JUMO dTRANS p20 DELTA

Differential pressure transmitter

Operating Manual

40302200T90Z001K000

V7.00/EN/00519462/2021-01-06

Contents

Contents

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.

Note symbols

NOTE!

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

2 General information

DANGER!

The device is suitable for measuring pressure in gases and liquids without solids content.
In the SIL version (functional safety), this device is used in safety-related systems for minimum, maximum and area monitoring that fulfil the requirements of the series of standards DIN EN 61508:2011.
A failure of the device or other devices connected to it, e.g. due to an operating error, can lead to dangerous malfunctions of the whole plant.

▶ Therefore please also observe the corresponding safety manual from the device series.

NOTE!

Read this operating manual before putting the device into service. Keep the operating manual in a place that is accessible to all users at all times.
All necessary settings are described in this operating manual. Nevertheless, should problems be encountered during startup please do not make any unauthorized manipulations. This could endanger your rights under the warranty!
Please contact the nearest branch office or the head office.

2.1 Areas of application

The device with HART® interface combines maximum precision with simple operation. It is used to measure the system pressure of gases, steams, and liquids. The integrated LCD display shows measured values and device data.

The version with explosion protection "Ex ia (intrinsically safe)" allows the device to be installed up to zone 0.

The housing and sensors are manufactured from high-grade stainless steel. Diaphragm seals can also be connected for specific process technology applications (see data sheets 409772 to 409784).

The device is programmable and therefore readily adaptable to a variety of different measurement tasks. An easy-to-use setup program is available as an accessory to enable operation via the interfaces. A rotary knob makes manual operation on-site very convenient and quick.

The pressure transmitter with 4 to 20 mA and HART® protocol was evaluated with regard to functional safety and is certified by TÜV Nord according to DIN EN 61508/-1/-2, edition 2.0. These measuring devices are suitable for monitoring process level and process pressure up to SIL2. Further details can be found in the Safety Manual.

Use in "Ex-area"

In the **Ex ia** version, the device is permitted for use in the "Ex-area" if it has a corresponding identification marking on the nameplate.

Functional safety use

In the SIL version, the device is permitted for use according to IEC 61508 if it has a corresponding identification marking on the nameplate.

Application areas

The device can be used for various applications, e.g.

- For level measurements in pressurized containers
- For foam formation
- In containers with mixers or sieve installations
- For liquid gases
- For default level measurements
- For flow measurements

Measured process variables

Differential pressure

Calculated process variables

- Flow
- Filling level (level, volume, or mass)

2 General information

2.2 Scope of delivery

Operating Manual

The operating manual describe the mounting, the electrical connection, the startup and operation of the device.

Safety manual (option)

The safety manual describes the safe application with the installation according to IEC 61508.

Calibration certificate

The device is supplied with a calibration certificate and a setup print-out.

These documents contain information about the set parameters and/or the measured parameters for the respective device.

If the calibration certificate is lost or if you need another copy, the calibration certificate can be requested from the manufacturer by specifying the device's F number (see nameplate). You will find the supplier's address on the back cover of the manual.

Setup program (option)

The setup program is available as an option: part no. 00537577

All the device's parameters can be conveniently checked and adjusted using the setup program - there are also additional functions, e.g.:

- Recording the measured values
- Graphical view of temperature and pressure
- Detailed diagnostic messages
- Display of the complete order code and the device configuration (for follow-up orders)

The setup program accesses the device via

- the JUMO interface (standard) or
- the HART® interface (optional)

DANGER!

The JUMO interface must not be used in the Ex-area!
The device may only be operated using the rotary knob or the HART® interface!

PC interface cable (option)

Available as an accessory: PC interface cable with USB/TTL converter and two adapters (USB transmitter cable), part no. 00456352.

The device can be connected to a PC's USB port via the JUMO interface with the PC interface cable.

HART® modem (option)

Available as an accessory: HART® modem for USB, part no. 00443447.

The device can be connected to a PC's USB® port via the HART® interface with the HART® modem.

Input isolating amplifier (option)

Available as an accessory: Input isolating amplifier for Ex-applications, HART®-capable, part no. 00577948.

Devices with explosion protection ATEX Ex ia must be connected via an input isolating amplifier for use in the Ex-area!

Diaphragm seal (option)

Available as an accessory: see data sheets 409770 to 409786.

Diaphragm seals are used for adjusting to particular applications if conventional pressure connections cannot be used.

CAUTION!

Diaphragm seals are installed by default and must not be removed from the device!

Valve manifolds (option)

Available as an accessory: see data sheet 409706.

Additional JUMO accessories (option)

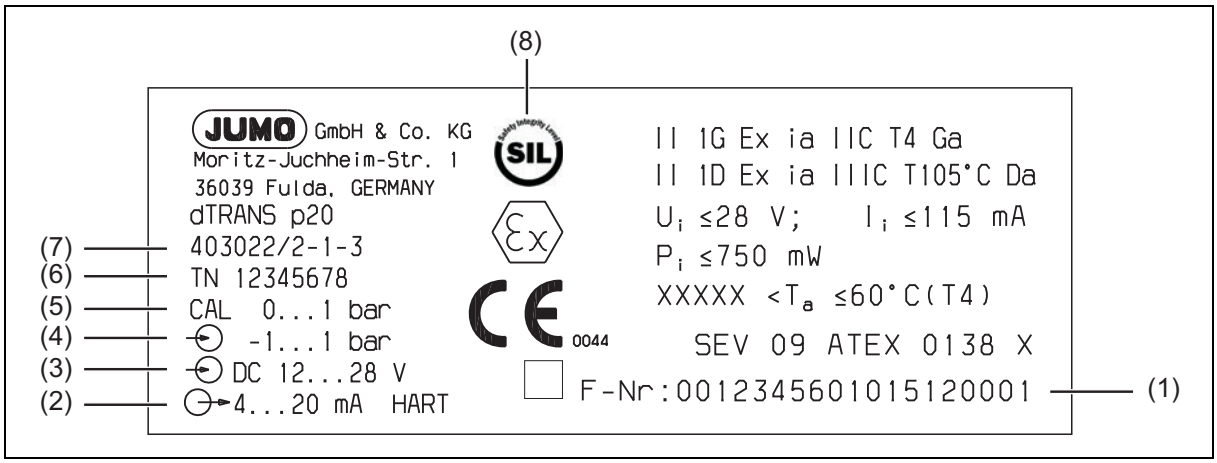
Additional accessories available: see data sheet 409700 (shut-off valves, measurement device holders, transition pieces, seals, etc.).

3 Identifying the device version

3.1 Nameplate

Housing

Sample identification marking on the device housing



(1) Fabrication number
(2) Output signal
(3) Voltage supply
(4) Nominal measuring range
(5) Default measuring range
(6) Part number
(7) Type
(8) SIL version

Date of manufacture

The date of manufacture (year and calendar week) of the device is encoded in the manufacturing number. The numbers 12 to 15 identify the year of manufacture and the calendar week.

3.2 Order details

	(1)	**Basic type**
403022		JUMO dTRANS p20 DELTA – Differential pressure transmitter
	(2)	**Basic type extension**
0		None
2		SIL[a]
9		Special version
	(3)	**Explosion protection**
0		None
1		ATEX Ex ia[b]
	(4)	**Housing**
1		Short, stainless steel, with M12 connection[c]
2		Long, stainless steel, with cable fitting
3		Precision casting, with cable fitting M20
	(5)	**Electrical connection**
36		Round plug M12 × 1
82		Plastic cable fitting
93		Metal cable fitting
	(6)	**Cover material**
20		CrNi (stainless steel)
85		Plastic
	(7)	**Display**
0		None
1		With display (LCD)
	(8)	**Operation**
0		None
1		With control knob
	(9)	**Input – nominal measuring range**
532		0 to 1 bar DP
530		-10 to +10 mbar DP[d, e]
531		-1 to +1 bar DP[e]
533		-1 to +6 bar DP
534		-1 to +100 bar DP
	(10)	**Output**
405		4 to 20 mA, two-wire, without SIL
410		4 to 20 mA, two-wire with HART® protocol
	(11)	**Process connection**
511		2× pressure connection 1/4-18 NPT according to DIN EN 837
998		Diaphragm seal version, screwed
	(12)	**Process connection material**
20		CrNi (stainless steel)
80		Tantalum
82		NiMo

3 Identifying the device version

	(13)	Measuring system, filling medium
01		Silicon oil
02		Halogenized oil for oxygen application
	(14)	**Extra codes**
000		None
100		Customer-specific factory setting[f]
226		GOST/EAC approval[g]
624		Oil and grease free
633		Mounting brackets for 2" tube
634		TAG number
635		NACE manufacturer's declaration[h]
681		Expanded admissible ambient temperature
694		Increased nominal pressure PN 420 bar
932		HART® version 5

[a] SIL is only available with 4 to 20 mA, two-wire with HART® protocol and extra code HART® version 5. SIL is not available for the measuring range -10 to +10 mbar DP and not with extra code extended permissible ambient temperature.
SIL devices are always delivered with display.

[b] ATEX Ex ia does not apply in connection with a cable fitting made out of plastic and the connection 4 to 20 mA (output 405).

[c] The short housing is only available with a round plug M12 × 1.

[d] This input is only available with a process connection made out of stainless steel.

[e] The inputs are not available with an increased nominal pressure.

[f] Please specify the setting you want in plain text. For default setting see “Accuracy” section in the data sheet.

[g] Upon request

[h] Only with NiMo and not for measuring ranges -10 to +10 mbar DP and -1 to +1 bar DP available.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)		(12)		(13)		(14)
Order code		/		-		-		-		-		-		-		-		-		-		-		-		/	
Order example	403022	/	0	-	0	-	2	-	82	-	20	-	1	-	1	-	532	-	405	-	511	-	20	-	1	/	000

3.3 Accessories

Designation	Part no.
PC interface with USB/TTL converter[a]	00456352
HART® modem USB[b]	00443447
4-pole cable box, straight, M12 × 1 with 2 m PVC cable	00404585
4-pole cable box, angled, M12 × 1 with 2 m PVC cable	00409334
SET oval flange 1/2“ NPT/accessory set 7/16-20UNF	00543775
Ex-i Power supply/input isolating amplifier, Type 707530/38	00577948
Mounting brackets, set includes screws 7/16-20UNF	00543777

Designation	Data sheet
Valve manifolds	409706
Diaphragm seal with dairy pipe fitting DIN 11851	409772
Diaphragm seal with clamp connection	409774
Diaphragm seal with DRD flange or VARIVENT® socket	409776
Diaphragm seal with ISS/SMS/RJT socket and (grooved) union nut	409778
Membrane diaphragm seal 4MDV-10	409780
Diaphragm seal with screw-in thread DIN ISO 228/1 or ANSI B1.201	409782
Diaphragm seal with flange connection DIN EN 1092-1 with sealing strip form B1	409784
Diaphragm seal with flange connection according to ANSI B 16.5 with sealing strip form RF	409786
Ex-i repeater power supply/input isolating amplifier	707530

[a] The PC interface cable is the connection between the JUMO interface of the differential pressure transmitter and the USB interface of a PC.

[b] The HART® modem is the connection between the HART® interface of the differential pressure transmitter and the USB interface of a PC.

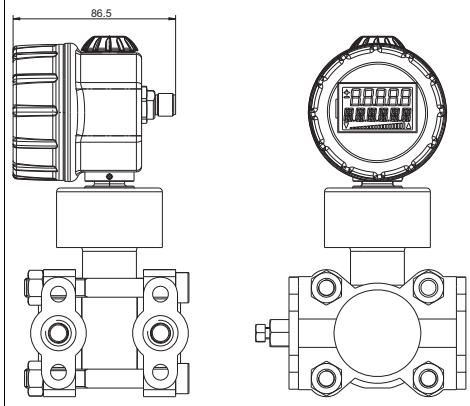
3.4 Software

Description	Part no.
JUMO setup dTRANS p20 series	00537577
Device Type Manager (DTM), JUMO dTRANS p20	00738288

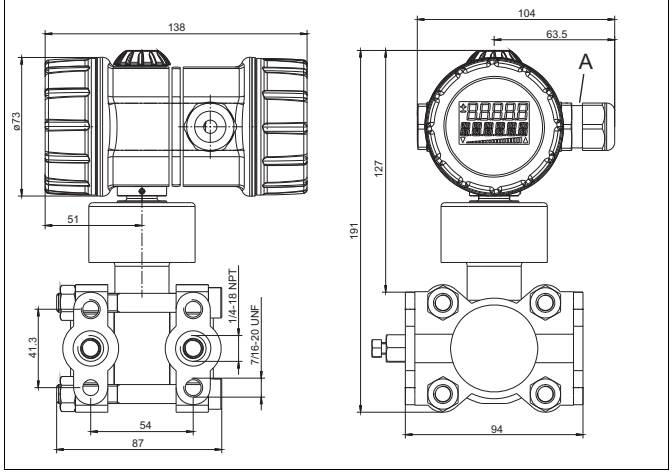
3 Identifying the device version

3.5 Dimensions

Type 403022/0-0-1
(short, stainless steel, with M12 connection)

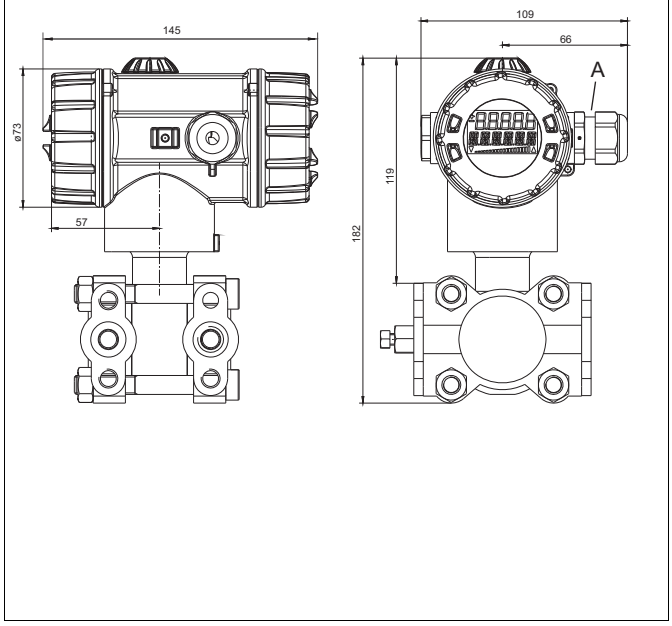


Type 403022/0-0-2
(long, stainless steel, with cable fitting)



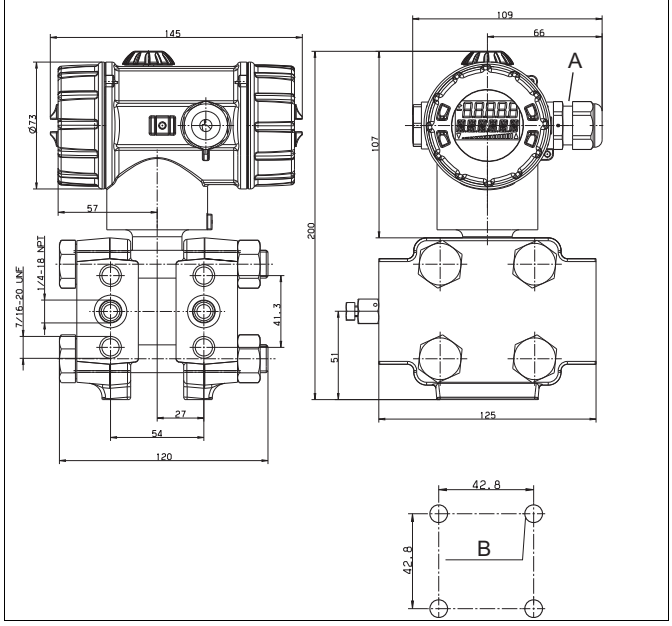
A M20 × 1.5 cable fitting

Type 403022/0-0-3
(precision casting, with cable fitting)



A M20 × 1.5 cable fitting

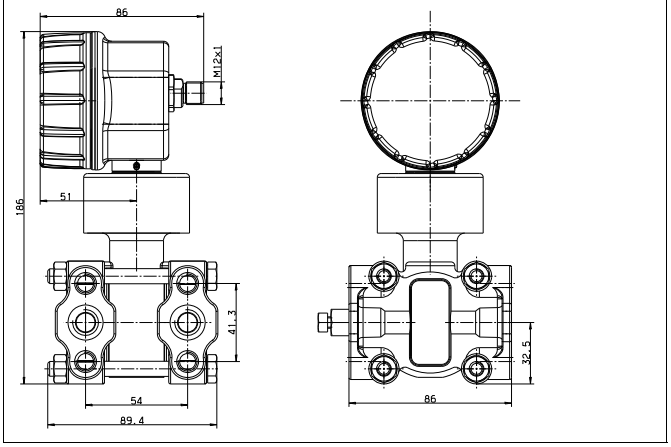
For extra code 694
(increased nominal pressure PN420)



A M20 × 1.5 cable fitting

B M8 for mounting

Type 403022/0-0-1 (without display and operation) for nominal measuring range -10 to +10 mbar, nominal pressure PN2 (bar)



4 Technical data

4.1 General Information

Reference conditions	DIN EN 60770 and DIN EN 61298
Ambient temperature	22 °C ±5 K
Air pressure	1000 hPa (±25 hPa)
Voltage supply	DC 24 V
Burden	50 Ω
Sensor system	Silicon sensor with stainless steel separating diaphragm
Pressure transfer medium	
For measuring system filling medium 1	Silicon oil
For measuring system filling medium 2	Halogenized filling oil
Admissible load changes	> 10 million
Position	
Mounting position	Any
Calibration position	Device upright, process connection at the bottom
Zero offset depending on position	≤ 1 mbar A zero offset is possible on-site or via setup
Display[a]	LCD, two-line with bar graph
Alignment	Display unit rotatable in 90° steps Housing rotatable ±160°
Size	Display 22 × 35 mm, font size 7 mm/5-digits
Color	Black
Portrayable measuring units	
Input pressure	inH_2O, inHg, ftH_2O, mmH_2O, mmHg, psi, bar, mbar, kg/cm^2, kPa, torr, MPa, mH_2O
Measured value	% or scaled with freely adjustable measuring unit
Output current	mA
Sensor temperature	°C, °F
Additional display data	Minimum pressure, maximum pressure, error, overrange, underrange, operating hours
Operation	
On-site	With rotary knob and LCD
Setup program	Via interface
Interface	
Standard	JUMO interface[b]
For output 410 (4 to 20 mA with HART®)	JUMO interface[b] and HART® interface

[a] optional; SIL version only available with display

[b] The JUMO interface may not be used in a potentially explosive area! In such a case the device can be operated via the rotary knob or the HART® interface.

4.2 Input

Nominal pressure					
Nominal measuring range	-10 to +10 mbar DP[a]	-1 to +1 bar DP	0 to 1 bar DP	-1 to +6 bar DP	-1 to +100 bar DP
Nominal pressure (bar)	PN2	PN210	PN210, optionally PN420		

[a] Without SIL

4.3 Output

analog output	
For output 405 (4 to 20 mA)	4 to 20 mA, 2-wire
For output 410 (4 to 20 mA with HART®)	4 to 20 mA, two-wire with HART® version 7 (optionally with HART® version 5, extra code 932, always with SIL version)
Jump response time T60	≤ 190 ms without attenuation
Attenuation	Adjustable 0 to 100 s
Burden	
For output 405 (4 to 20 mA)	Burden ≤ (U_B-12 V) ÷ 0.022 A
For output 410 (4 to 20 mA with HART®)	Burden ≤ (U_B-12 V) ÷ 0.022 A; additional: min. 250 Ω, max. 1100 Ω

4.4 Voltage supply

For version	
Explosion protection 0 (none)	DC 12 to 36 V
Explosion protection 1 (ATEX Ex ia)	DC 12 to 28 V The voltage supply must be intrinsically safe and must not exceed the following maximum values: Ui ≤ DC 28 V Ii ≤ 115 mA Pi ≤ 750 mW Ci = 6 nF Li = 105 µH

4 Technical data

4.5 Mechanical features

Process connection	
Materials	
Membranes	
For process connection 20 (stainless steel)	Stainless steel 316 L
For process connection 82 (HASTELLOY®)	HASTELLOY® C276, material-no. 2.4819
For process connection 80 (tantalum)	Tantalum
Flange	Stainless steel 316
Seal	PTFE
Housing	
Materials	
For housing 1 (short, stainless steel)	Stainless steel 1.4404
For housing 2 (long, stainless steel)	Stainless steel 1.4404, VMQ
For housing 3 (precision casting)	Stainless steel 1.4408
For material lid 20 (stainless steel)	Precision casting 1.4408, seal FPM
For material lid 85 (plastic)	PA, seal FPM
For electrical connection 36 (round plug M12 × 1)	Brass, nickel-plated
For electrical connection 82 (cable fitting, plastic)	PA
For electrical connection 93 (cable fitting, metal)	Brass, nickel-plated
For operation 0 (without control knob)	-
For operation 1 (with control knob)	PA
Explosion protection	
For	
Explosion protection 0 (without)	The device is **not** approved for use in an Ex-area.
Explosion protection 1 (ATEX Ex ia)	EC-type examination certificate SEV 09 ATEX 0138 X II 1G Ex ia IIC T4 Ga II 1D Ex ia IIIC T105 °C Da
Weight	
Type 403022/0-0-1 (housing, short)	Approx. 3.0 kg
Type 403022/0-0-2 (housing, long)	Approx. 3.3 kg
Type 403022/0-0-3 (housing, precision casting)	Approx. 4.0 kg
For extra code 694 (increased nominal pressure)	The weight of the device increases by approximately 3.8 kg.

4.6 Environmental influences

Admissible temperatures					
Operation	Version	Temperature class	Maximum medium temperature	Ambient temperature[a]	Increased ambient temperature (extra code 681)[a, b, c]
	Standard		110 °C	-40 to +85 °C	-50 to +85 °C
	II 1G Ex ia	T4	100 °C	-40 to +60 °C	-50 to +60 °C
	II 1D Ex ia	T105 °C	100 °C	-40 to +60 °C	-50 to +60 °C
Storage	-40 to +85 °C				
Admissible humidity					
Operation	100 % including condensation on the device outer case				
Storage	90 % without condensation				
Admissible mechanical load					
Vibration strength	2 g, 10 to 500 Hz according to DIN EN 60770-3				
Shock resistance	15 g for 6 ms according to IEC 60068-2-29				
Electromagnetic compatibility	According to EN 61326				
Interference emission	Class B[d]				
Interference immunity	Industry				
Protection type					
For version					
Explosion protection 0 (without)	IP66/67 according to DIN EN 60529				
Explosion protection 1 (ATEX Ex ia)	IP66 according to DIN EN 60529				

[a] Under -20 °C limited function: stationary use, increased danger of cable break, display without function; under -30 °C operation of the device not possible.

