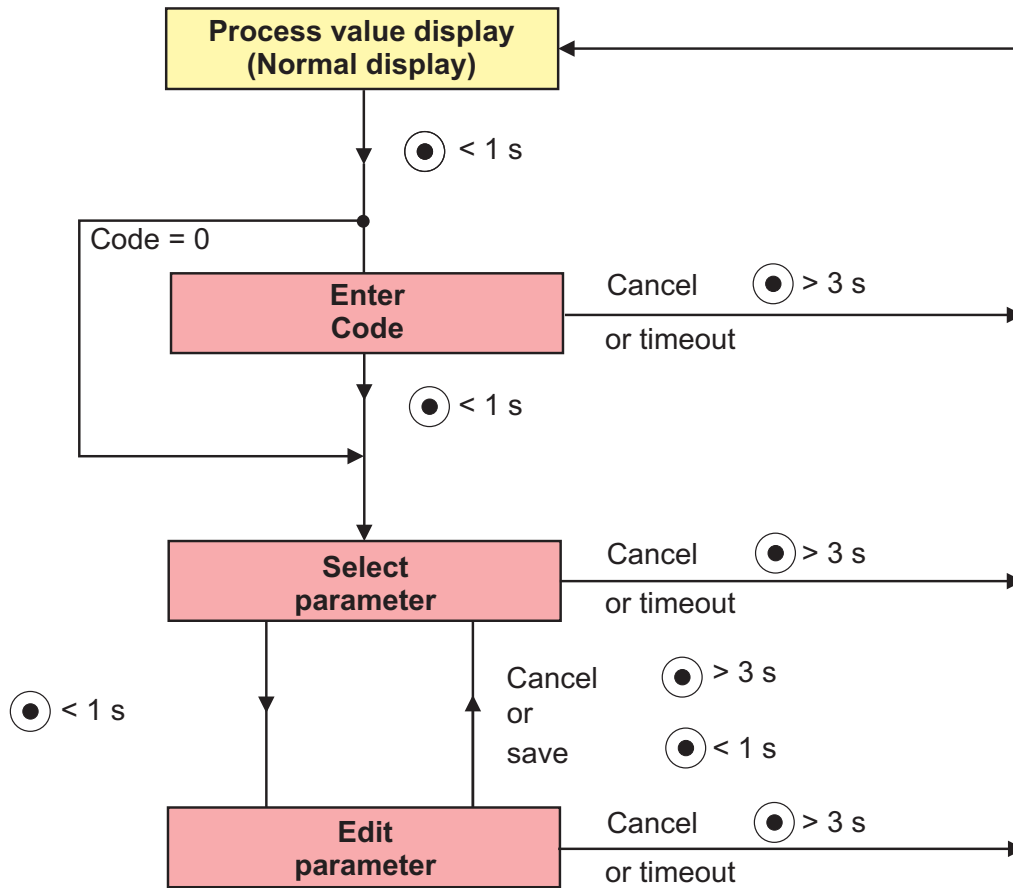
NOTE!

To change back from setting mode to the measuring mode:

- Press "No" (cancel) or
 - Wait for "Timeout" = No actions for 60 seconds.
-

6 Operation

6.3 Levels



6.4 Parameter

6.4.1 Input

Parameter	Display	Setting range ^a
Unit of pressure		bar kPa MPa psi mbar Note: The units kPa and mbar are not configurable for all measuring ranges.
Offset (zero point correction)		-20.00 to 0,00 to +20.00 % of the measuring range Note: Automatic offset correction, see chapter 7.5 "Setting the zero point (offset) (Off.P)", Page 31
Damping (filter time constant)		0.00 to 99.99 s

^a The default setting is highlighted in **bold**.

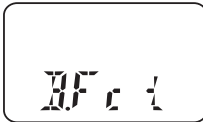


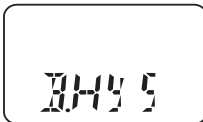

6.4.2 Analog output

Parameter	Display	Setting range ^a
Type of signal (only with analog output)		4 to 20 mA 0 bis 20 mA 0 to 10 V
Scaling start (only with analog output)		0.00 to 75.00% of the nominal measuring range
Scaling end (only with analog output)		25.00 to 100% of the nominal measuring range
Signal in case of error (only for analog output)		3.4 mA or 22 mA for output signals 4 to 20 mA 0 mA or 22 mA for output signals 0 to 20 mA 0 V or 10.7 V for output signals 0 to 10 V chapter 7.9 "Setting the error signal (S.Err)", Page 38 Note: Depending on the configured output signal

^a The default setting is highlighted in **bold**.





6 Operation


6.4.3 Binary output 1

Parameter	Display	Setting range ^a
Switching function (only with switching output)		Closing hysteresis Opening hysteresis Normally open contact window Normally closed contact window see chapter 7.10 "Setting the switching function (B.Fct)", Page 39
Switching point (only with switching output)		0.00 to 100.00% of the nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", Page 39
Release point (only with switching output)		0.00 to 100.00% of the nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", Page 39
Hysteresis (only with switching output and configured switching point or release point)		0.00 to 100.00% of the nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", Page 39 Note: Application exclusively with window switching functions.
Switching delay (only with switching output)		0.00 to 99.99 s see chapter 7.10 "Setting the switching function (B.Fct)", Page 39

^a The default setting is highlighted in **bold**.






6.4.4 Binary output 2

Parameter	Display	Setting range ^a
Switching function (only with 2nd switching output)		Closing hysteresis Opening hysteresis Normally open contact window Normally closed contact window see chapter 7.10 "Setting the switching function (B.Fct)", Page 39
Switching point (only with 2nd. switching output)		0.00 to 100.00% of the nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", Page 39
Release point (only with 2nd. switching output)		0.00 to 100.00% of the nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", Page 39
Hysteresis (only with 2nd. switching output and configured switching point or release point)		0.00 to 100.00% of the nominal measuring range see chapter 7.10 "Setting the switching function (B.Fct)", Page 39 Note: Application exclusively with window switching functions.

Parameter	Display	Setting range ^a
Switching delay (only with 2nd. switching output)		0.00 to 99.99 s see chapter 7.10 "Setting the switching function (B.Fct)", Page 39

^a The default setting is highlighted in **bold**.

