JUMO SIRAS P21 DP

Differential pressure transmitter

Operating Manual

40302400T90Z001K000

V1.01/EN/00728473/2024-05-07

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Contents

1.1 General information

This document contains all the information required to ensure the product is used safely and as intended.

Preventing personal injury and material damage

- Ensure you have read and fully understood the document as well as the safety information and warnings
- Store the document in its entirety in an easily accessible location, and so that it can be read in full at all times
- Contact the manufacturer if you have any questions about the product or document

1.1.1 Warranty conditions

Improper use, failure to observe this manual, the use of underqualified personnel, or unauthorized modifications to the device that are not included in this manual, or that are even prohibited, release the manufacturer from liability for any resulting damage. In these cases, the manufacturer's warranty no longer applies.

1.2 Current document issue

The manufacturer reserves the right to update specific information in this document without notice. The version and the date of issue will be revised each time the document is updated.

1. Identify the version (1) and date of issue (2) on the title page of the document.

2. Scan the adjacent QR code or follow the hyperlink to download the latest document issue and further information about the product.

qr-403024-en.jumo.info

1.3 Other applicable device documentation

This document is supplemented by the documents listed below:

Product group	Document type
403024	Data sheet – JUMO SIRAS DP
409601	Data sheet – flow measurement with pitot tube
409602	Data sheet – flow measurement with orifice plate
	Flow product check list

To find the documents, enter the number of the product group in the search bar on the JUMO website.

1 Basic information

1.4 Definition of terms

Use in document	Definition
Medium, measurement medium	Gases and liquids without solids content
Product lifecycle	Product identification, acceptance of the goods, storage, installation, connection, operation, troubleshooting, maintenance, disposal

1.5 Symbols and signal words

1.5.1 Warning symbols

DANGER!

The signal word "DANGER" indicates an immediate danger.

Non-observance will lead to death or serious injury.

▶ The instructions in the warning notice must be observed and followed!

WARNING!

The signal word "WARNING" indicates an imminent danger.

Non-observance can lead to death or serious injury.

▶ The instructions in the warning notice must be observed and followed!

CAUTION!

The signal word "CAUTION" indicates an imminent danger.

Non-observance can lead to minor or moderate injury.

▶ The instructions in the warning notice must be observed and followed!

NOTICE!

The signal word "NOTICE" indicates possible damage to property.

Non-observance can lead to damage to devices, systems or the environment.

▶ Observe the instructions in the note for avoiding damage!

1.5.2 Note symbols

NOTE!

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

NOTE!

This symbol is used in tables and indicates that further information is provided after the table.

REFERENCE!

This symbol refers to **further information** in other sections, chapters, or other manuals.

FURTHER INFORMATION AND DOWNLOADS

This document uses QR codes and hyperlinks to provide further information, downloads, and contact options via the Internet.

DISPOSAL!

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

1 Basic information

NOTE!

This product is built based on state-of-the-art technology and is safe to use. It has been tested and was shipped from the factory in safety-instrumented, perfect working order.

A safe working and operating environment protects the user from death or serious injury, and protects the product and plant against damage.

As a result, it is essential to observe and take on board the following safety information!

2.1 Intended use

The differential pressure transmitter JUMO SIRAS P21 DP (type 403024) is a device for measuring pressure or differential pressure, or for measuring flow according to the differential pressure principle in gases and liquids without solids content.

With the 4 to 20 mA output signal, you can transfer the measured values to an automation system. The current output is the only analog interface of the device.
When the SIL function is activated, you are allowed to use the device as a safety measuring probe in a control circuit with SIL 2. With two devices working in parallel, you achieve SIL 3.

The user is responsible for choosing the right material required for the process, and for complying with the specifications stated in the technical data, in the data sheet, and in the Safety Manual (e.g., the process and ambient temperature, positive pressure ranges, pressure surges).

Unprofessional or improper use of the device can lead to application-related risks (e.g., corrosion due to selecting the wrong material, or consequential damage due to incorrectly installing or adjusting the device).

JUMO shall not be held liable for damage resulting from unprofessional or improper use.

NOTE!

The safety function is only valid for "safety-related output signals". The device checks these signals when activating the safety function as part of the validation.

Usage	Suitable	Not suitable
Continuous measurement of pressure or the fill level or flow derived from it	x	
For conductive and non-conductive media	x	
SIL 2/SIL 3 safety applications[a]	x	
In potentially explosive areas		x

[a] To achieve SIL 3, you must use two devices in parallel

NOTE!

The device is not suitable for safety applications in the sense of the Pressure Equipment Directive 2014/68/EU.

2 Safety

2.2 Qualification of personnel

The personnel deployed must meet the following requirements in all phases of the product lifecycle:

- Trained electrical, mechanical, and plant engineering personnel.
- Members of personnel are familiar with this documentation and the safety information and warnings it contains.

2.3 Safety measures for mounting, establishing the electrical connection, maintenance, and cleaning

Adequately prepare authorized, qualified personnel

- Ensure you have read and fully understood the operating manual, in particular the safety information and warnings
- Contact the manufacturer if you have any questions or queries

Ensure a safe working and operating environment

- Check the environmental influences to which the device will be exposed
- Observe the installation notes
- Switch off the voltage and secure it so that it cannot switch on again
- Stop medium circulation, empty the pipes
- Use only suitable tools when working on the device and plant
- Check that the process connections are leak-tight during startup, operation, and any subsequent startups
- Observe the relevant accident prevention regulations and safety requirements for electrical devices

2.4 Safety measures during operation

Create a safe operating environment over the product's entire service life

- Only ever use the device for its intended purpose
- Do not place the device or process connections under mechanical strain
- Systematically check that the process connections are leak-tight
- Protect the device from electromechanical interference, UV radiation, and the weather (when using outside)
- Only perform modifications and repairs to the product if expressly permitted by the operating manual

2.5 Hazardous materials

Using hazardous materials as a medium may result in abrasive and corrosive damage to components of the product that come into contact with the medium. The medium may leak and present a fire hazard and a risk to health.

Carry out a risk assessment taking into consideration the safety data sheet for the relevant hazardous substance for mounting, operation, maintenance, cleaning, and disposal:

- Comparison and systematic checking of the durability of the components of the product that come into contact with the medium and the admissible environmental influences.
- Assessment of the risk to people and the environment.
- Assessment of the fire hazard due to the product materials, the admissible environmental influences, and the voltage supply.

2.6 Acceptance of goods, storage, and transport

2.6.1 Scope of delivery

1× JUMO SIRAS P21 DP – device in ordered version including calibration certificate
1× JUMO SIRAS P21 DP operating manual including Safety Manual
1 × licence code for JUMO setup program for JUMO SIRAS P21

Options

USB HART® modem, part no. 00443447
Further deliverable accessories – see data sheet 409700 Shut-off valves, measurement device holders, transition pieces, seals

2.6.2 Checking the delivery

- Ensure that the packaging and its contents are undamaged.
- Check the delivery for completeness against the packing slip and order details.
- Inform the supplier immediately if there is any damage.
- Store damaged parts until clarification is received from the supplier.

2.6.3 Storage

Improper storage may result in damage to the device.

- Store the device in a dry and dust-free environment.
- Observe the device storage temperature range, see "Storage", Page 28.

2.6.4 Packaging and transport

If the device is not protected properly against external influences, it may become damaged during transport.

- Transport the device in an impact-proof packaging solution that protects it against moisture and dirt.
- Also comply with the admissible storage temperatures while the device is being transported.
- Protect all electrical and mechanical connections from damage.

2.7 Returning devices

WARNING!

Risk of injury due to hazardous substance residue in device

Risk of serious injuries in the event of contact with the medium!

▶ Before returning the device to the manufacturer, rinse hazardous substances out of all hollow spaces in the device, and neutralize them!

Proceed as follows to return devices for repairs or recalibration:

1. Rinse hazardous substances out of all hollow spaces in the device, and neutralize them!
2. The Supplementary sheet for product returns must first be completed correctly and signed. Then enclose it with the shipping documents and attach it to the packaging, ideally on the outside.
3. Use the original packaging or a suitably secure container for sending the device.

Further information on this chapter:

Cleaning the device	⇨ chapter 11 "Maintenance", Page 97

2.8 Disposal

WARNING!

Risk of injury due to hazardous substance residue in device

Risk of serious injuries in the event of contact with the medium!

▶ Before disposing of the device, rinse hazardous substances out of all hollow spaces in the device, and neutralize them!

DISPOSAL

Devices and/or replaced parts should not be placed in the trash at the end of their service life as they consist of materials that can be recycled by specialist recycling plants.

Dispose of the device and the packaging material in a responsible and environmentally friendly manner.

For this purpose, observe the country-specific laws and regulations for waste treatment and disposal.

The purpose of the device is to measure pressure and fill level, monitor minimum, maximum, and range values of gases and liquids without solids content, as well as measuring flow according to the differential pressure principle. It provides highly accurate measurements and readings, and is easy to use. The housing and sensor are manufactured from high-grade stainless steel.
The device can be programmed via the rotary knob and the LCD display or via the HART® interface using a handheld device or using a PC. This enables you to adapt the device for various different types of measuring tasks. For operation via the HART® interface, there is a specially developed WindowsTM-based software that you can use.

For flow measurement, connect the two pressure inputs of the device to a pipe upstream and downstream of an orifice plate according to DIN EN ISO 5167-2 or to a pitot tube. By means of the pressure difference measured upstream and downstream of the orifice plate/pitot tube, the device can almost proportionally output the flow through the pipe.

The pressure transmitter with 4 to 20 mA and HART® protocol has been assessed in terms of functional safety and is certified by TÜV Nord according to DIN EN 61508/-1/-2/-3, edition 2.0. These measuring devices are suitable for process fill level monitoring and process pressure monitoring up to SIL 2. Please see the Safety Manual for further information on this topic.

WARNING!

If the device, or another device connected to it, fails, e.g., due to an operating error, this could result in dangerous malfunctioning of the entire plant.

▶ Therefore, please make sure you read and observe the section "Safety Manual", Page 43 in this operating manual.

NOTE!

Read this operating manual before putting the device into operation. 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 carry out any unauthorized manipulations. This could endanger your rights under the warranty!
Please contact the nearest branch office or the head office.

3.1 Areas of application

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 (volume or mass)
- Fill level (level, volume, or mass)

3 Device Description

Functional safety use

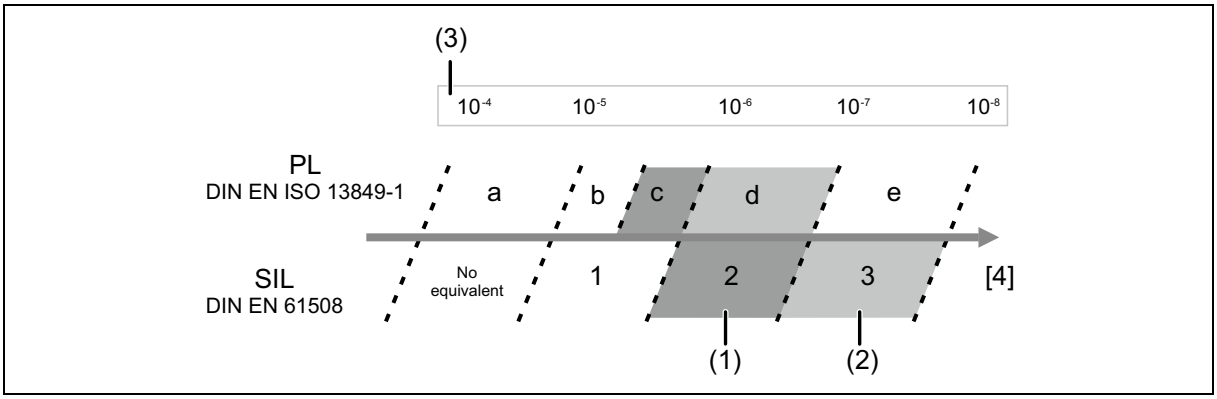
WARNING!

Loss of safety function during parameterization!

During parameterization, the safety function does not function. This could result in a dangerous operating situation.

▶ Make sure that the machine that uses the safety signal is in a safe operating state during parameterization of the device.

The device uses the standard 4 to 20 mA current interface, has been evaluated in terms of functional safety, and certified by TÜV Nord according to DIN EN 61508-1 up to -7, Edition 2.0.
You can use the device for process fill level monitoring and process pressure monitoring up to SIL 2/PLc (one device) SIL 3/PLd (two devices). Please refer to chapter 7 "Safety Manual", Page 43 in this operating manual for further information on this topic.



(1) When using one device SIL 2/PLc

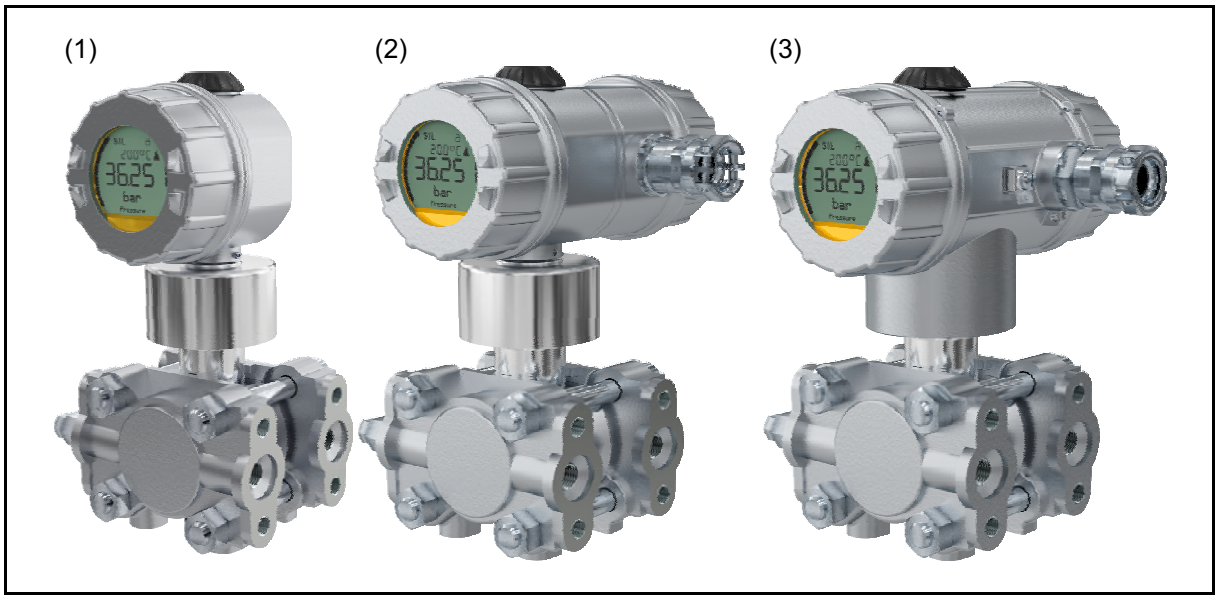
(2) When using two devices: SIL 3/PLd

(3) Probability per hour of a failure

If you would like to use the safety function, you must apply the corresponding parameterization and activate the safety function chapter 9.4.2 "Activating the safety function", Page 78.

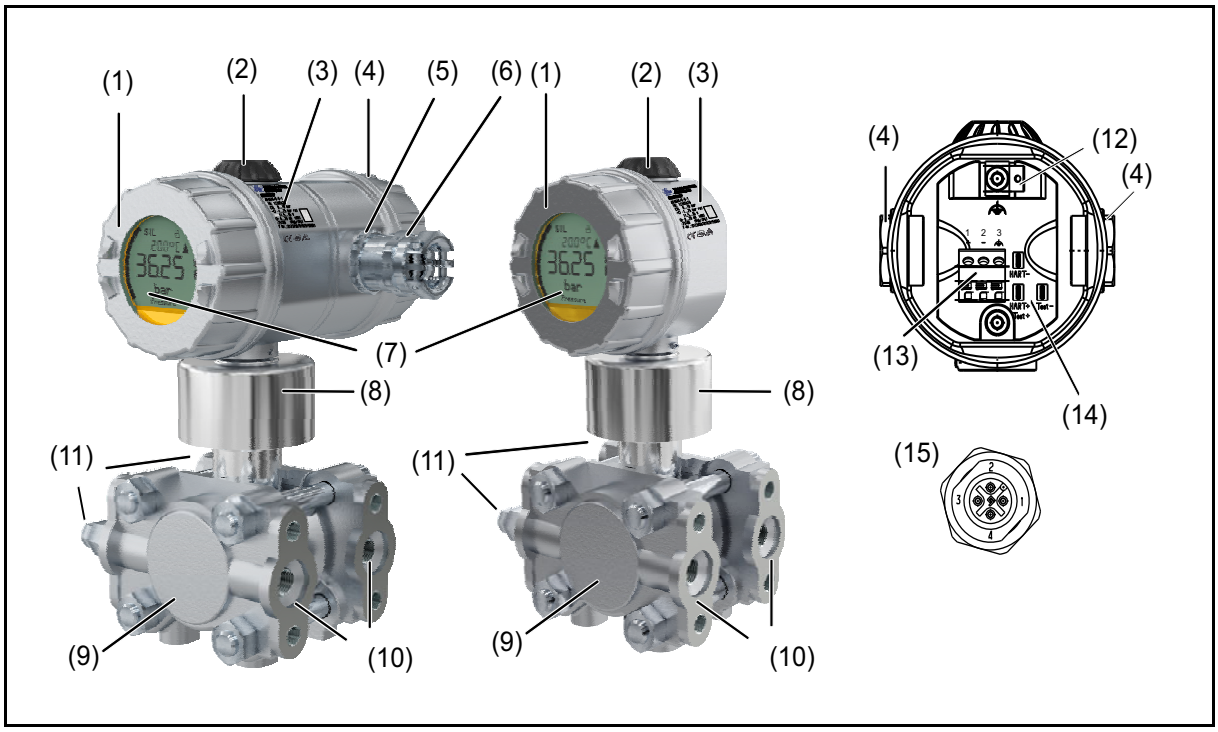
Device overview

The device is available in the following three versions:



(1) Short housing, stainless steel
(2) Long housing, stainless steel
(3) Long housing, precision casting (Ex-d version)

4 Identifying the device version

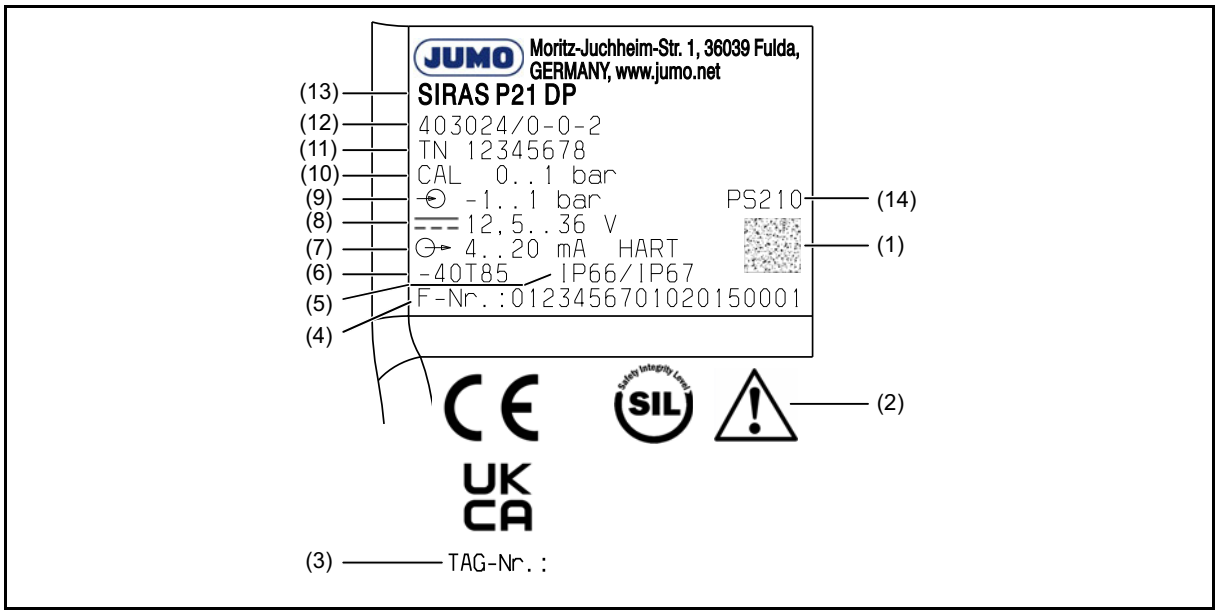


(1) Bezel
(2) Rotary knob
(3) Nameplate
(4) Housing lid, rear
(5) Flange for cable fitting
(6) Cable fitting (standard)
(7) LCD display
(8) Differential pressure sensor unit
(9) Pressure measuring cell
(10) Process connection
(11) Vent valve
(12) Functional ground
(13) Voltage supply
(14) Test connections for HART®/ voltage supply
(15) Connection M12, voltage supply, short housing

4.1 Nameplate

Housing

The identification marking can be found on the side of the device housing.