[b] In the range from -40 to -50 °C the device must be permanently in operation. Furthermore, the lid with the device inspection glass must additionally be protected against mechanical impact and shock effects. Please contact JUMO for further details.

[c] Without SIL

[d] The product is suitable for industrial use as well as for households and small businesses.

4 Technical data

4.7 Accuracy

Including non-linearity, hysteresis, non-repeatability, zero point and final value deviation (corresponds to measurement deviations according to IEC 61298-2), calibrated at vertical installation position with the process connection at the bottom

Differential pressure					
Nominal measuring range	-10 to +10 mbar DP[a]	-1 to +1 bar DP	0 to 1 bar DP	-1 to +6 bar DP	-1 to +100 bar DP
Default measuring range	0 to 10 mbar	0 to 1 bar		0 bar to 6 bar	0 bar to 100 bar
Smallest MSP[b]	1 mbar[c]	5 mbar[c]		0.350 bar	2.5 bar
Turndown ratio (r)[d]	r ≤ 20	r ≤ 400	r ≤ 200	r ≤ 20	r ≤ 40
Non-linearity for reference conditions	0.1 % for r ≤ 2	0.07 % for r ≤ 10		0.07 % for r ≤ 5	
	r × 0.05 % for 2 ≤ r ≤ 20	r × 0.007 % for 10 ≤ r ≤ 400	r × 0.007 % for 10 ≤ r ≤ 400	r × 0.014 % for 5 ≤ r ≤ 20	r × 0.014 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP at 20 °C	0.2 % for r ≤ 2	0.1 % for r ≤ 10		0.1 % for r ≤ 5	
	r × 0.1 % for 2 ≤ r ≤ 20	r × 0.01 % for 10 ≤ r ≤ 400	r × 0.01 % for 10 ≤ r ≤ 200	r × 0.02 % for 5 ≤ r ≤ 20	r × 0.02 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP Range: 20 to 85 °C	0.5 % for r ≤ 2 (only to 60 °C)	0.2 % for r ≤ 10		0.2 % for r ≤ 5	
	r × 0.25 % for 2 ≤ r ≤ 20 (only to 60 °C)	r × 0.02 % for 10 ≤ r ≤ 400	r × 0.02 % for 10 ≤ r ≤ 200	r × 0.04 % for 5 ≤ r ≤ 20	r × 0.04 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP Range: -40 to +20 °C	1.0 % for r ≤ 2	0.6 % for r ≤ 10		0.6 % for r ≤ 5	
	r × 0.5 % for 2 ≤ r ≤ 20	r × 0.06 % for 10 ≤ r ≤ 400	r × 0.06 % for 10 ≤ r ≤ 200	r × 0.12 % for 5 ≤ r ≤ 20	r × 0.12 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP Range: 60 to 85 °C	2.0 % for r ≤ 2	2.0 % for r ≤ 2		2.0 % for r ≤ 2	
	r × 1.0 % for 2 ≤ r ≤ 20				
Influence of the static pressure P (bar) in % from the nominal measuring range	≤ 1 %	≤ P × 0.0005 %	≤ P × 0.0003 %	≤ P × 0.0025 %	≤ P × 0.001 %
Long-term stability in % as of the nominal measuring range	≤ 0.6 %/year	≤ 0.1 %/year			≤ 0.2 %/year

[a] Without SIL

[b] MSP = measuring span

[c] For the calibration certificate from JUMO the smallest MSP is 10 mbar. MSPs smaller than 10 mbar can be adjusted by the user.

[d] r = span of the nominal measuring range ÷ adjusted measuring span

4.8 Approvals and approval marks

Approval mark	Test facility	Certificates/certification numbers	Inspection basis	Valid for
ATEX	Electrosuisse	SEV 09 ATEX 0138 X, issue 04 (2017-10-13)	EN 60079-0 EN 60079-11 EN 60079-26	403022/x-1-...
EAC	RU	RU C-DE.ME92.B.00440	-	Extra code 226
SIL	TÜV Nord (German Technical Inspection Agency)	No. SEBS-A. 140944/16 V1.0	DIN EN 61508/-1/-2	Basic type extension 2

Specific conditions of use

- The intrinsically safe circuit must be limited to overvoltage category I as defined in IEC 60664-1 and the circuits must be supplied exlusively from a certified intrinsically safe power source with the protection level „ia“.
- Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and temperature class for the JUMO dTRANS p20 type 403025 process pressure transmitter is shown in the following table:

Temperature class	T6	T5	T4	T3
Maximum permissible ambient tempearture in top part of enclosure with electronics (°C)	-50 to +50	-50 to +65	-50 to +85	-50 to +85
Maximum permissible measuring temperature (°C)	+60	+70	+115	+175

- Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and temperature class for the JUMO dTRANS p20 DELTA type 403022 process pressure transmitter is shown in the following table:

Temperature class	T4
Maximum permissible ambient tempearture in top part of enclosure with electronics (°C)	-50 to +60
Maximum permissible measuring temperature (°C)	+100

- Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and maximum surface temperature for the JUMO dTRANS p20 type 403025 process pressure transmitter is shown in the following table:

Surface temperature (°C)	T105
Maximum permissible ambient tempearture in top part of enclosure with electronics (°C)	-50 to +60
Maximum permissible measuring temperature (°C)	+100

- Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and maximum surface temperature for the JUMO dTRANS p20 DELTA type 403022 process pressure transmitter is shown in the following table:

Surface temperature (°C)	T105
Maximum permissible ambient tempearture in top part of enclosure with electronics (°C)	-50 to +60
Maximum permissible measuring temperature (°C)	+100

- In the temperature range of -40 to -50 °C the lid with inspection glass of the appliance has to be additionally protected against mechanical impact- respectively collision effect.

5.1 Before mounting

DANGER!

Depressurize the plant before installing the device!
The device may only be opened in the potentially explosive area when disconnected from the power supply!

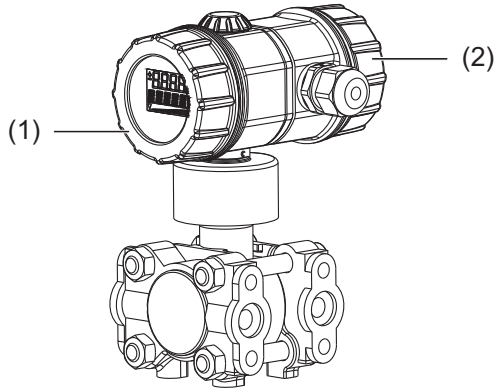
NOTE!

Select a freely accessible and low-vibration installation location, preferably near the measuring point. Ensure that the admissible ambient temperature is adhered to (take possible heat radiation into account).
The device can be installed above or below the pressure sensing point.

5.2 Unscrew the front ring or case lid

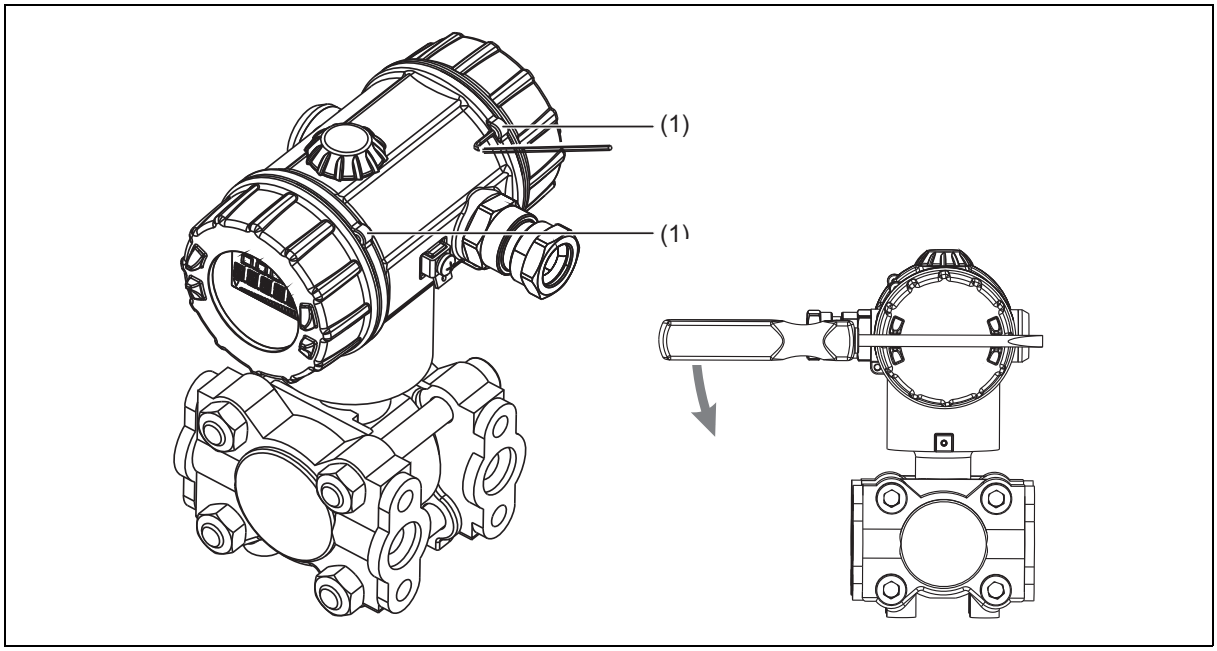
Plastic cover ring

The front ring (1) and the rear housing cover (2) can be unscrewed.



(1) Front ring (plastic)
(2) Housing cover (plastic)

The bezel and the rear case lid can be removed using a screwdriver, or similar.



(1) Bezel

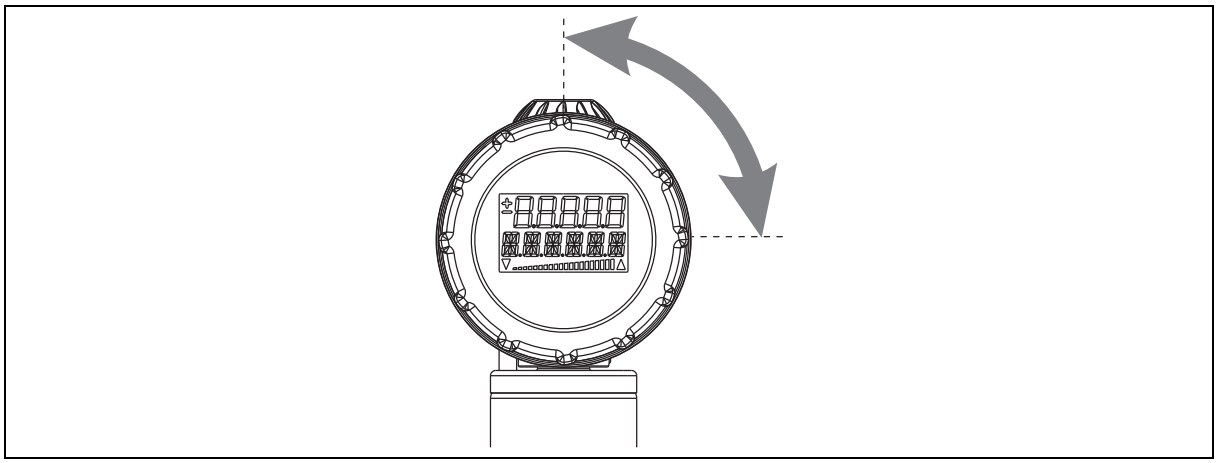
NOTE!

Only tighten by hand!

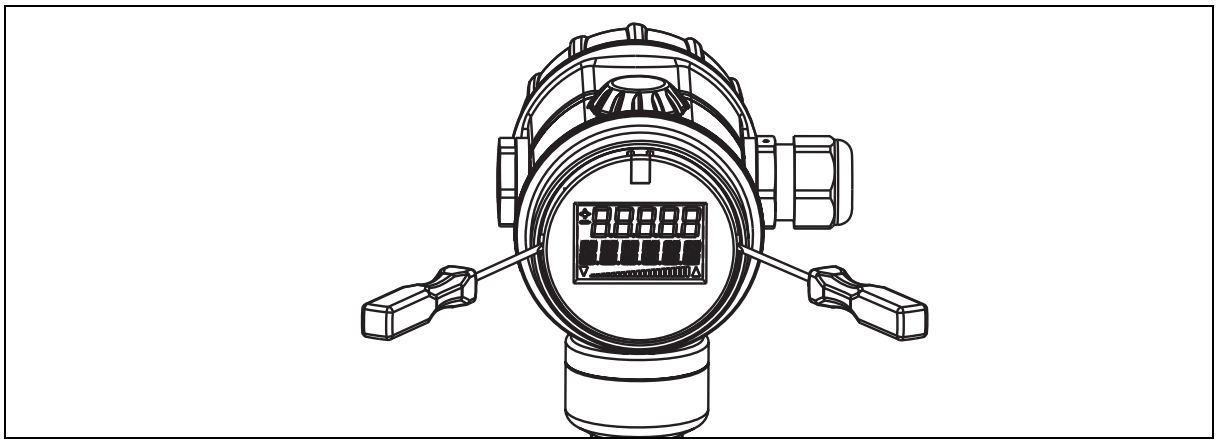
5.3 Rotating the LCD (display)

Installation position

The rated position of the device is vertically upright.



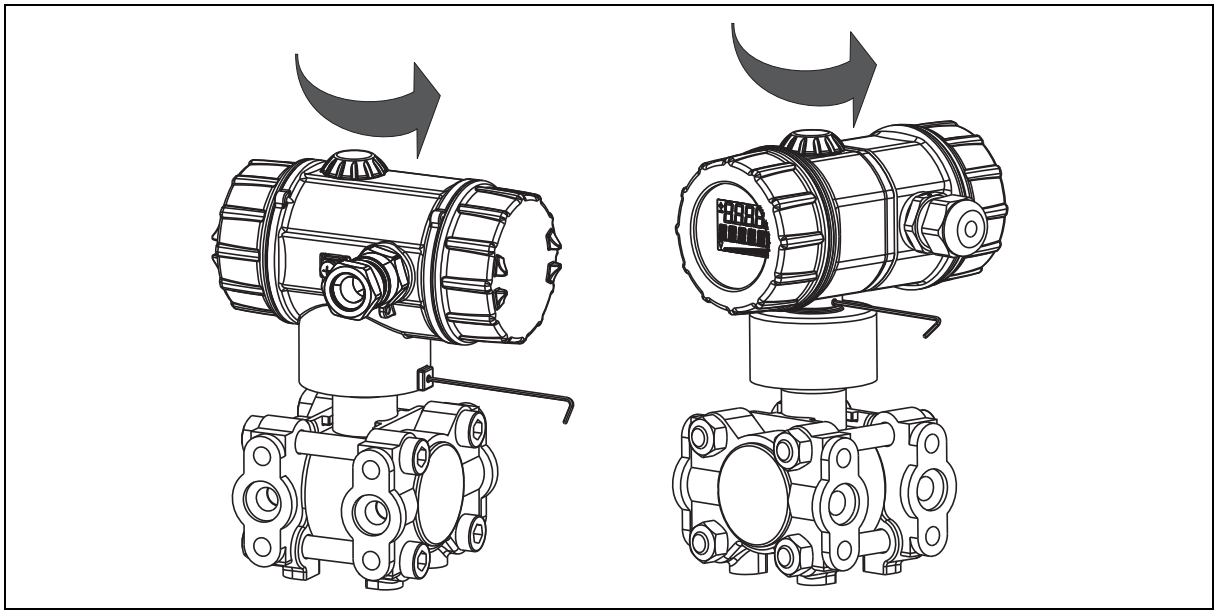
Depending on the conditions of the measuring point, the device can be installed in any other position. The LCD display can be rotated in 90° steps depending on the desired installation position.



1. To unscrew the bezel, see chapter 5.2 "Unscrew the front ring or case lid", Page 23.
2. Lift out the electronics module using a narrow (small) screwdriver.
3. Rotate the electronics module into the desired position (90° steps) and insert again.
4. Screw on the bezel so that it is hand-tight.

5.4 Rotating the housing

The housing can be rotated by ±160°.



1. Loosen the threaded pin using a 1.5 mm hex wrench.
2. Rotate the housing to the desired position.
3. Screw on the threaded pin again until it is **tight**.

5.5 Pressure connection

Seals

Operating conditions (for example material compatibility) must be considered when selecting the seal.

Checking for seal tightness

The pressure connection must be checked for seal tightness once established.

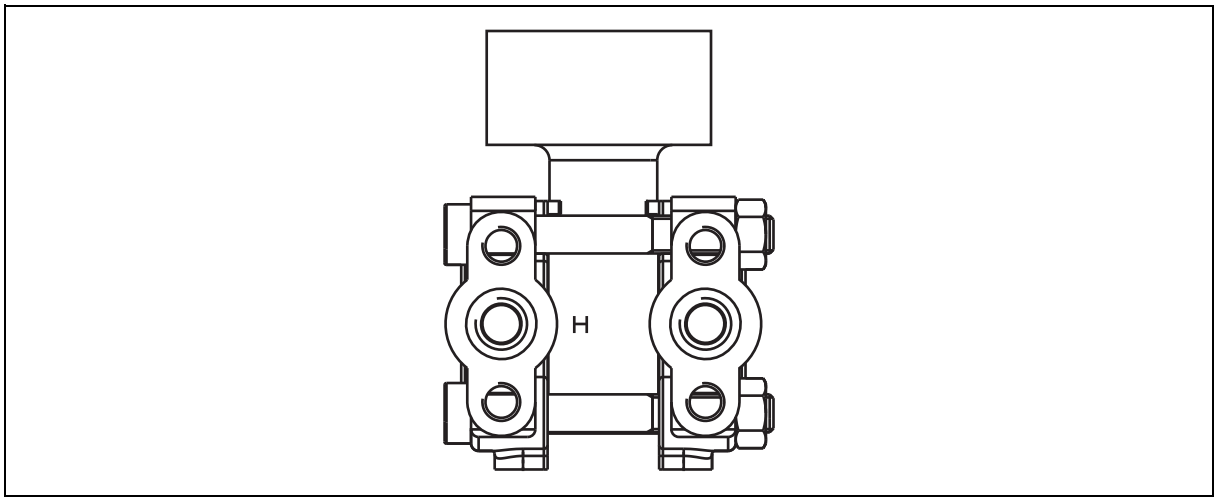
CAUTION!

If shut-off valves are used incorrectly, this can lead to personal injury or significant material damage!

Observe the correct order when opening or closing the valves!

▶ The device must not be vented when **used in toxic media**!

Differential pressure



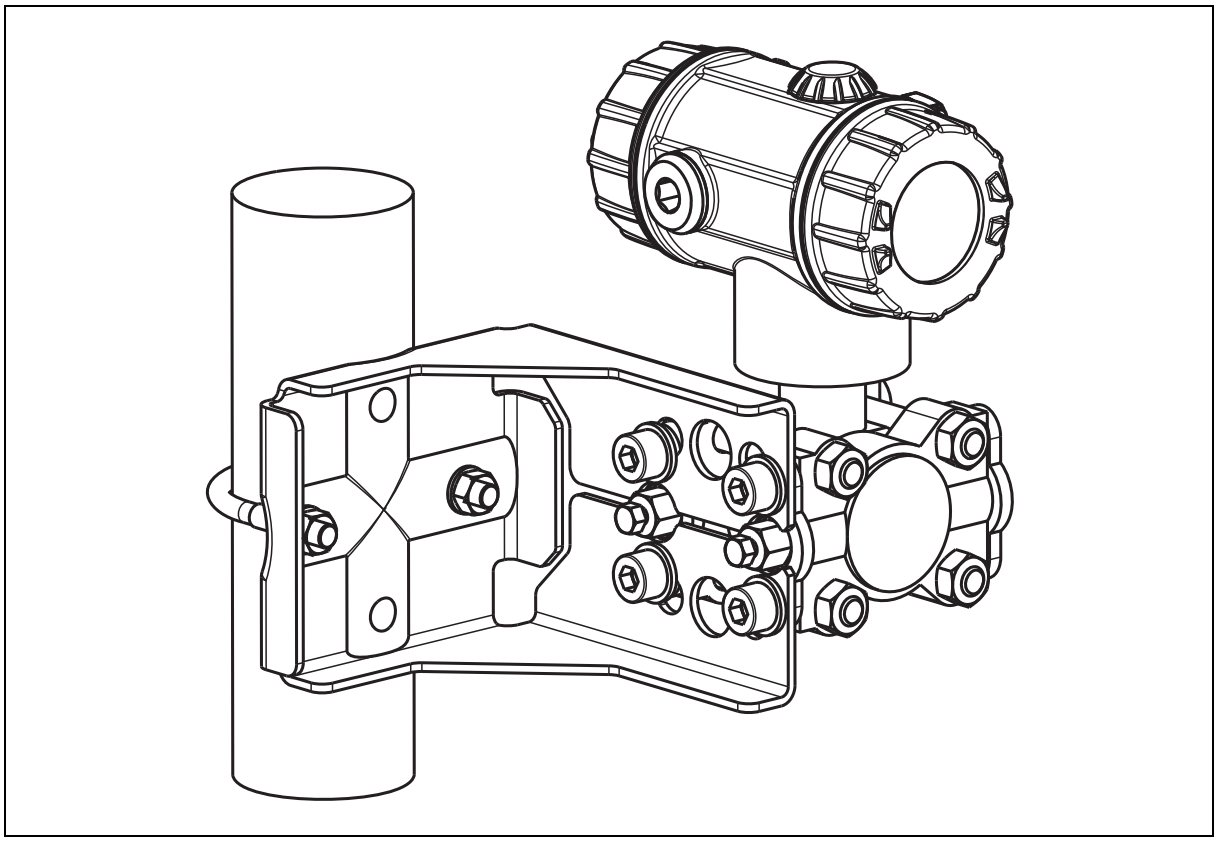
NOTE!

The connection for the higher pressure is labeled with "H".

5.6 Bracket for wall and pipe mounting

Mounting example

(Part no. 00543777)



5.7 Level measurement with a diaphragm seal

The device is ideally suited for level measurements in open and closed containers.

5.7.1 General information

A device with a capillary and diaphragm seals is a closed system that is filled with oil under vacuum.