6.4.5 Display and operation

Parameter	Display	Setting range ^a
Display position		Std = standard (for standard operation) turn = um 180° gedreht (für Überkopfbetrieb) see chapter 7.15 "Setting the display alignment (D.Dir)", Page 43
Unit of the actual value display (only with analog output)		Unit of pressure (see parameter "Uni.P") percent of scaled area see chapter 7.16 "Setting the digital indicator (D.Uni)", Page 43
Version D		Software version of the operating unit see chapter 7.17 "Displaying the software version of the operating unit (SW.Di)", Page 44
Version S		Software version of the signal unit see chapter 7.18 "Displaying the software version of the signal unit (SW.Si)", Page 44
Code (can only be edited via the set-up program)		0000 to 0072 to 9999 see chapter 7.2 "Unlocking the device (enter the code).", Page 27

^a The default setting is highlighted in **bold**.

7 Startup

7.1 Quick introduction



NOTE!

This is a proposal to be able to configure the device reliably within a short time. When checking the setting possibilities specified in this list prior to starting configuration, timeouts can be avoided during configuration.

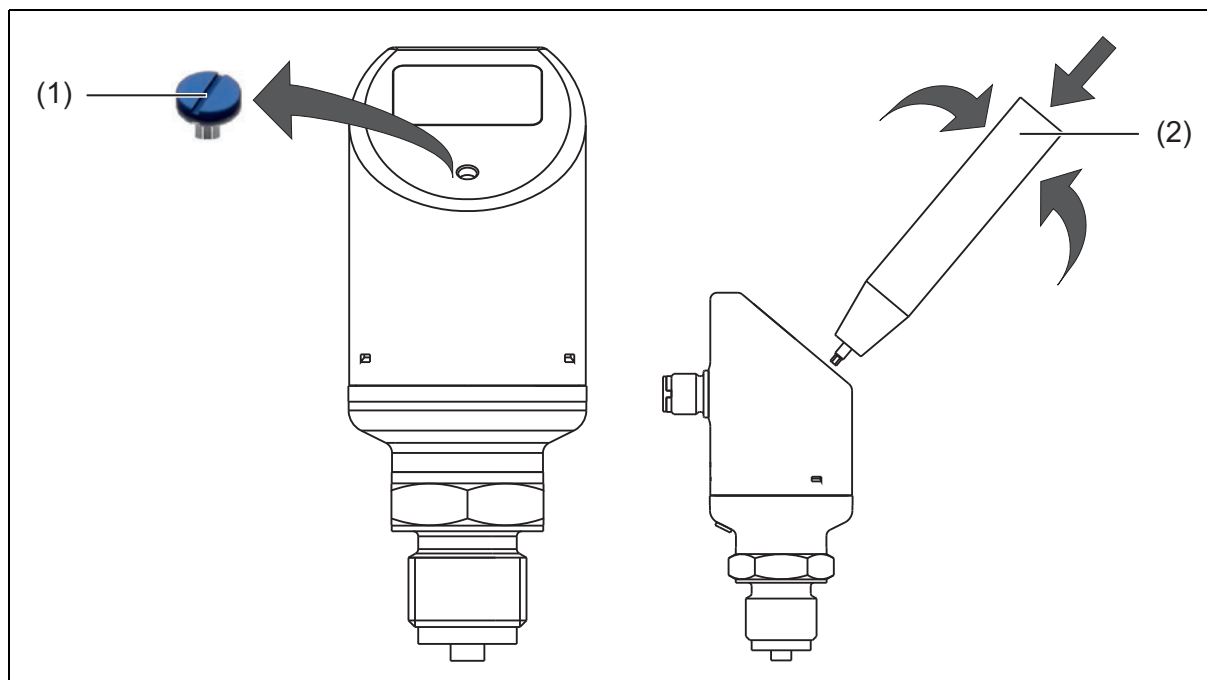
1. Mount the device.
⇒ chapter 5 "Mounting", Page 14
2. Install the device.
⇒ chapter 4 "Electrical connection", Page 12
3. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
4. Select the unit of the measured value.
⇒ chapter 7.4 "Select the unit of measured (Uni.P)", Page 28
5. Set the output signal.
⇒ chapter 7.7 "Setting the output signal (S.Type)", Page 32
6. Set the output signal scaling (restrict the measuring range).
⇒ chapter 7.8 "Setting scaling", Page 33
7. Set the switching function.
⇒ chapter 7.10 "Setting the switching function (B.Fct)", Page 39
8. Set the switching point.
⇒ chapter 7.11 "Setting the switching point (B.Sp)", Page 41

7.2 Unlocking the device (enter the code).

The device is protected against unauthorized operation by a code.

Code is set to 0072 (factory setting). Changes are only possible with the setup program. The device will become unprotected when the setup program is used to set the code to 0000.

Unlocking

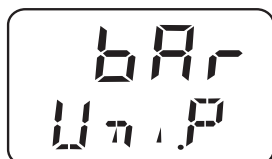


- (1) Sealing screw
- (2) Combination tool

1. Unscrew the sealing screw (1).
2. Briefly press the combination tool (2) (or the 0.5 x 3 screwdriver, or size 2 Allen key) until the third "0" (counted from the left) flashes.
3. Turn the combination tool until "7" appears.
4. Briefly press the combination tool until the fourth "0" (counted from the left) flashes.
5. Turn the combination tool until "2" appears.

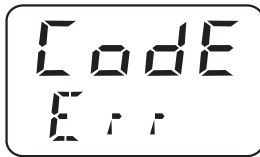


6. Briefly press the combination tool – the device changes to the parameter level.



If an incorrect code was entered:

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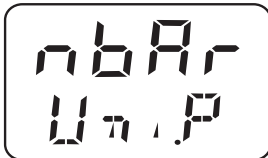


7.3 Cancel operation

1. Press the combination tool for more than 3 seconds or
2. wait for a "timeout" (no actions for more than 60 seconds)

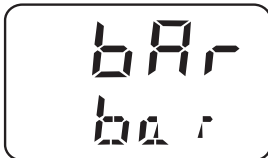
7.4 Select the unit of measured (Uni.P)

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. „Turn“ until „Uni.P“ appears in the bottom line..
3. „Press“ (bar flashing, Uni.P static)



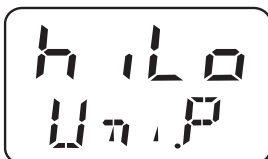
The measured pressure is displayed in Milibar.