(1)	DataMatrix code fabrication number	(2)	Note: "Read the operating manual!"
(3)	TAG no. – customer-specific ID	(4)	Fabrication number
(5)	Protection type provided by housing (IP Code)	(6)	Temperature range
(7)	Output signal	(8)	Voltage supply
(9)	Nominal measuring range	(10)	Default measuring range
(11)	Part no.	(12)	Type
(13)	Type designation	(14)	Maximum admissible pressure

Date of manufacture

The device's date of manufacture (year and calendar week) is part of the fabrication number. Numbers 12 to 15 denote the year of manufacture and the calendar week.

Safety function

If you activate the safety function, you can use the device in a safety-related control circuit as a measuring probe for pressure, fill level, or flow.

In this capacity, the individual device achieves Performance Level c (PLc) according to DIN EN ISO 13849-1 and Safety Integrity Level 2 (SIL 2) according to DIN EN 61508. When using two devices in a redundant setup, you achieve Performance Level d (PLd) according to DIN EN ISO 13849-1 and Safety Integrity Level 3 (SIL 3) according to DIN EN 61508. The systematic capability for hardware and software (SC) according to DIN EN 61508 corresponds to Class SC 3.

Before putting the device with activated safety function into operation, you must first define the relevant parameters in the chapter 10 "Configuration", Page 81 of the Safety Manual. Transfer these parameters to the device. This is carried out either on the device itself or using the supplied software.

You can only activate the safety function on the device itself.

4 Identifying the device version

4.2 Order details

	(1)	**Basic type**
403024		JUMO SIRAS P21 DP – differential pressure transmitter
	(2)	**Basic type extension**
000		None
	(3)	**Explosion protection**
0		None
1		ATEX, IECEx ia (in preparation)
2		ATEX, IECEx ia + d combined release (in preparation)
	(4)	**Housing**
1		Short, stainless steel, with M12 connection[a]
2		Long, stainless steel, with cable fitting
3		Long, precision casting, with cable fitting
	(5)	**Electrical connection**
36		Round plug M12 × 1
93		Metal cable fitting
	(6)	**Lid material**
20		CrNi (stainless steel)
	(7)	**Display**
1		With display (LCD)
	(8)	**Operation**
1		With rotary knob
	(9)	**Input – nominal measuring range**
532		0 to +1 bar DP
531		-1 to +1 bar DP
533		-1 to +6 bar DP
534		-1 to +100 bar DP
	(10)	**Output**
410		4 to 20 mA, two-wire with HART® protocol
	(11)	**Process connection**
511		2 x pressure connection 1/4-18NPT according to DIN EN 837
	(12)	**Process connection material**
20		CrNi (stainless steel)
	(13)	**Measuring system filling medium**
01		Silicon oil

	(14)	Extra codes
000		Without extra code
100		Customer-specific configuration[b]
624		Oil and grease-free
633		Mounting brackets for 2" pipe
634		With TAG number

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

[b] Please specify the setting you want in plain text. For default settings, see 84.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)		(12)		(13)		(14)
Order code		/		-		-		-		-		-		-		-		-		-		-		-		/	
Order example	403024	/	000	-	0	-	2	-	82	-	20	-	1	-	1	-	533	-	410	-	511	-	20	-	1	/	000

4.3 Accessories

Designation	Part no.
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
5-pole cable box, straight, M12 × 1, without a cable	00419130
5-pole cable box, angled, M12 × 1, without a cable	00419133
HART® modem USB[a]	00443447
Holder for wall and pipe mounting	00543777
Ex-i repeater power supply and input isolating amplifier 707530/38	00577948
JUMO flowTRANS DP P01/P02/P03/P04 pitot tube	
JUMO flowTRANS DP R01/R02 orifice plate according to DIN EN ISO 5167-2	

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

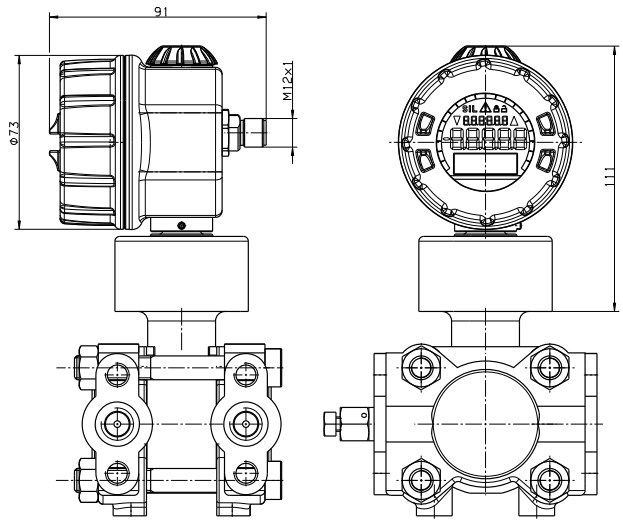
4.4 Software

Designation	Part no.:
JUMO setup program SIRAS P21 series	00770008
Device Description (DD); available via the FieldComm Group website	

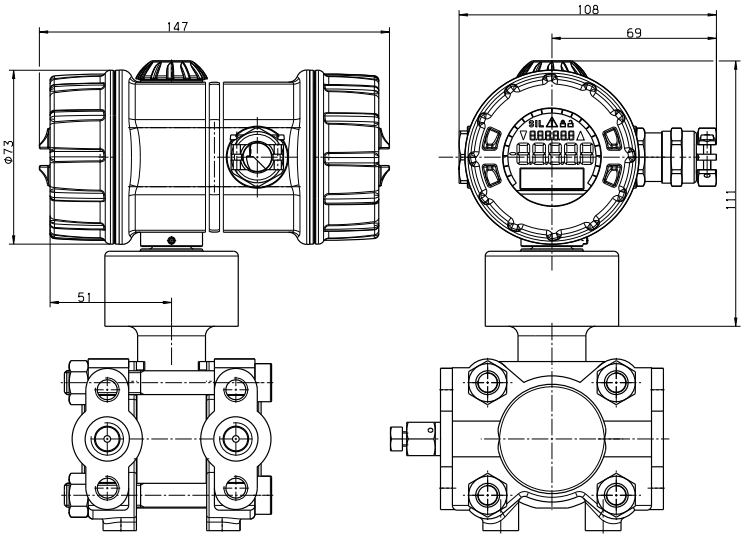
4 Identifying the device version

4.5 Dimensions

Type 403024/000-0-1 (short, stainless steel, with M12 connection)

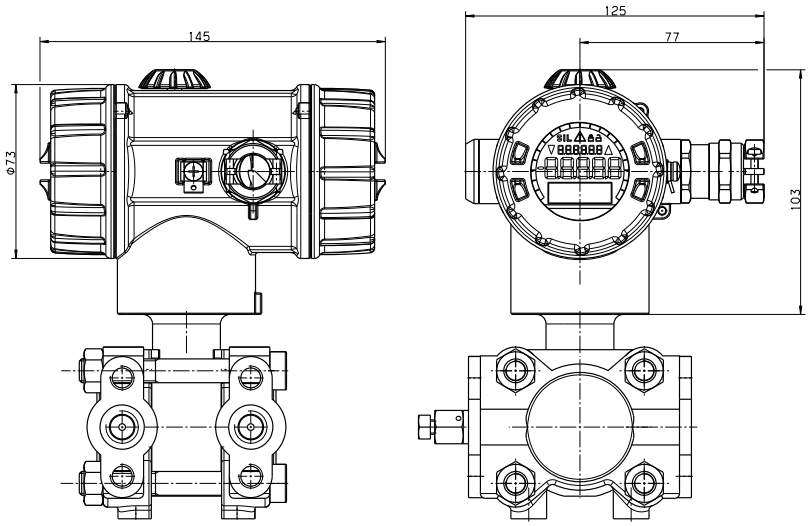


Type 403024/000-0-2 (long, stainless steel, with cable fitting)

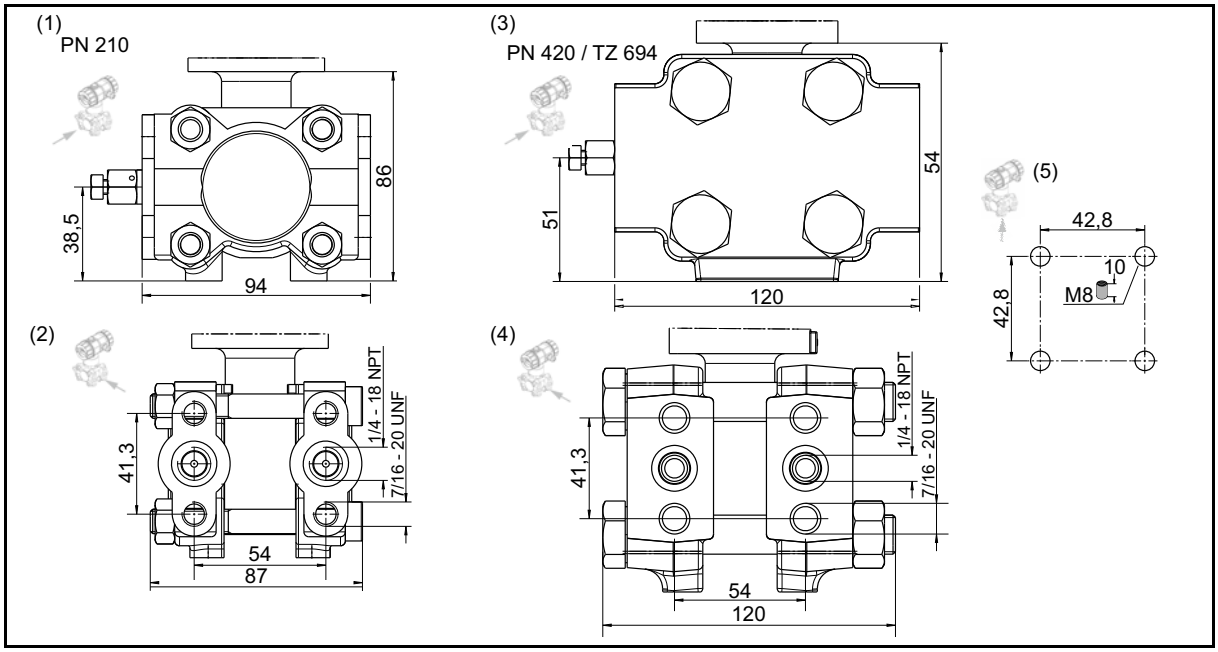


M20 × 1.5 cable fitting

Type 403024/000-0-3 (precision casting, with cable fitting)



Cable fitting M20 x 1.5 Ex-d version



1	Pressure measuring cell PN210, front view	2	Pressure measuring cell PN210, side view
3	Pressure measuring cell PN420, front view	4	Pressure measuring cell PN420, side view
5	Borehole diagram, fastening of all pressure measuring cells		

4 Identifying the device version

5.1 General Information

Reference conditions	DIN EN 60770 and DIN EN 61298
Ambient temperature	25 °C ±5 °C
Humidity	5 - 80 % RH ±5 %
Ambient pressure	Constant, 860 to 1060 mbar (12.47 to 15.37 psi)
Position of measuring cell	Horizontal ±1°
Voltage supply	24 V DC ±3 V DC
Sensor system	Silicon sensor with separating membrane made from stainless steel
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	
Installation position	Any
Calibration position	Device upright, process connection at the side on the pressure measuring cell
Position-dependent zero offset	Relative pressure: zero point correction is possible on-site or via setup
	Absolute pressure: manual readjustment is possible
Display	Dotmatrix LCD with 96 x 32 pixels, 7-segment digit display for pressure and temperature, pictograms for SIL, warning triangle, configuration locking, LED backlight, bargraph with 20 segments for analog output
Languages	German; English; French; Spanish, Russian
Alignment	Horizontal, can be rotated in 90° angle increments Housing rotatable by ±160°
Large display area	27 x 9 mm, font size 9 mm, 5-digit
Font color	Black
Displayable 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 configured pressure unit, fill level measurement unit, or flow unit
Output current	mA
Sensor temperature	°C, °F
Additional display data	Minimum pressure, maximum pressure, errors, measuring range overflow Measuring range underflow, operating hours, device parameters
Operation on site	With rotary knob and LCD
setup program	Via HART® interface
Interface	Two-wire 4 to 20 mA with overlaid HART® signal, HART® protocol version 7 HART® signal is for configuration and remote diagnosis

5 Technical data

5.2 Input

Nominal measuring range/ measuring range Default setting[a]	-1 to +1 bar DP	0 to 1 bar DP	-1 to +6 bar DP	-1 to +100 bar DP
Pressure measuring cell	PN210	PN210		
Smallest measuring span	5 mbar	5 mbar	60 mbar	2.5 bar
Overload capability on one side	160 bar	160 bar	200 bar	200 bar
Overload capability on both sides	240 bar	240 bar	240 bar	240 bar

[a] The default setting of the measuring range corresponds to the nominal measuring range

5.3 Output

Analog output	
Output	4 to 20 mA, two-wire with HART® version 7
Step response time T63	≤ 200 ms without damping
Damping	Adjustable 0 to 100 s
Burden 4 to 20 mA with HART®	≤ (U_B - 12.5 V) / 0.024 A Min. 250 Ω, max. 1100 Ω
Output signal limits	3.6 to 24 mA
Transmission behavior	Linear, square root extraction or Characteristic line that extracts the square root on both sides for bidirectional flow calculation
Failure signal	According to NAMUR NE 43 Max. alarm: 21.6 mA Min. alarm: 3.6 mA
Reference accuracy	≤ ±0.05 % referring to 20 mA
Residual ripple	Max. ±3 % residual ripple within the admissible voltage range (without affecting the 4 to 20 mA signal)
Influence of voltage supply	≤ ±0.1 µA /V

5.4 Voltage supply

For version Explosion protection 0 (without)	DC 11.5 to 36 V
For Ex version	DC 12 to 28 V
Residual ripple	Residual ripple of voltage supply ≤3 % (without affecting the 4 to 20 mA signal)
Influence of voltage supply	≤ ±0.1 µA /V

5.5 Mechanical features

Process connection, Materials of membrane	
20 (stainless steel)[a, b]	316 L
Flange	Stainless steel 316
Seal	PTFE
Materials of housing	
1 (short, stainless steel)	Stainless steel 1.4404
2 (long, stainless steel)	Stainless steel 1.4404, VMQ
3 (precision casting)	Precision casting 1.4408
Lid 20 (stainless steel)	Precision casting 1.4408, seal FPM
Electrical connection 36 (round plug M12 × 1)	Brass, nickel-plated
Electrical connection 93 (cable fitting, metal)	Brass, nickel-plated
Control knob	PA
Weights	
Type 403024/000-0-1 (housing, short)	Approx. 3.0 kg
Type 403024/000-0-2 (housing, long)	Approx. 3.3 kg
Type 403024/000-0-3 (housing, precision casting)	Approx. 4.0 kg

[a] The device is not suitable for the heating oil medium.

[b] The medium is not allowed to corrode the membrane material.

5.6 Environmental influences

5.6.1 Ambient temperature range

Version	**Ambient temperature range**[a, b]
Connection 93 cable fitting (metal)	-40 to +85 °C
Connection 36 round plug M12 x 1	-25 to +85 °C

[a] Operating temperature range of the LCD display: -20 to +85°C; outside of this range, the display will not work

[b] It must be noted that, below -40 °C, there will be functional limitations. In safety-related applications, operation is only admissible if the ambient temperature is no lower than -40 °C.

5.6.2 Average temperature range

Average temperature range	
Standard	-40 to +85 °C

5.6.3 Protection type

Protection type	
Protection type	IP66/IP67 according to DIN EN 60529

5.6.4 Climate class

Climatic features according to DIN EN 60721-3-X	
Stationary use, weather-proof acc. to DIN EN 60721-3-3	from IE37: 3K7/3M3
Stationary use, not weather-proof acc. to DIN EN 60721-3-4	from IE42: 4K3/4M3
Transport acc. to DIN EN 60721-3-2	from IE23: 2K4/2M2

5.6.5 Electromagnetic compatibility

Electromagnetic compatibility acc. to DIN EN 61326-3-1, DIN EN 61326-2-3, DIN EN 60730-2-6 and NAMUR Recommendation NE 21	
Maximum deviation	≤ 0.5 % of span
Interference emission:	Class B
Interference immunity	Industry

5.6.6 Mechanical load

Admissible mechanical load:	
Vibration strength	2 G, 10 to 2000 Hz acc. to IEC 60068-2-6
Shock resistance	15 G for 6 ms acc. to IEC 60068-2-27

5.6.7 Storage

Storage	
Storage temperature	-40 to +85 °C
Admissible humidity of the device exterior hull	90 % without condensation

5.7 Accuracy

Contains the maximum measurement deviation, including non-linearity after limiting point setting, hysteresis, non-repeatability, measurement deviation of the measuring range end value and measurement deviation at the measuring range start.

Measurement deviation in the nominal measuring range	Reference accuracy[a] in % MSP[b]	Reference accuracy [a] in % MSP[b]
-1 to +1 bar	r ≤ 10 : 1 ± 0.05	r > 10 : 1 ± (0.00225 x r + 0.0275)
0 to +1 bar	r ≤ 5 : 1 ± 0.075	r > 5 : 1 ± (0.0095 x r + 0.0275)
-1 to +6 bar	r ≤ 10 : 1 ± 0.05	r > 10 : 1 ± (0.00225 x r + 0.0275)
-1 to +100 bar	r ≤ 5 : 1 ± 0.10	r > 5 : 1 ± 0.02 x r

[a] r = spread – ratio of the measuring span calibrated per default to the configured measuring span

[b] MSP = configured measuring spans

Influence of the ambient temperature in the nominal measuring range	In the range -10 to +60 °C[a,b]	In the range -30 to -10 °C and +60 to +85 °C[a,b]
-1 to +1 bar	± (0.03 x r + 0.017)	± (0.06 x r + 0.034)
0 to +1 bar	± (0.03 x r + 0.017)	± (0.06 x r + 0.034)
-1 to +6 bar	± (0.012 x r + 0.017)	± (0.024 x r + 0.034)
-1 to +100 bar	± (0.042 x r + 0.04)	± (0.084 x r + 0.08)

[a] r = spread – ratio of the measuring span calibrated per default to the configured measuring span

[b] MSP = configured measuring spans

Influence of the ambient temperature in the nominal measuring range	In the range -40 to -30 °C[a,b]	
-1 to +1 bar	± (0.06 x r + 0.3)	
0 to +1 bar	± (0.06 x r + 0.2)	
-1 to +6 bar	± (0.024 x r + 0.4)	
-1 to +100 bar	± (0.084 x r + 0.5)	

[a] r = spread – ratio of the measuring span calibrated per default to the configured measuring span

[b] MSP = configured measuring spans

The basic accuracy comprises the reference accuracy and the influence of the ambient temperature (pressure sensor and electronics error of the analog output of 0.05 %) for the temperature range of -10 to + 60 °C.

Basic accuracy in nominal measuring range	r = 1 : 1 in % MSP[a]	r = 2 : 1 in % MSP[a]	r = 3 : 1 in % MSP[a]	r = 4 : 1 in % MSP[a]	r = 5 : 1 in % MSP[a]
-1 to +1 bar	± 0.11	± 0.14	± 0.17	± 0.20	± 0.23
0 to +1 bar					
-1 to +6 bar	± 0.10	± 0.11	± 0.12	± 0.13	± 0.14
-1 to +100 bar	± 0.14	± 0.18	± 0.22	± 0.26	± 0.31

[a] MSP = configured measuring spans

The long-term stability relates to the measuring span calibrated per default.

Long-term stability in the nominal measuring range	1 year in % MSP[a]	5 years in % MSP[a]	10 years in % MSP[a]
-1 to +1 bar	± 0.025	± 0.050	± 0.075
0 to +1 bar			
-1 to +6 bar	± 0.038	± 0.075	± 0.150
-1 to +100 bar	± 0.050	± 0.070	± 0.100

[a] MSP = configured measuring spans

The total deviation is calculated based on the combined measuring accuracies of the basic accuracy (reference accuracy as well as the influence of ambient temperature and static pressure and the electronics error) and the long-term stability.
The basic accuracy used here corresponds to the temperature range of -10 to +60 °C and a spread (r) of 1 : 1.

Total deviation in nominal measuring range	**1 year in % MSP[a]**	**5 years in % MSP[a]**	**10 years in % MSP[a]**
-1 to +1 bar	± 0.14	± 0.16	± 0.19
0 to +1 bar			
-1 to +6 bar	± 0.14	± 0.18	± 0.25
-1 to +100 bar	± 0.19	± 0.21	± 0.24

[a] MSP = configured measuring spans

Device-internal accuracy specification with respect to flow as a calculated variable from the differential pressure. A level control-dependent factor conditioned by the root characteristic line is added to the potential deviation of the differential pressure.

NOTE!

As the characteristic line that extracts the square root is stored as bidirectional, this also applies for the negative axis in the case of a corresponding, symmetrical measuring range. It is only for small flows that the differential pressure principle becomes increasingly inaccurate.