- Remove membrane protection before installation
- Do not open closed system
- Do not touch or clean the diaphragm seal membranes with hard or sharp tools
- Bending radius of the capillaries: ≥ 100 mm
- Install capillaries such that they are free from vibration in order to avoid pressure fluctuations and device faults; avoid shaking during operation
- To ensure correct measuring results, do not install the capillaries in the vicinity of heating or cooling lines; capillaries should preferably have the same temperature on both sides during operation; isolate the capillary in case of large temperature differences
- The length of the capillaries and the diaphragm seal connections used (material, diameter) should be the same for the duplex diaphragm seal system

NOTE!

The filling oil influences the temperature application range and the response time of a diaphragm seal system. The medium and ambient temperature, as well as the process pressure are therefore decisive when selecting the filling oil.
Take note of the maximum possible temperature and pressures during commissioning/cleaning of the tank.
Pay attention to the tolerability of the filling oil with the requirements of the medium. For example, only filling oils that do not pose a health risk may be used in the food industry.

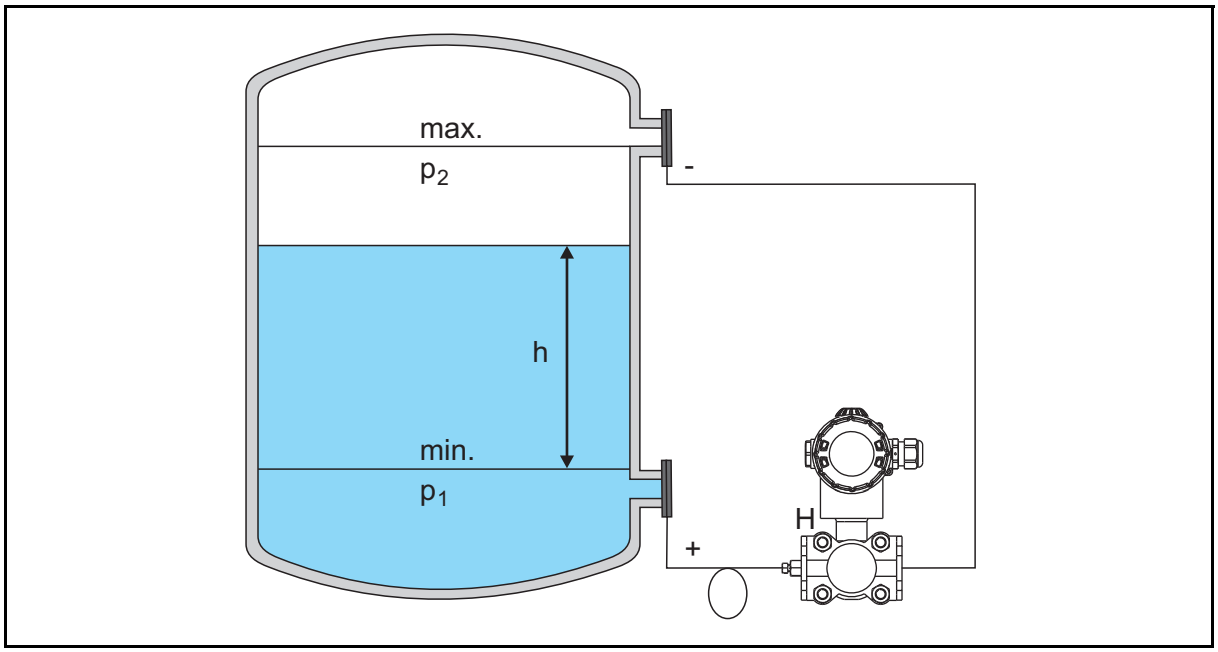
NOTE!

The level measurement is only ensured between the top edge of the lower diaphragm seal and the bottom edge of the upper one.
In vacuum applications it is recommended to install the device below the lower diaphragm seal. This prevents a vacuum load on the diaphragm seal caused by presence of the filling oil in the capillaries.

5.7.2 Measuring arrangement in open or closed containers with ± measuring ranges

The device must be installed according to the following diagram:

1. Always connect the minus side diaphragm seal via a capillary above the maximum filling level (MINUS input is at top).
2. Always connect the plus side diaphragm seal (marked "H") via a capillary at the bottom process connection (PLUS input is at bottom).
3. The level measurement is only ensured between the top edge of the lower diaphragm seal and the bottom edge of the upper one.
4. The device can be placed (in terms of height) anywhere between the lower and upper diaphragm seal.
5. In vacuum applications it is recommended to install the device below the lower diaphragm seal. This prevents a load on the diaphragm seal membrane caused by the filling oil in the capillaries.
6. For the device configuration, see chapter 8 "Configuration", Page 52.

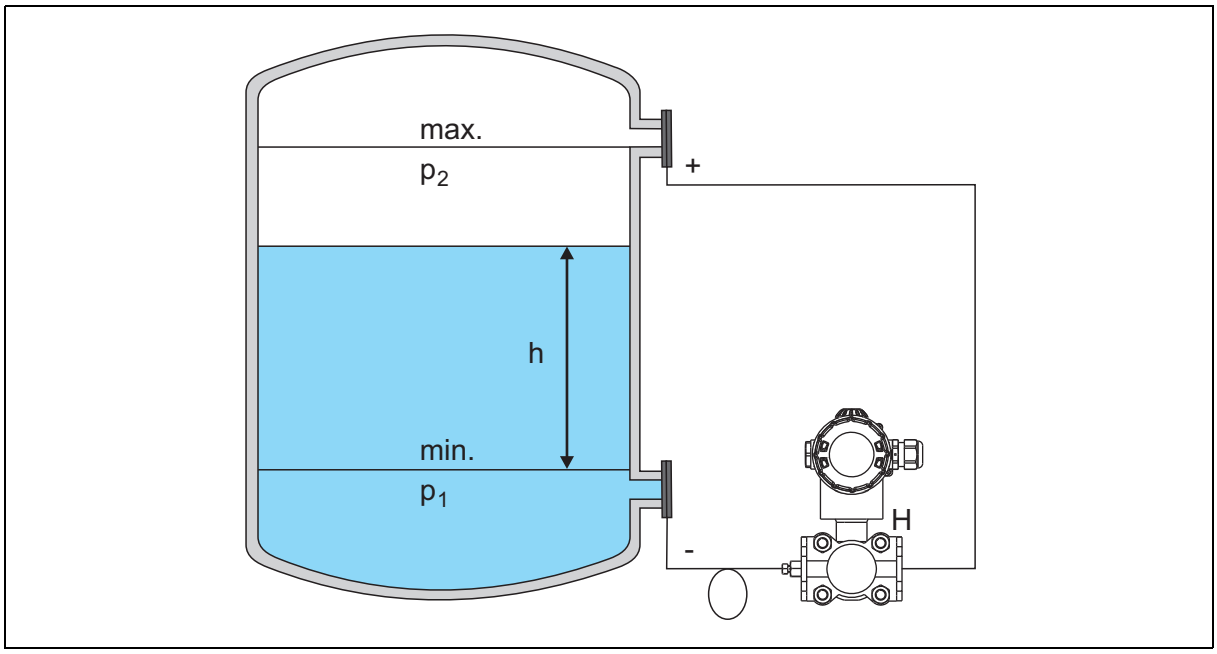


h (filling level) 4 to 20 mA

5.7.3 Measuring arrangement in open and closed containers with a measuring range of 0 to 1 bar

The device must be installed according to the following diagram:

1. Always connect the minus side diaphragm seal via a capillary at the bottom process connection (MINUS input is at bottom).
2. Always connect the plus side diaphragm seal (marked "H") via a capillary above the maximum filling level (PLUS input is at top).
3. The level measurement is only ensured between the top edge of the lower diaphragm seal and the bottom edge of the upper one.
4. The device can be placed (in terms of height) anywhere between the lower and upper diaphragm seal.
5. In vacuum applications it is recommended to install the device below the lower diaphragm seal. This prevents a load on the diaphragm seal membrane caused by the filling oil in the capillaries.
6. For the device configuration, see chapter 8 "Configuration", Page 52.



h (filling level) 4 to 20 mA

NOTE!

There must be **no** zero point adjustment performed after the installation when the tank is empty.

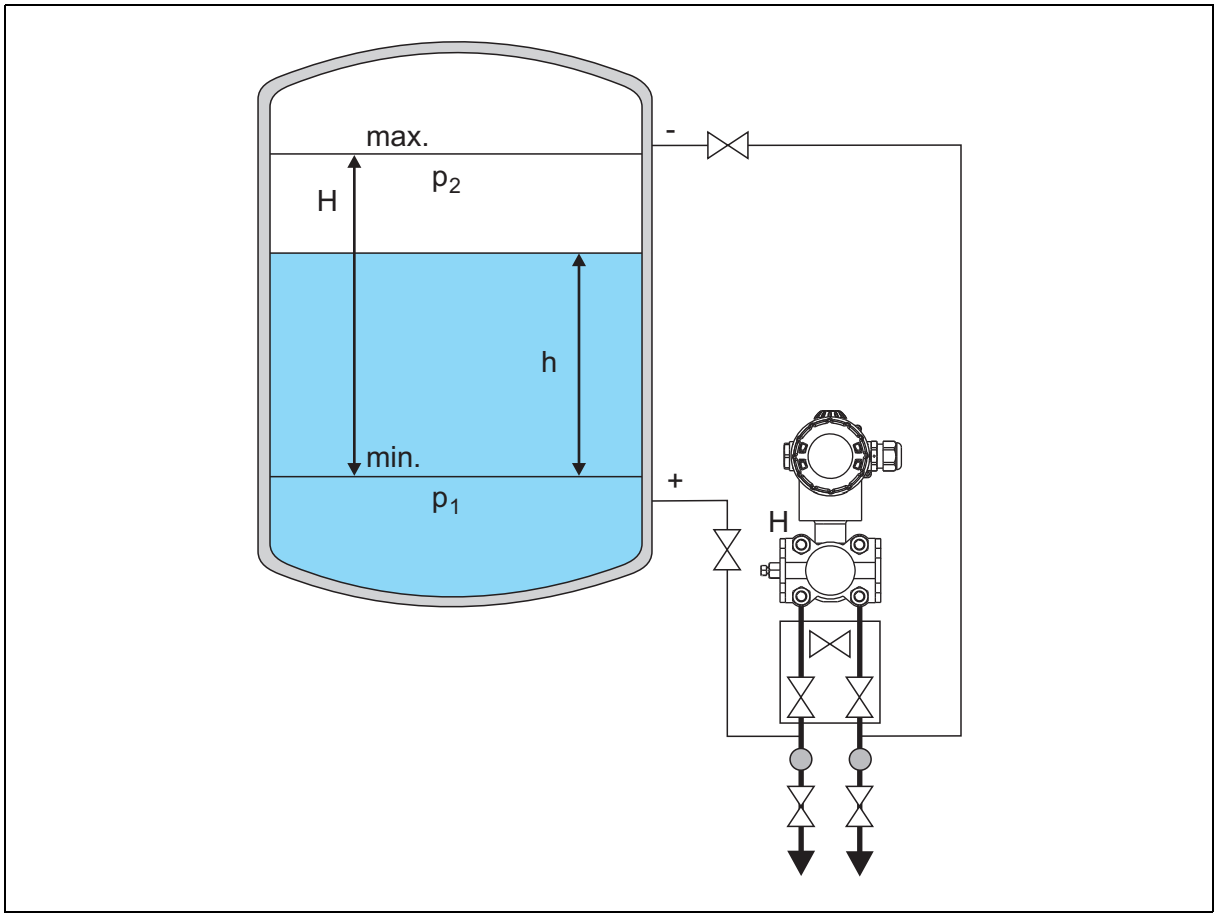
5.8 Level measurement without a diaphragm seal

The device is ideally suited for level measurements in open and closed containers.

5.8.1 Measuring arrangement in open or closed containers with ± and 0 to 1 bar measuring ranges

The device must be installed according to the following diagram:

1. Always connect the minus side (zero) via a differential pressure pipe at the top process connection (MINUS input is at top).
2. Always connect the plus side (marked "H") via a differential pressure pipe below the maximum filling level (PLUS input is at bottom).
3. If possible, install the device below the lower measurement connection so that the lower differential pressure pipe is always filled with liquid.
4. It is a good idea to mount cutters and drain valves in order to catch and remove deposits, pollutants or liquid in the differential pressure pipes
5. For the device configuration, see chapter 8 "Configuration", Page 52.



h (filling level) 4 to 20 mA

NOTE!

Applies for ± measuring ranges or a measuring range from 0 to 1 bar.
It is recommended to install the device behind a shut-off valve in order to allow easy cleaning and functional testing.

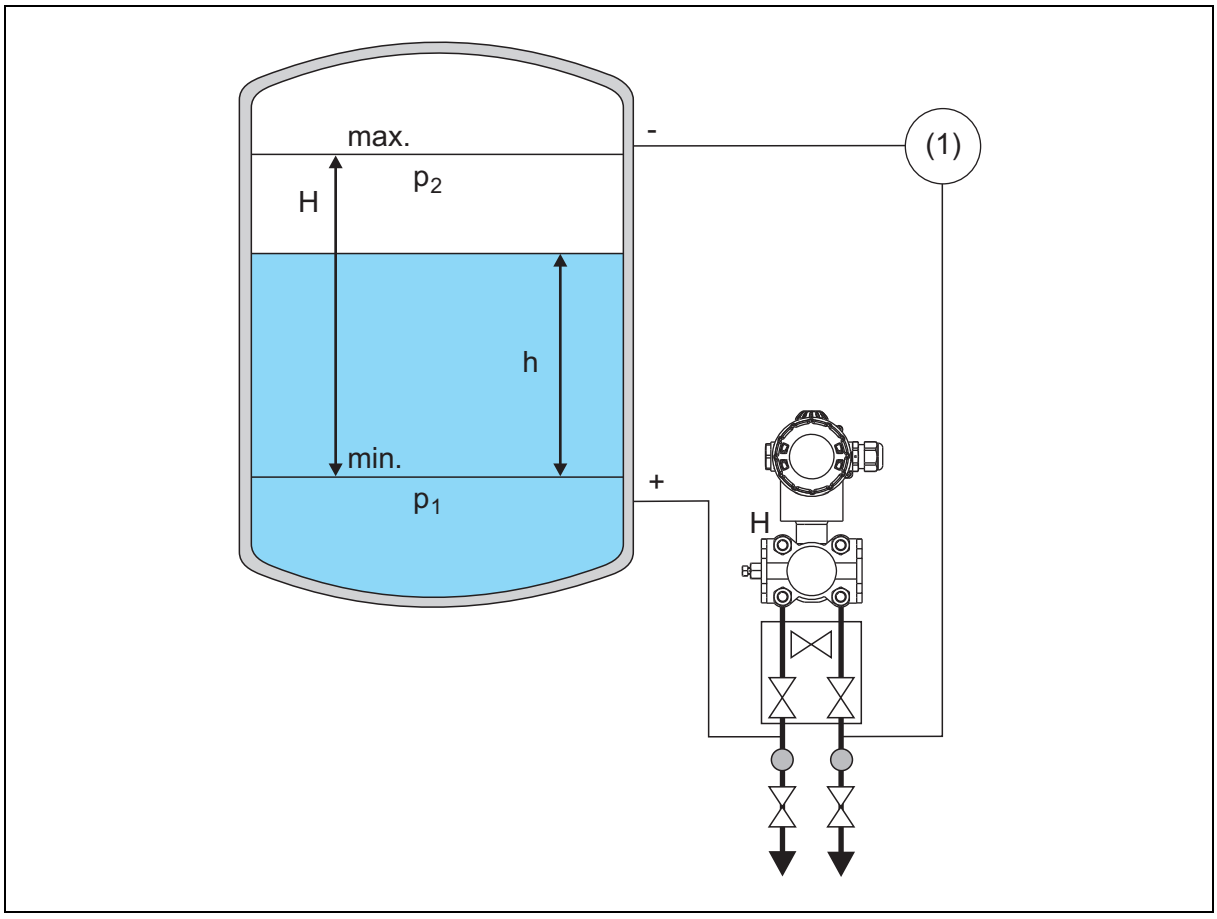
Do not install the device in the following positions:
- in the filling flow
- in the tank outlet
- at a position in the tank that could be affected by the mixer pressure pulses

With media that can harden upon cooling, the measuring device must be incorporated in the insulation.

5.8.2 Measuring arrangement for steam layering and ± measuring ranges

The device must be installed according to the following diagram:

1. Always connect the minus side (zero) via a differential pressure pipe at the top process connection (MINUS input is at top).
2. Always connect the plus side (marked "H") via a differential pressure pipe below the maximum filling level (PLUS input is at bottom).
3. If possible, install the device below the lower measurement connection so that the lower differential pressure pipe is always filled with liquid.
4. For level measurement in closed containers with steam layering, a condensing vessel ensures a filled differential pressure pipe and thus constant pressure on the minus side.
5. Fill up the differential pressure pipe in a cold state with water via the condensing vessel or via the valve block.
6. For the device configuration, see chapter 8 "Configuration", Page 52.



(1) Condensing vessel
h (filling level) 4 to 20 mA

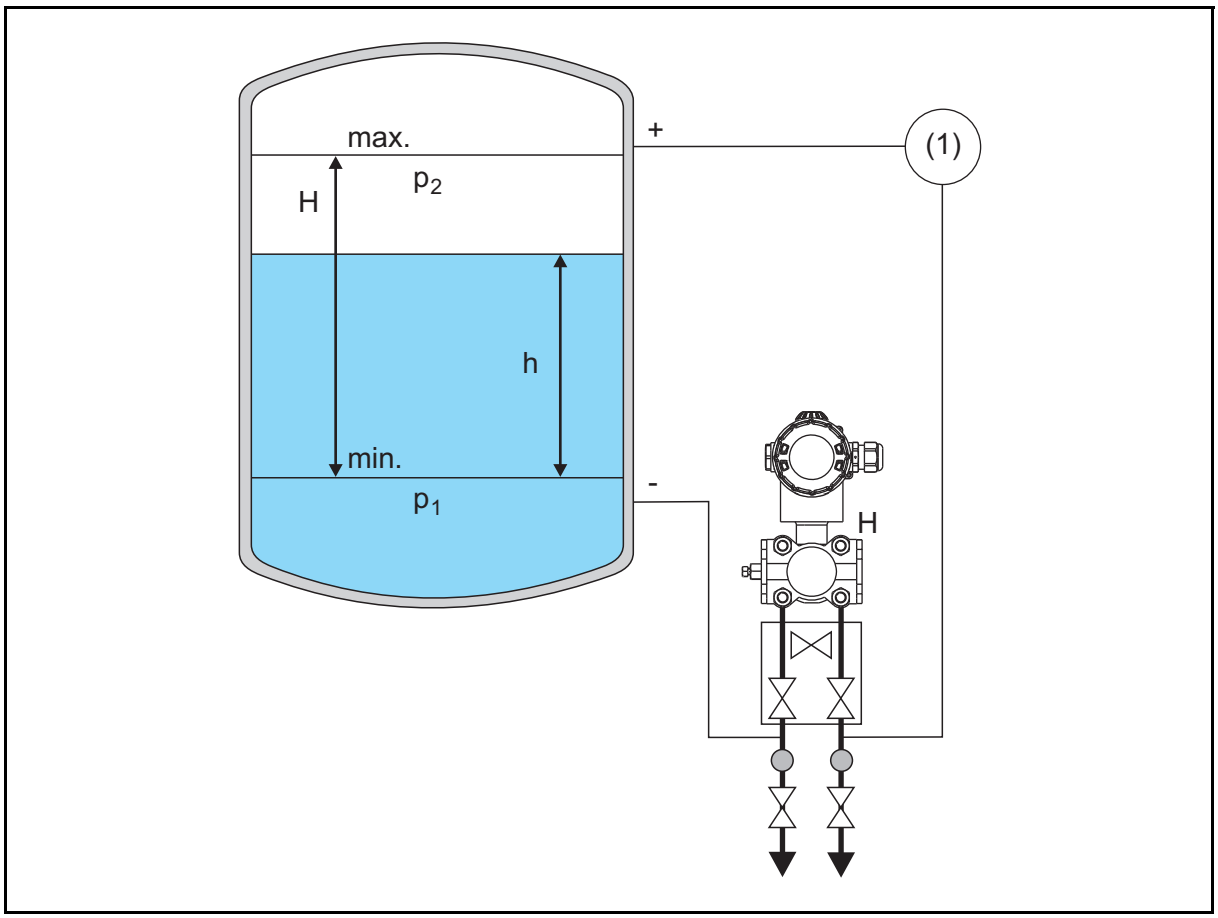
NOTE!

Install the condensing vessel at the same height as the extraction support and at the same distance to the measuring device.

5.8.3 Measuring arrangement for steam layering and a measuring range of 0 to 1 bar

The device must be installed according to the following diagram:

1. Always connect the plus side (marked "H") via a differential pressure pipe on the upper process connection (PLUS input is at top).
2. Always connect the minus side (zero) via a differential pressure pipe below the maximum filling level (MINUS input is at bottom).
3. If possible, install the device below the lower measurement connection so that the lower differential pressure pipe is always filled with liquid.
4. For level measurement in closed containers with steam layering, a condensing vessel ensures a filled differential pressure pipe and thus constant pressure on the minus side.
5. Fill up the differential pressure pipe in a cold state with water via the condensing vessel or via the valve block.
6. For the device configuration, see chapter 8 "Configuration", Page 52.