4. „Press“



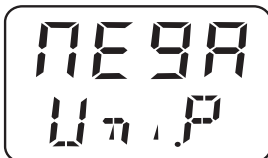
The measured pressure is display in bar.

5. „Turn“



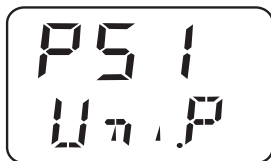
The measured pressure is displayed in Kilopascal.

6. „Turn“



The measured pressure is displayed in Megapascal.

7. „Turn“



The measured pressure is displayed in psi.

Confirm the setting: „Press“ until the display stops flashing.



NOTE!

See chapter 7.16 "Setting the digital indicator (D.Uni)", Page 43

7 Startup

7.4.1 Display and setting possibilities of the device

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	0000	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!

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

7.5.1 Automatic offset setting

This setting applies the current measured value as the new zero point.



NOTE!

Automatic offset setting is only possible for devices with relative pressure measuring range!

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "Off.P" appears in the bottom line.
3. "Press" twice in quick succession.
This applies the current measured value as the zero point.

7.5.2 Edited offset setting

This setting lets you increase or reduce the measured pressure by a configurable value.

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "Off.P" appears in the bottom line.
3. "Press"



flashing

fixed



NOTE!

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

7 Startup

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

The filter time constants (damping) can be used to "damp" the measured value.

Small filter time constant: The measured value is updated faster.

Large filter time constant: The measured value is updated slower.

The value is entered in seconds with two decimal places.

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "DamP" appears in the bottom line.
3. "Press"



NOTE!

Attenuation affects the behavior of the display's analog output, and the switching outputs.

7.7 Setting the output signal (S.Type)

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "S.Type" appears in the bottom line.
3. "Press"



Example:

4.20 A = (Output signal of 4 to 20 mA)

0.20 A = (Output signal of 0 to 20 mA)

0.10 U = (Output signal of 0 to 10 V)

7.8 Setting scaling

User-specific measuring range

The user measuring range (2) is defined by:

- Measuring range start (4)
- Measuring range end (5)
- Measuring span (MSP)

Example:

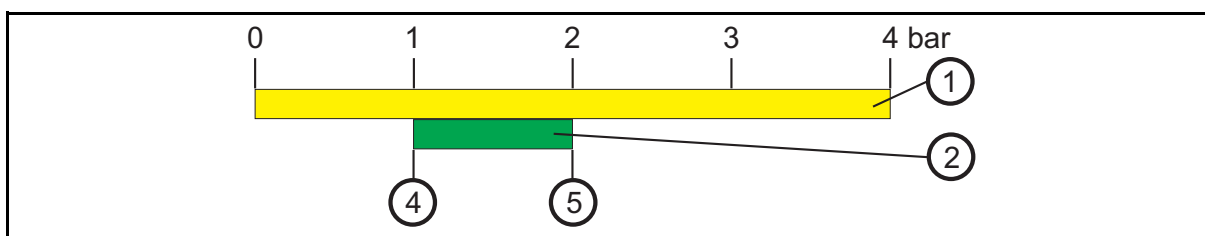
Actual The device has a nominal measuring range (1) from 0 to 4 bar.

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

Measuring range start (4) is 1 bar.

Measuring range end (5) is 2 bar.

Measuring span (MSP) is 1 bar.



7 Startup

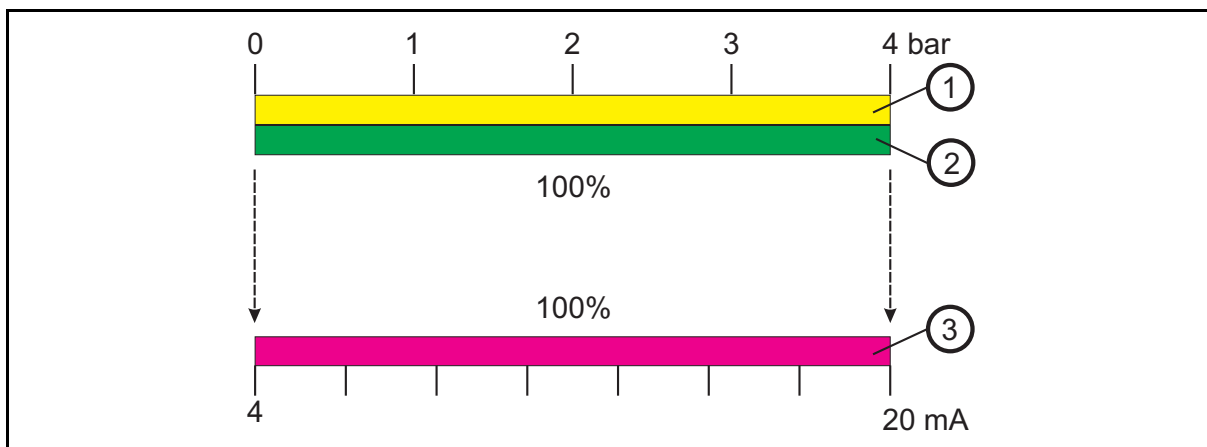
Scaling

The scaling of the output signal of the device describes how the measured pressure is converted into an output signal.

Simple example:

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

Target The user would like: the "User 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 %).



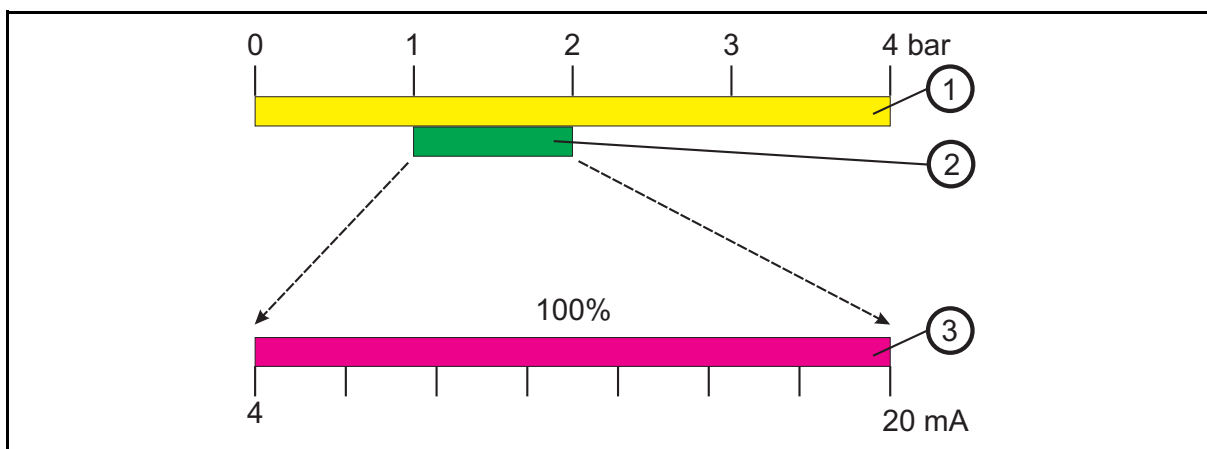
User-specific scaling

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 "User 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 %).