Pressure adjustment in %	**Flow rate error factor: differential pressure (incl. temperature drift)**
≥ 50 %	≤ 0.71-fold
≥ 25 %	≤ 1.00-fold
≥ 20 %	≤ 1.12-fold
≥ 11.1 %	≤ 1.50-fold
≥ 6.25 %	≤ 2.00-fold
≥ 2.78 %	≤ 3.00-fold

5.8 Approvals and approval marks

SIL	
Test facility	TÜV Nord (German Technical Inspection Agency)
Certificate/test no.	SEBS-A.084722/14 V1.0
Inspection basis	DIN EN 61508/-1/-2/-3: 2011 DIN EN ISO 13849-1: 2016 DIN EN ISO 13849-2: 2013
Valid for	Entire JUMO SIRAS P21 device range

NOTE!

Please see the type examination certificate chapter 13.2 "Examination certificate", Page 116 regarding special conditions for use.

6.1 Before mounting

WARNING!

Risk of injury resulting from pressurized media!

If you open the pressurized system, you could be injured by components that are slung away or by the escaping medium.

▶ Before starting with the installation, make sure that the system is depressurized.

NOTICE!

Exceeding the device temperature range can result in operational malfunction!

If the device temperature exceeds +85 °C, this can cause the device to malfunction.

▶ If you use the device in a hot environment or for measuring hot media, you will have to ensure – potentially through using additional ventilation or cooling measures – that the device temperature does not exceed +85 °C.

NOTE!

The admissible medium temperature range is -40 to +85 °C.
The device cannot be guaranteed to function properly in a temperature range below -40 °C.
In safety-related applications – operation with activated safety function – the ambient and medium temperature are not allowed to go below -40 °C!

NOTE!

You can install the device above or below the pressure tapping point. Choose an installation location that is easily accessible and largely free from vibration. Make sure that the ambient temperature stays within the admissible limits and that the temperature does not become affected by thermal radiation.

Checking for seal tightness

After connecting the pressure, check it is leak tight.

CAUTION!

Risk of accident when opening or closing shut-off valves!

If you operate the shut-off valves incorrectly or open/close them in the wrong order, this could result in personal injury or considerable material damage.

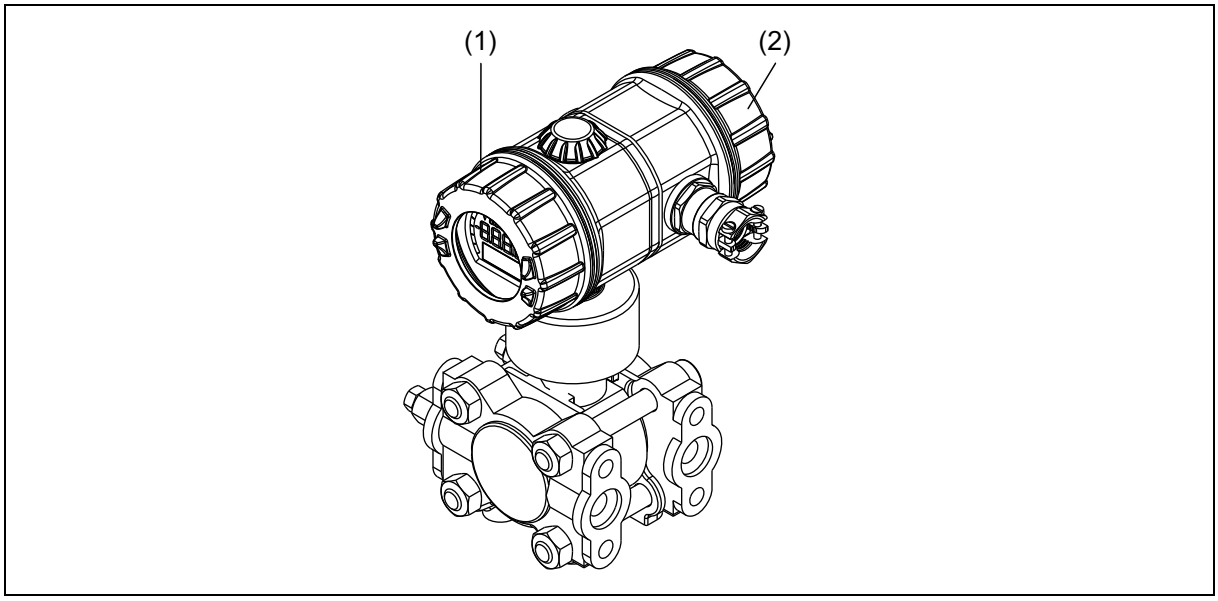
▶ Open and close the valves only if you have been authorized to do so by the operator and have the necessary specialist knowledge and expertise.

▶ Observe the order when opening or closing the valves.

▶ When **using the device with toxic media**, do not vent the device, or only vent it if you observe the safety data sheets for the respective media!

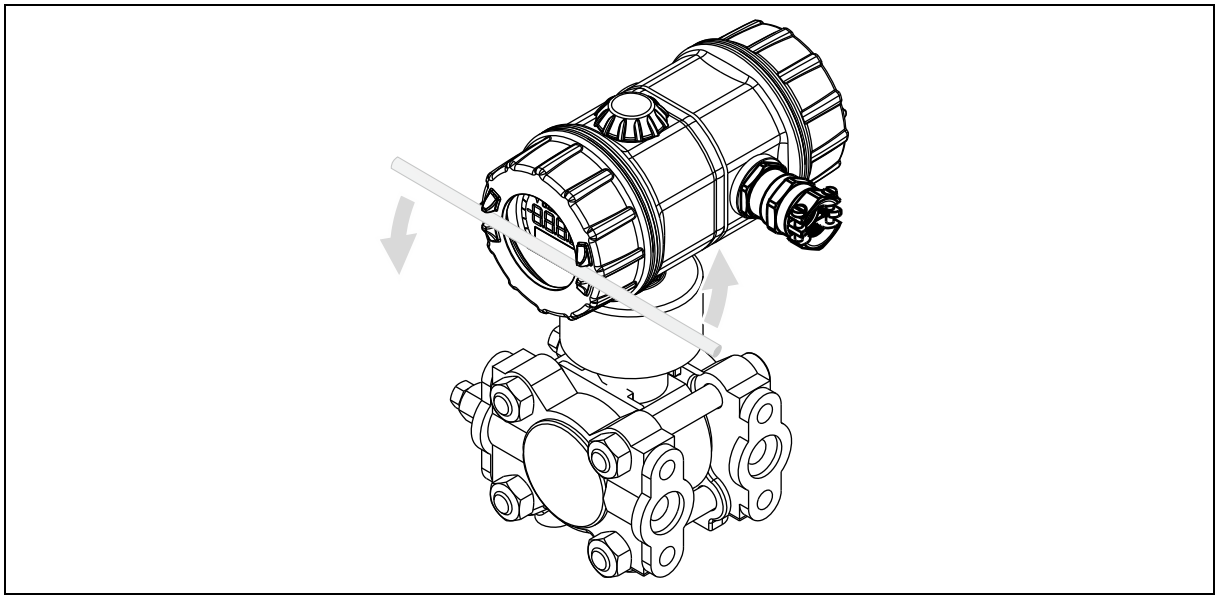
6.2 Unscrew the front ring or case lid

The version with a short housing is equipped only with a bezel. The version with a long housing is equipped with a bezel and a housing lid on the rear.



(1) Bezel (2) Housing lid

You can unscrew the bezel and the rear-side housing lid by hand or with a screwdriver.



NOTE!

Twist the bezel on by hand only!

6.3 Rotating the LCD (display)

The standard installation position of the device is vertically upright.

It is possible to install the device in any other installation position. To help make it easier to read the device display, you can rotate the display module by 90° angle increments in the housing. In addition, you can rotate the housing on the sensor. See "Rotating the housing", Page 34.

NOTICE!

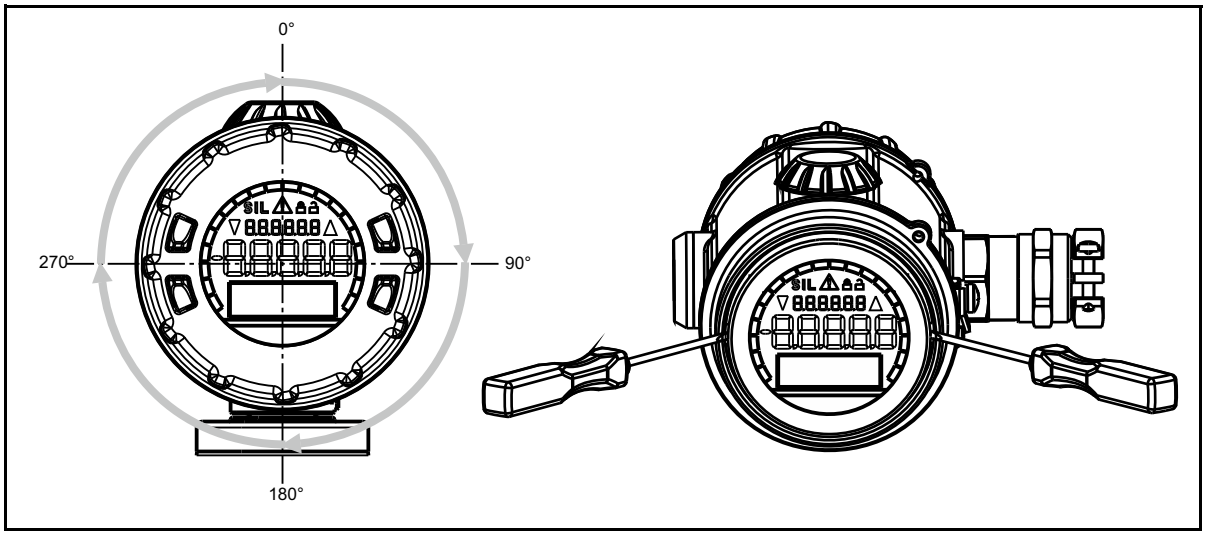
Danger of damaging the cables and electronics components of the device!

If you remove the display module from the housing and rotate it, you could damage the cables, connectors, and electronics components.

- ▶ Handle the display module with great care.
- ▶ Do not rotate the cables any further than is necessary to rotate the module.

NOTE!

You can rotate the display when the device is installed in the plant and also when it is not installed.



Rotating the display:

1. Disconnect the device from the voltage supply.
2. Unscrew the bezel. See "Unscrew the front ring or case lid", Page 31
3. Remove the display from the device.
   If required, use a precision screwdriver.
   When removing the display, watch out for the connecting cables of the device.
4. Rotate the display (90° angle increments) and insert into the housing in the desired position.
5. Check that the O-ring is properly positioned on the housing.
6. Place the bezel on the housing and hand-screw it on.

6.4 Rotating the housing

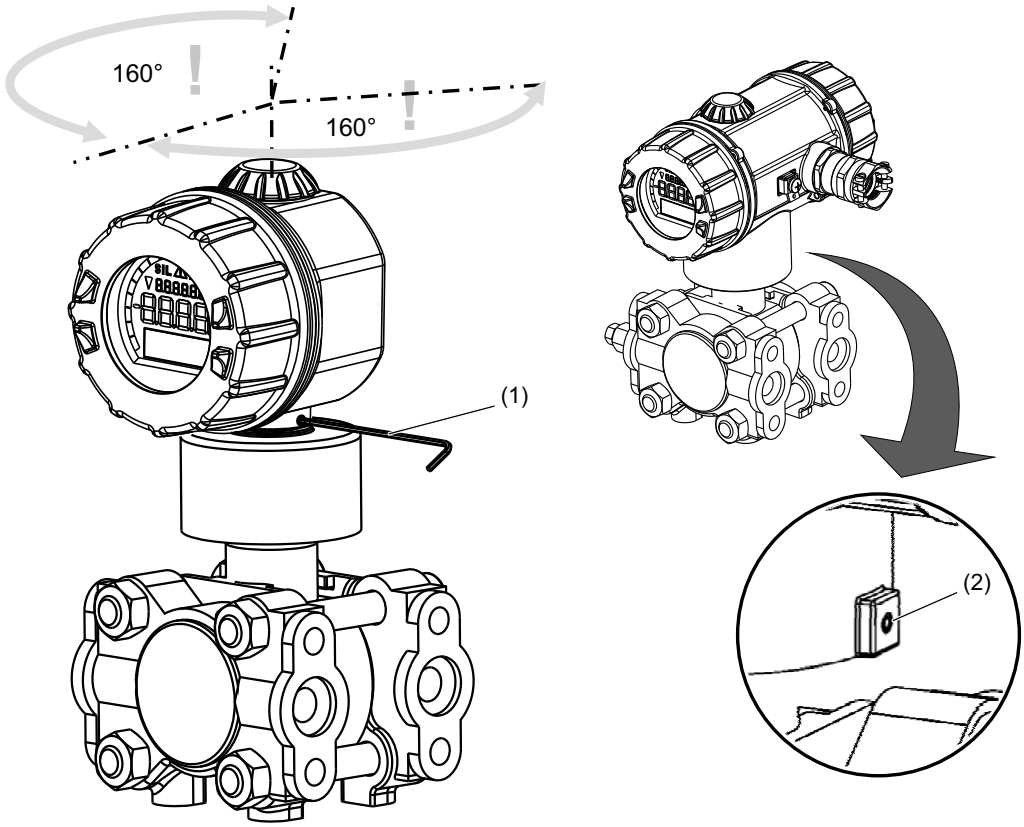
If you are not happy with the readability of the display, you can either rotate the display in the housing – see chapter 6.3 "Rotating the LCD (display)", Page 33 – or rotate the housing of the device on the sensor by ±160°.

NOTICE!

Risk of damaging the device internally!

It is also possible to rotate the housing on the sensor by more than 160° to the left or right. There is no stop for this on the device. If you rotate the housing on the sensor by more than 160° to the left or right, you could damage the device internally.

▶ Make sure that you adhere to the rotation limits



(1) Hex key 1.5 mm
Figure shows device with short housing

(2) For devices with a long housing (precision casting – 3), the screw is located on the rear side of the housing

Starting point: The device is installed

Rotating the device:

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**.

6.5 Process connection

Seals

When selecting the seals, make sure to observe the operating conditions (e.g., material compatibility).

Tightening torques

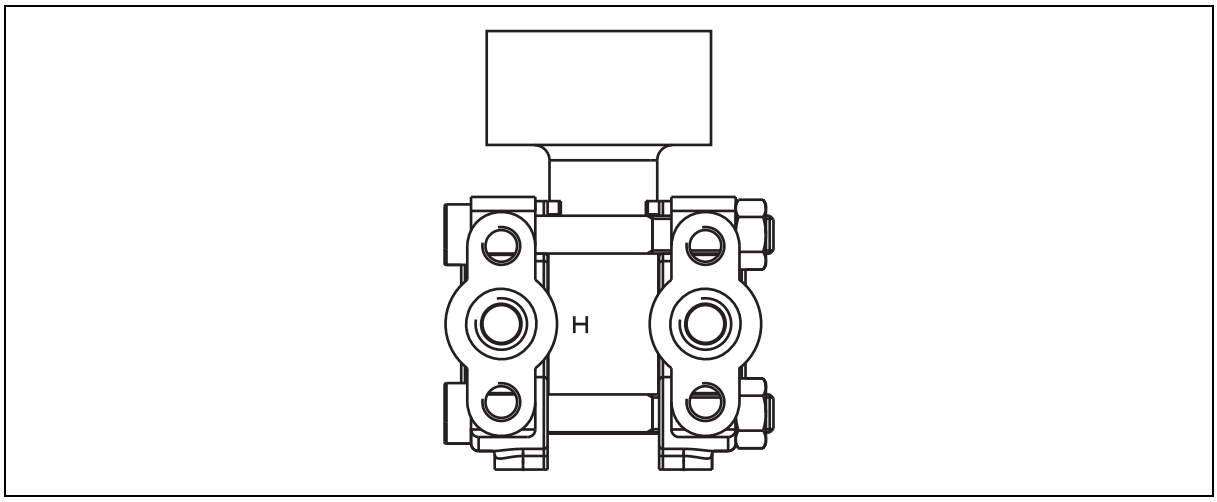
Maximum 35 Nm

The correct tightening torque is dependent on the size, material, and shape of the seal used, as well as the pressure connection of the device.

NOTE!

Depending on the plant configuration, the following examples must be adjusted to the requirements.

Differential pressure



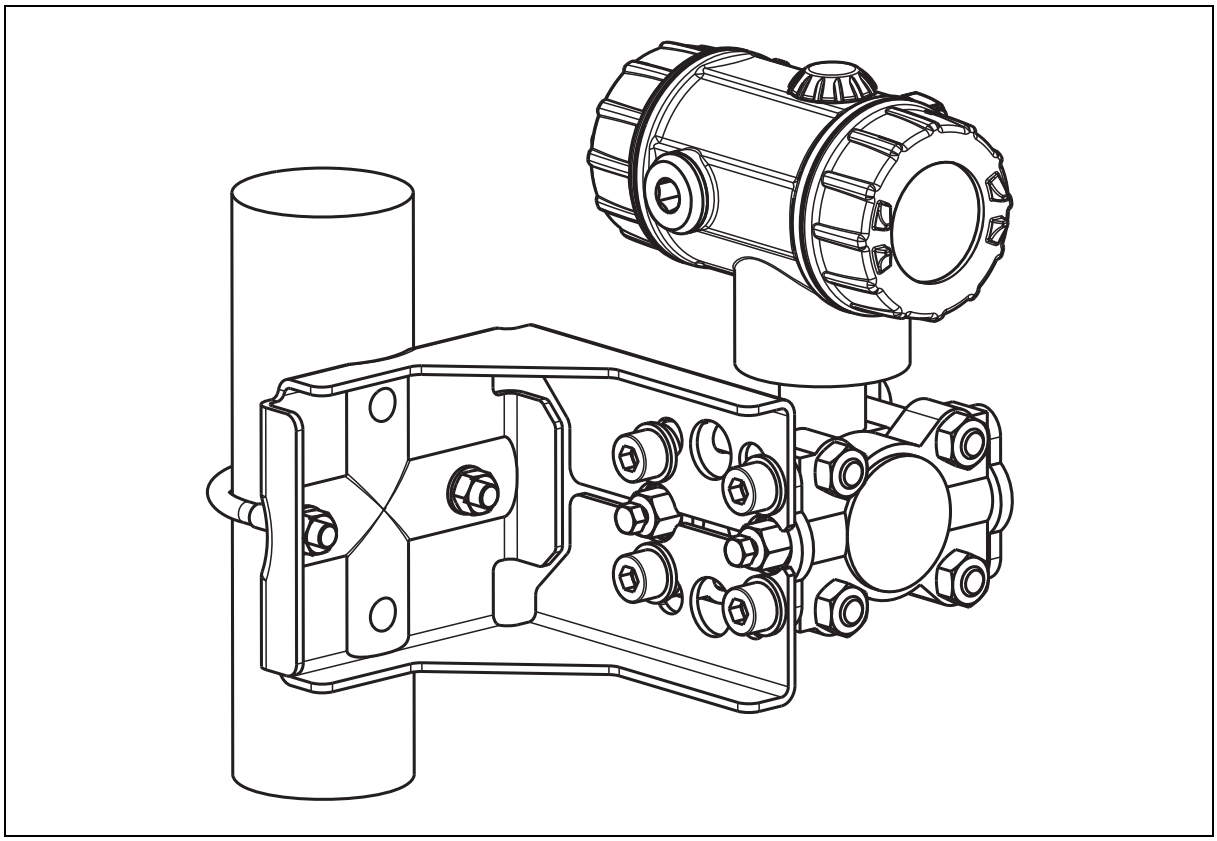
NOTE!