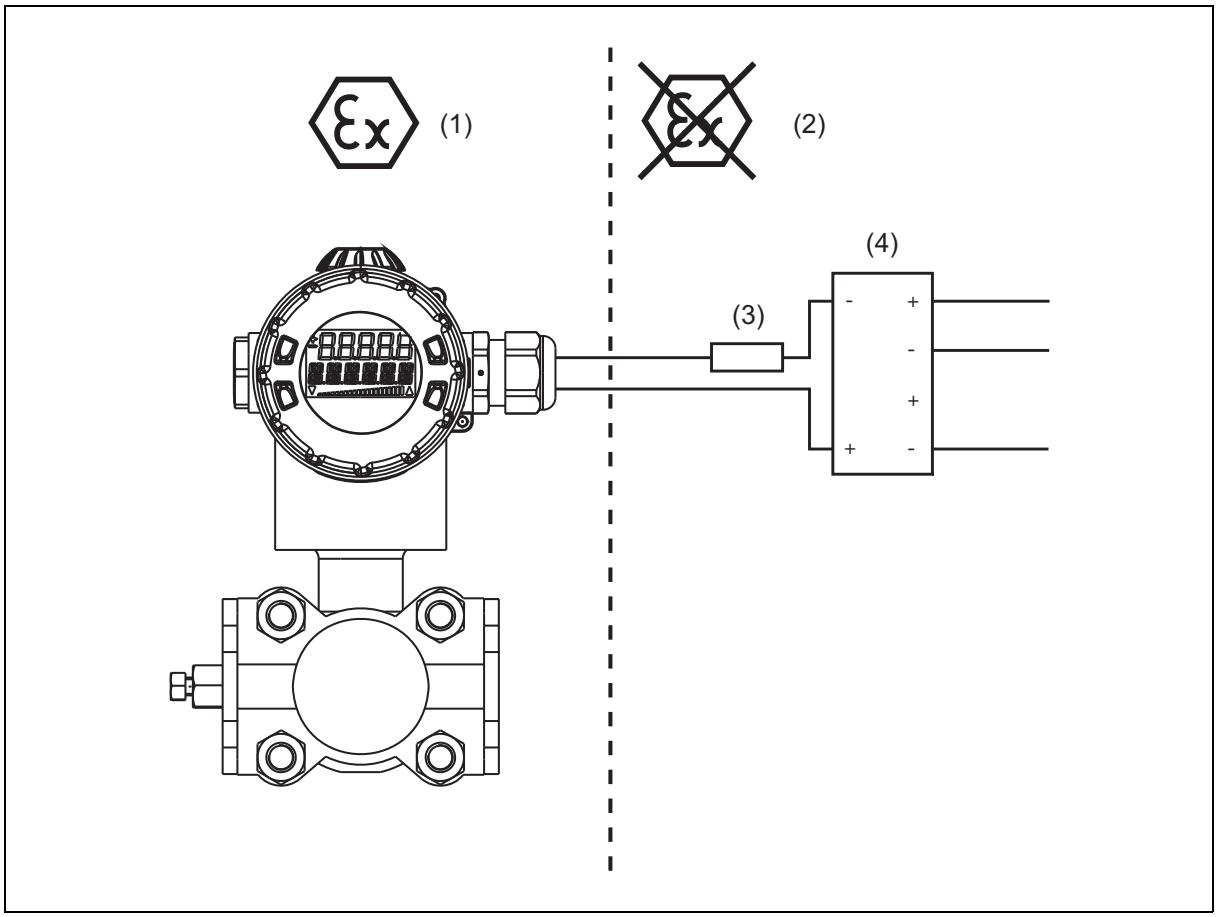


(1)	Condensing vessel
h (filling level)	4 to 20 mA

NOTE!

Install the condensing vessel at the same height as the extraction support.

5.9 Assembly in the explosion area



(1) Hazardous (Ex) area Zone 0/20
(2) Non-hazardous area
(3) Burden (optional for HART® interface)
(4) Voltage supply device with isolating converter for connecting explosion-protected transmitters

6.1 Installation notes

DANGER!

The electrical connection must only be carried out by qualified personnel.
Ground the device!

The device must be completely disconnected from the mains voltage if there is a risk of contact with live parts during work on the equipment.

The electromagnetic compatibility meets standard EN 61326.

The device is suitable for use in SELV or PELV electrical circuits according to protection rating 3.

For connecting devices with Ex-approval, see chapter 6.4 "Electrical connection in Ex areas", Page 42.

In addition to a faulty installation, incorrectly set values could also impair the orderly function of the downstream process or lead to other damage.

Conductor cross-sections and ferrules

	Permissible cross-section
Without ferrule (for rigid cable only)	0.2 to 1.5 mm^2 AWG 24 to 16
With ferrule (for rigid or flexible cable)	0.25 to 0.75 mm^2

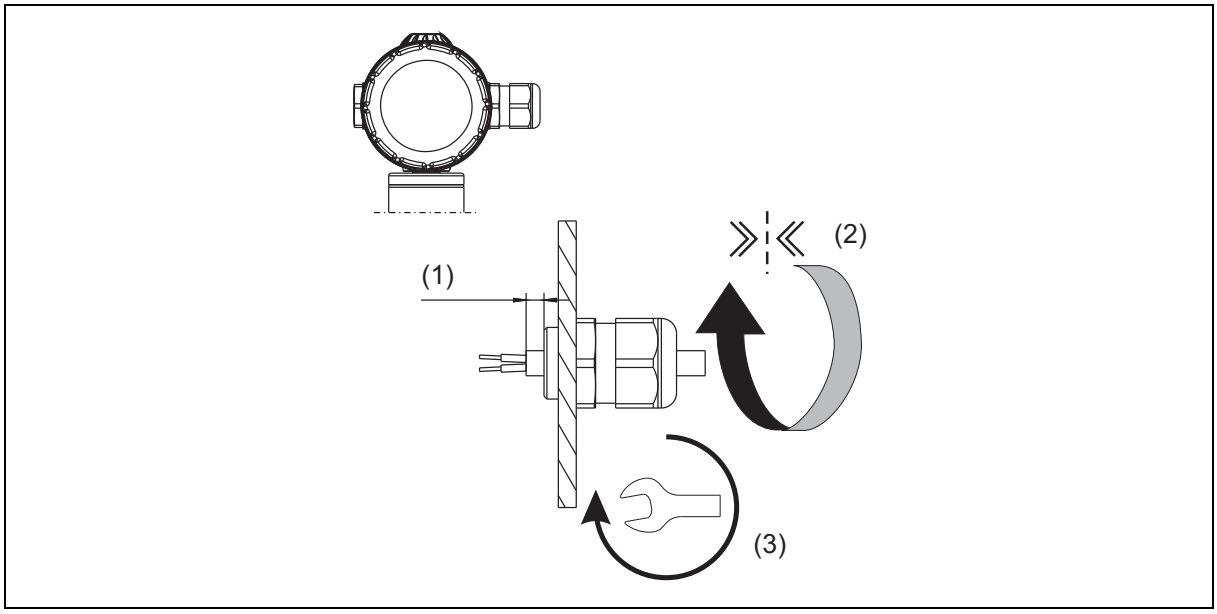
6.2 Device with cable gland

General information

DANGER!

For connection to devices in Ex areas see chapter 6.4 "Electrical connection in Ex areas", Page 42.

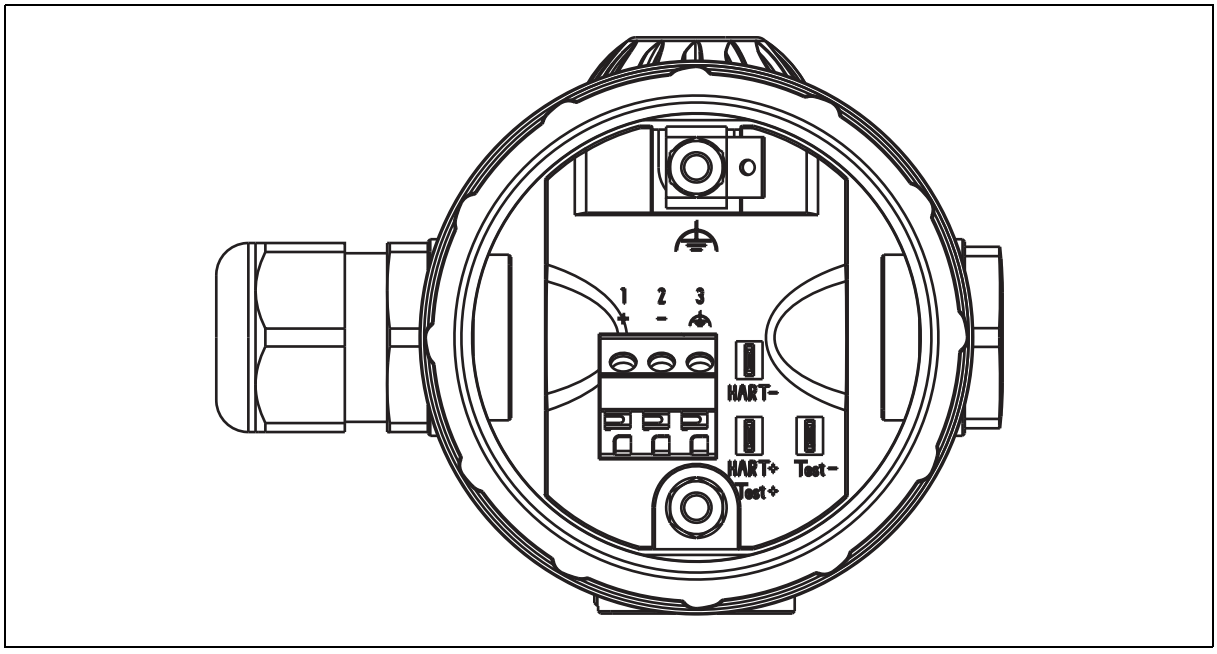
- Permissble cable diameter for devices with cable gland made of: 6 to 12 mm
- Max. wire cross-section 1.5 mm^2
- Lay signal lines separate from cables with voltages of > 60 V.
  Use a shielded cable with twisted wires.
  Avoid the vicinity of large electrical systems.
  The full specification as per HART® version 5.1, will only be achieved with a shielded cable.



(1) The Connecting cable must extend at least 5 mm into the housing
(2) Tighten the screw fitting by hand until you encounter resistance
(3) Tighten the screw connection with a wrench:
Plastic 4.5 Nm approx.
Metal 8 Nm approx.

Connection

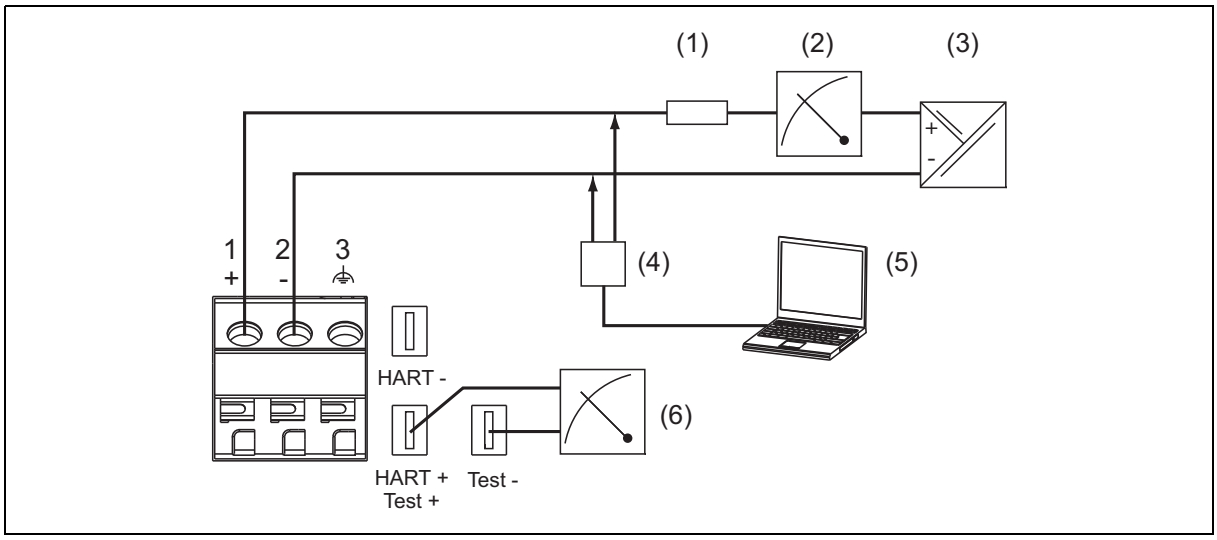
1. Unscrew the housing cover from behind, see chapter 5.2 "Unscrew the front ring or case lid", Page 23
2. Ground the device.
3. To connect the connecting cables, see the following illustration.



Terminal assignment

Connection	Terminal assignment
	82 (plastic), 93 (metal) Cable fitting
Voltage supply DC 12 to 36 V for **non**-Ex-version DC 12 to 28 V for Ex-version	1 L+ 2 L-
Output 4 to 20 mA, 2-wire Load-independent current: 4 to 20 mA In voltage supply	1 L+ 2 L-
Test connection for current output Internal resistance of the ammeter ≤ 10 Ω	TEST + TEST -
Test connection for HART® The burden must be present!	HART + HART -
Functional ground	3

Operation and test



(1) Total burden: Burden ≤ (U_B-12 V) ÷ 0.022 A;
for HART® in addition: min. 250 Ω, max. 1100 Ω

(2) Display or recording device, controller, PLC, etc.

(3) Voltage supply:
for **non** Ex version DC 12 to 36 V
for Ex version DC 12 to 28 V

(4) HART® modem

(5) PC or Notebook

(6) Inherent resistance of ammeter ≤ 10 Ω

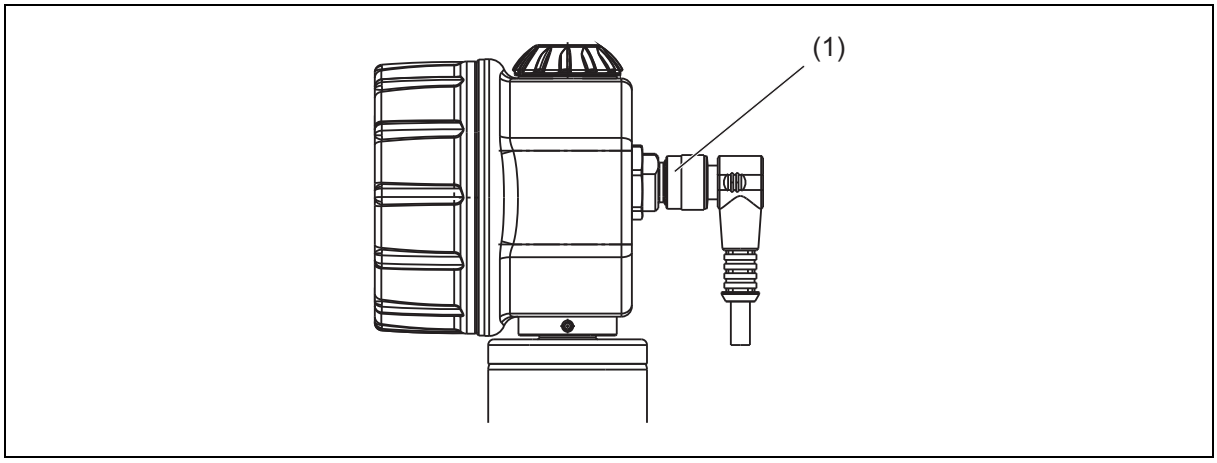
6 Installation

6.3 Device with M12 connector

DANGER!

For connection of the device in an Ex area see chapter 6.4 "Electrical connection in Ex areas", Page 42!

▶ Connect the device to ground using pin 4 of the device connector (1), see "Terminal assignment ", Page 41.



(1) Device connector

A suitable connection is provided by a

- 4-pin cable box, straight, M12 × 1, with 2 m PVC cable, part no. 00404585, or a
- 4-pin cable box, angled, M12 × 1, with 2 m PVC cable, part no. 00409334, or a
  5-pin cable box, straight, M12 × 1, without cable, part no. 00419130, or a
- 5-pin cable box, angled, M12 × 1, without cable, part no. 00419133

For pin configuration see below.

General information

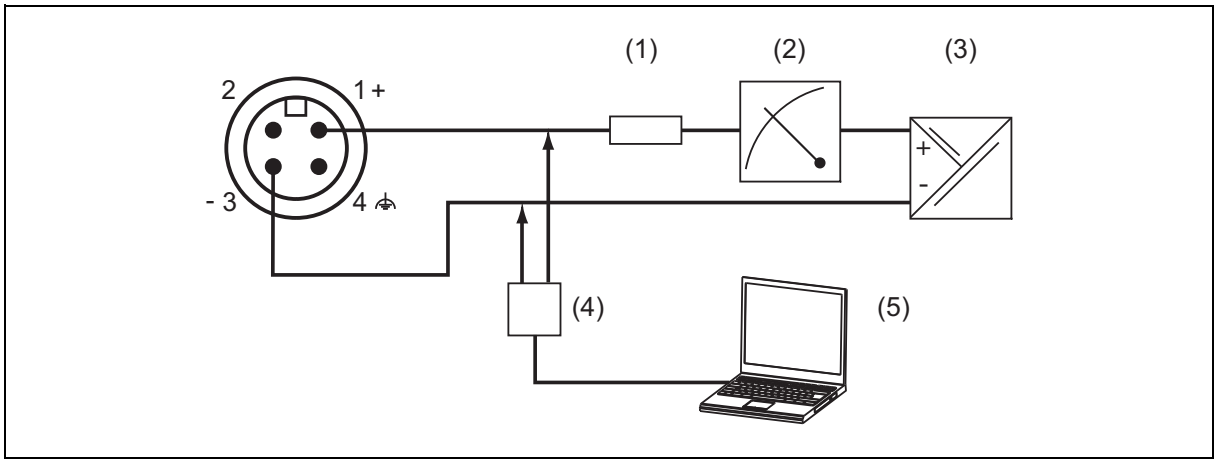
- Lay signal lines separate from cables with voltages of > 60 V
- Use a shielded cable with twisted wires
- Avoid the vicinity of large electrical systems
- The full specification as per HART®, will only be achieved with a shielded cable.

Terminal assignment

Connection	Terminal assignment	Color coding[a]
	36 round plug M12 × 1	
Voltage supply DC 12 to 36 V for **non**-Ex-version DC 12 to 28 V for Ex-version	1 L+ 3 L-	Brown Blue
Output 4 to 20 mA, 2-wire Load-independent current: 4 to 20 mA In voltage supply	1 L+ 3 L-	Brown Blue
Functional ground	4	Black

[a] The color coding is only valid for A-coded standard cables!

Operation



(1) Total burden: Burden ≤ (U_B-12 V) ÷ 0.022 A;
for HART® in addition: min. 250 Ω, max. 1100 Ω

(2) Display or recording device, controller, PLC, etc.

(3) Voltage supply:
for **non** Ex version DC 12 to 36 V
for Ex version DC 12 to 28 V

(4) HART® modem

(5) PC or Notebook

6 Installation

6.4 Electrical connection in Ex areas

General information

The relevant regulations must be observed during electrical connection; furthermore, in the potentially explosive area the minimum requirements according to Directive 1999/92/EC apply, for example:

- Regulation for the project planning, selection and installation of electrical plants in potentially explosive areas (IEC/EN 60079-14)
- EU type examination certificate

NOTE!

Only certified measuring devices may be used in intrinsically safe electrical circuits,!

NOTE!

The intrinsically safe electrical circuit must be restricted to overvoltage category I, as stipulated in IEC 60664-1. The electrical circuit supply is **only** to be provided by a certified, intrinsically safe power source with a protection level of "ia".

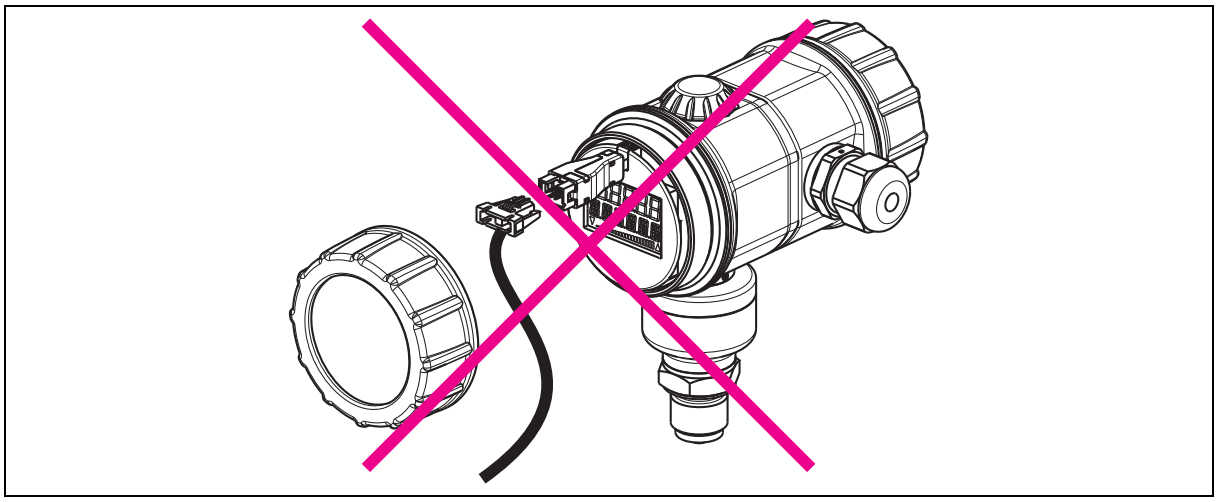
NOTE!

In particular, equipment used in potentially explosive areas where hybrid mixtures are present must be checked. Hybrid mixtures are explosive mixtures of flammable gases, vapors, or mists with flammable dusts. The operator is responsible for checking that the equipment is suitable for such uses.

DANGER!

Only the HART® modem may be used in the explosion-proof area!
The JUMO interface must not be used!