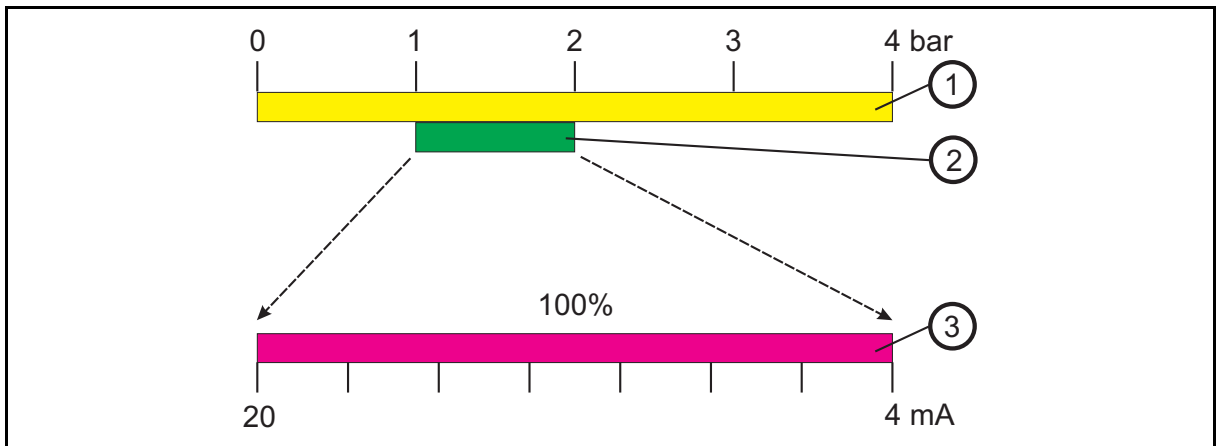
Inversion of the output signal

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

The output signal

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

Example 20 to 4 mA



- | | |
|-----------------------------------|--------------------------------|
| (1) Nominal measuring range (NMB) | (2) User measuring range (MB) |
| (3) Output signal | (4) Measuring range start (MA) |
| (5) Measuring range end (ME) | |
| Measuring span (MSP) | |

7 Startup

7.8.1 Setting the scaling start value (Sc.Lo)



NOTE!

The output signal can only be scaled on devices with analog output.

Setting range: 0 to 75% of the nominal measuring range

Default setting: Measuring range start

Example:

The device has a measuring range from -400 to +400 mbar.

The output signal of the device is 0 to 20 mA.

Target: The range 0 to 200 mbar (user measuring range) must be displayed on the output side as 0 to 20 mA.

Setting: Scaling start value (Sc.Lo) = 0.000
Scaling end value (Sc.Hi) = 200.0

Result: If the pressure is **below** 0 mbar, the device places the error "Measuring range under-shot" and provides the corresponding error signal (0 mA) at the output.

At a pressure of 0 mbar, the device provides 0 mA at the output.

At a pressure of 200 mbar, the device provides 20 mA at the output.

If the pressure **exceeds** 200 mbar, the device reports the error "Measuring range exceeded" and provides the corresponding error signal (22 mA) at the output.

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "Sc.Lo" appears in the bottom line.
3. "Press" (- flashing, Sc.Lo static)



NOTE!

The value is entered "digit-by-digit"!

7.8.2 Setting the scaling end value (Sc.Hi)



NOTE!

The output signal can only be scaled on devices with analog output!
See chapter 7.8.1 "Setting the scaling start value (Sc.Lo)", Page 36 for an explanation.

Setting range: 25 to 100 % of the nominal measuring range

Default setting: Measuring range end

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "Sc.Hi" appears in the bottom line.
3. "Press" (- flashing, Sc.Lo static)



NOTE!

The value is entered "digit-by-digit"!

7 Startup

7.9 Setting the error signal (S.Err)



NOTE!

An error signal for overrange or underrange is only transmitted on devices with analog output.

Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "S.Err" appears in the bottom line.
3. "Press"



Example:

3.4 nA = In case of measuring range **underflow**
Error signal = 0 mA for output of 0 to 20 mA
Error signal = 3.4 mA for output of 4 to 20 mA
Error signal = 0 V for output of 0 to 10 V

22 nA = In case of measuring range **overflow**
Error signal = 22 mA for output of 0 to 20 mA
Error signal = 22 mA for output of 4 to 20 mA
Error signal = 10.7 V for output of 0 to 10 V