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

6.6 Bracket for wall and pipe mounting

Installation example

(Part no. 00543777 accessories – not included in scope of delivery)



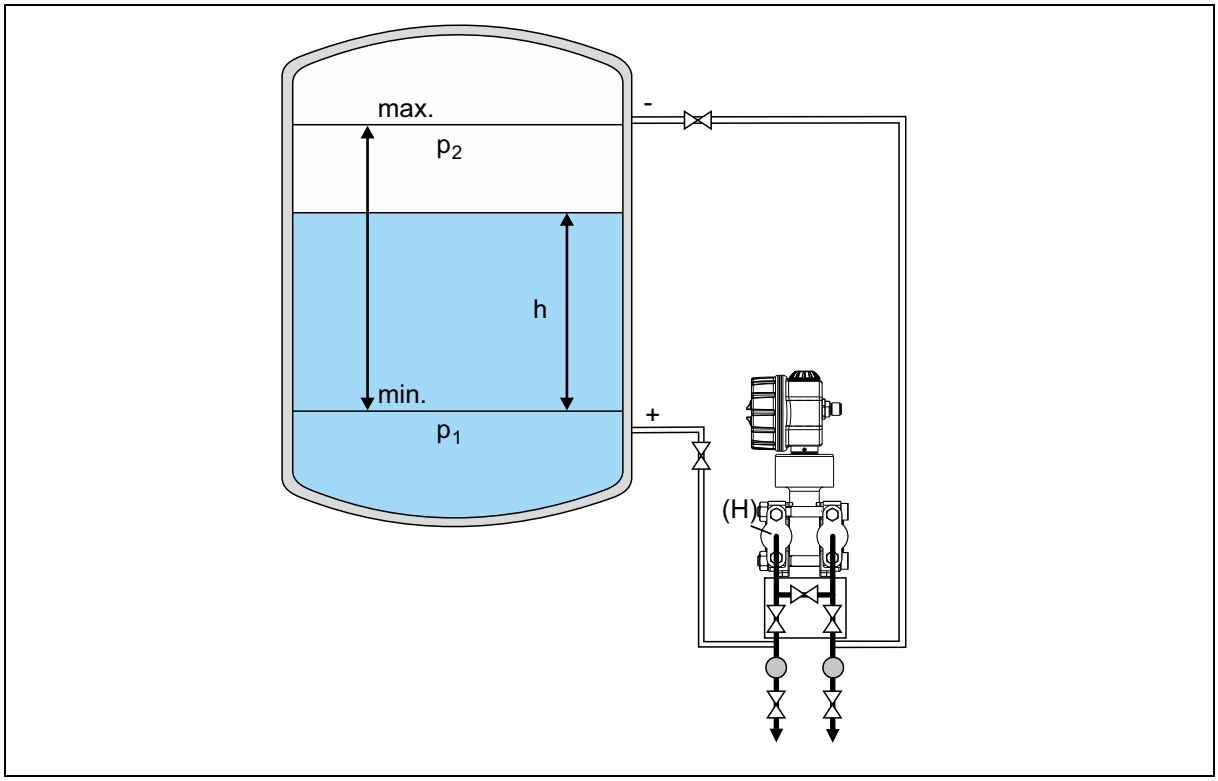
6.7 Level measurement without a diaphragm seal

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

6.7.1 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 fill 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 install separators and shut-off valves in order to catch and remove deposits, pollutants, or liquid in the differential pressure pipes.
5. For the device configuration, see chapter 10 "Configuration", Page 81.



h (fill level) 4 to 20 mA

NOTE!

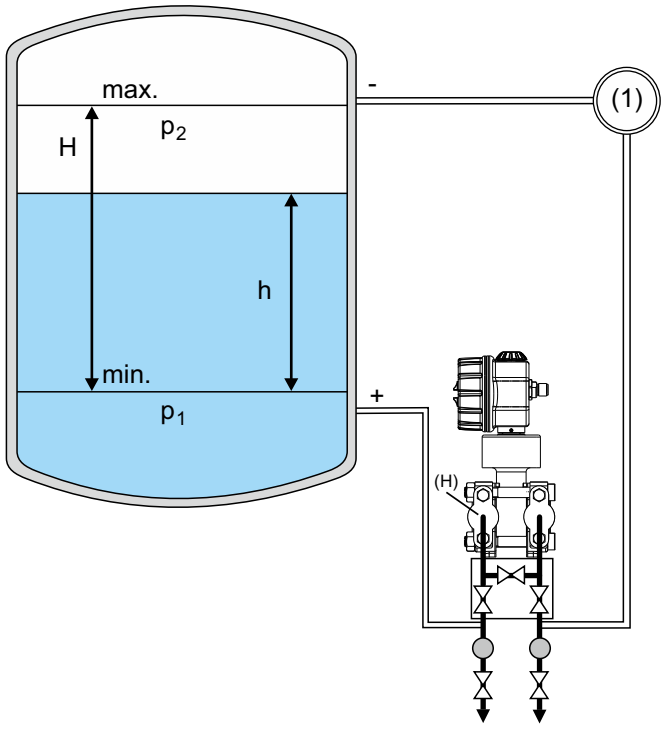
Applies for ± measuring ranges or a measuring range from 0 to 1 bar.
It is recommended to install the device downstream of a shut-off valve in order to allow easy cleaning and functional testing.
Do not install the device in the following positions:
- In the filling flow
- In the tank outlet
- At a position 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.

6.7.2 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 fill 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 measurements 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 10.3 "Level measurement configuration with a pressure specification - recommended (tank empty, tank full)", Page 91.



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

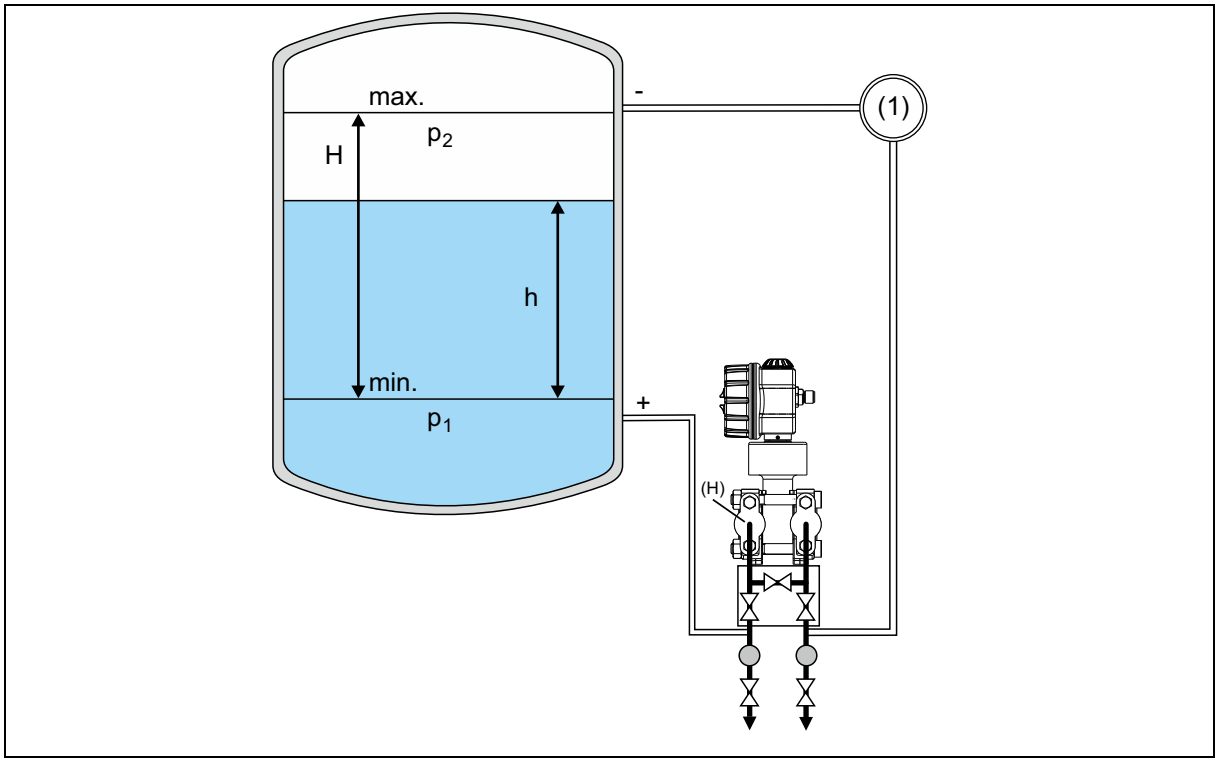
NOTE!

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

6.7.3 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 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 fill 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 install separators and shut-off valves in order to catch and remove deposits, pollutants, or liquid in the differential pressure pipes.
5. For the device configuration, see chapter 10 "Configuration", Page 81.



h (fill 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 downstream of 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.

6.8 Flow measurement

For flow measurement, the device uses sensors based on the differential pressure principle. For this, JUMO offers two types of sensors:

- JUMO flowTRANS DP P (409601): differential pressure method with pitot tube
- JUMO flowTrans DP R (409602): differential pressure method with orifice plate

6 Mounting

Please see the corresponding data sheet for information on the probe type suitable for your application or send the completed check list to sensors@jumo.net

6.8.1 Measuring arrangement for flow measurement with pitot tube

If you wish to use the pitot tube for measuring the flow in a pipe, JUMO has four types of probes and two connection possibilities in its product range.

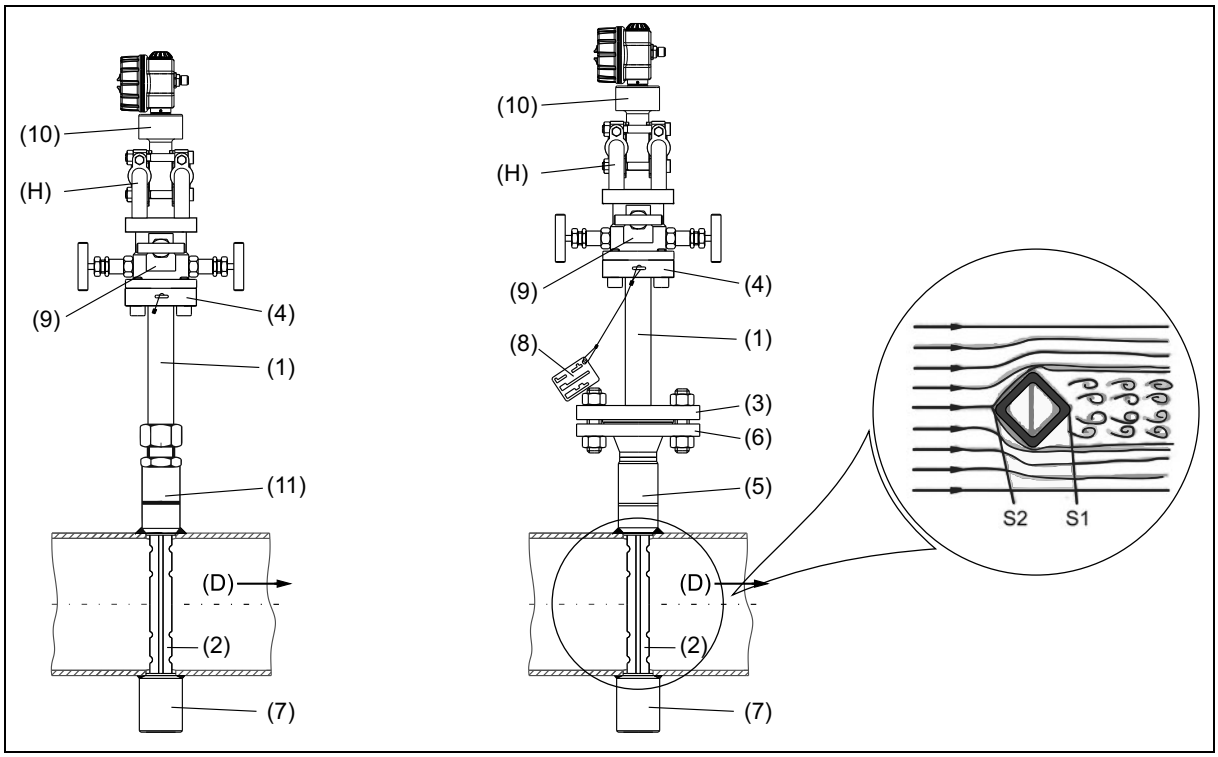
Pitot tube P01 and P02

- Flow measurement of liquids
- Nominal width up to DN2000

Pitot tube P03 and P04

- Flow measurement of saturated steam and overheated steam
- Nominal width up to DN1000

Both variants, mounting pipes with mounting flange, or the weld-in screw connections, are welded into the measuring line.



(1)	Pitot tube	(2)	Probe profile	(3)	Probe flange
(4)	Probe head	(5)	Mounting pipe with mounting flange flowTrans DP P02/P04	(6)	Mounting flange
(7)	Counter-bearing – if required	(8)	Nameplate	(9)	Valve block
(10)	Differential pressure transmitter	(11)	Weld-in screw connection flowTrans DP P01/P03		
(D)	Flow direction Measurement medium	(S1)	Low-pressure side of the probe profile	(S2)	High-pressure side of the probe profile

6.8.2 Measuring arrangement for flow measurement with orifice plate

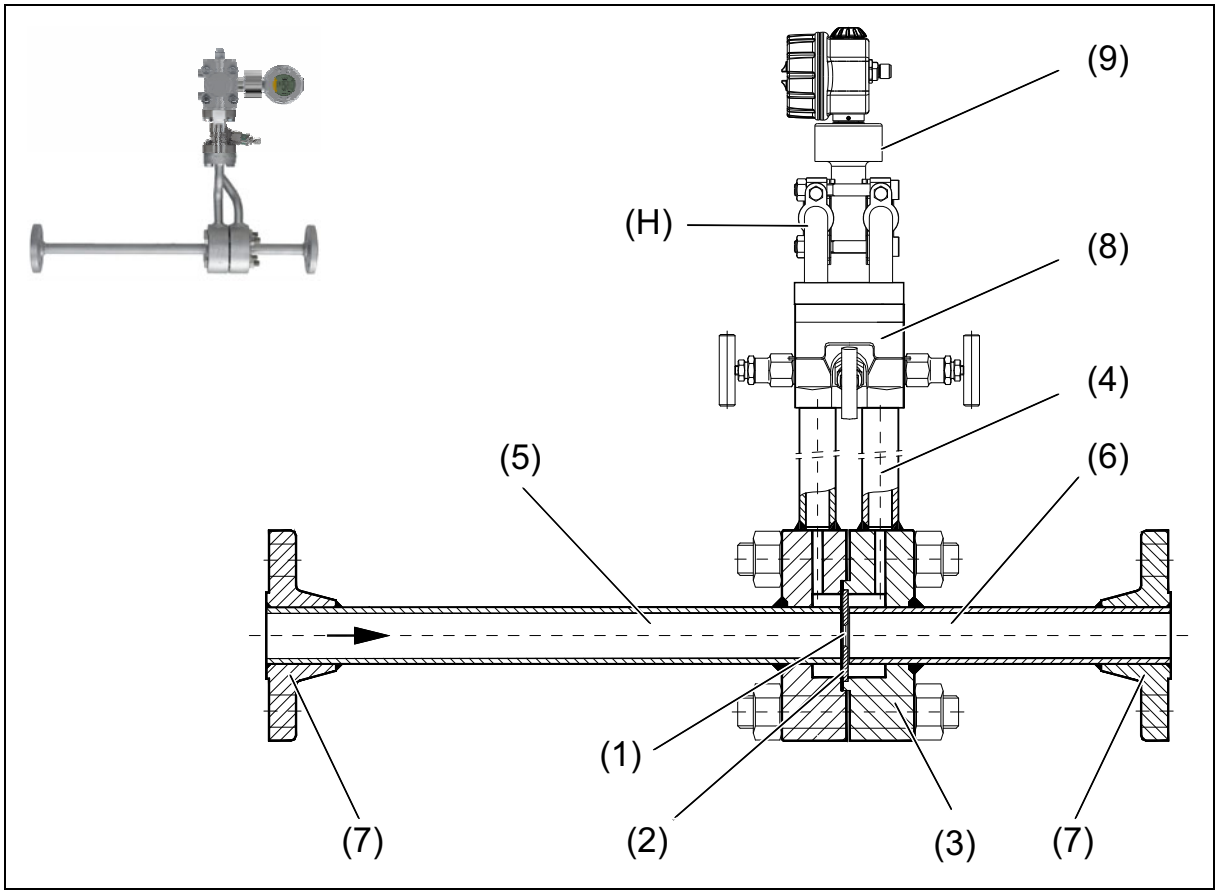
If you wish to use an orifice plate according to DIN EN ISO 5167-2 for flow measurement in a pipe, JUMO offers two connection possibilities depending on the planned pipe diameter. See also data sheet 409602.

Flow measurement with orifice plate R01

Meter run R01 is used up to cable diameter DN40. The orifice plate in question has a ring chamber tap, i.e., the exchangeable measuring insert is held by two carrier rings. The required meter runs and the connection for a valve or the differential pressure transmitter consist of a pre-installed unit.

NOTE!

It is necessary to adhere to the meter run in order to achieve the highest possible measuring accuracy.



(1)	Orifice plate, primary element	(2)	Measuring insert	(3)	Carrier ring
(4)	Pressure tapping support	(5)	Inlet section	(6)	Outlet section
(7)	Pipe flange	(8)	Valve block	(9)	Differential pressure transmitter
H	High-pressure pressure input				

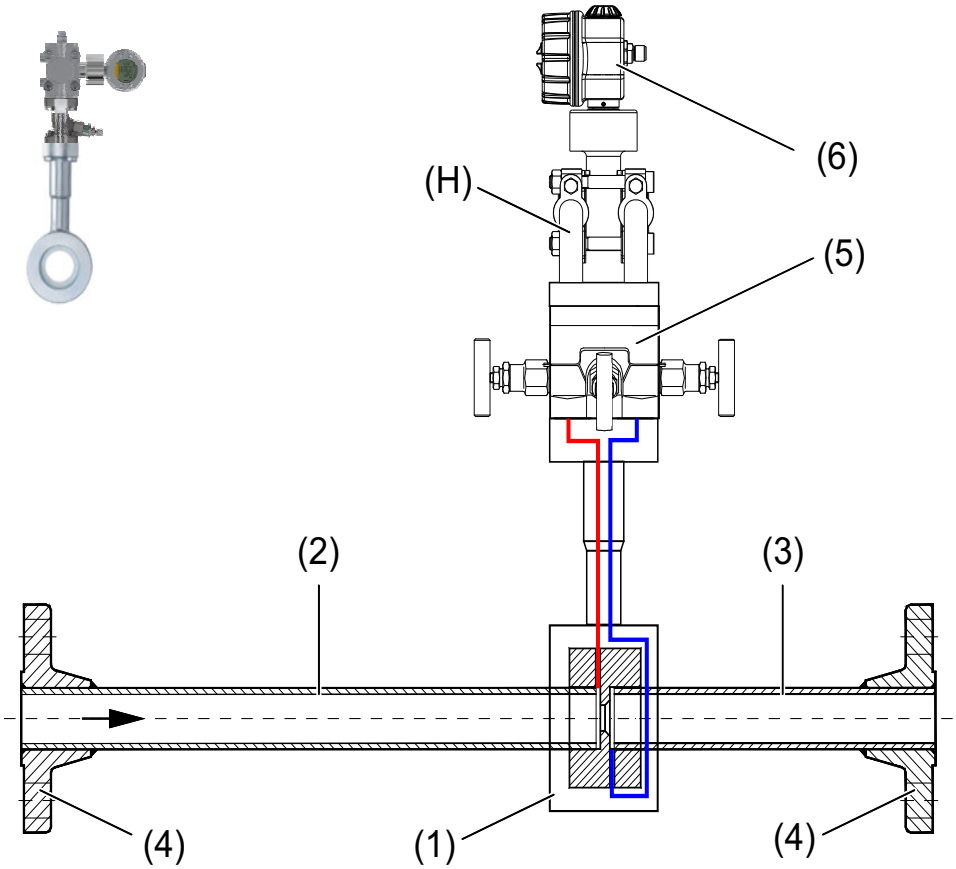
Flow measurement with orifice plate R02

From cable diameter DN50, orifice plate R02 is suitable, which is available in a separate and in a compact design type.

NOTE!

You should flange the differential pressure transmitter directly to the valve block. Installation directly on the flange of the orifice plate R02 is not expedient, because if servicing is required, you would have to depressurize and empty the entire system.

It is necessary to adhere to the meter run in order to achieve the highest possible measuring accuracy.



(1)	Orifice plate R02	(2)	Inlet section	(3)	Outlet section
(4)	Pipe flange	(5)	Valve block	(6)	Differential pressure transmitter
H	High-pressure pressure input				

6.8.3 Installation for flow measurement

Install the device in the following order:

1. Connect the low-pressure side of the differential pressure transmitter via a 5-way or 3-way valve to the low-pressure side of the pitot tube or orifice plate.
2. Connect the high-pressure side (identification marking "H") of the differential pressure transmitter via a 5-way or 3-way valve to the high-pressure side of the pitot tube or orifice plate.
3. Fill up the differential pressure pipe in a cold state with water via the valve block.
4. For the device configuration, see "Configuration for flow measurement with pitot tube or standard orifice plate", Page 95.

The JUMO SIRAS P21 device family consists of the following types:

- Type 403028 JUMO SIRAS P21 AR (relative pressure, absolute pressure)
- Type 403024 JUMO SIRAS P21 DP (differential pressure)

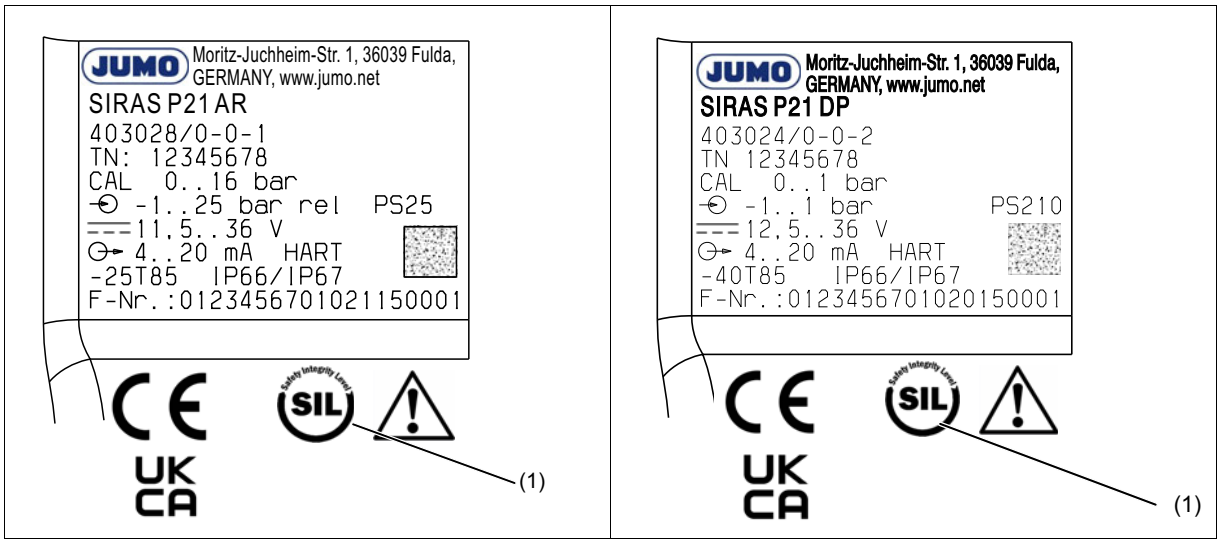
NOTE!