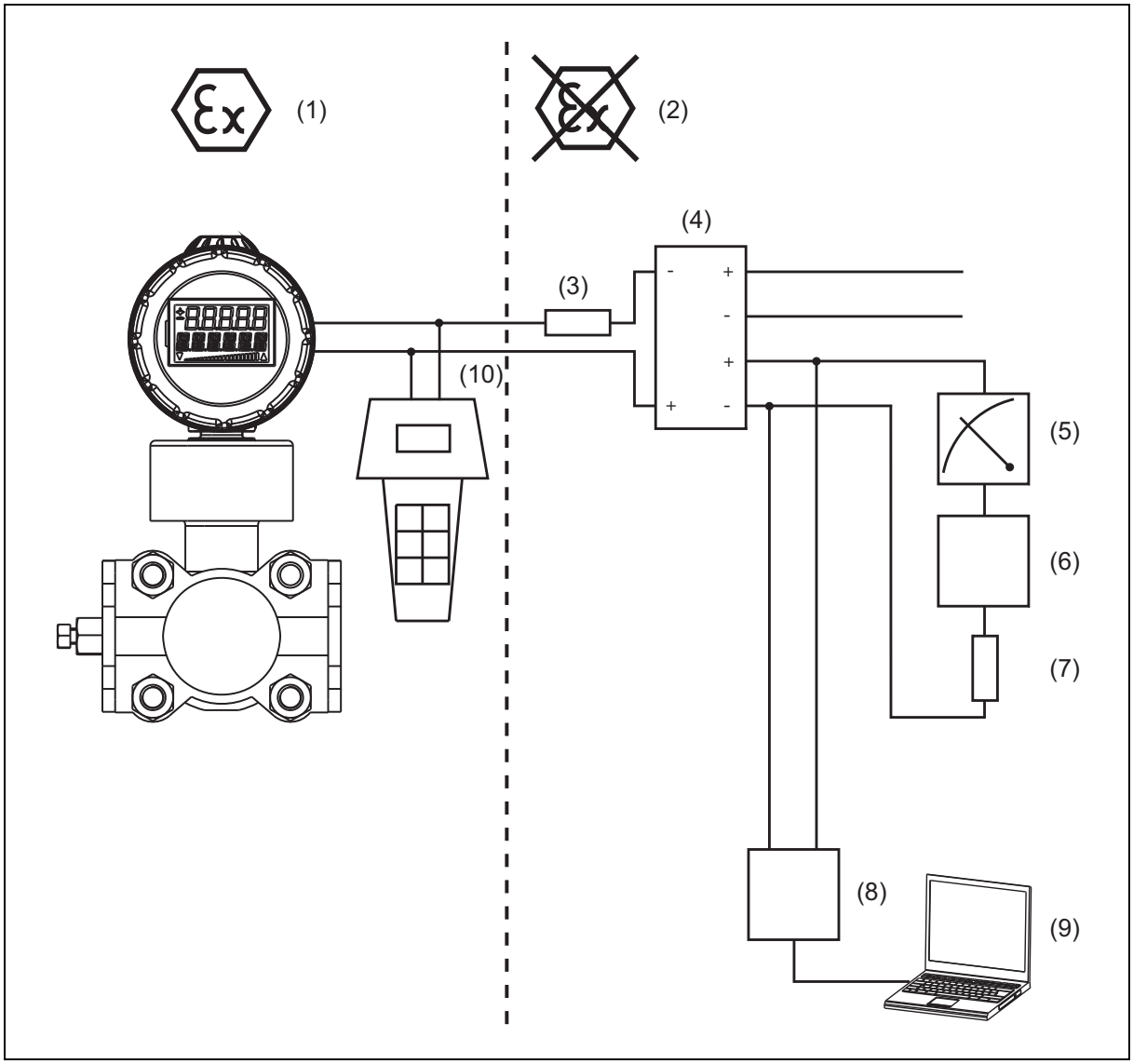
▶ The device's voltage supply must be intrinsically safe and must not exceed the following maximum values:
U_i: DC 28 V
I_i: 115 mA
P_i: 750 mW



NOTE!

Connecting the HART® communicator or the HART® modem is optional.
A minimum burden must be present on the signal circuit in order to facilitate error-free communication, see the previous pages.
The burden is usually already integrated when using input isolating amplifiers.

6.4.1 Connection diagram "Ex"



(1) Potentially explosive area zone 0/20

(2) Non-potentially explosive area

(3) Burden for HART® ≤ (U_B-12 V) ÷ 0.022 A;
additional: min. 250 Ω, max. 1100 Ω

The current limiting resistor integrated in the input isolating amplifier must be included in this calculation.

(4) Input isolating amplifier for connecting explosion-proof devices

(5) Indicating device or recorder, controller, PLC, etc.

(6) Further devices

(7) Burden for HART® min. 250 Ω, max. 1100 Ω

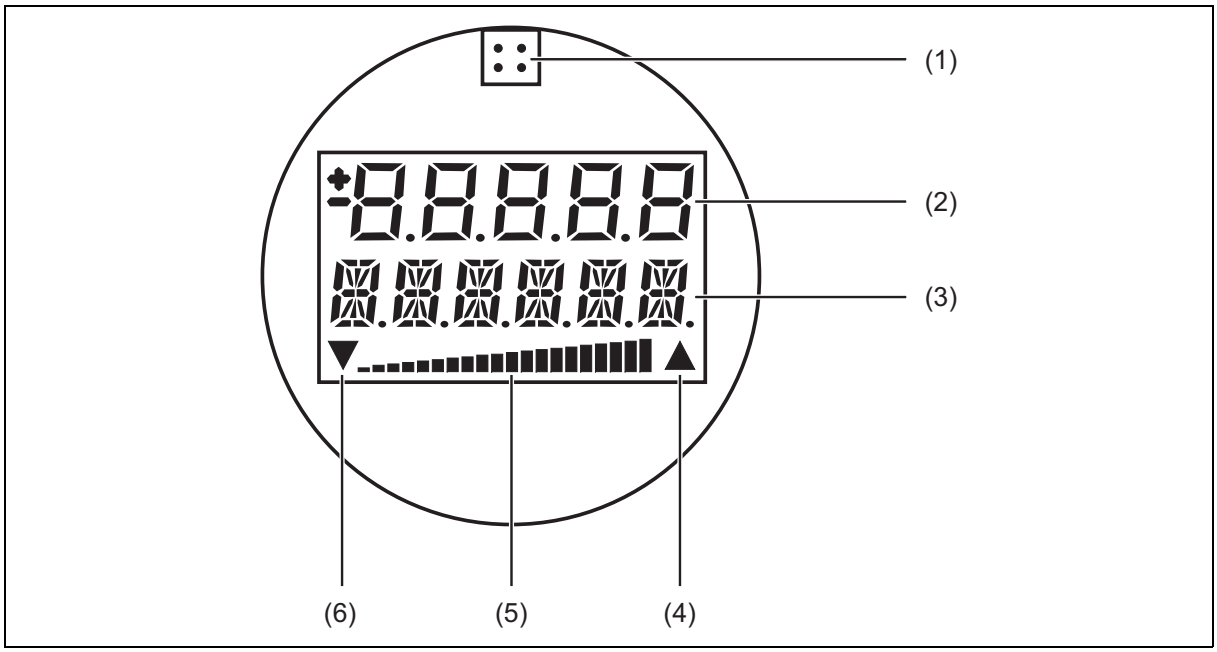
The current limiting resistor integrated in the input isolating amplifier must be included in this calculation.

(8) HART® modem

(9) PC or laptop

(10) HART® communicator, intrinsically safe

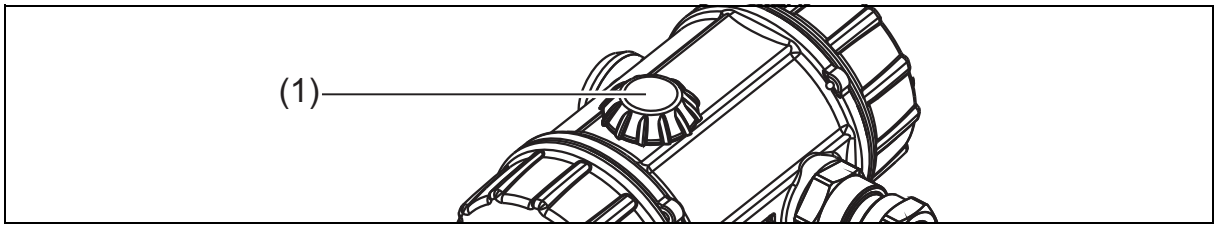
7.1 Display



(1) Socket for JUMO setup interface (behind a cover)
(2) Measured value
(3) Measuring unit
(4) Overrange
(5) Percentage control of the measuring range
(6) Underrange

7 Operation

7.2 Operation with rotary knob or with setup programm



(1) Rotary knob

The device is operated either

- with the rotary knob (1) or
- via the optional setup program or
- via the HART® interface, e.g. with a handheld or PC

program.

NOTE!

Alternatively, for operation via a rotary knob, all actual values and parameters can very easily be displayed or adjusted by means of the setup program.

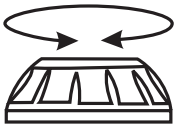
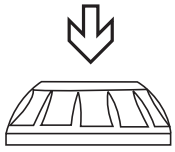
Furthermore, the setup program offers an array of useful additional functions, e.g.:

- Recording the measured values
- Graphical view of temperature and pressure
- Detailed diagnostic messages
- Display of the complete order code and the device configuration (can be printed out, e.g. for project documents or follow-up orders)

The setup program can address the device via the following interfaces:

- JUMO setup interface
  The PC interface cable with USB/TTL converter (USB transmitter cable) is required to connect the PC to the device, part no. 00456352
- HART® interface
  A HART® modem is required to connect the PC to the device, part no. 00443447

Rotating and pressing

	Rotate Select parameter or set values
	Press Confirm parameter or values

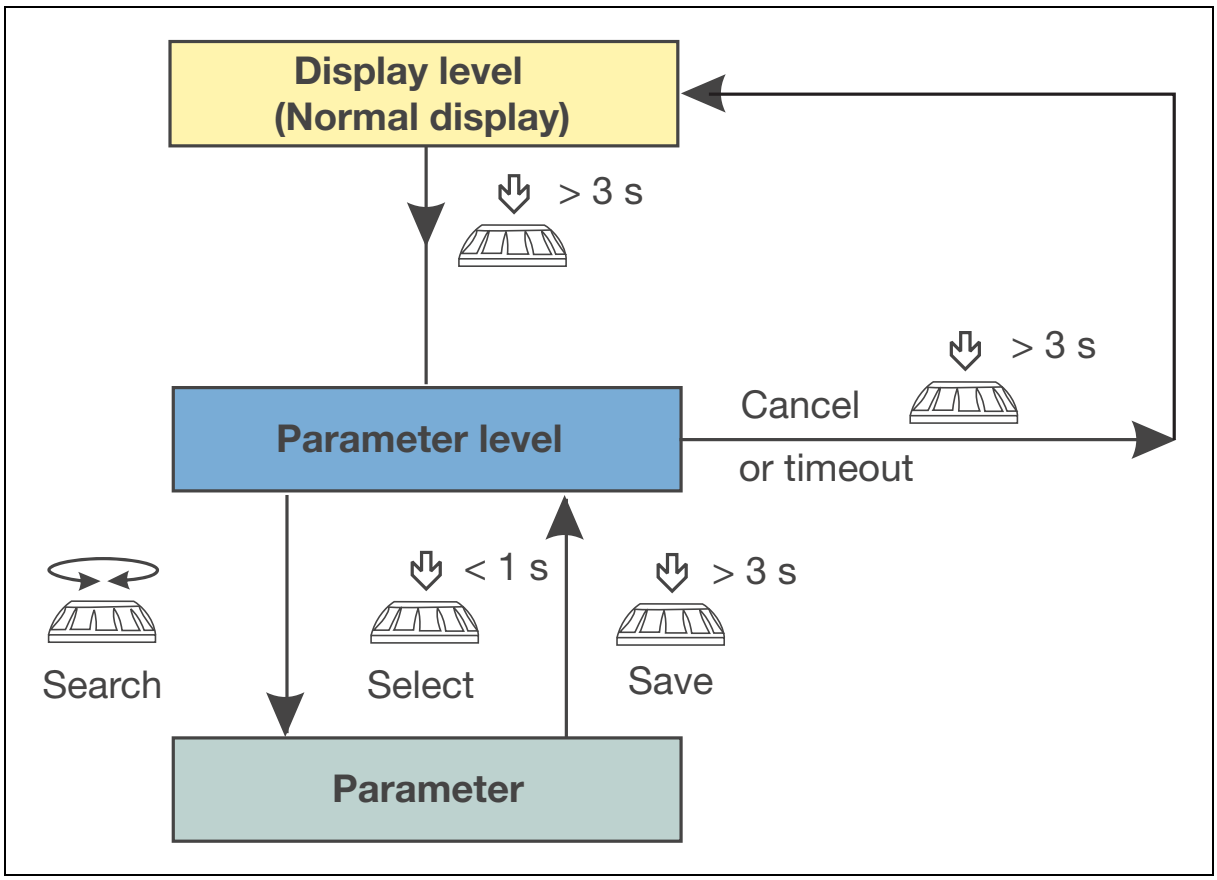
7.3 The level concept

Two levels

Operation is on two levels:

NOTE!

After the device is turned on, it is on the display level. You can go to the parameter level through the following operation.

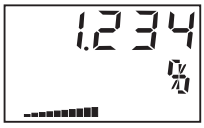
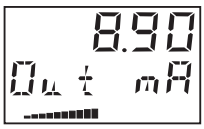
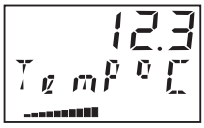
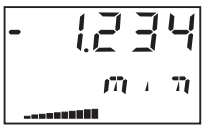
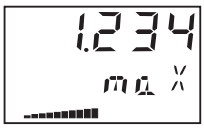
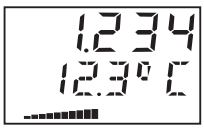


7 Operation

7.3.1 The display level

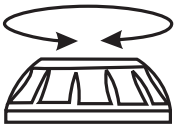
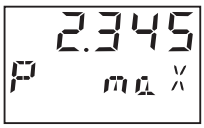
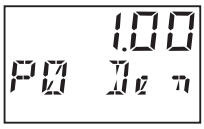
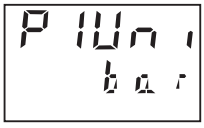
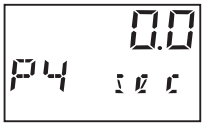
The measured pressure and other values are displayed at the display level. The output current is shown in % as a bar chart in the third line of the display.

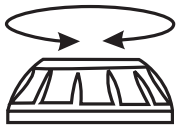
It is not possible to change parameters at the display level!

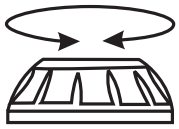
Action	Display (example)	Explanation
		Displays the pressure with measuring unit
		Displays the measured value in % or measured value scaled with a choice of measuring unit
		Displays the calculated output current in mA.
		Displays the sensor temperature in °C or °F.
		Displays the stored minimum pressure in the selected measuring unit
		Displays the stored maximum pressure
		Displays the pressure value and the sensor temperature in the selected measuring units

7.3.2 The parameter level

The device parameters can be displayed and changed at the parameter level.

Action	Display (example)	Explanation	Selection[a]
		**P min** Stored minimum pressure	Reset by  > 3 seconds
		**P max** Stored maximum pressure	Reset by  > 3 seconds
		**P0 Den** "Density" Density correction	0.01 to **1.00** to 99.99
		**P1 Uni** "Unit" Pressure measuring unit	inH2O inHG ftH2O mmH2O mmHG PSI **bar** mbar kg/cm2 kPa TORR MPa mH2O
		**P2 mA** Measuring range Lower range value	**4.00** to 20.00 mA
		**P3 mA** Measuring range Upper range value	4.00 to **20.00** mA
		**P4 sec** Attenuation	**0.00** to 100.0 s
		**P5 RS** "Range start" Measuring range Lower range value	Nominal measuring range

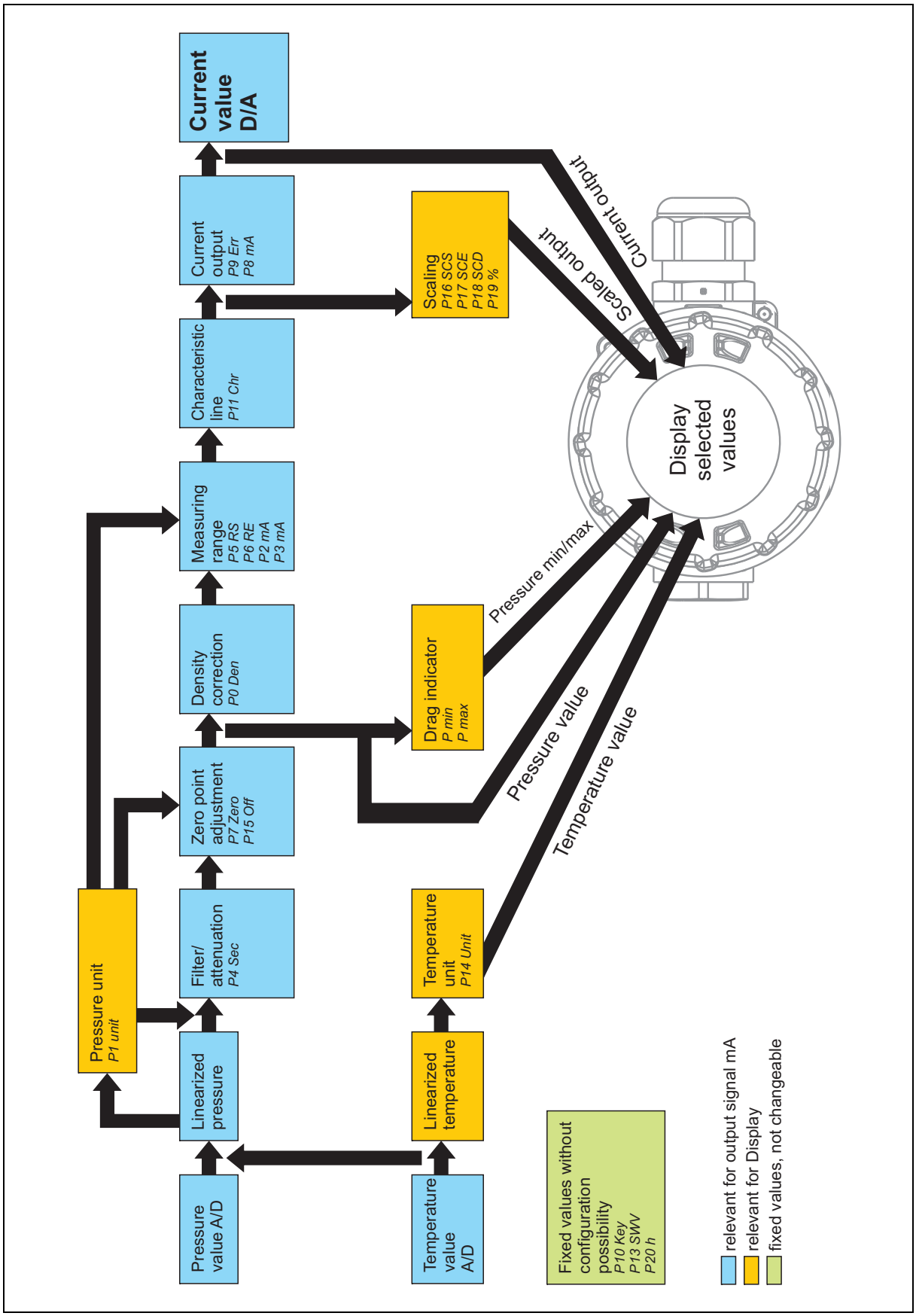
Action	Display (example)	Explanation	Selection[a]
	25.00 P6 RE	**P6 RE** "Range end" Measuring range Upper range value	Nominal measuring range
	0.123 P7 Zero	**P7 Zero** Zero point adjustment	Current pressure
	4.00 P8 mA	**P8 mA** Current generator	3.60 to **4.00** to 21.60 mA
	ErHi P9 Err	**P9 Err** Current in case of malfunction	ErLo = 3.6 mA **ErHi = 21.6 mA** LASt = last value
	0 P10 Key	**P10 Key** Key lock	**0** = no lock LA = all, interface released L0 = all, without measurement start LS = alle, ohne Messanfang und -ende LALL = alle, inkl. Schnittstelle
	Lin P11 Chr	**P11 Chr** Characteristic line "Characteristic"	**Lin = linear** SLin = linear bis Beginn Radizierung SoFF = off until start of square root extraction
	9.40 P12 %	**P12 %** Insertion point of Radizierung	5.0 to **9.4** to 15.0 % vom Ausgangsstrom
	01.05 P13 SWV	**P13 SWV** Software version	Editing not possible
	°C P14 Unit	**P14 Uni** Temperature measuring unit	**°C**/°F
	0.0 P15 OFF	**P15 OFF** Pressure value offset (zero offset)	Nominal measuring range

Action	Display (example)	Explanation	Selection[a]
		**P16 SCS** Scaling start „Scaling start“	-9999 to **0** to +9999
		**P17 SCE** Scaling end „Scaling end“	-9999 to **100** to +9999
		**P18 SCD** Decimal place scaling „Scaling decimal point“	**Auto = automatic** 0 = no decimal place 1 = 1 decimal place 2 = 2 decimal places 3 = 3 decimal places
		**P19 %** Scaling unit	**% (default setting)** kg/sec kg/min kg/h t/min t/h l/sec l/min l/h m3/sec m3/min m3/h L m3 UsrTEXT
		**P20 h** Operating hours	Editing not possible

[a] Default settings are shown in **bold**.

8 Configuration

8.1 Data flow diagram



8.2 Description of the possible configurations

P0 Den **Density correction**

Configuration of the density of the medium to be measured

This may, for example, be relevant for the level measurement in order to display the correct filling height from the measured pressure.

CAUTION!

The set value should remain at the value 1 and should be changed in exceptional cases.

P1 Uni **Pressure measuring unit**

The pressure value unit can be configured here. The pressure value unit is shown on the display and can be taken from the HART® protocol.

P2 mA **Measuring range lower range value**

Configuration of the device (measuring range) with pressure specification

If the tank is empty, the start point (zero point) of the pressure/level measurement can be set here. The advantage of this procedure: The device is immediately configured for the application (e.g. tank).

CAUTION!

No further density corrections may be configured. No other values may be entered under P5 RS.

P3 mA **Measuring range upper range value**

Configuration of the device (measuring range) with pressure specification

If the tank is full, the end point (full) of the pressure/level measurement can be set here. The advantage of this procedure: The device is immediately configured for the application (e.g. tank).

CAUTION!

No further density corrections may be configured. No other values may be entered under P6 RE.

P4 Sec **Attenuation**

Time constant defined in seconds

Depending on the default setting, it is ensured that the measured value responds with a delay to short, fast pressure changes.

P5 RS **Measuring range lower range value**

Configuration of the device (measuring range) without pressure specification

Any values can be entered here as the lower range value. It is important when, for example, a differential pressure measurement with a diaphragm seal is attached to an application (e.g. filling level) and no configuration with a pressure specification can be performed. There is a calculation example available under chapter 8.4 "Level measurement configuration without a pressure specification", Page 59.

CAUTION!

No further density corrections may be configured. No other values may be entered under P2 mA.

P6 RE **Measuring range upper range value**

Configuration of the device (measuring range) without pressure specification

Any values can be entered here as the upper range value. It is important when, for example, a differential pressure measurement with a diaphragm seal is attached to an application (e.g. filling level) and no configuration with a pressure specification can be performed. There is a calculation example available under chapter 8.4 "Level measurement configuration without a pressure specification", Page 59.

CAUTION!

No further density corrections may be configured. No other values may be entered under P3 mA.

P7 Zero **Zero point adjustment** (only for relative pressure)

The applied pressure is stored as a zero point.

CAUTION!

Only perform this configuration if it is certain that the zero point is actually present on the device (e.g. after installing or correcting the position of the device). Otherwise a zero offset can also be configured with this. The zero offset is stored as an offset (P15).
Zero point adjustment is not possible with absolute pressure sensors.

P8 mA **Current generator**

The device outputs a freely adjustable current value. The analog output has no reference to the pressure measurement. The actual pressure measurement continues to be performed in the background and can be queried via the interfaces. If the current generator was manually started via P8, this is represented by an icon next to P8 and can also be stopped again by exiting P8.