7.10 Setting the switching function (B.Fct)

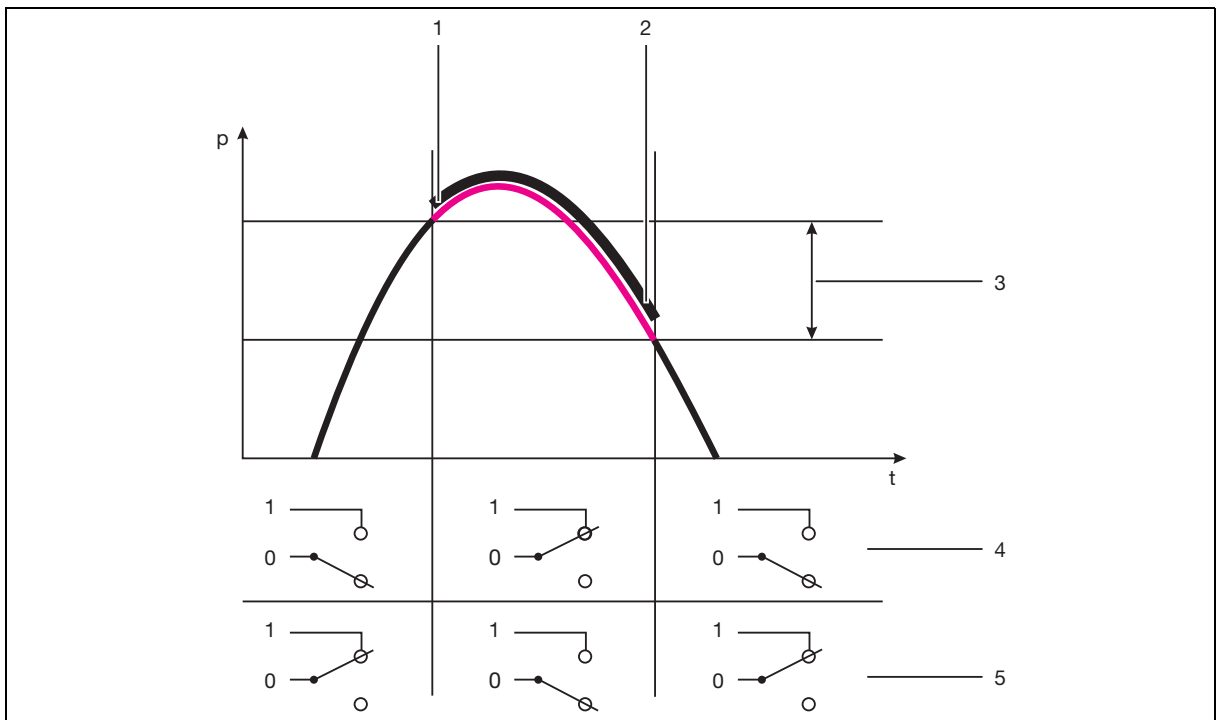
The response of the switching output of the device can be selected:

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

7.10.1 Hysteresis (switching differential)

Relay behavior

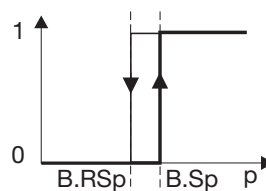
- Hysteresis, N/O contact
- Hysteresis, N/C contact



- | | |
|---|-------------------------|
| (1) Switching point (Sp) | (2) Release point (RSp) |
| (3) Hysteresis (switching differential) | (4) N/O contact |
| (5) N/C contact | |

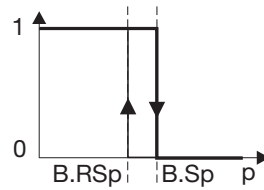
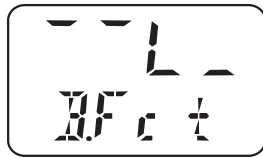
Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. „Turn“ until „B.Fct“ appears in the bottom line.
3. „Press“



7 Startup

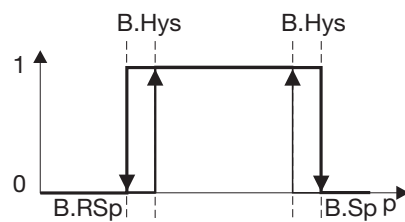
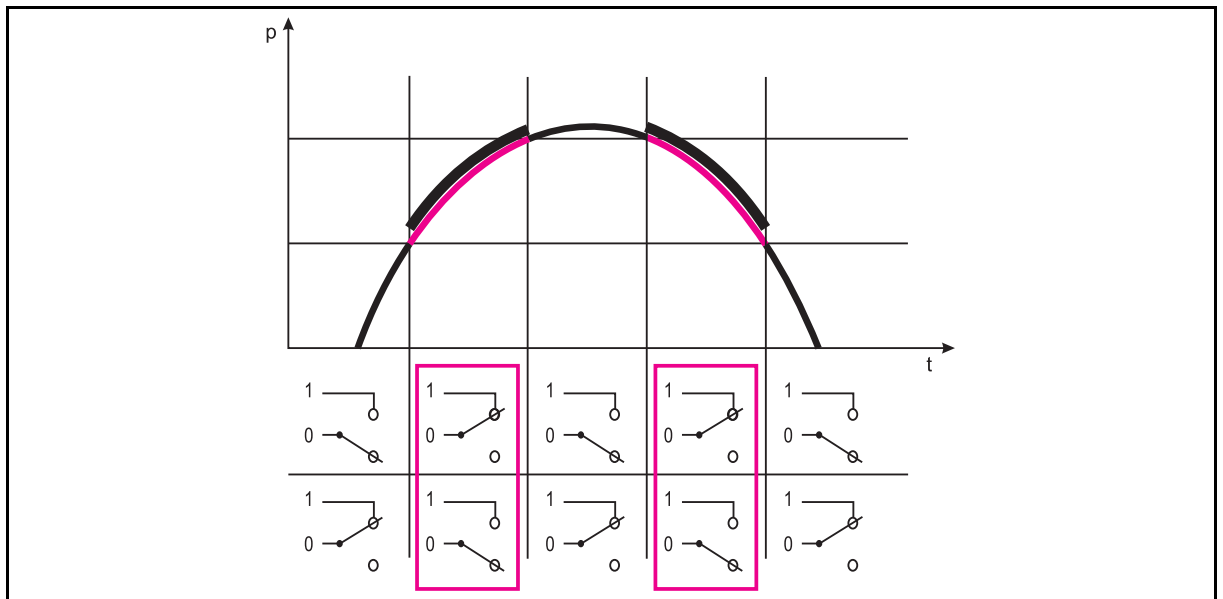
0 = Hysteresis make contact (switching differential) (factory setting)



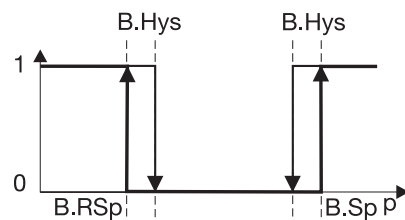
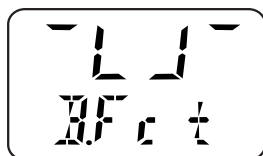
1 = Hysteresis break contact (switching differential) = min. contact

7.10.2 Window

Relay response



2 = Window function make contact



3 = Window function break contact

7.11 Setting the switching point (B.Sp)

⇒ chapter 7.10 "Setting the switching function (B.Fct)", Page 39

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

Default setting: 50 % of the nominal measuring range

Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "B.Sp" appears in the bottom line.
3. "Press" (- flashing, B.SP static)



NOTE!

The value is entered "digit-by-digit!"