This chapter "Safety Manual" applies in equal measure for the above-mentioned types.
For this reason, you will find information on both the JUMO SIRAS P21 AR and the JUMO SIRAS P21 DP in this chapter.

For intended use, see "Intended use", Page 11.

7.1 Nameplate

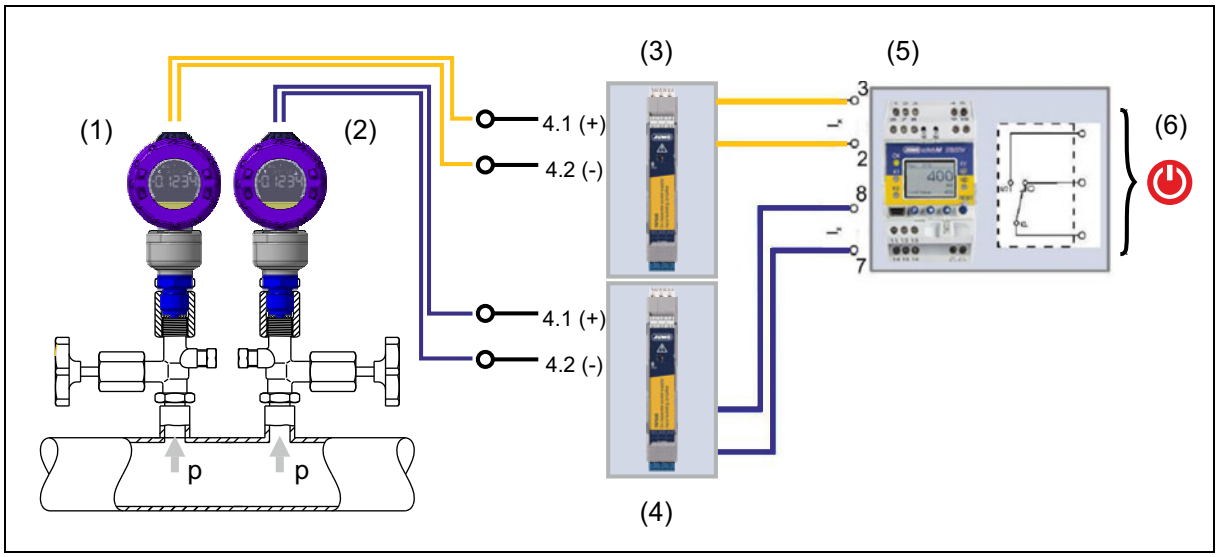
Devices that you use as safety components must have the SIL identification marking on them. See figure.



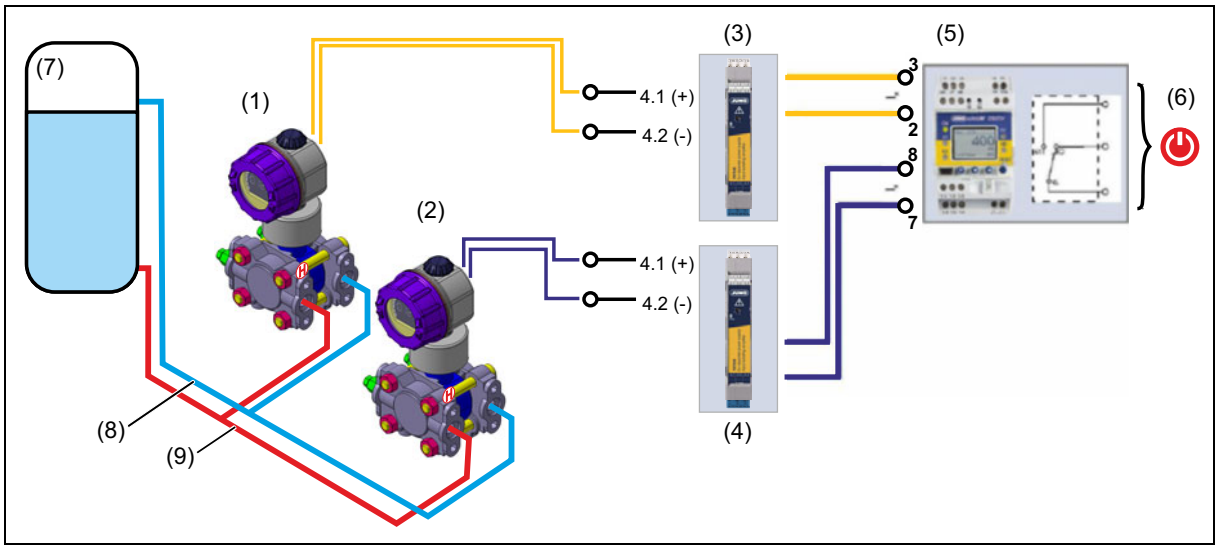
(1) SIL identification marking for JUMO SIRAS P21 AR and JUMO SIRAS P21 DP

7.2 SIL 3 connection diagram

If you want to operate the device in Safety Integrity Level 3, you will need a redundant safeguard. For this you will need to integrate two identically configured devices in your safety controller. The following figure shows a potential configuration.



(1) Device 1 JUMO SIRAS P21 AR
(2) Device 2 JUMO SIRAS P21 AR
(3) JUMO Ex-i repeater power supply and input isolating amplifier 707530
(4) JUMO Ex-i repeater power supply and input isolating amplifier 707530
(5) JUMO safetyM STB/STW 701150
(6) Switch-off or establishing operationally safe state



(1) Device 1 JUMO SIRAS DP21 DP
(2) Device 2 JUMO SIRAS DP21 DP
(3) JUMO Ex-i repeater power supply and input isolating amplifier 707530
(4) JUMO Ex-i repeater power supply and input isolating amplifier 707530
(5) JUMO safetyM STB/STW 701150
(6) Switch-off or establishing operationally safe state

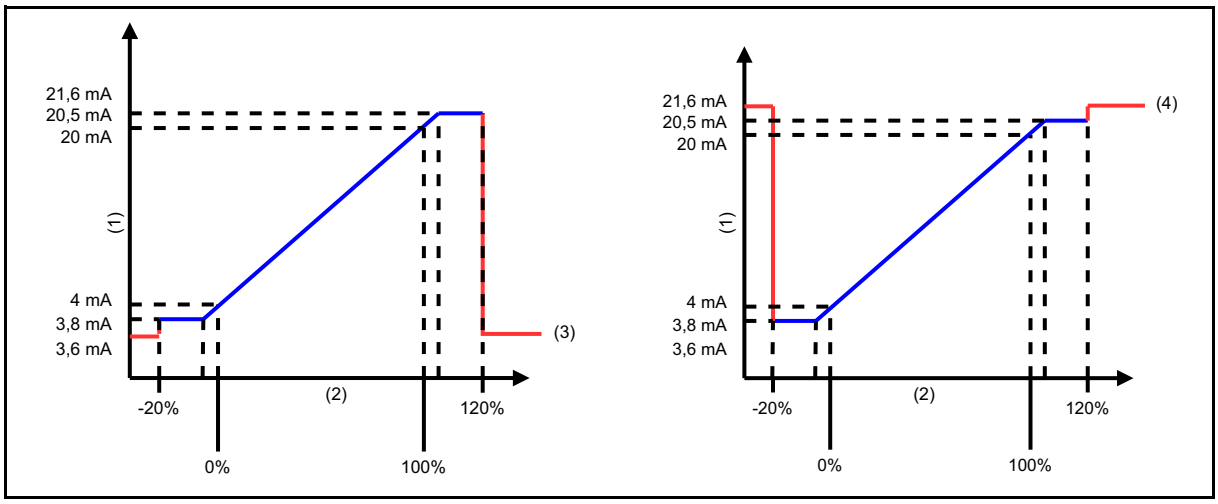
7.3 Safety function

The safety function relates to measuring pressure and fill level. The pressure transmitter generates a process-related measured value, which is transmitted to the logic unit as a 4 to 20 mA output signal. The current output is the only safety-related signal of the transmitter; it delivers:

Safety-related signals	Value
Valid output signal in the sense of the NAMUR recommendation NE 43 (measurement information)	4 to 20 mA
Outside of the parameterized range between 3.8 mA and 20.5 mA in the sense of the NAMUR recommendation NE 43 (measurement information) up to the specified error limits -20 % and 120 %. See graphic. In the case of exceeding or undershooting, the failure information is issued.	3.8 to 4.0 mA 20 to 20.5 mA
An output signal in case of malfunction in the sense of the NAMUR recommendation NE 43 (failure information).	≤3.6 mA or ≥21.0 mA
Safety accuracy in addition to the accuracy specifications stated in the data sheet	1.5 %
Error tolerance time	5.0 s

NOTE!

For reliable error detection, the downstream logic unit must be able to detect and evaluate HI alarms (≥21.0 mA) and LO alarms (≤3.6 mA).



1	Output	2	Input
3	Fault current low (LO)	4	Fault current high (HI)

7.4 Validity of the Safety Manual

NOTE!

The functional safety assessment in this Safety Manual and the representation of the certificates relate exclusively to devices with activated safety function.

7 Safety Manual

7.5 Relevant standards

Failure of the devices can affect the safety of persons and/or the safety of the environment. To assess the functional safety of the device, it is certified according to DIN EN 61508.

- For the safety function up to SIL 2, SC 3 according to DIN EN 61508: Functional safety of electrical/electronic/programmable electronic safety-related systems
- For the safety function up to PL c, in the case of redundant application PL d according to DIN EN ISO 13849: Safety of machinery – Safety-related parts of control systems

7.5.1 Terms and abbreviations according to DIN EN 61508

Name	Description
Actuator	Part of a safety-instrumented system that intervenes in the process to achieve a safe operating state.
EUC	**E**quipment **U**nder **C**ontrol Equipment, machine, apparatus, or system used for manufacturing, shaping materials, for transport, medical purposes, or other activities.
E/E/PE	**E**lectrical/**E**lectronic/**P**rogrammable **E**lectronic: based on electrical (E) and/or electronic (E) and/or programmable electronic (PE) technology
Failure	End of the ability of a functional unit to perform a required function or operation of a functional unit differs in some way from the requirement.
DC	**D**iagnostic **C**overage Number of dangerous failures detected by automatic diagnostic online tests. The number of dangerous failures is calculated as the rate of detected dangerous failures divided by the total rate of dangerous failures.
Error	An abnormal condition that can cause a reduction or the loss of the ability of a functional unit to perform a required function.
Functional safety	A part of overall safety related to the EUC and EUC control system that depends on the correct function of the safety-related E/E/EP system and other risk-mitigating actions.
Functional unit	Unit consisting of hardware or software or both that is suitable for performing a stated task.
Dangerous failure	Failure of an element and/or subsystem, and/or system involved in implementing the safety function, which a) prevents the safety function being executed on demand (on-demand operation type), or causes the failure of a safety function (operating mode with continuous demand), so that the EUC transitions to a dangerous or potentially dangerous state; or b) reduces the probability of executing the safety function correctly on demand.
Safe failure	Failure of an element and/or subsystem, and/or system involved in implementing the safety function, which a) causes false triggering of the safety function, switching the EUC (or parts of it) to a safe operating state, or maintaining a safe operating state; or a) increases the probability of false triggering of the safety function, switching the EUC (or parts of it) to a safe operating state, or maintaining a safe operating state

Name	Description
Hazard	Potential source of damage
Safety	Freedom from unreasonable risk
safety function	Function performed by a safety-related E/E/PE system, or other risk-mitigating measures, that is designed to achieve or maintain a safe operating state for the EUC taking a specified dangerous incident into consideration.
Safety integrity	The probability of a safety-related system executing the required safety function under all specified conditions within a specified period of time according to requirements.
SIL	**S**afety **I**ntegrity **L**evel – One of four discrete levels, equivalent to a safety integrity value range, where Safety Integrity Level 4 represents the highest level of safety integrity and Safety Integrity Level 1 the lowest.
Safety-related system	A system which both - performs necessary safety functions that are required to achieve or maintain a safe operating state for the EUC, and - which is designed to achieve the necessary safety integrity for the required safety functions, either autonomously, or in combination other safety-related E/E/PE systems and other risk-mitigating measures.
SIS	**S**afety **I**nstrumented **S**ystem – Safety instrumented system to perform one or more safety-instrumented functions. A SIS consists of sensor(s), logic system, and actuator(s).
Lambda: **λ**	Failure rate per hour
Lambda **D**angerous: λ_D	Rate of dangerous failures per hour
Lambda **D**angerous **D**etect: λ_{DD}	Rate of detected dangerous failures per hour
Lambda **D**angerous **U**ndetect: λ_{DU}	Rate of undetected dangerous failures per hour
Lambda **S**afe: λ_S	Rate of safe failures per hour
Lambda **S**afe **D**etect: λ_{SD}	Rate of detected safe failures per hour
Lambda **S**afe **U**ndetect: λ_{SU}	Rate of undetected safe failures per hour
BPCS	**B**asic **P**rocess **C**ontrol **S**ystem – operation and monitoring system as one system
DC	**D**iagnostic **C**overage
FIT	**F**ailure **I**n **T**ime ($1x10^{-9}$ per h)
HFT	**H**ardware **F**ailure **T**olerance
PFD	**P**robability of **F**ailure **D**etected – (probability of a dangerous failure on demand)
PFD_{AVG}	**P**robability of **F**ailure **D**etected **av**era**g**e – (average probability of a dangerous failure on demand)
PFH	**P**robability of dangerous **F**ailure per **H**our
MooN	Architecture with M from N channels
MTBF	**M**ean **T**ime **B**etween **F**ailures
MTTR	**M**ean **T**ime **T**o **R**estoration
MTTF	**M**ean **T**ime **T**o **F**ailure – mean time to a dangerous failure
MRT	**M**ean **R**epair **T**ime
SFF	**S**afe **F**ailure **F**raction
SC	**S**ystematic **C**apability
PTC	**P**roof **T**est **C**overage – diagnostic coverage during repeat test

Further terms:

Error tolerance time – all internal tests have been performed after this maximum time.

7.5.2 Failure rates and SFF for type 403024

Valid for an average ambient temperature in the housing of 30 °C.

T_i [years]	λ_S [Fit]	λ_{DD} [Fit]	λ_{DU} [Fit]	SFF	PFH (1/h)	PFD_{avg} (Proof test A PTC= 93.27 %)	PFD_{avg} (Proof test B PTC= 80.29 %)	PFD_{avg} (Proof test C PTC= 67.63 %)
T_i = 1 year	0.00	1012.19	78.07	92.84 %	7.81×10^{-8}	6.27×10^{-4}*	1.03×10^{-3}*	1.41×10^{-3}*
T_i = 3 years						1.27×10^{-3}	1.58×10^{-3}	1.88×10^{-3}
T_i = 5 years						1.90×10^{-3}	2.12×10^{-3}	2.34×10^{-3}

* see example calculations in "Calculation of PFDavg", Page 48.

7.5.3 Failure rates and SFF for type 403028

Valid for an average ambient temperature in the housing of 30 °C.

T_i [years]	λ_S [Fit]	λ_{DD} [Fit]	λ_{DU} [Fit]	SFF	PFH (1/h)	PFD_{avg} (Proof test A PTC= 91.33 %)	PFD_{avg} (Proof test B PTC= 82.28 %)	PFD_{avg} (Proof test C PTC= 63.23 %)
T_i = 1 year	0.00	1001.60	99.01	91.00 %	9.90×10^{-8}	8.51×10^{-4}	1.20×10^{-3}	1.95×10^{-3}*
T_i = 3 years						1.64×10^{-3}	1.92×10^{-3}	2.49×10^{-3}
T_i = 5 years						2.44×10^{-3}	2.63×10^{-3}	3.04×10^{-3}

7.5.4 Calculation of PFDavg

The plant operator is to specify the following:

- The proof test interval T_i
- The planned operating duration T_M
- The PTC value for the proof test they performed (A, B, or C)

In this context, the operating duration T_M must be at least equal to the proof test interval T_i, but no greater than the lifetime of 10 years. This must be taken into consideration when evaluating the probability of a dangerous failure PFD_{avg} of the sensor system. In the case of a 1-channel system architecture, the average probability of a dangerous failure PFD_{avg} of the transmitter can be calculated from the following formula:

$$PFD_{avg} = \lambda_{dd} \cdot MTTR + PTC \cdot \lambda_{du} \cdot \left(\frac{T_i}{2} + MRT \right) + (1 - PTC) \cdot \lambda_{du} \cdot \frac{T_M}{2}$$

λ_{dd}	Detectable critical failures
λ_{du}	Non-detectable critical failures
MTTR	**M**ean **T**ime **T**o **R**estoration – mean time to discover the error and repair the system (assumption 72 h)
PTC	**P**roof **T**est **C**overage – percentage of errors that can be detected during the proof test
T_i	Proof **T**est **I**nterval – test interval that the operator can determine themselves (1 year = 8,760h)
MRT	**M**ean **R**epair **T**ime, mean time to repair the system (assumption: 72 h)
T_M	Mission **T**ime – planned operating time (10 years = 87,600 h)

Example type 403024 (JUMO SIRAS P21 DP):

Proof test	λ_{dd} [Fit*)]	λ_{du} [Fit*)]	MTTR [h]	PTC [%]	T_i [h]	MRT [h]	T_M [h]	PFD_{avg}
A	1012.19	78.07	72	93.27	8,760	72	87,600	6.27×10^{-4}
	$PFD_{avg} = 1012{,}19 \times 10^{-9} \frac{1}{h} \times 72\ h + 0{,}9327 \times 78{,}07 \times 10^{-9} \frac{1}{h} \times \left(\frac{8760\ h}{2} + 72\ h\right) + (1 - 0{,}9327) \times 78{,}07 \times 10^{-9} \frac{1}{h} \times \frac{87600\ h}{2} = 6{,}27 \times 10^{-4}$							
B	1012.19	78.07	72	80.29	8,760	72	87,600	1.03×10^{-3}
	$PFD_{avg} = 1012{,}19 \times 10^{-9} \frac{1}{h} \times 72\ h + 0{,}8029 \times 78{,}07 \times 10^{-9} \frac{1}{h} \times \left(\frac{8760\ h}{2} + 72\ h\right) + (1 - 0{,}8029) \times 78{,}07 \times 10^{-9} \frac{1}{h} \times \frac{87600\ h}{2} = 1{,}03 \times 10^{-3}$							
C	1012.19	78.07	72	67.63	8,760	72	87,600	1.41×10^{-3}
	$PFD_{avg} = 1012{,}19 \times 10^{-9} \frac{1}{h} \times 72\ h + 0{,}6763 \times 78{,}07 \times 10^{-9} \frac{1}{h} \times \left(\frac{8760\ h}{2} + 72\ h\right) + (1 - 0{,}6763) \times 78{,}07 \times 10^{-9} \frac{1}{h} \times \frac{87600\ h}{2} = 1{,}41 \times 10^{-3}$							

*) Please note: 1 Fit = 1×10^{-9} x 1/h

7.6 Regular tests

The device test can be carried out as follows:

- Proof test A: complete test by the manufacturer; the device must be sent to the manufacturer for this purpose.
- Proof test B: comprehensive test; the device must be removed from the operating plant for this purpose.
- Proof test C: simplified test; the device can remain in the operating plant for this purpose.

Depending on the device type, 403024 or 403028, different values occur for the proof test coverage (PTC).

NOTE!

If the device exhibits anomalies during regular inspection, such as deviations in accuracy or error messages, you must replace the device.

After the lifetime of 10 years expires, you must replace the devices as they no longer meet the requirements of their SIL certification.

7.6.1 Proof test A

(corresponds to factory calibration)

For a complete check, you must remove the device from the operating plant and send it to the manufacturer.
See back cover of this operating manual for service addresses.

Device type	Detection of dangerous undetected failures (λ_{DU})	PTC
403024	0.9327	93.27 %
403028	0.9133	91.33 %

7.6.2 Proof test B

In the following steps, compare the displayed pressure measured value with the applied pressure and the current output. In this test, suitable measurement methods/measurement equipment are to be used. The determined measuring accuracy must be in the range of the accuracy specification from the data sheet.