P9 Err **Current in case of malfunction**

Option for setting which fault current the device should output in case of a malfunction. The default value is set to 21.6 mA according to NAMUR NE 43.

P10 Key **Key lock**

This makes it possible to set a keypad lock in different stages. This is a safety feature to prevent accidental, but also intentional configuration changes to the device.

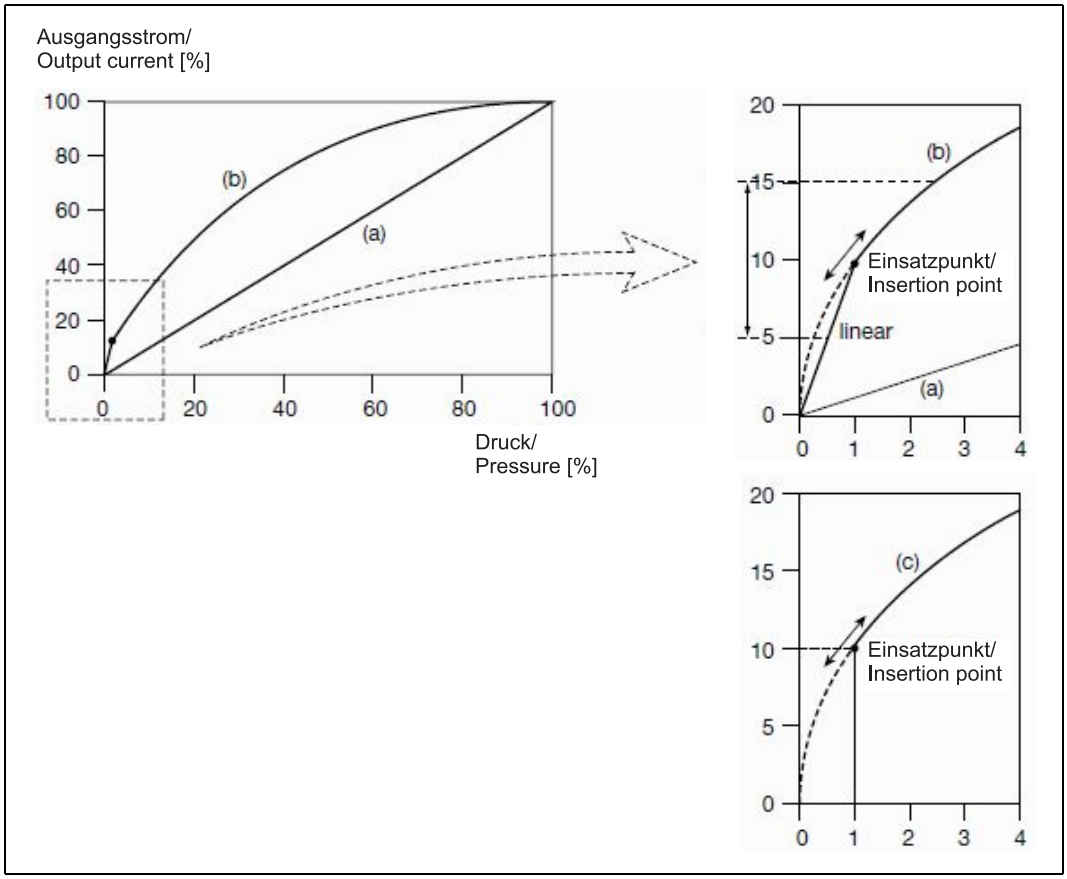
NOTE!

To cancel a set lock (LA, L0, LS), the user must press the P-key for longer than 5 s in the "Current in case of malfunction" (P9 Err) display screen.
The "LALL" lock can only be set or canceled in the setup program.

P11 Chr **Characteristic line**

This point is not relevant for relative/absolute pressure measurement and should therefore not be configured. It can be used with the differential pressure measurement to implement a flow measurement.

With P11, the characteristic line of the preset value Lin = pressure proportional can be reconfigured to a square root extraction characteristic line SLin or SOff = flow proportional. For the flow measurement, parameter P12 = insertion point relevant, below the characteristic line for low flow suppression either linearly connected (SLin) or completely disabled (SOff).



(a) = Lin = linear

(b) = SLin = square-root, linear up to insertion point

(c) = SOFF = square-root, disconnected up to insertion point

P12 % **Insertion point of the square root extraction**

This point is not relevant for relative/absolute pressure measurement and should therefore not be configured. It can be used with the differential pressure measurement to implement a flow measurement. The insertion point of the square root extraction sets the start point for the flow measurement.

P13 SWV **Software version**

For information only
No configuration option

P14 Uni **Temperature measuring unit**

The temperature value can be read on the display or via the HART® signal. There is no option to transmit the temperature value via a 4 to 20 mA signal. The temperature unit can be configured here.

P15 Off **Pressure value offset**

The offset value of the pressure value (relative or absolute pressure) is shown in figures here (e.g. after the zero point adjustment). The values listed there should only be corrected in exceptional cases as it is possible to manually readjust an offset there. Please contact the manufacturer for this.

P16 SCS **Scaling start**

Configuration option to show the pressure value assignment on other physical values/units. For example, the pressure value applied on the device can be scaled to liters and other units (see P19). The scaling start is set here (e.g. 0).

P17 SCE **Scaling end**

Configuration option to show the pressure value assignment on other physical values/units. For example, the pressure value applied on the device can be scaled to liters and other units (see P19). The scaling end is set here (e.g. 100).

P18 SCD **Decimal place scaling**

Configuration option to show the pressure value assignment on other physical values/units. For example, the pressure value applied on the device can be scaled to liters and other units (see P19). The scaling decimal place is set here.

P19 % **Scaling unit**

Configuration option to show the pressure value assignment on other physical values/units. The scaling unit is set here.

P20 h **Operating hours**

For information only
No configuration option

8.3 Level measurement configuration with a pressure specification - recommended (tank empty, tank full)

The following description applies to level measurements of all measuring ranges with or without a diaphragm seal.

With rotary knob operation (parameter level)

Swap from display level to parameter level, see chapter 7.3 "The level concept", Page 47

The following configuration steps should be taken:

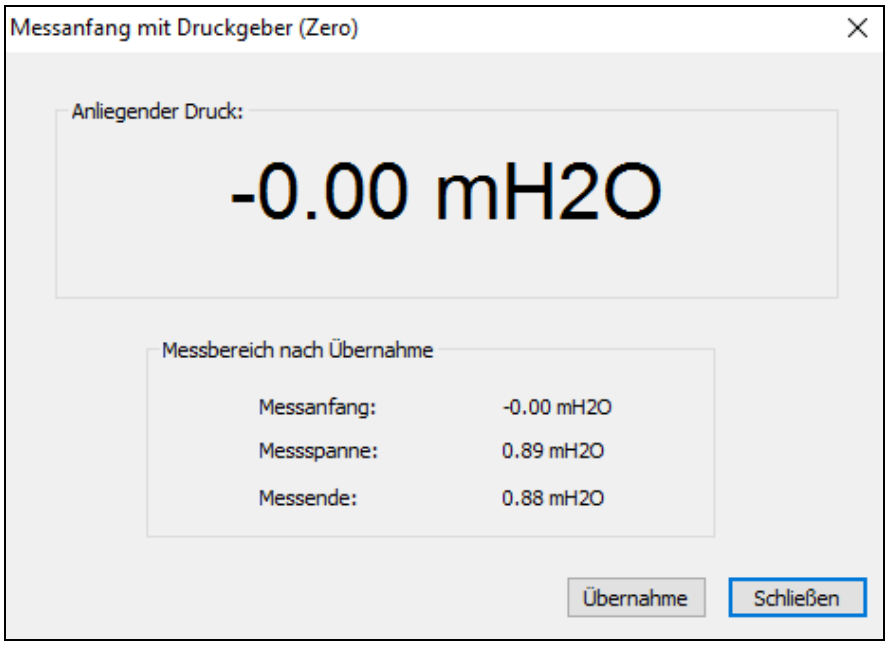
P1	Measuring unit, e.g. mbar
P2	Measuring range lower range value: 4 mA (configuration with empty tank)
P3	Measuring range upper range value: 20 mA (configuration with full tank)
P4	Attenuation: 0
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P19	Scaling unit: L (liters)

Swap from parameter level to display level

With JUMO setup program

Extras **Extras: Online operation_measuring start with pressure transmitter (zero)** – with empty tank

Confirm transfer.



Extras **Extras: Online operation_measuring end with pressure transmitter (span)** – with full tank

Confirm transfer.

8 Configuration

NOTE!

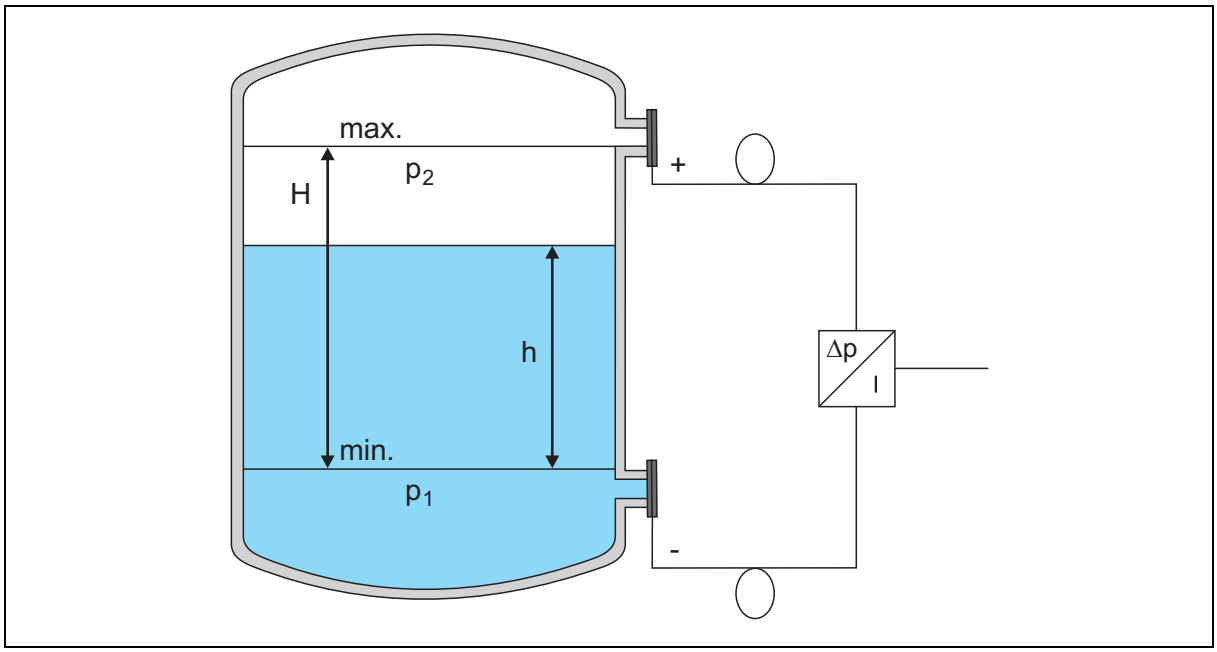
No zero point adjustment should be performed when configuring the level measurement with a pressure specification.

8.4 Level measurement configuration without a pressure specification

8.4.1 With a diaphragm seal in closed containers with a measuring range of 0 to 1 bar

NOTE!

The filling oil in the diaphragm seal used has an influence on the configuration of the device and therefore always needs to be considered in the calculation.



Range start (4 mA):

Measuring range lower range value P5	[mbar]	=	$H \times \rho_{oil} \times g \times 0.01$

Range end (20 mA):

Measuring range upper range value P6	[mbar]	=	$(H \times \rho_{oil} - h \times \rho_{liq}) \times g \times 0.01$

Legend:

H	[mm]	=	Vertical distance of the diaphragm seal
h	[mm]	=	Max. level of the measured liquid, $0 < h \leq H$
ρ_{oil}	[g/cm³]	=	0.96, density of the oil in the capillary
ρ_{liq}	[g/cm³]	=	Density of the measured liquid
g	[m/s²]	=	9.81, gravitational acceleration

Example:

Tank height		=	10 m
H	[mm]	=	9000
h	[mm]	=	8000
ρ_{liq}	[g/cm³]	=	1.00, density of the water, 4 °C
Measuring range lower range value P5	[mbar]	=	$9000 \times 0.96 \times 9.81 \times 0.01 = 847.6$
Measuring range upper range value P6	[mbar]	=	$(9000 \times 0.96 - 8000 \times 1.00) \times 9.81 \times 0.01 = 62.8$

With rotary knob operation (parameter level)

Swap from display level to parameter level, see chapter 7.3 "The level concept", Page 47

The following configuration steps should be taken:

P1	Unit, e. g. mbar
P4	Attenuation: 0
P5	Measuring range lower range value: 847.6, see example calculation
P6	Measuring range upper range value: 62.8, see example calculation
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P19	Scaling unit: L (liters)

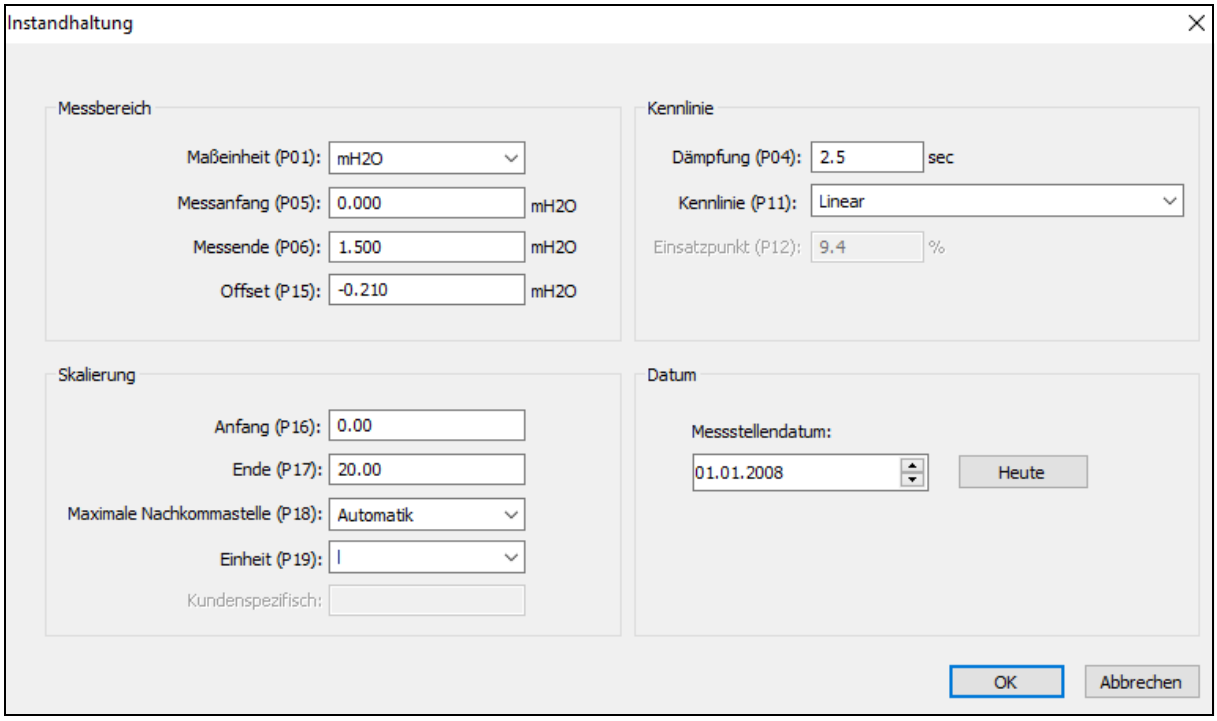
Swap from parameter level to display level

With JUMO setup program

Data transfer from the device

Editing Maintenance

The following dialog window opens: "Maintenance":



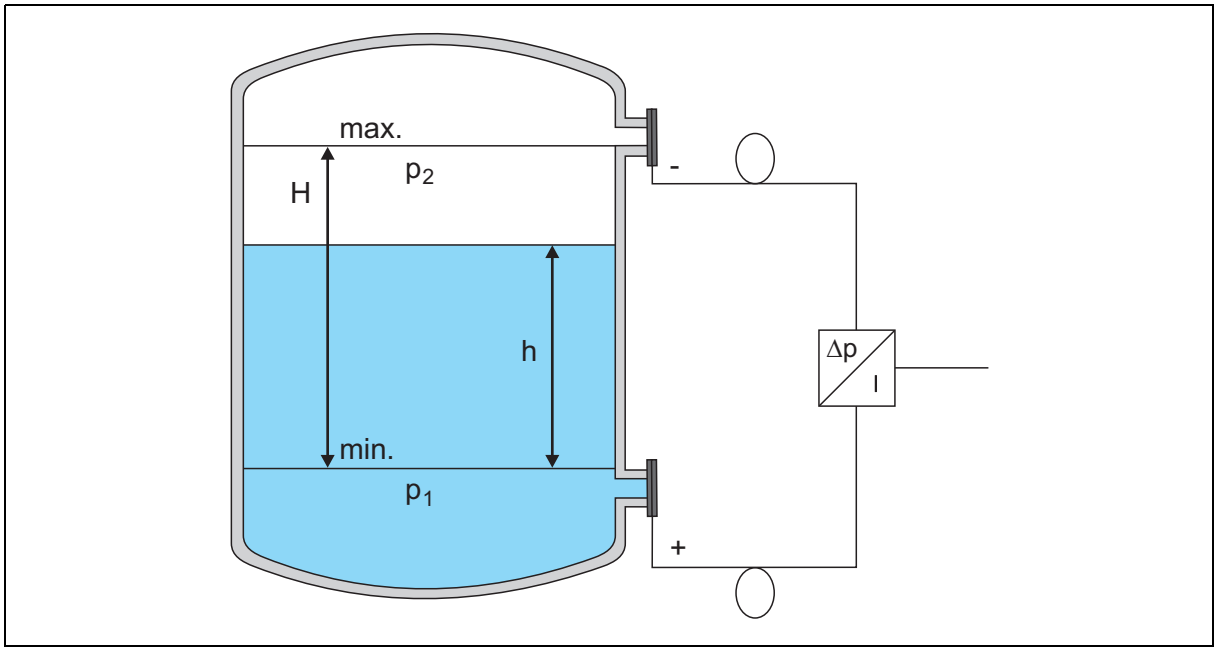
P01	Measuring unit, e.g. mbar
P04	Attenuation: 2.5
P05	Measuring range lower range value: 847.6, see example calculation
P06	Measuring range upper range value: 62.8, see example calculation
P11	Characteristic line: linear
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P18	Maximum decimal place: automatic
P19	Scaling unit: L (liters)

After entering the desired values: Start data transfer to device.

CAUTION!

A zero point adjustment should generally not be performed (e.g. when the tank is empty) in a measuring range of 0 to 1 bar.

8.4.2 With a diaphragm seal in closed containers with ± measuring ranges



Range start (4 mA):

Measuring range lower range value P5	[mbar]	=	$-(H \times \rho_{oil} \times g \times 0.01)$

Range end (20 mA):

Measuring range upper range value P6	[mbar]	=	$-(H \times \rho_{oil} - h \times \rho_{liq}) \times g \times 0.01$

Legend:

H	[mm]	=	Vertical distance of the diaphragm seal
h	[mm]	=	Max. level of the measured liquid, $0 < h \leq H$
ρ_{oil}	[g/cm^3]	=	0.96, density of the oil in the capillary
ρ_{liq}	[g/cm^3]	=	Density of the measured liquid
g	[m/s^2]	=	9.81, gravitational acceleration

Example:

Tank height		=	10 m
H	[mm]	=	9000
h	[mm]	=	8000
ρ_{liq}	[g/cm^3]	=	1.00, density of the water, 4 °C
Measuring range lower range value P5	[mbar]	=	$-(9000 \times 0.96 \times 9.81 \times 0.01) = -847.6$
Measuring range upper range value P6	[mbar]	=	$-(9000 \times 0.96 - 8000 \times 1.00) \times 9.81 \times 0.01 = -62.8$

With rotary knob operation (parameter level)

Swap from display level to parameter level, see chapter 7.3 "The level concept", Page 47

The following configuration steps should be taken:

P1	Unit, e. g. mbar
P4	Attenuation: 0
P5	Measuring range lower range value: 62.8, see example calculation
P6	Measuring range upper range value: 847.6, see example calculation
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P19	Scaling unit: L (liters)

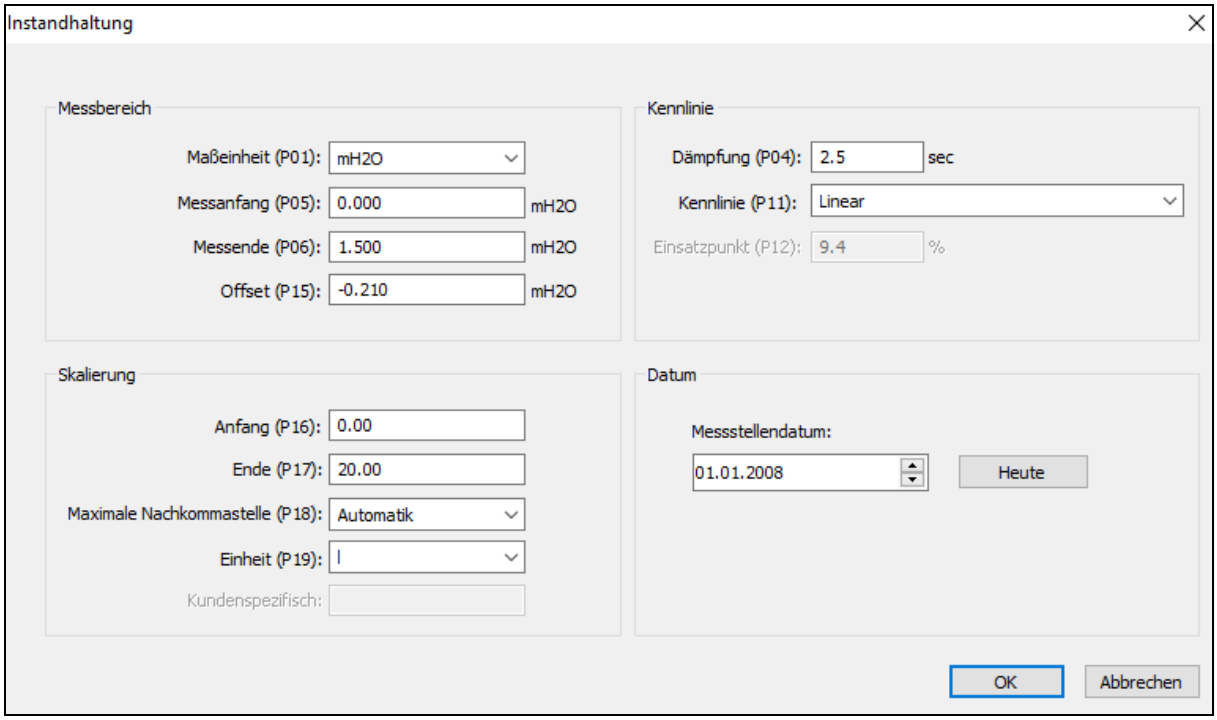
Swap from parameter level to display level

With JUMO setup program

Data transfer from the device

Editing Maintenance

The following dialog window opens:



P01	Measuring unit, e.g. mbar
P04	Attenuation: 2.5
P05	Measuring range lower range value: 62.8, see example calculation
P06	Measuring range upper range value: 847.6, see example calculation
P11	Characteristic line: linear
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P18	Maximum decimal place: automatic
P19	Scaling unit: L (liters)

NOTE!