7.12 Setting the release point (B.RSp)

⇒ chapter 7.10 "Setting the switching function (B.Fct)", Page 39

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

Default setting: 40 % of the nominal measuring range

Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "B.RSp" appears in the bottom line.
3. "Press" (- flashing, B.RSP static)



NOTE!

The value is entered "digit-by-digit!"



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7.13 Setting the switching differential (hysteresis) (B.HYS)

⇒ chapter 7.10 "Setting the switching function (B.Fct)", Page 39

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

Default setting: 40 % of the nominal measuring range

Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "B.HYS" appears in the bottom line.
3. "Press" (- flashing, B.HYS static)



NOTE!

The value is entered "digit-by-digit"!

7.14 Setting the switching delay (B.DLY)

Setting range: 0.00 to 99.99 s

Default setting: 0.00 s

Setting

The switching delay is not effective for all switching edges. Only applies for JUMO DELOS SI and JUMO DELOS HP.

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "B.DLY" appears in the bottom line.
3. "Press" (- flashing, B.DLY static)



NOTE!

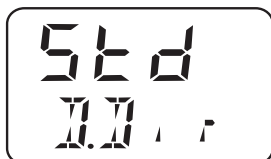
The value is entered "digit-by-digit"!

7.15 Setting the display alignment (D.Dir)

Setting range: std = Standard = Device vertical
 turn = rotated = Device overhead
 Default setting: std

Setting

1. Unlock the device.
 ⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "D.Dir" appears in the bottom line.
3. "Press" (- flashing, D.Dir static)



or

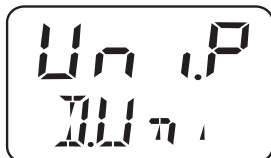


7.16 Setting the digital indicator (D.Uni)

Setting range: Uni.P = Unit of pressure set as for "Uni.P,"
 see chapter 7.4 "Select the unit of measured (Uni.P)", Page 28
 Pro.2 = Percentage of the scaled measuring range = "Sc.Hi" minus "Sc.Lo,"
 see chapter 7.8.1 "Setting the scaling start value (Sc.Lo)", Page 36, and
 chapter 7.8.2 "Setting the scaling end value (Sc.Hi)", Page 37
 Default setting: std

Setting

1. Unlock the device.
 ⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. „Turn“ until „D.Uni“ appears in the bottom line.
3. „Press“



Uni.P = The measured value is displayed in the selected unit,
 see chapter 7.4 "Select the unit of measured (Uni.P)", Page 28

or

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Pro.2 = The measured value is displayed as a percentage of the scaled measuring range, see chapter 7.8.1 "Setting the scaling start value (Sc.Lo)", Page 36 und chapter 7.8.2 "Setting the scaling end value (Sc.Hi)", Page 37

Example:

The measuring range of the device has been set to -50 to +350 mbar eingestellt, the scaled measuring range is 300 mbar. When the device measures a pressure of 150 mbar, 50 % is displayed.

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

Setting range: Read only

Default setting: -

Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. „Turn“ until „SW.Di“ appears in the bottom line.
3. „Press“ (A 01 alternating)



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

Setting range: Read only

Default setting: -

Setting

1. Unlock the device.
⇒ chapter 7.2 "Unlocking the device (enter the code).", Page 27
2. "Turn" until "SW.Si" appears in the bottom line.
3. "Press" (U 01 alternating)



8.1 Setting the zero point (offset) (Off.P)

8.1.1 Automatic offset setting



NOTE!

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

On the device See chapter 7.5.1 "Automatic offset setting", Page 31

Using the setup program Not possible

8.1.2 Edited offset setting

On the device See chapter 8.1.2 "Edited offset setting", Page 45

Using the setup program

1. Connect the device to the PC.
2. Start the setup program, see chapter 9 "Setup program", Page 46 ff.
3. Input/Offset

9 Setup program

9.1 Function

Configurable parameters

The device can be conveniently operated using a PC with the optionally available PC setup software (part no. 00522384).

Depending on the device version, it is possible to set, for example:

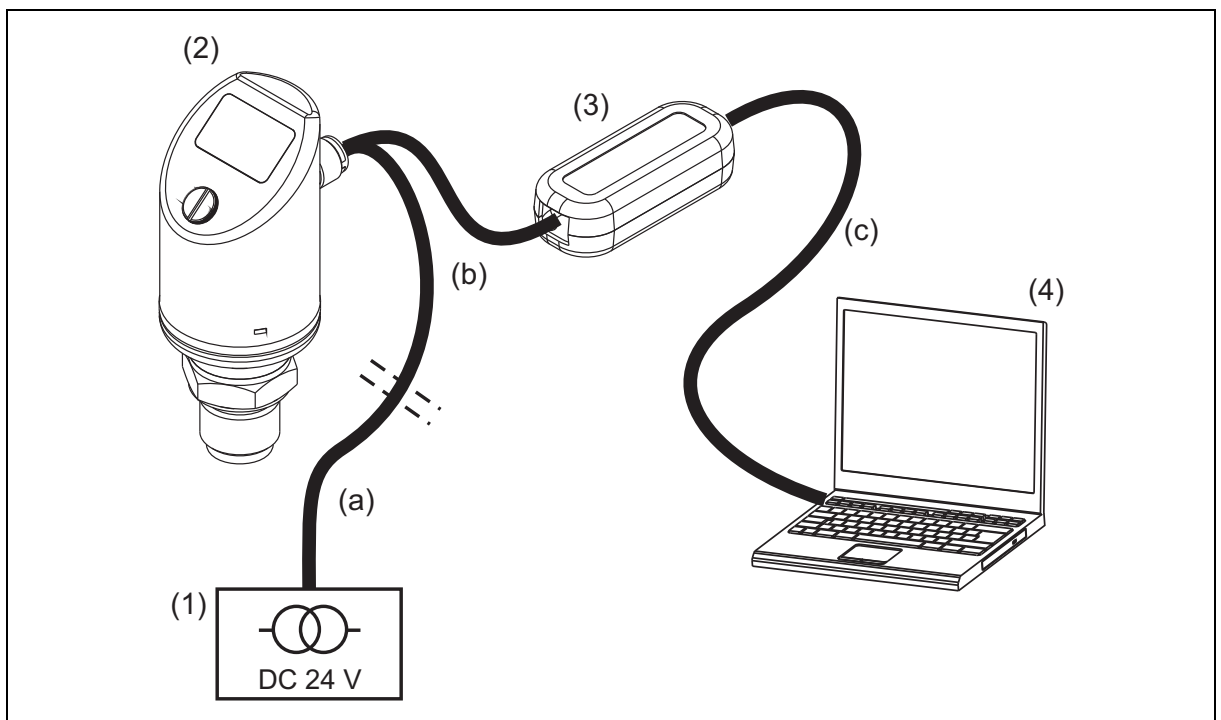
- Measuring range and range limits
- Behavior of outputs in the event of a measuring range overflow
- Functions of the K1 and K2 switching outputs
- Setting of custom functions (e.g. tables for special linearizations)



NOTE!