Step	Action	Please note
1	Carry out the tests of proof test C	
2	Check the lower limit of the measuring range (displayed measured value and current output)	
3	Check the upper limit of the measuring range (displayed measured value and current output)	

With proof test B, the following values for the proof test coverage (PTC) can be achieved:

Device type	Detection of dangerous undetected failures (λ_{DU})	PTC
403024	0.8029	80.29 %
403028	0.8228	82.28 %

7.6.3 Proof test C

Step	Action		Please note
1	Test the current device status of the test piece with the setup program. Status must be 'OK'		
2	If active, deactivate safety function of the test piece. Configure analog output for simulation of current output signal. Simulate the following output signal values and verify either using downstream devices in the operating plant or using a current meter that is additionally connected:		Verification of the proper function of the analog output including whether the error signal values can be generated.
	Simulated value:	Measured value:	
	3.6 mA	3.59 to 3.61 mA	
	8 mA	7.99 to 8.01 mA	
	16 mA	15.99 to 16.01 mA	
	21.6 mA	21.59 to 21.61 mA	
3	Reactivate the safety function.		Verification that, in the event of an interruption to the output current signal, the internal test identifies the interruption of the signal path and signals it.

With proof test C, the following values for the proof test coverage (PTC) can be achieved:

Device type	Detection of dangerous undetected failures (λ_{DU})	PTC
403024	0.6763	67.63 %
403028	0.6323	63.23 %

7.7 Determination of Safety Integrity Level (SIL)

Due to the architecture 1oo1D of the pressure transmitter categorized as type B, the hardware fault tolerance = 0. This results in the following in line with architecture path 1H of DIN EN 61508-2:

NOTE!

The devices use a 1-channel design (1oo1D architecture) and thus have a HFT = 0.
Two pressure transmitters whose output signal is evaluated by a safety-instrumented logic unit must be provided for a HFT = 1.

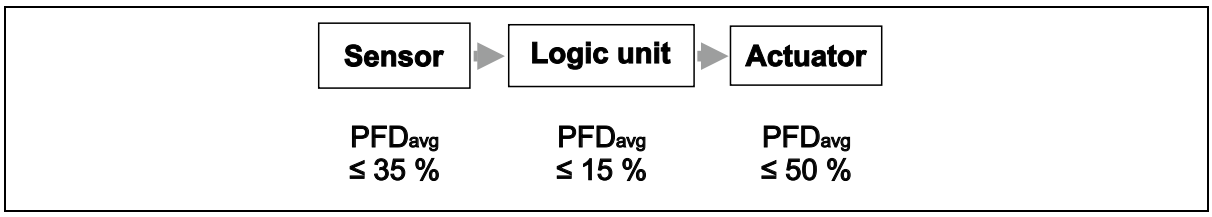
7.7.1 Average probability of dangerous failure on demand PFDavg

The following table shows how the "Safety Integrity Level" (SIL) depends on the "average probability of dangerous failures of a safety function of the entire safety-related system" (PFD_{avg}) according to DIN EN 61508. The "low demand mode" is considered, i.e., the demand rate for the safety-related system is once a year on average.

Table low demand PFD according to DIN EN 61508:

Safety Integrity Level	**Operating mode with low demand rate PFD_{avg} (low-demand mode)**
4	$\geq 10^{-5}$ to $<10^{-4}$
3	$\geq 10^{-4}$ to $<10^{-3}$
2	$\geq 10^{-3}$ to $<10^{-2}$
1	$\geq 10^{-2}$ to $<10^{-1}$

The sensor, logic unit, and actuator together form a safety-related system that performs a safety function. The "average probability of dangerous failures of the entire safety-related system" (PFD_{avg}) is usually divided up into the sensor, logic unit, and actuator subsystems according to the following figure:



Typical distribution of the "average probability of dangerous failures of a safety function on demand" (PFD_{avg}) across the subsystems.

The specifications relating to functional safety in this Safety Manual relate to the transmitter as a subsystem (sensor). If required, you may have to factor in an additional repeater power supply and input isolating amplifier.

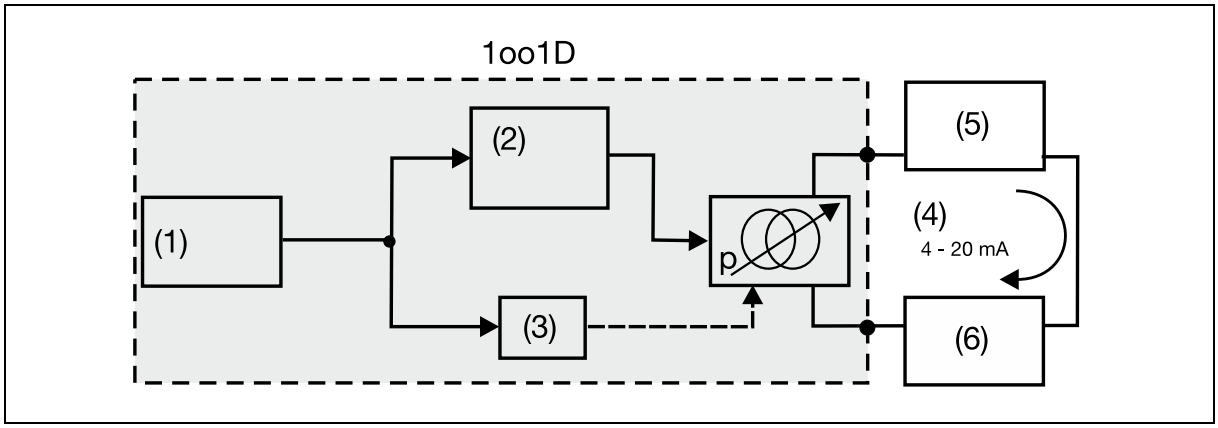
7.7.2 Average frequency of a dangerous failure per hour (PFH)

The following table shows how the Safety Integrity Level (SIL) depends on the "average frequency of a dangerous failure per hour" (PFH) according to DIN EN 61508.

Table high demand PFH according to DIN EN 61508:

Safety Integrity Level	**Operating mode with high demand rate PFH (high-demand mode)**
4	$\geq 10^{-9}$ to $<10^{-8}$
3	$\geq 10^{-8}$ to $<10^{-7}$
2	$\geq 10^{-7}$ to $<10^{-6}$
1	$\geq 10^{-6}$ to $<10^{-5}$

7.7.3 Safety-relevant system properties



1	Sensor	2	Channel
3	Diagnostics, monitor, checker	4	4 to 20 mA signal
5	External supply	6	Evaluation unit
p	Pressure-dependent current source		

Safety feature	**Requirement/comment**
SIL	SIL 2
Systematic Capability (**S**ystematic **C**apability)	SC=3
Operating mode in terms of safety function	Operating mode with low and high demand rate possible
Safety function	The safety function of the JUMO SIRAS P21 AR/DP relates to the measurement of pressure values; the measured value is transmitted at the 4 to 20 mA analog output
Nominal measuring range	See accuracy specifications in the data sheet
Safety accuracy	1.5 % plus the accuracy specifications stated in the data sheet
Subsystem type	Type B
Safety architecture	1oo1D
Hardware **F**ailure **T**olerance	HFT = 0
Average failure probability of a safety function upon demand (overall system)	SIL 2: low demand: PFD_{avg} $<10^{-2}$ high demand: PFH $<10^{-6}$
Interval for regular inspection (T1)	1 year – the operator can define this interval themselves. See "Determination of Safety Integrity Level (SIL)", Page 52
Lifetime	Maximum of 10 years

NOTE!

The devices use a 1-channel design (1oo1D architecture) and thus have a HFT = 0.

Two pressure transmitters whose output signal is evaluated by a safety-instrumented logic unit must be provided for a HFT = 1.

7.7.4 Overall accuracy of the safety function – example calculation

To determine the overall accuracy of the safety function, add a safety accuracy of 1.5 % of the nominal measuring range to the accuracy specifications from the data sheet.

The safety accuracy describes the maximum impact of a random single error on the measured value that is still classified as non-critical.

The resulting overall accuracy is used to add a safety reserve for process monitoring. This is so the plant is safely switched off in the event of a random single error.

Overall accuracy of the safety function =
±[accuracy specification from the technical data + 1.5 % safety accuracy]

Example:

Fill level check and overfill monitoring of a liquid tank with a filling height of 5 m.

Accuracy specification from the technical data, incl.
Long-term stability: e.g. . . . . 0.2 %

Additional safety accuracy: . . . . . 1.5 %
Overall accuracy of safety function: . . . . . 1.7 %

An accuracy of: . . . . . 1.7 %
based on the height: . . . . . .5 m
results in: 0.09 m

The type 403024 transmitter checks the fill level and outputs this to the process control system as a 4 to 20 mA signal.

The overfill safeguard in process monitoring must be set to a value of (5 m - 0.09 m = 4.91 m).

This ensures safe switch-off before overfilling, even if a random, single error occurs.

7.8 Safety-relevant parameterization

The following steps must be performed for safe device parameterization:

Step	Action
1	Adjust all safety-relevant parameters via the parameter level. See "Activating the safety function", Page 78 It is possible to perform the parameterization via the rotary knob and via the HART® interface.
2	Test safety function. See "Activating the safety function", Page 78
3	Activate the parameterization and editing protection. See "Parameterization and editing protection", Page 76

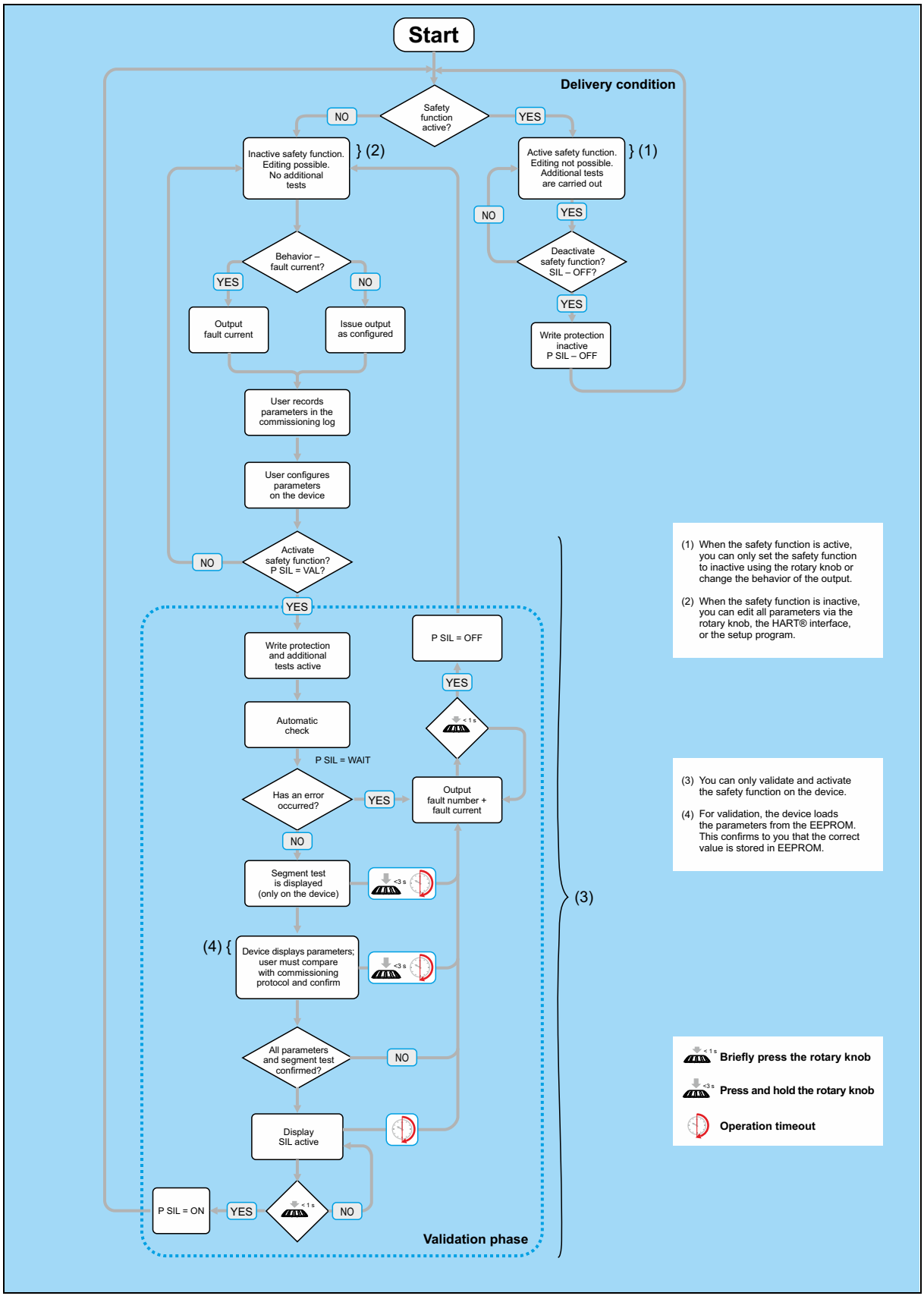
- You have entered the safety-relevant parameters/settings prior to safety-related operation via the local controls or using the setup program.
  Check the parameters/settings on the device's display.
  See "Configuration", Page 73

NOTE!

The device does not implement any "network and system security" measures according to the IEC 62443 standards series. This means that only the "safety" aspect is considered.

- During safety operation, you are only allowed to use the interface (HART® protocol) and the local operation for reading/validating data.
  It is not possible to change the parameters during operation.
- You must carry out a complete functional test for startup.

Parametrization diagram



7.8.1 Startup protocol

Fundamentally, all parameters must be configured to reflect the requirements of the safety-related system. Document the adjusted parameters in a startup protocol.
For this you can print out this page and enter the parameters in the "Value specification" column.
Check and confirm the settings when you put the device into operation.

Startup protocol for JUMO SIRAS P21			
Device designation:			
Measuring point:			
Serial number:			
Company:			
Segment test successful ? YES [ ]			
Parameter	**Selection options***	**Value specification**	**Tested**
Pressure measuring unit	inH_2O, inHG, ftH_2O, mmH_2O, mmHG, psi, **bar**, mbar, kg/cm^2, kPa, TORR, MPa, mH_2O		
Damping	**0.0** to 100.0 s		
Pressure value offset (zero offset)	±10 % of the nominal measuring range		
Pressure measurement start	Nominal measuring range		
Pressure measurement end	Nominal measuring range		
Density correction	0.01 to **1.00** to 99.99		
Fill level measurement start			
Fill level measurement end			
Flow start			
Flow end			
Flow rate factor			
Characteristic line			
Application point of square root extraction	Sq. rt. ext. ap. pt. = (0 to 9999 in measuring unit "Flow rate")		
Output selector			
Active current loop			
Current in case of malfunction	Low 3.6 mA **High 21.6 mA**		
SIL active?			
Safety function is active (SIL appears in the display)			
*** Values in bold indicate the default settings**			
Date:			
Time			
Tested by:			
Signature:			

8.1 Installation notes

DANGER!

Risk of personal injury or damage to plant due to malfunctioning!

If the installation is carried out by persons with inadequate qualifications, it cannot be guaranteed that the device will function properly. This could result in personal injury or material damage.

- ▶ Make sure that the electrical installation is carried out by a person with an adequate qualification.
- ▶ During installation, disconnect any system components supplied with mains voltage from the mains voltage.

Electromagnetic compatibility

The electromagnetic compatibility corresponds to the following norms:

- DNV GL®CG-0339: ship approval
- NAMUR NE 21 electromagnetic compatibility of operating equipment of testing and laboratory technology
- DIN EN 61326-1, DIN EN 61326-2-3, DIN EN 61326-3-1 electrical equipment for measurement, control and laboratory use – EMC requirements
- DIN EN 60730-1 automatic electrical control devices

Safety extra low voltage/protective extra-low voltage

- The device only works with a maximum voltage of DC 36 V consisting of safety extra low voltage (SELV) electrical circuits or protective extra-low voltage (PELV) electrical circuits with safe disconnection.
- The device must be equipped with an electrical circuit that meets the requirements of EN 61010-1 with regard to "Limited-energy circuits".

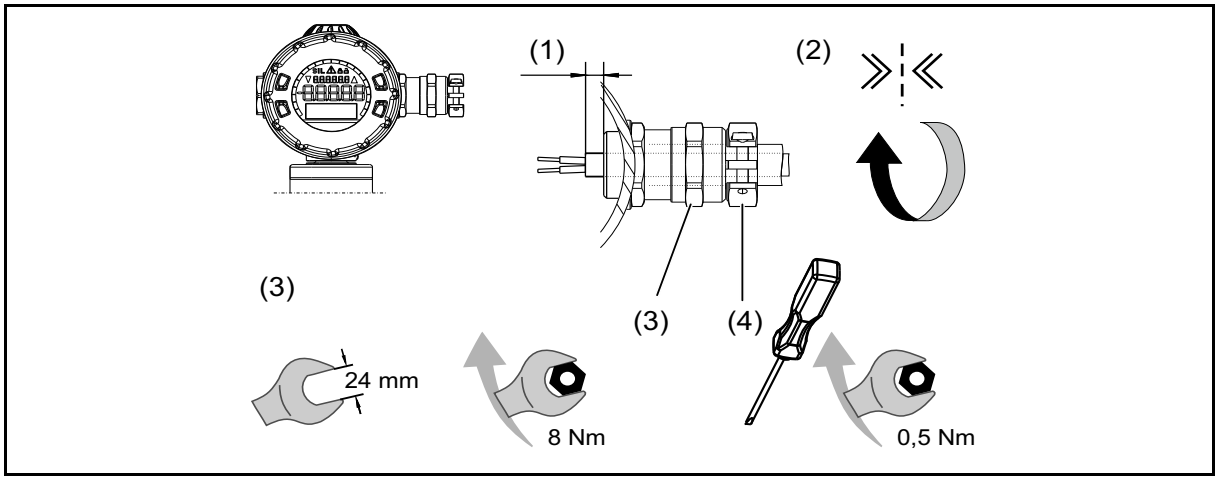
Conductor cross-sections and ferrules

	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

8 Electrical connection

8.2 Device with cable gland

- Admissible cable diameters for devices with cable fitting: 6 to 12 mm
- Max. conductor cross section of 1.5 mm^2
- Lay the signal lines isolated from cables with a voltage of > 60 V
  - Use protected cables with twisted cores
  - Keep away from large, electrical plants
  - The full specification according to HART® can only be achieved with a protected cable



(1) The connecting cable must reach at least 5 mm into the housing

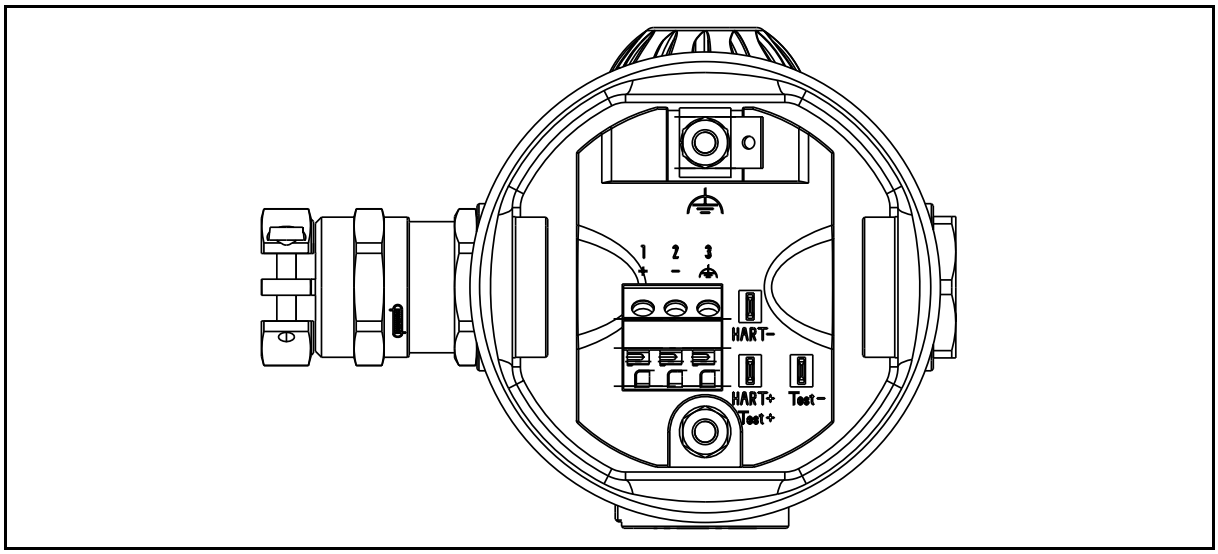
(2) Tighten the screw connection by hand until resistance is felt

(3) Tighten the screw connection using a wrench:
Torque 8 Nm

(4) Tighten strain relief clamp
Torque 0.5 Nm

Connection

1. Unscrew the housing lid at the rear, see "Unscrew the front ring or case lid", Page 31
2. Ground the device.
3. For connecting the connecting cables, see the following figure:

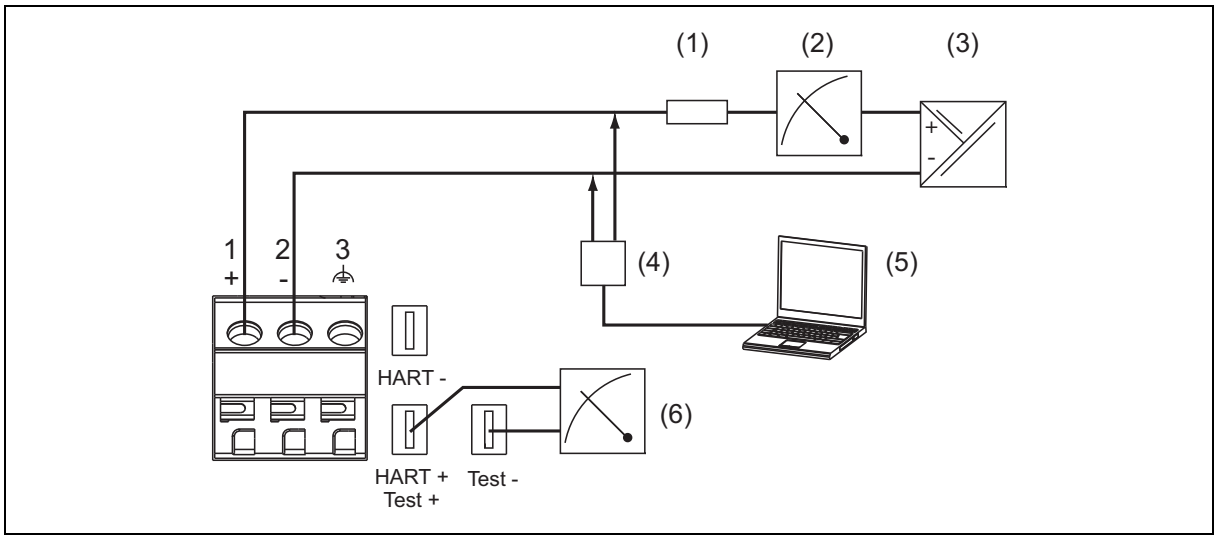


Terminal assignment – devices with cable fitting

Connection	**Terminal assignment**
	93 cable fitting
Voltage supply DC 12.5 to 36 V for **non-**Ex version DC 12.5 to 28 V for Ex version	1 L+ 2 L-
Output 4 to 20 mA, two-wire load-independent current of 4 to 20 mA in voltage supply	1 L+ 2 L-
Test connection for current output Internal resistance of the measuring device ≤ 10 Ω	TEST + TEST -
Test connection for HART® The burden must be present!	HART + HART -
Functional ground	3

8 Electrical connection

Operation and testing



(1) Burden: total burden ≤ (U_B-12.5 V) ÷ 0.024 A;
for HART® min. 250 Ω, max. 1100 Ω

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

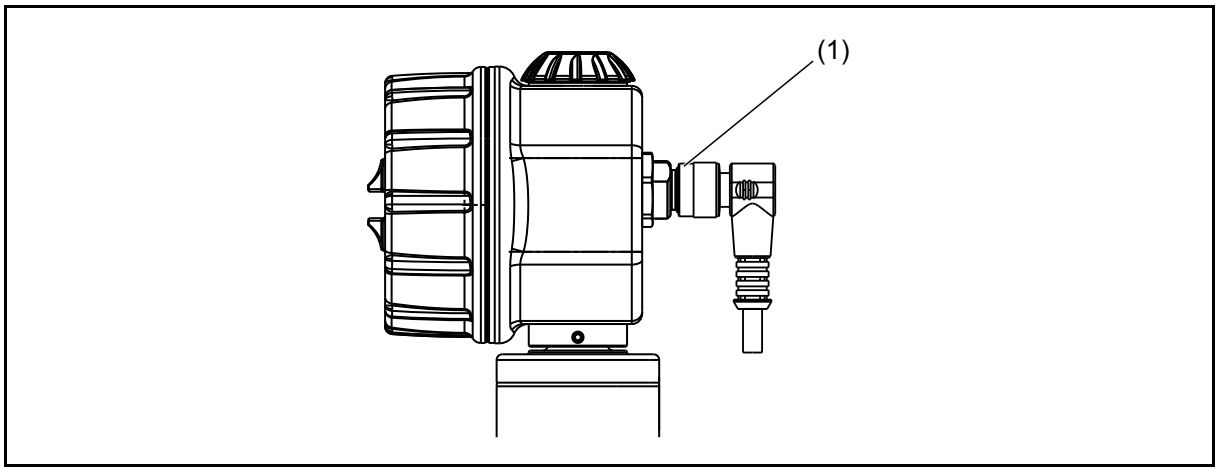
(3) Voltage supply: DC 12.5 to 36 V
(e.g., with JUMO Ex-i repeater power supply and input isolating amplifier, type 707530)

(4) HART® modem

(5) PC or notebook

(6) Internal resistance of measuring device: ≤ 10 Ω

8.3 Device with M12 connector



(1) Cable box angled at M12 screw connection

A suitable connection is provided by a

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

For terminal assignment, see below.

General information

- Lay the signal lines isolated from cables with a voltage of > 60 V
- Use protected cables with twisted cores
- Keep away from large, electrical plants
- The full specification according to HART® can only be achieved with a protected cable

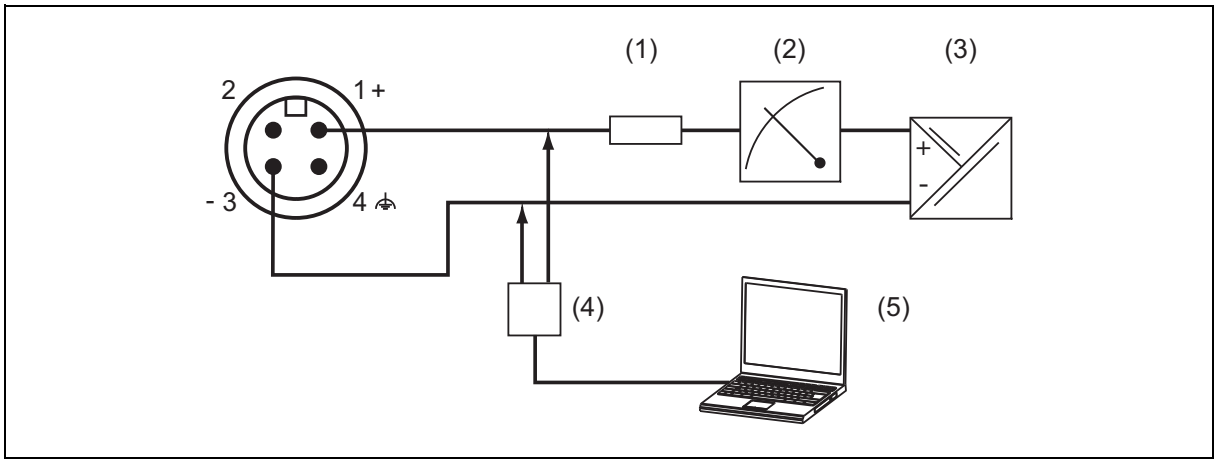
8 Electrical connection

Terminal assignment – M12 round plug

Connection	Terminal assignment	Color assignment[a]
	36 round plug M12 × 1	
Voltage supply DC 12.5 to 36 V for **non-**Ex version DC 12.5 to 28 V for Ex version	1 L+ 3 L-	Brown Blue
Output 4 to 20 mA, two-wire load-independent current of 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) Burden: total burden ≤ (U_B-12.5 V) ÷ 0.024 A;
(for HART® min. 250 Ω, max. 1100 Ω

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

(3) Voltage supply: DC 12.5 to 36 V
(e.g., with JUMO Ex-i repeater power supply and input isolating amplifier, type 707530)

(4) HART® modem

(5) PC or notebook

You can operate or configure the device in one of the following ways:

- Via the rotary knob and the integrated display
- Via the device (handheld) connected via the HART® interface
- Via the PC connected to the HART® interface via modem and the supplied setup program

NOTE!

As an alternative to operation via the rotary knob, you can very easily read off and configure all measured values and parameters by means of the setup program.

NOTE!

If burst mode is active on the device, there could be communication problems when communicating with the setup program. In this case, please deactivate burst mode on the device.

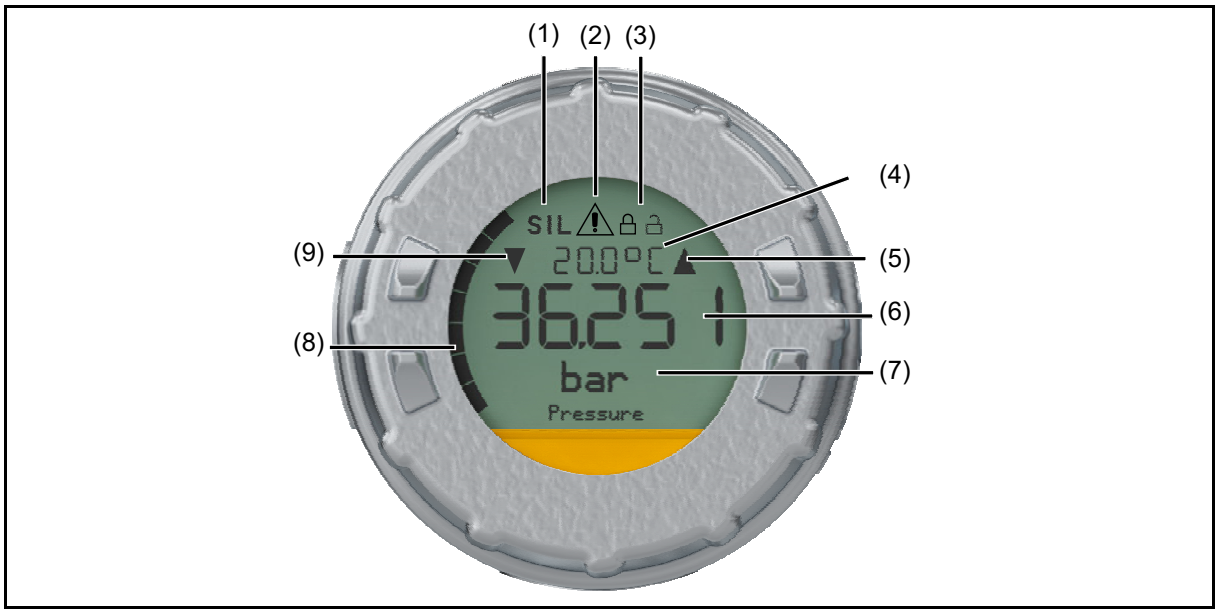
Furthermore, the setup program offers an array of useful additional functions, e.g.:

- Recording the measured values
- Graphical representation 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)

To use the setup program, you must operate the device via the HART® interface. To connect the device with a PC, you need a conventional HART® modem or the HART® modem from the JUMO product range (part no. 00443447).

9 Operation

9.1 Display



(1) Safety function display

(2) Malfunction display – there is an error; for a list of errors and malfunctions, see "Overcoming errors and malfunctions", Page 97

(3) Configuration locked or unlocked

(4) Temperature display °C or °F (6 characters)

(5) Display "Measurement end exceeded"

(6) Measurement value display, current, minimum value, maximum value (5 characters)

(7) Clear text display 3-row – display of main menu, measurand, and designation, Error output, see "Plain text display", Page 66

(8) Bar graph – shows the measured value relative to the measurement start and measurement end in analog form in 5 %-increments

(9) Display "Measurement start exceeded"

NOTE!

As soon as the device is supplied with voltage, the display shows the JUMO logo and the device name. A progress bar shows the initialization process. The device always starts in the same state (safety function on/off) as when you switched it off.

When you start the device for the first time, the language query process will be carried out in English.

You can change the language at a later point in the submenu "Configuration >Device data >Language".

In the submenu "Configuration >Device data >Language query", you can select whether the device should ask you to choose a language every time you restart the device.

9.1.1 Display illumination

The display of the device is equipped with a backlight. The control activates the backlight if you turn or press the rotary knob. If you do not apply any further entries, the backlight stays switched on for 60 seconds and then goes out.

There are three modes for the backlight via the menu "Configuration > Display/Operation > Illumination":

- "Always off"
- "Always on"
- "When pressed"

You can set the switch-on duration of the display backlight in the submenu "Configuration > Display/Operation > Illumination timeout" to a duration of between 10 and 999 seconds.

NOTE!

To operate the backlight, a voltage supply of at least 16 V
is required. If the voltage supply is low, the device deactivates the backlight.

9.1.2 Contrast of the display

If you want to adjust the readability of the display to your specific situation, you can adjust the contrast of the display in the menu "Configuration > Display/Operation > Contrast" in ten levels. Ex works, the device is set to level 5.

9.1.3 Operation timeout

If you have navigated to one of the submenus, the display returns to the normal display after 60 seconds. You can set the timeout time to a value of 0 to 999 seconds in the menu "Configuration > Display/Operation > Operation timeout".

9.1.4 Display operating temperature

The display of the device functions in an ambient temperature range of -20 to +85 °C. If the ambient temperature is outside of this range, the display will not work. In this case, the display will only show the warning triangle.
The medium temperature can go down to -40 °C, but is no longer displayed below -20 °C.

NOTE!

The admissible temperature range of the measurement medium is -40 to +85 °C.
The device cannot be guaranteed to function properly in a temperature range below -40 °C.
In safety-related applications (with activated safety function), the ambient and medium temperature are not allowed to go below -40 °C!

CAUTION!

Exceeding the device temperature range can result in operational malfunction!

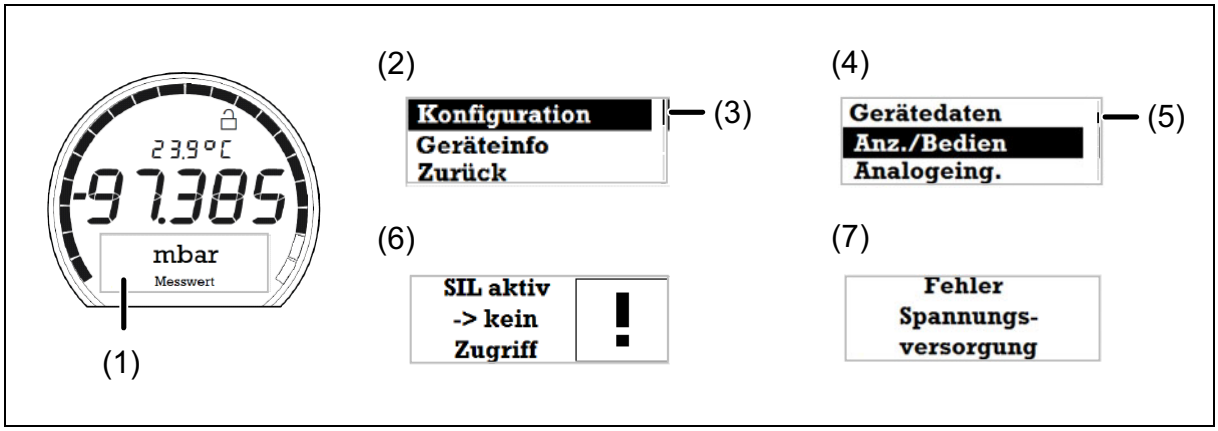
If the device temperature exceeds +85 °C, this can cause the device to malfunction.

▶ If you use the device in a hot environment or for measuring hot media, you will have to ensure – potentially through using additional ventilation or cooling measures – that the device temperature does not exceed +85 °C.

9.1.5 Plain text display

During operation, the plain text display shows the measuring unit and the information about which value is currently displayed. Via the plain text display integrated in the display, you can navigate through the menu structure and enter configuration parameters. The device itself issues messages or information about any errors via the plain text display.

On the right side of the plain text display is the navigation index. If you navigate through the menu using the rotary knob, the navigation index shows the relative position. The size of the side bar varies with the number of menu items in the corresponding menu.



(1) Plain text display, measured value normal display

(2) Main menu

(3) Navigation index in main menu

(4) Configuration, display/operation menu

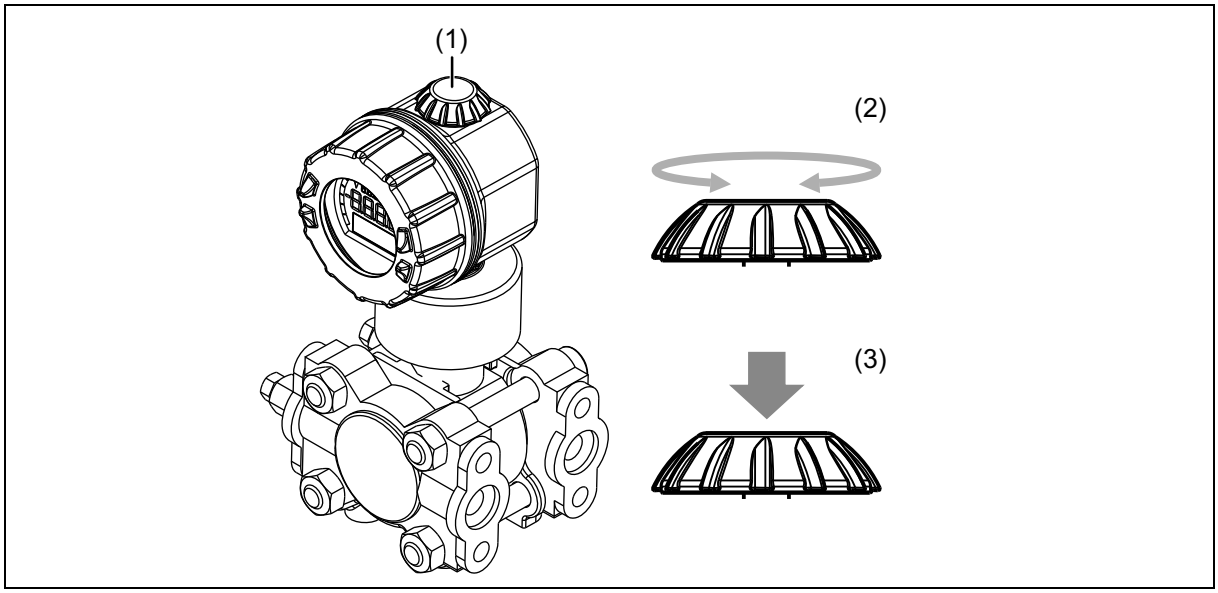
(5) Navigation index in Configuration menu

(6) Device notification; when the safety function is activated, you cannot change any parameters

(7) Device error message

9.2 Operation with rotary knob

There is a rotary knob on the top of the device. You can use this rotary knob to navigate through the different displays and apply settings on the device.



(1) Rotary knob
(2) Rotate – select parameter or adjust values
(3) Press – confirm parameter or values

NOTE!

Alternatively, you can configure the device via the integrated HART→ interface with a PC, a HART® handheld device* or via the control system.

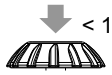
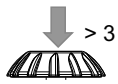
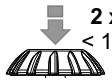
* HART®-compatible handheld devices:

- Emerson: FC475 and AMS tool
- ABB: DHH805-A
- E+H: Field Xpert SFX350, SFX370
- Honeywell: MCT404
- Meriam: MFC5150
- Yokogawa: YHC5150X

9.2.1 Rotary knob commands

You can also use the rotary knob to navigate through the menu.

The following table shows the rotary knob commands.