No zero point adjustment should be performed after configuring the level measurement without a pressure specification (for ± measuring range).

8.4.3 Without a diaphragm seal in closed containers with ± measuring ranges or 0 to 1 bar

The device is ideally suited for level measurements in open and containers.

With rotary knob operation (parameter level)

Swap from display level to parameter level, see chapter 7.3 "The level concept", Page 47

The following configuration steps should be taken:

P1	Unit, e. g. mbar
P4	Attenuation: 0
P5	Measuring range lower range value: 0
P6	Measuring range upper range value: 2.00 (2 m water column in this example)
P7	Zero point adjustment, set device to zero, e.g. if tank is empty
P11	Characteristic line: linear
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P19	Scaling unit: L (liters)

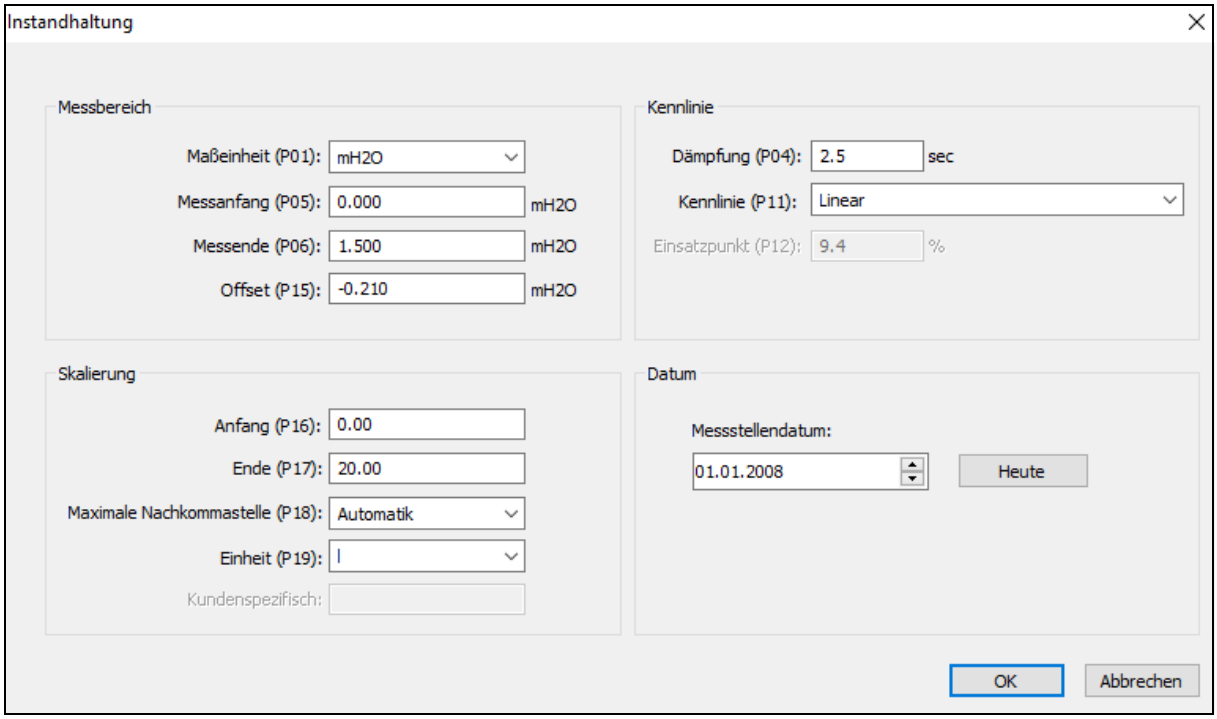
Swap from parameter level to display level

With JUMO setup program

Data transfer from the device

Editing Maintenance

The following dialog window opens:



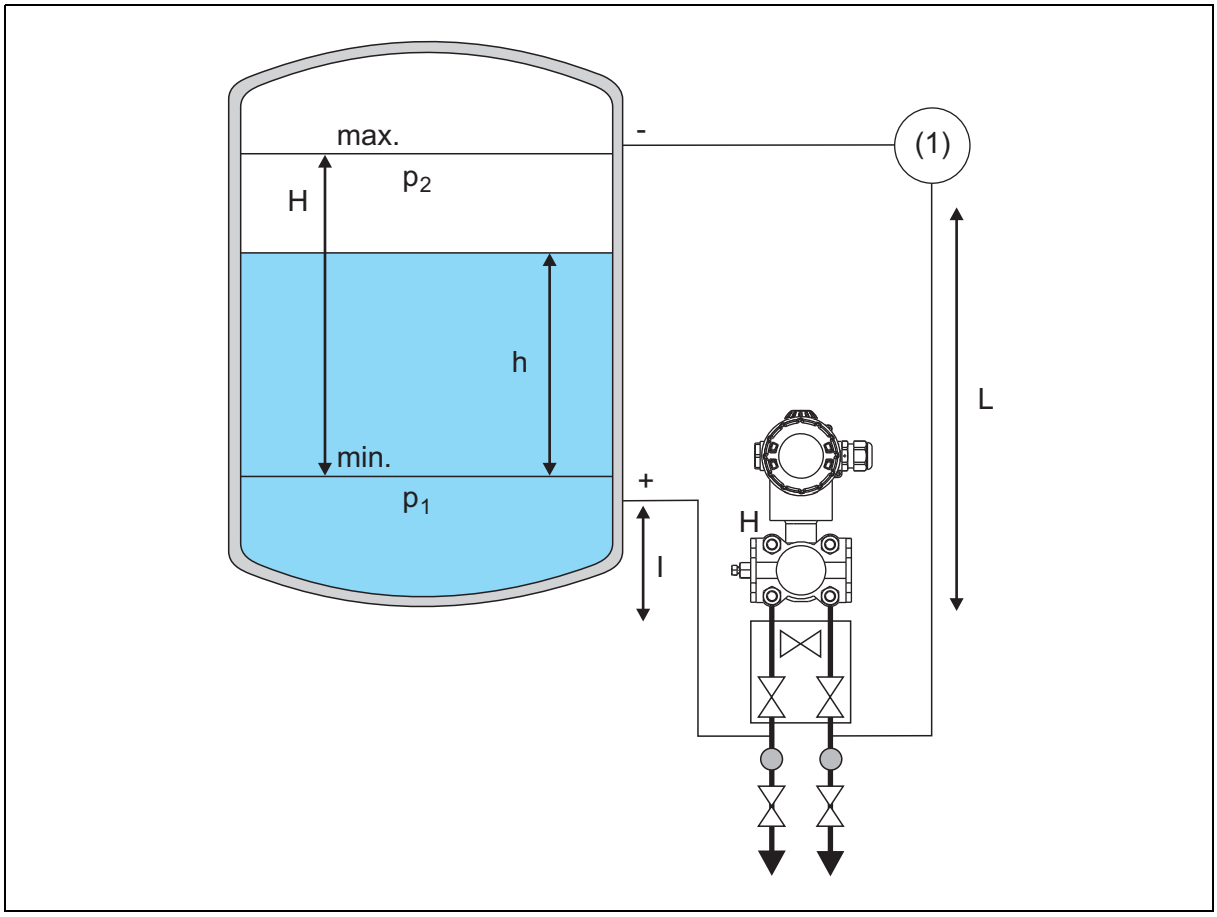
P01 Measuring unit, e.g. mbar
P04 Attenuation: 0
P05 Measuring range lower range value: 0
P06 Measuring range upper range value: 2.00 (2 m water column in this example)
P11 Characteristic line: linear
P14 Temperature measuring unit (only for displaying or as HART® signal): °C
P16 Scaling start: scaling on the tank, e.g. in liters: 0
P17 Scaling end: scaling on the tank, e.g. in liters: 200
P18 Maximum decimal place: automatic
P19 Scaling unit: L (liters)

After entering the desired values: Data transfer to device

Zero point adjustment, set device to zero, e.g. if tank is empty

Extras **Extras: Online operation_sensor zero point calibration**

8.4.4 For steam layering with ± measuring ranges



(1) Condensing vessel
l Vertical distance from tank to measuring device input
L Vertical distance from condensing vessel to measuring device input

Range start (4 mA):

Measuring range lower range value P5	[mbar]	=	$(L - l) \times \rho_{vap} \times g \times 0.01$

Range end (20 mA):

Measuring range upper range value P6	[mbar]	=	$([L - l] + H) \times \rho_{vap} \times g \times 0.01$

Legend:

H	[mm]	=	Max. filling level height
h	[mm]	=	Max. level of the measured liquid, $0 < h \leq H$
L	[mm]	=	Vertical distance from tank to measuring device input (low pressure)
l	[mm]	=	Vertical distance from condensing vessel to measuring device input (high pressure)
ρ_{vap}	[g/cm^3]	=	1.00, density of the water, 4 °C
ρ_{liq}	[g/cm^3]	=	Density of the measured liquid
g	[m/s^2]	=	9.81, gravitational acceleration

Example:

Tank height		=	10 m
H	[mm]	=	7000
h	[mm]	=	6000
L	[mm]	=	8000
l	[mm]	=	100
Measuring range lower range value P5	[mbar]	=	(8000 - 100) × 1.00 × 9.81 × 0.01 = 77.50
Measuring range upper range value P6	[mbar]	=	([8000 - 100] + 7000) × 1.00 × 9.81 × 0.01 = 1461.69

With rotary knob operation (parameter level)

Swap from display level to parameter level, see chapter 7.3 "The level concept", Page 47

The following configuration steps should be taken:

P0	Density correction for ρ_{liq}: Density of the liquid to be measured, water at 4 °C = density 1
P1	Unit, e. g. mbar
P4	Attenuation: 0
P5	Measuring range lower range value: 77.50, see example calculation
P6	Measuring range upper range value: 1461.69, see example calculation
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P19	Scaling unit: L (liters)

Swap from parameter level to display level

CAUTION!

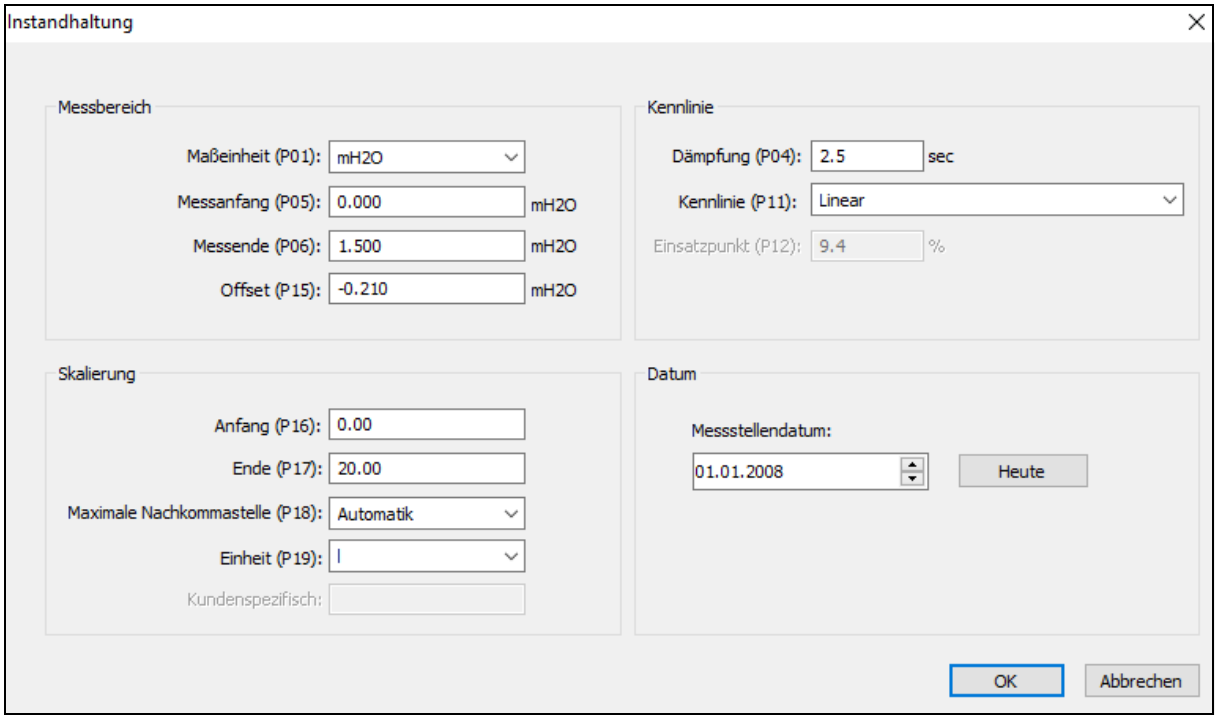
No zero point adjustment may be performed for this configuration of the level measurement

With JUMO setup program

Data transfer from the device

Editing Maintenance

The following dialog window opens:



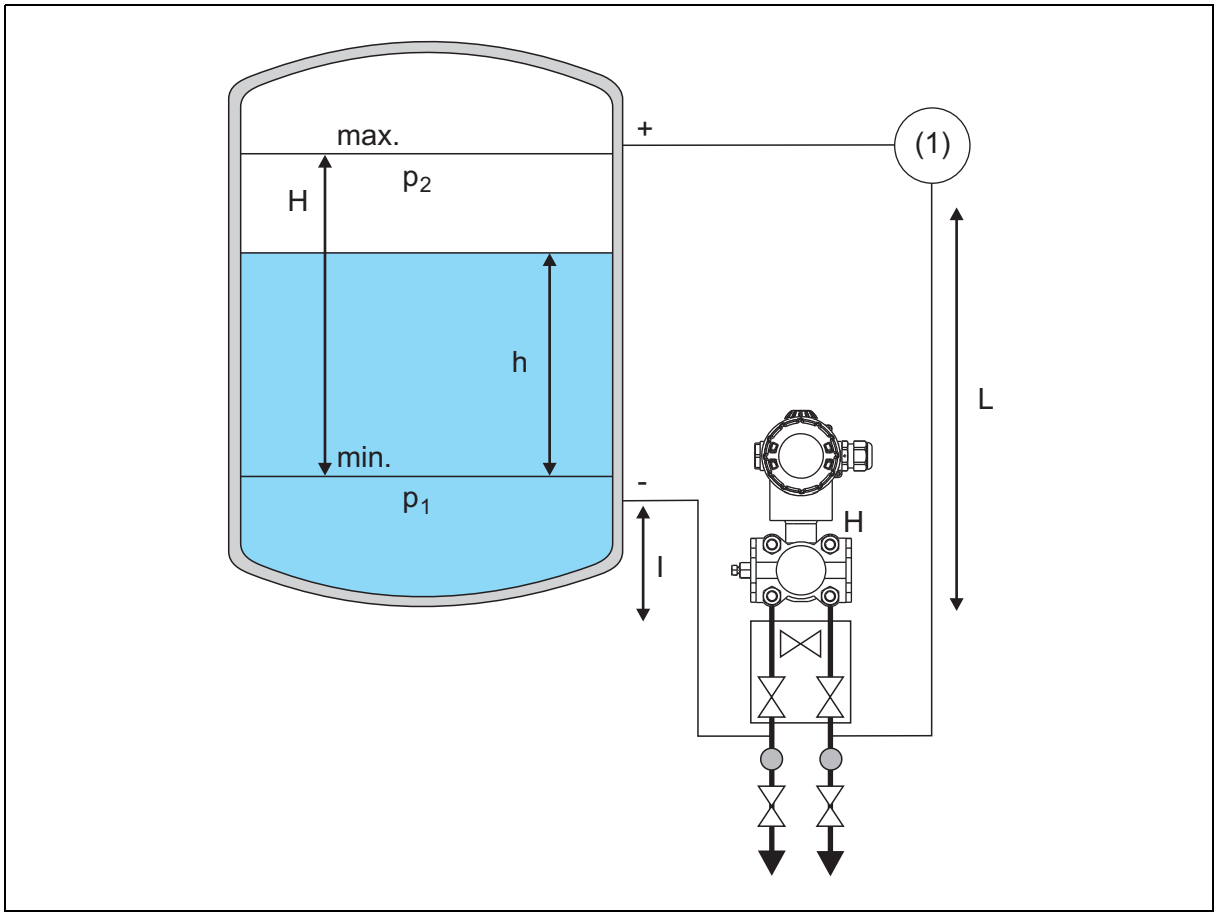
P01 Measuring unit, e.g. mbar
P04 Attenuation: 0
P05 Measuring range lower range value: 77.50, see example calculation
P06 Measuring range upper range value: 1461.69, see example calculation
P11 Characteristic line: linear
P14 Temperature measuring unit (only for displaying or as HART® signal): °C
P16 Scaling start: scaling on the tank, e.g. in liters: 0
P17 Scaling end: scaling on the tank, e.g. in liters: 200
P18 Maximum decimal place: automatic
P19 Scaling unit: L (liters)

After entering the desired values: Data transfer to device

Zero point adjustment, set device to zero, e.g. if tank is empty

Extras **Extras: Online operation_sensor zero point calibration**

8.4.5 For steam layering with a measuring range of 0 to 1 bar



(1) Condensing vessel
l Vertical distance from tank to measuring device input
L Vertical distance from condensing vessel to measuring device input

Range start (4 mA):

Measuring range lower range value P5	[mbar]	=	$([L - l] + H) \times \rho_{vap} \times g \times 0.01$

Range end (20 mA):

Measuring range upper range value P6	[mbar]	=	$(L - l) \times \rho_{vap} \times g \times 0.01$

Legend:

H	[mm]	=	Vertical distance of the diaphragm seal
h	[mm]	=	Max. level of the measured liquid, $0 < h \leq H$
L	[mm]	=	Vertical distance from tank to measuring device input (low pressure)
l	[mm]	=	Vertical distance from condensing vessel to measuring device input (high pressure)
ρ_{vap}	[g/cm^3]	=	1.00, density of the water, 4 °C
ρ_{liq}	[g/cm^3]	=	Density of the measured liquid
g	[m/s^2]	=	9.81, gravitational acceleration

Example:

Tank height		=	10 m
H	[mm]	=	7000
h	[mm]	=	6000
L	[mm]	=	8000
I	[mm]	=	100
Measuring range lower range value P5	[mbar]	=	([8000 - 100] + 7000) × 1.00 × 9.81 × 0.01 = 1461.69
Measuring range upper range value P6	[mbar]	=	(8000 - 100) × 1.00 × 9.81 × 0.01 = 77.50

With rotary knob operation (parameter level)

Swap from display level to parameter level, see chapter 7.3 "The level concept", Page 47

The following configuration steps should be taken:

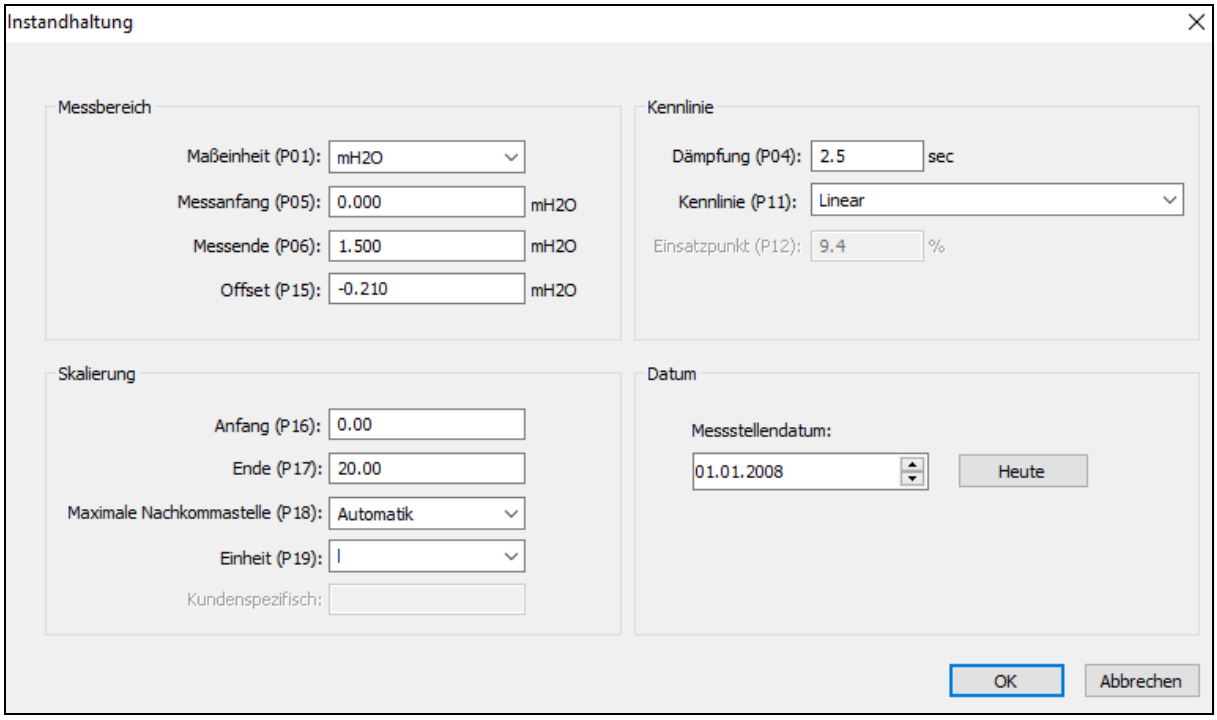
P0	Density correction for ρ_{liq}: Density of the liquid to be measured, water at 4 °C = density 1
P1	Unit, e. g. mbar
P4	Attenuation: 0
P5	Measuring range lower range value: 1461.69, see example calculation
P6	Measuring range upper range value: 77.50, see example calculation
P14	Temperature measuring unit (only for displaying or as HART® signal): °C
P16	Scaling start: scaling on the tank, e.g. in liters: 0
P17	Scaling end: scaling on the tank, e.g. in liters: 200
P19	Scaling unit: L (liters)

Swap from parameter level to display level

With JUMO setup program

Data transfer from the device

Editing	Maintenance
	The following dialog window opens:



P01 Measuring unit, e.g. mbar
P04 Attenuation: 0
P05 Measuring range lower range value: 1461.69, see example calculation
P06 Measuring range upper range value: 77.50, see example calculation
P11 Characteristic line: linear
P14 Temperature measuring unit (only for displaying or as HART® signal): °C
P16 Scaling start: scaling on the tank, e.g. in liters: 0
P17 Scaling end: scaling on the tank, e.g. in liters: 200
P18 Maximum decimal place: automatic
P19 Scaling unit: L (liters)

After entering the desired values: Data transfer to device

Zero point adjustment, set device to zero, e.g. if tank is empty

Extras **Extras: Online operation_sensor zero point calibration**

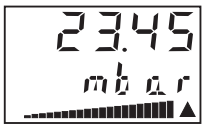
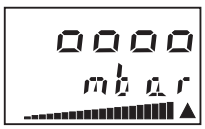
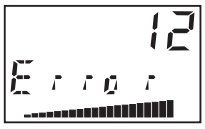
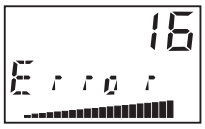
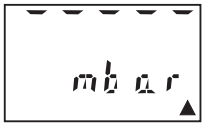
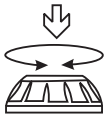
CAUTION!