Data transfer from or to the transmitter can only take place if the voltage supply is connected to it; see chapter 4 "Electrical connection", Page 12 ff.

Connection



- | | |
|---|----------------------------------|
| (1) Voltage supply DC 24 V | (2) Pressure switch, type 405052 |
| (3) USB/TTL converter,
part of part no. 00456352 | (4) Notebook/PC |
- (a) Cable box, straight, 4 pole, M12 × 1, 2 m PVC cable, part no. 00404585 or
cable box, angled, 4 pole, M12 × 1, 2 m PVC cable, part no. 00409334
- (b) Y transmitter cable, 5 pole, part no. 00507861
- (c) PC interface line (gray), part of (3)



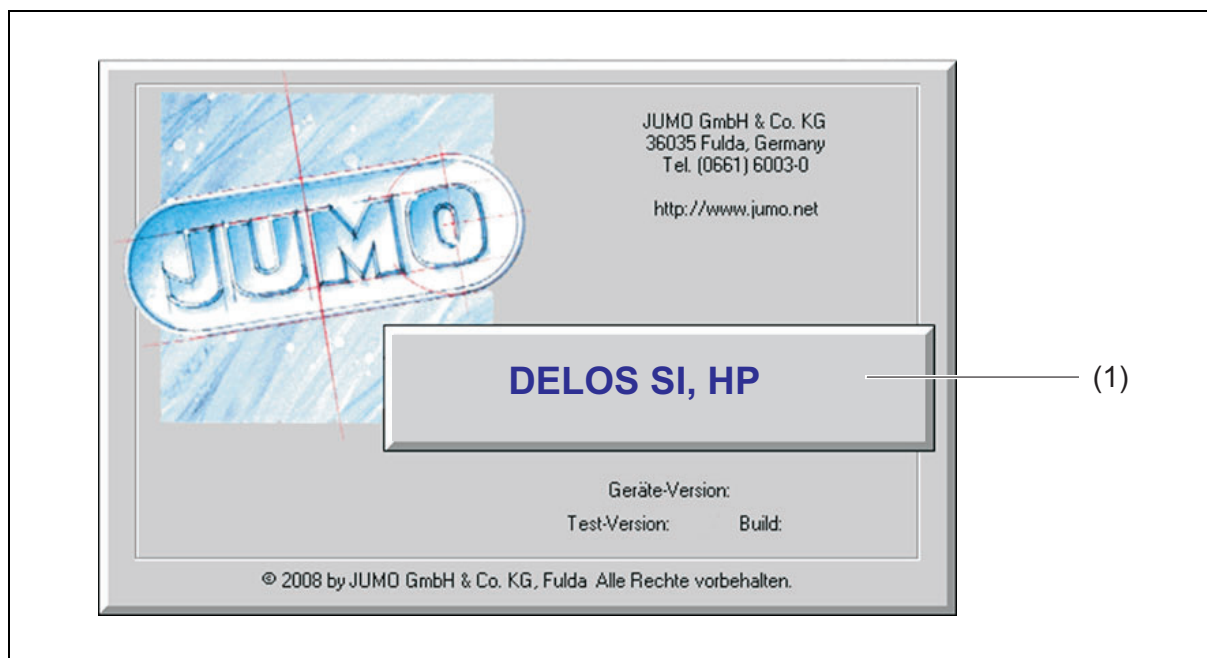
NOTE!

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

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).

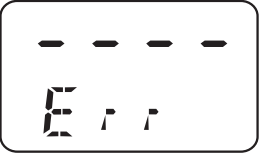

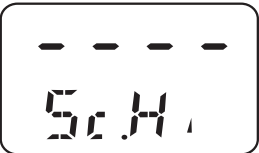
9.2 Start the setup program

Start/Programs/JUMO devices/Setup program JUMO DELOS SI, HP



Display	Possible cause	Measure
	Note at active setup. Note: Display up: „Set“ Display below: „Com“	Display disappears automatically, if the device is no longer connected to the setup.

10 Overcoming errors and malfunctions

Display	Possible cause	Measure
	<ul style="list-style-type: none"> Measuring range overflow or underflow Probe break 	Configuring another measuring range, see chapter 7.4 "Select the unit of measured (Uni.P)", Page 28
	<p>Device error:</p> <ul style="list-style-type: none"> 1 = Internal communication error 2 = Error, analog output 3 = Short circuit, switching output 1 4 = Short circuit switching output 2 5 = VCC 8 V outside the working range 6 to 8 = Internal communication error 9 = Invalid configuration 	<p>1, 6, 7, 8: Return device to Service; see reverse of operating manual for the address.</p> <p>2: Check ambient temperature. Check output for cable break. Output load too high (for current output) or too low (for voltage output).</p> <p>3, 4: Check the corresponding switching output.</p> <p>5: Check voltage supply.</p> <p>9: Check the configuration.</p>
	<p>Display overrun</p> <p>Upper display: „----“</p> <p>Lower display: Parameter name</p> <p>Value is less than -9999 or greater than +9999.</p>	<p>Check the corresponding switching output.</p> <p>Check configuration.</p>