No zero point adjustment may be performed for this configuration of the level measurement

NOTE!

If you notice an external fault (including a mechanical one), the device must be sent to the manufacturer to be repaired.

9.1 Overcoming errors and malfunctions

Error/fault		Possible cause	Remedy
Display:	None	No voltage supply	Turn on the voltage supply
		Device faulty	Send the device to the supplier for repairs.
Display:		Overrange, overpressure	Bring the pressure back into the measuring range or ajdust the measuring range.
Display:		Underrange, underpressure	
Display:		Pressure can no longer be displayed, overpressure	Adjust scaling or unit of measure
Display:		Pressure can no longer be displayed, underpressure	
Display:		The connection between sensor and electronic is broken.	a) Proof the plug connection at the back of the electronic module b) Send the device to the supplier for repairs.
Display:		An error was discovered in the electronics during the self test.	Send the device to the supplier for repairs.
Display:		Temperature sensor or pressure sensor faulty	Send the device to the supplier for repairs.
The rotary knob is not responding		Keyboard lock	Override keyboard lock
		Device faulty	Send the device to the supplier for repairs.

10 HART® 7 specification

The device is in the version with HART® protocol if it has a corresponding identification marking on the nameplate: 4 to 20 mA HART®

The following version applies for HART®:

- HART® 7 specification: standard version without SIL
- HART® 5 specification: standard version with SIL and with extra code 932

10.1 Device identification

Manufacturer	JUMO GmbH & Co. KG
Manufacturer ID	24716 (0x608C)
Device type	JUMO dTRANS p20
Device ID	58062 (0xE2CE)
HART® Protocol Version	7
Device version	1
Number of device variables	3
Physical layers supported	FSK
Device category	Transmitter, without galvanic isolation

10.2 Variable codes

The process pressure transmitter supports three device variables and two dynamic device variables as well as the fixed measurands percentage value and milliampere value.

The following table describes the variable numbering that is required for commands 9, 54, and 107.

Variable code	**Designation**	**Class**	**Unit**
0	Customer scaled value	Depending on the current P19 unit: 0 = not classified 66 = flow 68 = level	Depending on the current P19 unit: 57, 73, 74, 75, 77, 78, 24, 17, 138, 28, 131, 19, 41, 43, 253 = diverse flow and level units
1	Drag indicator minimum	65 = pressure	Depending on the current P1 unit: 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 237, 240 = diverse pressure units
2	Drag indicator maximum	65 = pressure	Depending on the current P1 unit: 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 237, 240 = diverse pressure units
244	Percent	0 = not classified	57 = percent
245	Current	84 = current	39 = mA
246	Primary variable	65 = pressure	Depending on the current P1 unit: 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 237, 240 = diverse pressure units

Variable code	Designation	Class	Unit
247	Secondary variable	64 = temperature	Depending on the current P14 unit: 32 = level C 33 = level F

10.3 HART® commands

Com-mand	HART® version	Designation	Request data	Response data (plus 2 status bytes7)
Universal commands (0 to 30 as well as 38 and 48)[a]				
0	5	Read unique identifier	None	12 bytes includes the long address
	7	Read unique identifier	None	22 bytes includes the long address
1	5, **7**	Read Primary Variable	None	1 byte unit code P 4 bytes pressure P as float
2	5, **7**	Read current and percent	None	4 bytes current as float 4 bytes percent as float
3	5, **7**	Read current and dynamic variables	None	4 bytes current as float 1 byte unit code P 4 bytes pressure P as float 1 byte unit code T 4 bytes temp T as float
6	5	Write polling address	1 byte short address	As request
	7	Write polling address	1 byte short address 1 byte LoopCurr_active	As request
7	**7**	Read loop configuration	None	1 byte short address 1 byte LoopCurr_active
8	7	Read dynamic variable classifications	None	1 Byte Class PrimV 1 Byte Class SecV 1 Byte Class ThirdV 1 Byte Class QuadV
9	7	Read device variables with status	1 byte DevVarCode [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode]	1 byte ExtendedDevStatus 8 bytes info about DevVar [8 bytes info about DevVar] [8 bytes info about DevVar] [8 bytes info about DevVar] 4 bytes TimeStamp
11	5, **7**	Read unique identifier by TAG	6 bytes TAG no.	Same as command 0
12	5, **7**	Read message	None	24 bytes message

Com-mand	HART® version	Designation	Request data	Response data (plus 2 status bytes7)
13	5, **7**	Read TAG + descriptor + date	None	6 bytes TAG no. 12 bytes description 3 bytes date
14	5, **7**	Read PV sensor info	None	3 bytes sensor man.no. 1 byte unit code sensor 4 bytes SensorMax as float 4 bytes SensorMin as float 4 bytes SensorSpan as float
15	5	Read device info	None	1 byte alarm code 1 byte "P11 Chr" 1 byte unit code sensor 4 bytes "P6 RE" (range end) 4 bytes "P5 RS" (range start) 4 bytes "P4 sec" 1 byte code write lock 1 byte manufacturer code
	7	Read device info	None	1 byte alarm code 1 byte "P11 Chr" 1 byte unit code sensor 4 bytes "P6 RE" (range end) 4 bytes "P5 RS" (range start) 4 bytes "P4 sec" 1 byte code write lock 1 byte manufacturer code 1 byte AnalogChannelFlag
16	5, **7**	Read final assembly number	None	3 bytes assembly number
17	5, **7**	Write message	24 bytes message	As request
18	5, **7**	Write TAG + descriptor + date	6 bytes TAG no. 12 bytes description 3 bytes calibration date	As request
19	5, **7**	Write final assembly number	3 bytes assembly number	As request
20	**7**	Read long TAG	None	32 bytes long TAG
21	**7**	Read unique identifier by Long TAG	32 bytes long TAG	Same as command 0
22	**7**	Write long TAG	32 bytes long TAG	As request
Common Practice Commands (32 to 121, except 38 and 48)[a]				
34	5, **7**	Write damping value	4 bytes "P4 sec"	As request
35	5, **7**	Write range values	1 byte unit code 4 bytes "P6 RE" 4 bytes "P5 RS"	As request
36	5, **7**	Set upper range value	None	None

Com-mand	HART® version	Designation	Request data	Response data (plus 2 status bytes7)
37	5, **7**	Set lower range value	None	None
38	5	Reset configuration changed flag	None	None
	7	Reset configuration changed flag	2 bytes ConfigChCnt	2 bytes ConfigChCnt
40	5, **7**	Fixed current mode	4 bytes "P8 mA" (0 = Current generator mode off)	As request
41	**7**	Perform self test	None	None
42	5, **7**	Perform device reset	None	None
43	5, **7**	Set PV zero ("P7 Zero") Absent with absolute pressure sensors!	None	None
44	5, **7**	Write PV units	1 byte "P1 Uni"	As request
45	5, **7**	Trim loop current zero	4 bytes measured mA as float	As request
46	5, **7**	Trim loop current gain	4 bytes measured mA as float	As request
48	**7**	Read additional device status	None	6 bytes dev specific status 1 byte extended dev status 1 byte dev operating mode 1 byte standardized status
54	**7**	Read device variable info	1 byte DevVarCode	27 bytes info about DevVar
59	5, **7**	Write number of response preambles	1 byte number of preambles	As request
103	**7**	Write burst period	1 byte BurstMsgNr 4 bytes BurstMinUpdTime 4 bytes BurstMaxUpdTime	As approved request; invalid values are automatically set to the nearest valid value
104	**7**	Write burst trigger	1 byte BurstMsgNr 1 byte BurstTrigMode 1 byte BurstTrigClass 1 byte BurstTrigUnits 4 bytes BurstTrigValue	As request

Command	HART® version	Designation	Request data	Response data (plus 2 status bytes7)
105	7	Read burst mode configuration	[1 byte BurstMsgNo]	1 byte BurstAktiv 1 byte BurstCmd 8 bytes BurstDevVarCode 1 byte BurstMsgNr 1 byte number BurstCfg 2 bytes BurstCmd16Bit 4 bytes BurstMinUpdTime 4 bytes BurstMaxUpdTime 1 byte BurstTrigMode 1 byte BurstTrigClass 1 byte BurstTrigUnits 4 bytes BurstTrigValue
107	7	Write burst device variables	1 byte DevVarCode [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode] [1 byte BurstMsgNo]	8 bytes BurstDevVarCode 1 byte BurstMsgNr
108	5	Write burst mode command number	1 byte BurstCmd	As request
	7	Write burst mode command number	2 bytes BurstCmd16Bit 1 byte BurstMsgNr	As request
109	5	Burst Mode Control	1 byte Burst_Active	As request
	7	Burst Mode Control	1 byte Burst_Active [1 byte BurstMsgNo]	As request
Device-specific commands (128 to 253)				
128	**7**	Write offset	1 byte unit code 4 bytes "P15 OFF"	As request
129	**7**	Read offset	None	1 byte "P1 Uni" 4 bytes "P15 OFF"
130	5, **7**	Reset min/max value	1 byte both/min/max	As request
131	5, **7**	Read min/max value	None	4 bytes DragIndicatorMax 4 bytes DragIndicatorMin In "P1 Uni"
132	5, **7**	Write output mode	1 byte "P11 Chr"	As request
133	5, **7**	Read output mode	None	1 byte "P11 Chr"
134	5, **7**	Write error mode	1 byte "P9 Err"	As request
135	5, **7**	Read error mode	None	1 byte "P9 Err"
136	5, **7**	Write keyboard mode	1 byte "P10 Key"	As request

Com-mand	HART® version	Designation	Request data	Response data (plus 2 status bytes7)
137	5, **7**	Read keyboard mode	None	1 byte "P10 Key"
138	**7**	Write temperature unit	1 byte "P14 Uni"	As request
141	5, **7**	Read square root start	None	4 bytes "P12 %"
142	5, **7**	Write square root start	4 bytes "P12 %"	As request
147	**7**	Write Scale_Beg + Scale_End	4 bytes "P17 SCE" 4 bytes "P16 SCS"	As request
148	5, **7**	Read Scale_Beg + Scale_End	None	4 bytes "P17 SCE" 4 bytes "P16 SCS"
149	7	Write Scale_Unit	1 byte unit code for "P19 %"	As request
151	7	Write Scale_Comma	1 byte "P18 SCD" [Auto/0/1/2/3]	As request
152	7	Read Scale_Comma	None	1 byte "P18 SCD" [Auto/0/1/2/3]

[a] Commandos 38 and 40 only become universal commands with HART® 7; previously they were common practice.

10.4 Burst mode commands

The burst mode is an operating mode in which the device sends telegrams independently without an inquiry. It is configured with the setup program or with the commands 103 to 109.

The following commands are available:

Command[a]	Designation
1	Primary variable
2	Current and percent
3	Current and dynamic variables
9	Device variables
48	Additional device status

[a] Commands 9 and 48 only as of HART® 7

10 HART® 7 specification

10.5 Performance data

The parameters that are listed below determine the performance of the process pressure transmitter.

Telegram length

The maximum telegraph length of up to 68 bytes occurs with this HART® 7 device with command 9 (39 bytes payload including 2 status bytes).

The HART® 5 device has a maximum telegram length of 56 bytes.

Operating modes

The process pressure transmitter has three output operating modes:

- Standard mode (single mode): current proportional to measurand
- Current generator mode: current is adjusted through HART® command 40 or through adjustment parameter "P8 mA"
- Constant current mode (multidrop mode): current is set to constant 4 mA in bus operation (HART® command 6)

Write protection

The device can be protected against unintentional overwriting of a parameter through a keyboard lock.

- At the device through parameter "P10 key"
- In the setup program under "Further maintenance data - Inhibit (P10)"
- Via HART® command 136 and 137

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More than sensors + automation

EU-Konformitätserklärung

EU declaration of conformity / Déclaration UE de conformité

Dokument-Nr.
Document No. / Document n°.
CE 601

Hersteller
Manufacturer / Etabli par
JUMO GmbH & Co. KG

Anschrift
Address / Adresse
Moritz-Juchheim-Straße 1, 36039 Fulda, Germany

Produkt
Product / Produit

Name *Name / Nom*	**Typ** *Type / Type*	**Typenblatt-Nr.** *Data sheet no. / N° Document d'identification*
dTRANS p20 DELTA	403022	403022

Wir erklären in alleiniger Verantwortung, dass das bezeichnete Produkt die Anforderungen der Europäischen Richtlinien erfüllt.

We hereby declare in sole responsibility that the designated product fulfills the requirements of the European Directives.

Nous déclare sous notre seule responsabilité que le produit remplit les Directives Européennes.

Richtlinie 1
Directive / Directive

Name
Name / Nom
EMC

Fundstelle
Reference / Référence
2014/30/EU

Bemerkung
Comment / Remarque

Datum der Erstanbringung des CE-Zeichens auf dem Produkt
Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit
2010

11 Declaration of conformity

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Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Fundstelle *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
EN 61326-1	2013	
EN 61326-2-3	2013	

Gültig für Typ
Valid for Type / Valable pour le type
403022/...

Richtlinie 2
Directive / Directive

Name
Name / Nom
ATEX

Fundstelle
Reference / Référence
2014/34/EU

Bemerkung
Comment / Remarque
Mod. B+D

Datum der Erstanbringung des CE-Zeichens auf dem Produkt
Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit
2011

Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Fundstelle *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
EN 60079-0	2012+A11:2013	
EN 60079-11	2012	
EN 60079-26	2015	

Gültig für Typ
Valid for Type / Valable pour le type
403022/*-1-...

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EU-Baumusterprüfbescheinigung 2.1

EU type examination certificate / Certificat d'examen de type UE

Fundstelle
Reference / Référence
SEV 09 ATEX 0138 X

Benannte Stelle
Notified Body / Organisme notifié
Eurofins Electrosuisse Product Testing AG

Kennnummer
Identification no. / N° d'identification
1258

Gültig für Typ
Valid for Type / Valable pour le type
403022/*-1-...

Anerkannte Qualitätssicherungssysteme der Produktion
Recognized quality assurance systems of production / Systèmes de qualité reconnus de production

Benannte Stelle	**Kennnummer**
Notified Body / Organisme notifié	*Identification no. / N° d'identification*
TÜV NORD CERT GmbH	0044

Richtlinie 3
Directive / Directive

Name
Name / Nom
RoHS

Fundstelle
Reference / Référence
2011/65/EU

Bemerkung
Comment / Remarque

Datum der Erstanbringung des CE-Zeichens auf dem Produkt
Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit
2017

11 Declaration of conformity

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Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Fundstelle *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
VDK Umweltrelevante Aspekte bei der Produktentwicklung und -gestaltung	V1	

Gültig für Typ
Valid for Type / Valable pour le type
403022/...

Aussteller
Issued by / Etabli par
JUMO GmbH & Co. KG

Ort, Datum
Place, date / Lieu, date
Fulda, 2018-01-03

Rechtsverbindliche Unterschrift
Legally binding signature / Signature juridiquement valable
Bereichsleiter Verkauf
ppa. Wolfgang Vogl

eurofins | Electrosuisse Product Testing

EU-Type Examination Certificate

(1)

(2) Equipment or protective system intended for use in potentially explosive atmospheres - **Directive 2014/34/EU**

(3) Certificate number: **SEV 09 ATEX 0138 X**

(4) Product: Process pressure transmitter
JUMO dTRANS p20 type 403025 or
JUMO dTRANS p20 Delta type 403022

(5) Manufacturer: JUMO GmbH & Co. KG

(6) Address: Moritz-Juchheim-Strasse 1, 36039 Fulda, GERMANY

(7) The equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) Eurofins Electrosuisse Product Testing AG, notified body No. 1258, in accordance with article 17 of Directive 2014/34/EU of the European parliament and of the council, dated 26 February 2014, certifies that this product has been found to comply with the essential health and safety requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report no 09-IK-0103.01 incl. extension 1 to 4

(9) Compliance with the essential health and safety requirements has been assured by compliance with:

EN 60079-0:12 + A11:13 **EN 60079-11:12** **EN 60079-26:15**

Except in respect of those requirements listed at item 18 of the schedule.

(10) If the sign «X» is placed after the certificate number, it indicates that the product is subjected to special conditions for safe use specified in the schedule to this certificate.

(11) This EU type examination certificate relates only to design and construction of the specified product. Further requirements of this directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

See Appendix page 5: (20) Marking

Eurofins Electrosuisse Product Testing AG
ATEX Notified Body 1258

Martin Plüss
Product Certification

12 Examination certificate

eurofins | Electrosuisse Product Testing

(13) **Appendix**

(14) **EU-Type Examination Certificate no. SEV 09 ATEX 0138 X**

(15) **Description of product**

The process pressure transmitter JUMO dTRANS p20 type 403025 or JUMO dTRANS p20 DELTA type 403022 serves for converting a physical measured quantity (pressure) into a standard electrical signal (4…20 mA). The device is intended for use within potentially explosive atmospheres. The stainless steel enclosure of the pressure transmitter has the type of protection IP 66 according to IEC 60529. The pressure transmitter can be housed in three different types of enclosure.
The process pressure transmitter JUMO dTRANS p20 type 403025 or JUMO dTRANS p20 DELTA type 403022 is attached to tanks or pipes by means of a process connection. The pressure measuring cell serves for zone separation and is made of stainless steel, Hastelloy®, Monel or titanium. This zone separation takes place by means of the diaphragm and subsequent flashback safe gap or the flashback safe gaps can also be integrated directly in the process connection upstream of the pressure measuring cell/pressure sensor.

Ratings:

Input and supply circuits	with type of protection intrinsic safety Ex ia IIC	
	only for connection to certified intrinsically safe circuits Maximum values:	
	Ui = 28 V	
	Ii = 115 mA	
	Pi = 750 mW	
	Ci = 6 nF	(effective internal capacitance)
	Li = 105 µH	(effective internal inductance)
or		
Input and supply circuits	with type of protection intrinsic safety Ex ia IIIC	
	only for connection to certified intrinsically safe circuits Maximum values:	
	Ui = 28 V	
	Ii = 115 mA	
	Pi = 750 mW	
	Ci = 6 nF	(effective internal capacitance)
	Li = 105 µH	(effective internal inductance)

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(16) **Report number** 09-IK-0103.01 incl. extension 1 to 4

(17) **Specific conditions of use**

1. The intrinsically safe circuit must be limited to overvoltage category I as defined in IEC 60664-1 and the circuits must be supplied exclusively from a certified intrinsically safe power source with the protection level "ia".
2. Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and temperature class for the JUMO dTRANS p20 type 403025 process pressure transmitter is shown in the following table:

Temperature class	T6	T5	T4	T3
Maximum permissible ambient temperature in top part of enclosure with electronics (°C)	-50 ... +50	-50 ... +65	-50 ... +85	-50 ... +85
Maximum permissible measuring temperature (°C)	+60	+70	+115	+175

3. Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and temperature class for the JUMO dTRANS p20 DELTA type 403022 process pressure transmitter is shown in the following table:

Temperature class	T4
Maximum permissible ambient temperature in top part of enclosure with electronics (°C)	-50 ... +60
Maximum permissible measuring temperature (°C)	+100

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4. Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and maximum surface temperature for the JUMO dTRANS p20 type 403025 process pressure transmitter is shown in the following table:

Surface temperature (°C)	T105
Maximum permissible ambient temperature in top part of enclosure with electronics (°C)	-50 ... +60
Maximum permissible measuring temperature (°C)	+100

5. Assignment between the maximum permissible ambient temperature in the electronics enclosure, measuring temperature and maximum surface temperature for the JUMO dTRANS p20 DELTA type 403022 process pressure transmitter is shown in the following table:

Surface temperature (°C)	T105
Maximum permissible ambient temperature in top part of enclosure with electronics (°C)	-50 ... +60
Maximum permissible measuring temperature (°C)	+100

6. In the temperature range of -40 °C ... -50 °C the lid with inspection glass of the appliance has to be additionally protected against mechanical impact- respectively collision effect.

(18) **Essential health and safety requirements**

In addition to the essential health and safety requirements (EHSRs) covered by the standards listed at item 9, the following are considered relevant to this product, and conformity is demonstrated in the report:

Clause **Subject**
None

(19) **Drawings and Documents**

See test report "Manufacturer's Documents"

(20) The marking of the equipment shall include the following:

Für JUMO dTRANS p20 Typ 403025: Ⓔx **II 1/2G Ex ia IIC T6 ... T3 Ga/Gb**
II 1/2D Ex ia IIIC T105 °C Da/Db

resp.

Für JUMO dTRANS p20 DELTA Typ 403022: Ⓔx **II 1G Ex ia IIC T4 Ga**
II 1D Ex ia IIIC T105 °C Da

部件名称 Product group: 403022	有毒有害物质或元素 Hazardous substances					
	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 Nut (Mutter)	○	○	○	○	○	○
螺钉 Screw (Schraube)	○	○	○	○	○	○

本表格依据 SJ/T 11364-2014的规定编制。
(This table is prepared in accordance with the provisions of SJ/T 11364-2014.)
O：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。
(O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.)
X：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。
(X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.)

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