11.1 General Information

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

11 Technical data

11.2 Measuring range and accuracy

Nominal measuring range bar	Linearity ^a % MSP	Accuracy at		Long-term stability ^b % MSP per year	Overload capacity ^c bar	Burst pressure bar
		20 °C ^d % MSP	-20 to +75 °C ^e % MSP			
0 to 0.4 bar relative pressure	0.15	0.35	0.7	≤ 0.2	1.6	2
0 to 1 bar relative pressure	0.15	0.3	0.6		4	5
0 to 4 bar relative pressure	0.1	0.25	0.5		16	20
0 to 10 bar relative pressure	0.1	0.25	0.5		40	50
0 to 25 bar relative pressure	0.1	0.25	0.5		100	125
0 to 60 bar relative pressure	0.1	0.25	0.5		240	300
-0.4 to +0.4 bar relative pressure	0.15	0.35	0.7		1.6	2
-1 to +1 bar relative pressure	0.15	0.3	0.6		4	5
-1 to +3 bar relative pressure	0.1	0.25	0.5		16	20
-1 to +9 bar relative pressure	0.1	0.25	0.5		40	50
-1 to +24 bar relative pressure	0.1	0.25	0.5		100	125
0 to 0.4 bar absolute pressure	0.15	0.35	0.7		1.6	2
0 to 1 bar absolute pressure	0.15	0.3	0.6		4	5
0 to 4 bar absolute pressure	0.1	0.25	0.5		16	20
0 to 10 bar absolute pressure	0.1	0.25	0.5		40	50
0 to 25 bar absolute pressure	0.1	0.25	0.5		100	125
0 to 60 bar absolute pressure	0.1	0.25	0.5		240	300

^a Linearity according to limit point setting

^b Reference conditions DIN EN 61298-1

^c All pressure transmitters are vacuum-proof.

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

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

11.3 Outputs

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

Attenuation	0 to 99.99 s
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)
Setting range Switching point Release point Hysteresis Input delay	Measurement range scaling (turn down) 1:4 Configurable in the nominal measuring range (> release point) Configurable in the nominal measuring range (< switching point) Configurable in the nominal measuring range 0 to 99.99 s
Burden Current 4 to 20 mA, three-wire (output 475) 0 to 20 mA, three-wire (output 476) Voltage DC 0 bis 10 V, three-wire (output 477)	$RL \leq (U_B - 6.5 \text{ V}) \div 0.022 \text{ A } (\Omega)$ $RL \leq (U_B - 6.5 \text{ V}) \div 0.022 \text{ A } (\Omega)$ $RL \geq 10 \text{ k}\Omega$
Step response time (analog input) T_{90}	$\leq 100 \text{ ms}$
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_B Contact rating Switching cycles Response time Short-circuit proof	$PNP \leq 2 \text{ V}$ $ON \leq 250 \text{ mA/OFF} \leq 1 \text{ mA}$ > 10 million $\leq 20 \text{ ms}$ Yes
Current load check Pulse period Periodic protective circuit with overcurrent	2 s; $T_{ON} 40 \text{ ms}$ $f = 0.5 \text{ Hz}$ Display: Err3 switching output K 1, Err4 switching output K 2

11 Technical data

11.4 Mechanical features

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

11.5 Environmental influences

Permissible temperatures	
Medium	-25 to +100 °C (135 °C max 1 hour/day; no function here)
For basic type extension 004	-25 to +200 °C
Environment	-25 to +75 °C
Ambient temperature -50 °C	Restricted function: stationary use only, danger of broken cable, display does not function
Storage	-40 to +85 °C
Permissible relative humidity	
In operation	100 % rel. humidity, including condensation of instrument outer sleeve
Storage	90 % rel. humidity, no condensation
Permissible mechanical loading	According to IEC 60068-2-6, IEC 60068-2-27
Vibration resistance	20 g, 10 to 2000 Hz
Shock resistance	50 g for 11 ms/100 g for 1 ms
Electromagnetic compatibility	According to DIN EN 61326-2-3, with 4-pin connecting cable and grounded enclosure only!
Interference emission	Class B ^a
Interference immunity	Industrial requirements
Protection	IP67, according to DIN EN 60529 (with suitable mating piece when connected)

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

11 Technical data

11.6 Electrical data

Voltage supply U_B^a 0 to 20 mA, three-wire 4 to 20 mA, three-wire 0 to 10 V, three-wire Less than the permitted voltage supply Reverse polarity protection	Nominal voltage DC 24 V DC 12 to 30 V DC 12 to 30 V DC 14 to 30 V Display Err 5 YES
Power consumption	≤ 45 mA without load, ≤ 545 mA with load 2× PNP
Electrical connection	Round plug M12 × 1, 4-pin, A-coded (for assignment see chapter 4.2 "Connection diagram", Page 12)
Circuit Requirements	SELV The device must be equipped with an electrical circuit that meets the requirements of EN 61010-1 with regard to "Limited-energy circuits".

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

11.7 Approvals and approval marks

EHEDG Test facility Certificate/Certification number Inspection basis Valid for	Research Center Weihenstephan for Brewing and Food Quality EL Class 1/EHEDG-C2000058 (2020-11-06) EHEDG design specifications (doc. 8 – Hygienic Design Principles) EHEDG tests for verifying ease of cleaning (doc. 2, Third Edition, July 2004, updated June 2007) Process connection 997 (JUMO PEKA)
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12 Maintenance, cleaning and returns

12.1 Maintenance

The pressure transmitter is maintenance-free.
For this reason, repairs must be performed by the manufacturer only.

12.2 Manual cleaning for maintenance or storage



NOTE!

Avoid damage to the device due to improper cleaning.

Do not damage the pressure transmitter, especially the parts touched by medium.
Cleaning agent must not attack the surface and seals.

12.3 Returns



WARNING!

Injury to persons, damage to property, environmental damage

Measured material residues on the removed product can cause injury to humans, and damage to the environment and equipment.

► Take sufficient precautionary measures.



NOTE!

In case of abnormalities, please send the device to the manufacturer together with a completed declaration of decontamination. You will find the declaration of decontamination on the website at:
<http://productreturn.jumo.info>



NOTE!

The product may only be disassembled in a safe, de-pressurized, and zero-voltage state by qualified personnel.

13 China RoHS

						
产品组别 Product group: 405052	产品中有害物质的名称及含量 China EEP Hazardous Substances Information					
部件名称 Component Name						
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳 Housing (Gehäuse)	○	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)	X	○	○	○	○	○
螺母 Nuts (Mutter)	○	○	○	○	○	○
螺栓 Screw (Schraube)	○	○	○	○	○	○
<p>本表格依据SJ/T 11364的规定编制。 This table is prepared in accordance with the provisions SJ/T 11364. ○ : 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。 Indicate the hazardous substances in all homogeneous materials' for the part is below the limit of the GB/T 26572.</p> <p>× : 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。 Indicate the hazardous substances in at least one homogeneous materials' of the part is exceeded the limit of the GB/T 26572.</p>						



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