	Next level or save
	Press for longer than 3 seconds – back or cancel During the normal display, display of errors saved in the device
	2 x short presses – special function of some parameters in the menu (e.g., adoption of displayed pressure value, measurement start using pressure specification)
	Rotate right until the next notch – navigate downward in the menu, next menu entry or increase value
	Rotate left until the next notch – navigate upward in the menu, previous menu entry or reduce value

9.3 Menus

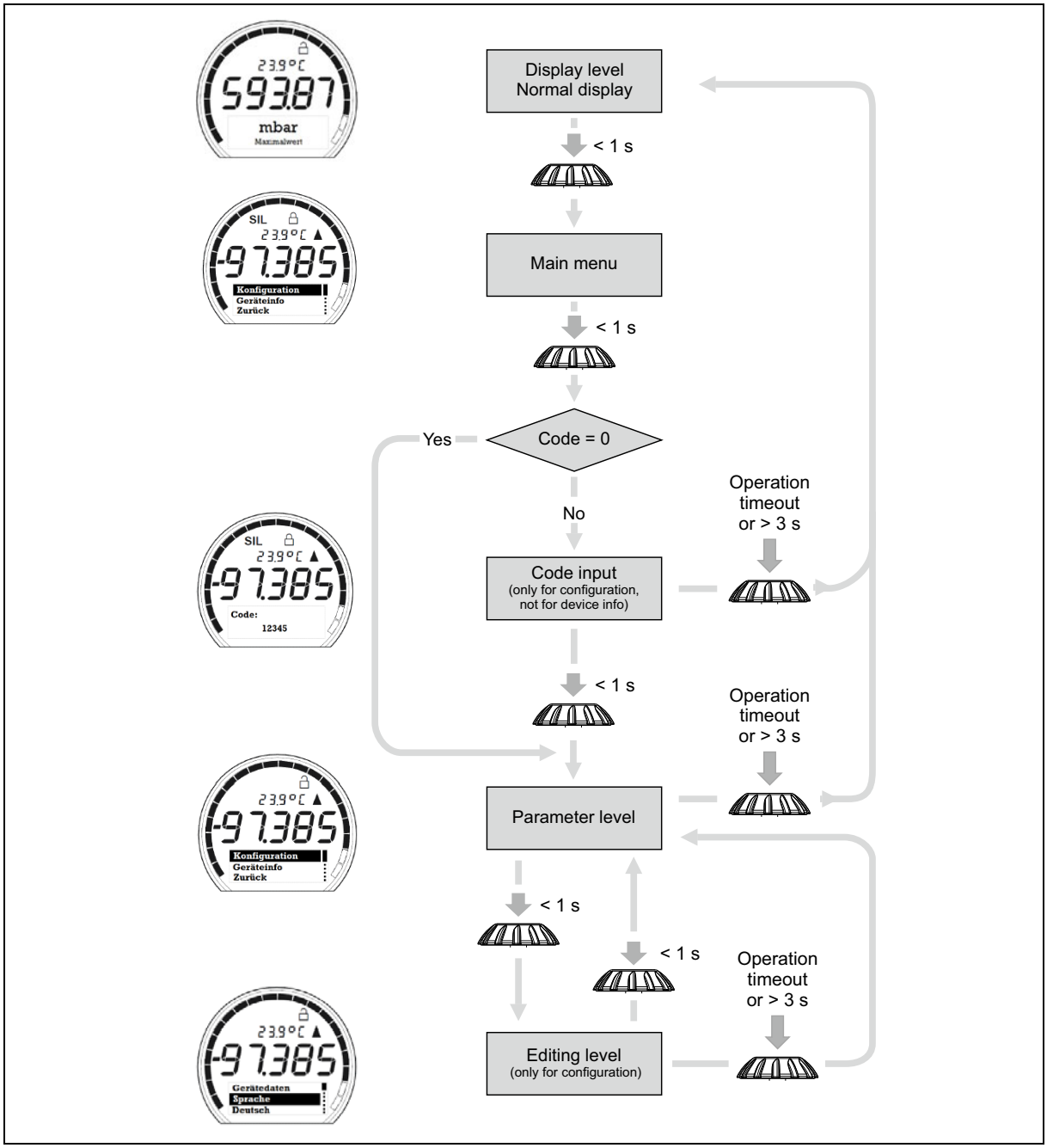
9.3.1 The level concept

The device is operated by using the rotary knob. Once you have switched on the device, the display shows the normal display. A short press of the rotary knob takes you to the main menu. An additional short press of the rotary knob takes you one level further down to the access code input or to the parameter level in each case. In the parameter level, you can select the parameters you want to edit by rotating left or right. A further press of the rotary knob takes you to the editing level, where you can set the desired parameter value.

If you do not enter anything, the display returns to the normal display after 60 seconds.
(Timeout operation; can be adjusted in the submenu "Configuration > Display > Operation > Operation timeout".)
A long press of the rotary knob takes you out of the level you are in and back to the normal display.

If you activate the parameterization and editing protection, you can lock access to the parameterization and editing level. Ex works, the parameterization and editing protection is disabled. For activation, see chapter "Main menu", Page 72

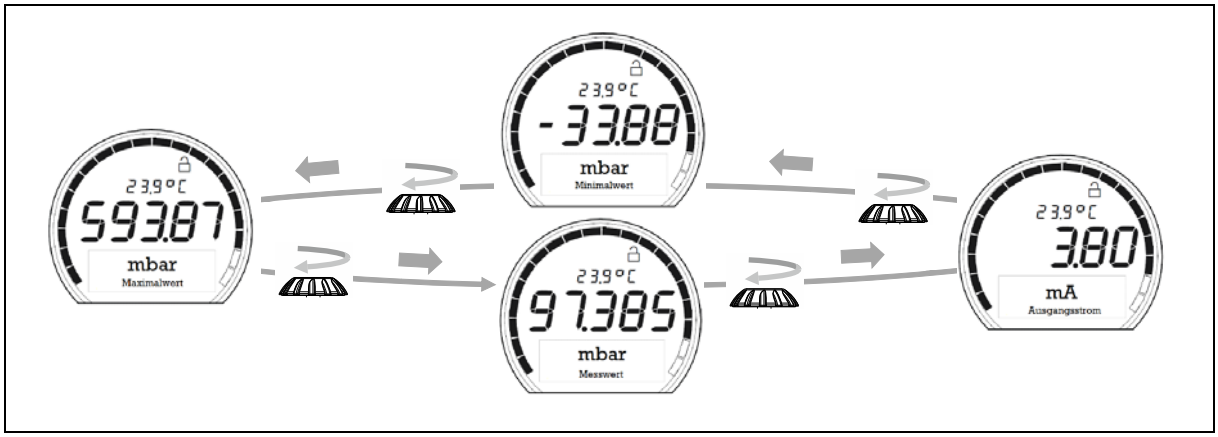
9 Operation


23.9 °C
593.87
mbar
Maximalwert
SIL
23.9 °C
-97.385
Konfiguration
Geräteinfo
Zurück
Code:
12345
Gerätedaten
Sprache
Deutsch
Display level
Normal display
< 1 s
Main menu
< 1 s
Code = 0
Yes
No
Code input
(only for configuration,
not for device info)
Operation
timeout
or > 3 s
< 1 s
Parameter level
< 1 s
< 1 s
Editing level
(only for configuration)

9.3.2 Normal display

In the display level, you can navigate through the different displays by rotating the rotary knob left or right.

- Depending on the configuration: pressure measured value, fill level measured value, or flow rate measured value[1]
- Output current
- Minimum pressure measured value
- Maximum pressure measured value



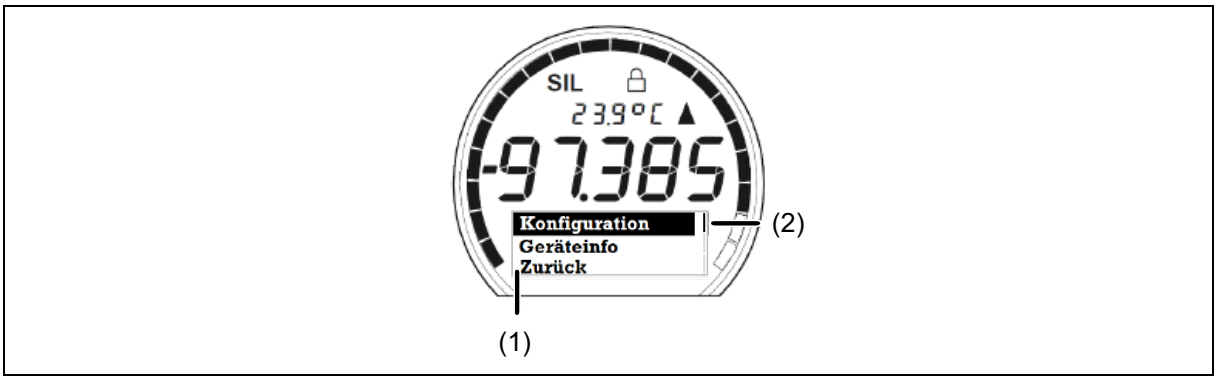
NOTE!

The display shows the measured values, the minimum value, and the maximum value with the number of decimal places set for pressure and fill level. The device displays the current temperature value in smaller digits above the measured value. Below 100°C/°F, the temperature value always has a decimal place. The display of the output current always has two decimal places.
If the value to be displayed exceeds five digits, the control will gradually delete the decimal places. If the value to be displayed exceeds the display possibility, the device shows 5 lines "- - - - -".

[1] Only for JUMO SIRAS P21 DP if you have selected flow rate in the output selector

9.3.3 Main menu

The display of the device is in the uppermost display level, the normal display. If you briefly press the rotary knob (< 1 s), the main menu opens in the plain text display with the menu items "Configuration" and "Device info".



(1) Main menu (2) Navigation index

NOTE!

If the parameterization and editing protection is activated, you must first enter the valid access code in order to access the "Configuration" menu.
See chapter "Unlocking the parameterization and editing protection", Page 77

As you cannot configure any settings under the menu item "Device info", this is freely accessible.

9.3.4 Configuration

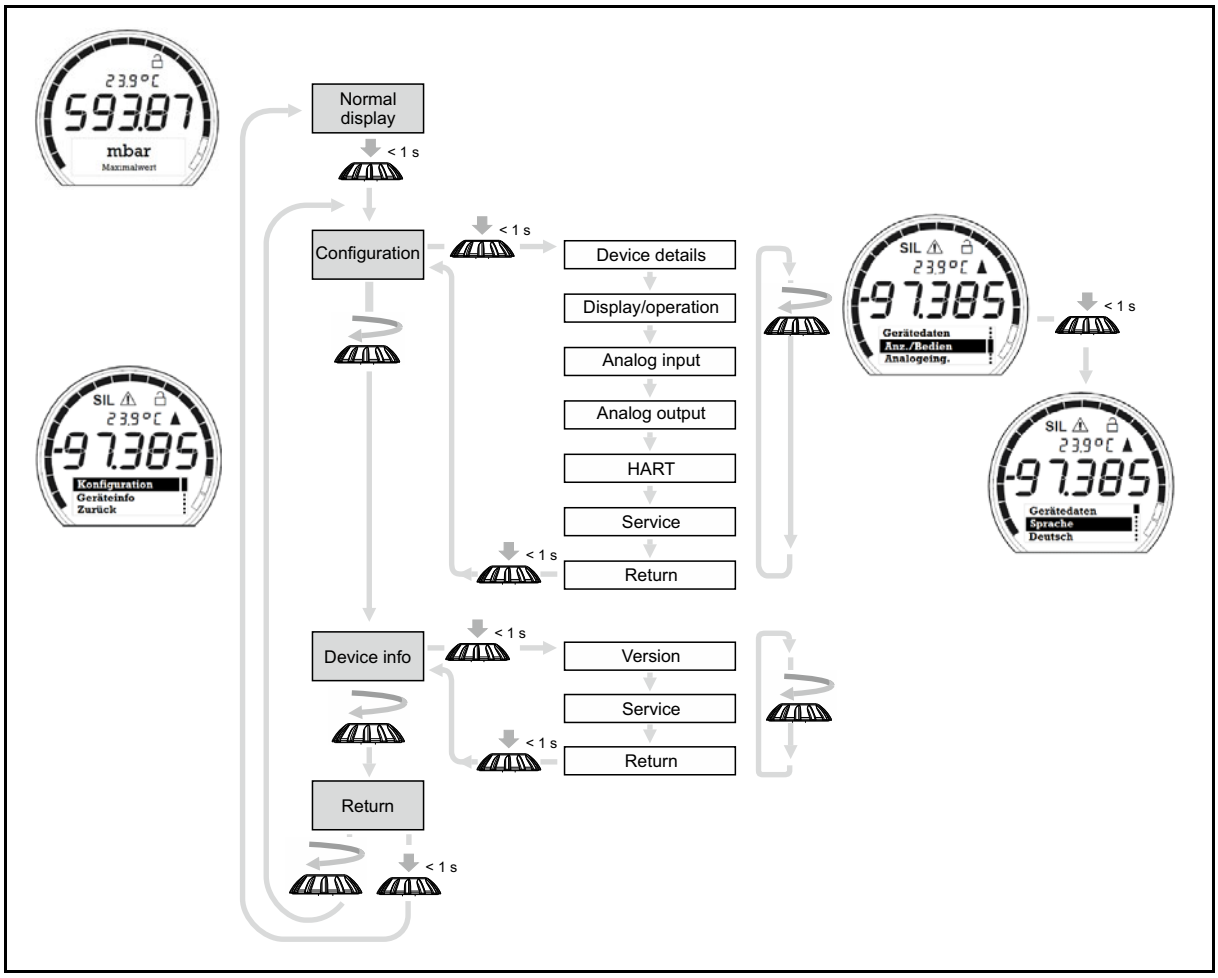
In the "Configuration" menu, you can configure all of the device settings. For this, the menu is subdivided by function. You can find details about the configuration options in the chapter "Description of the configuration options", Page 82.

NOTE!

Access to the "Configuration" menu is locked if you have activated the parameterization and editing protection. Only persons who have the access code can access the parameterization level.

If you have activated the safety function, you can still navigate through the menus, but you cannot change any of the parameters.
In this case, the device will show: "SIL active -> no access"

It is only possible to change the parameters if you deactivate the safety function.



The following table shows the various settings options under the individual menu items of the "Configuration" menu.

Menu	Display text	Function – display text
Device data	Safety function	Activate safety function
	Language	Select/change display language: German, English, French, Spanish, Russian
	Language query	Query of menu language when device starts up
	Temp. unit	Select/change temperature measuring unit

Menu	Display text	Function – display text
Disp./oper.	Normal display	Configure normal display
	Contrast	Adjust contrast of display
	Illumination	Set illumination mode
	Illumination timeout	Set timeout for illumination
	Operation timeout	Set operation timeout
	Code	Set access code for parameter level
Analog input	Pressure unit	Set pressure measuring unit for analog input
	Press. dec. pl.	Set decimal places for pressure display
	Pressure start	Set pressure measurement start
	Pressure end	Set pressure measurement end
	Damping	Set damping
	Pressure offset	Set pressure offset
	If you have selected "Sensor temp." in the output selector:	
	Temp. start	Set temperature range start
	Temp. end	Set temperature range end
	If you have selected "Fill level" in the output selector:	
	Fill level unit	Measuring unit for the fill level
	Fll. lev. dec. pl.	Configure decimal places for fill level display
	Fill lev. start	Start value for fill level display
	Fill lev. end	End value for fill level display
	Density correction	Correction value for the density of the measurement medium
	If you have selected "Flow rate" in the output selector:[a]	
	Flow rate unit	Measuring unit for the flow rate
	Flw. rt. dec. pl.	Set decimal places for flow rate display
	Flow rate start	Measuring range start for flow measurement
	Flow rate end	Measuring range end for flow measurement
	Flow rate factor	Pressure to flow rate conversion factor
	Characteristic line	Select characteristic line variant Linear to start of sq. rt. ext. Off to start of sq. rt. ext.
	Sq. rt. ext. ap. pt.	Application point of square root extraction in flow rate unit
Analog output	Output selector	Select signal of analog output
	Fault current	Select error signal
	SIL cur. inact.	Current at analog output in the case of disabled safety function
	Current simulation	Specify current values for test purposes – menu item is hidden if there is an error

Menu	Display text	Function – display text
HART® interface configuration – HART	Short address	Set HART® short address of the device
	Current loop	Activate current loop or activate constant multidrop output current
	Burst mode 1	Activate burst mode 1
	Burst mode 2	Activate burst mode 2
	Burst mode 3	Activate burst mode 3
Service	Minimum pressure	Display minimum pressure of the sensor
	Maximum pressure	Display maximum pressure of the sensor
	Reset min. pres.	Reset minimum pressure of the sensor
	Reset max. pres.	Reset maximum pressure of the sensor
	Reset device	Reset device to default settings

[a] Only for JUMO SIRAS P21 DP

Process connection, Materials of membrane	
20 (stainless steel)[a, b]	316 L
Flange	Stainless steel 316
Seal	PTFE
Materials of housing	
1 (short, stainless steel)	Stainless steel 1.4404
2 (long, stainless steel)	Stainless steel 1.4404, VMQ
3 (precision casting)	Precision casting 1.4408
Lid 20 (stainless steel)	Precision casting 1.4408, seal FPM
Electrical connection 36 (round plug M12 × 1)	Brass, nickel-plated
Electrical connection 93 (cable fitting, metal)	Brass, nickel-plated
Control knob	PA
Weights	
Type 403024/000-0-1 (housing, short)	Approx. 3.0 kg
Type 403024/000-0-2 (housing, long)	Approx. 3.3 kg
Type 403024/000-0-3 (housing, precision casting)	Approx. 4.0 kg

[a] The device is not suitable for the heating oil medium.

[b] The medium is not allowed to corrode the membrane material.

9.3.5 Device information

In the "Device info" menu you can see the following data:

- Software version and the fabrication number.
  These are important when sending queries to JUMO or when ordering further accessories.
- Operating hours, number of configuration changes

The values are purely for information purposes and cannot be edited.

Menu item	Display text	Function
Version	Software version	Software version of device firmware
Service	Operating time	Shows the operation time in hours (h)

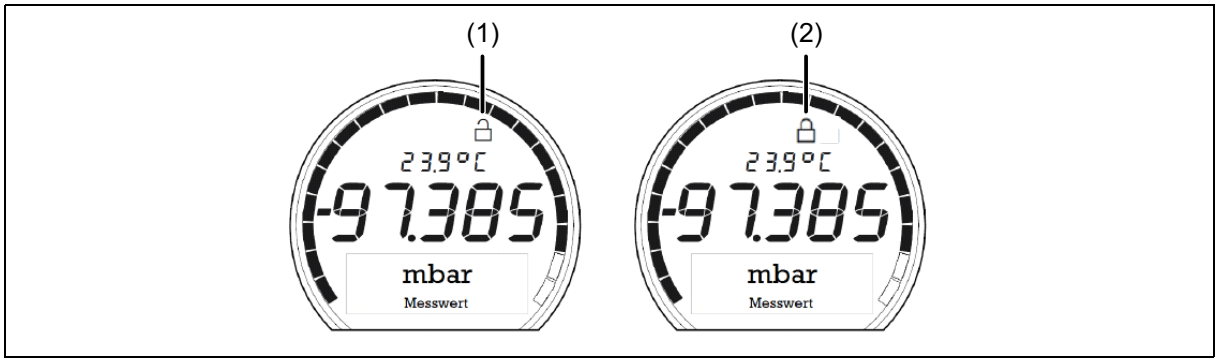
Menu item	Display text	Function
	Change counter	Counts every change made to the configuration upward from 0 in 1-step increments.

9.4 Parameterization and editing protection, safety function

9.4.1 Parameterization and editing protection

Activating the parameterization and editing protection

In order to protect the configuration against unwanted or arbitrary manipulation, you can protect access to the parameterization and editing level with an access code. The padlock symbol in the top right of the display indicates whether the protection is activated or deactivated.
The parameterization and editing protection is deactivated in the default settings.
You can activate it in the menu "Configuration > Display/Operation > Code".



(1) Parameterization and editing protection deactivated

(2) Parameterization and editing function active

NOTE!

By setting up an access code, you can limit access to the parameter level to a certain number of people. If you use the device as a component in a safety controller with activated safety function, you should protect access to the parameterization and editing level in each case by means of an access code.

You can fully remove the parameterization and editing protection by entering 0-0-0-0-0.

Activating the parameterization and editing protection

See menu "Configuration > Display/Operation > Code".

Starting point: Device is switched on, normal display with main menu, the access code is deactivated. The display shows the unlocked padlock symbol in the top right.

Entering the access code:

1) Select menu item "Configuration" by rotating the rotary knob.
2) Give the rotary knob one short press.
3) Select menu item "Display/Operation" by rotating the rotary knob.
4) Give the rotary knob one short press.
5) Select menu item "Code" by rotating the rotary knob.
6) Give the rotary knob one short press.
7) Set the desired digit by rotating the rotary knob.
8) Give the rotary knob a short press. The display moves on to the second/next digit to enter.
9) Repeat steps 7 and 8 until the five-digit access code is complete.
10) After confirming the fifth digit, the display switches to the menu "Display/Operation".

The lock is not active until the device returns to the normal display.

If you interrupt the entry process at any point and do not enter anything further, the display switches back to the normal display after 60 seconds or the timeout time set by you.

Pressing the rotary knob for longer than three seconds takes you back to the previous level.

Unlocking the parameterization and editing protection

Starting point: Device is switched on, normal display with main menu, the access code is activated – The display shows the locked padlock symbol in the top right.

Unlocking the device:

1) Select menu item "Configuration" by rotating the rotary knob.
2) Give the rotary knob one short press.
3) "Code" appears in the plain text display: the first place of the five-digit access code flashes.
4) Set the correct digit by rotating the rotary knob.
5) Give the rotary knob a short press. The display moves on to the second/next digit to enter.
6) Repeat steps 4 and 5 until the five-digit access code is complete.
7) After confirming the fifth digit, the display switches to the "Configuration" menu.

If you interrupt the entry process at any point and do not enter anything further, the display switches back to the normal display after 60 seconds or the timeout time set by you.

Pressing the rotary knob for longer than three seconds takes you back to the previous level.

9.4.2 Activating the safety function

Before activating the safety function on the device for use in a safety-related system, you must carry out the following mandatory steps:

1. Copy the startup protocol in the Safety Manual (see "Startup protocol", Page 56).
2. Enter the data for device identification and the value specifications into the startup protocol.
3. Calculate the values for the device parameters and enter these into the startup protocol.
4. Now transfer the parameters from the value specifications using the setup program, a handheld device, or via direct input on the device.

NOTE!

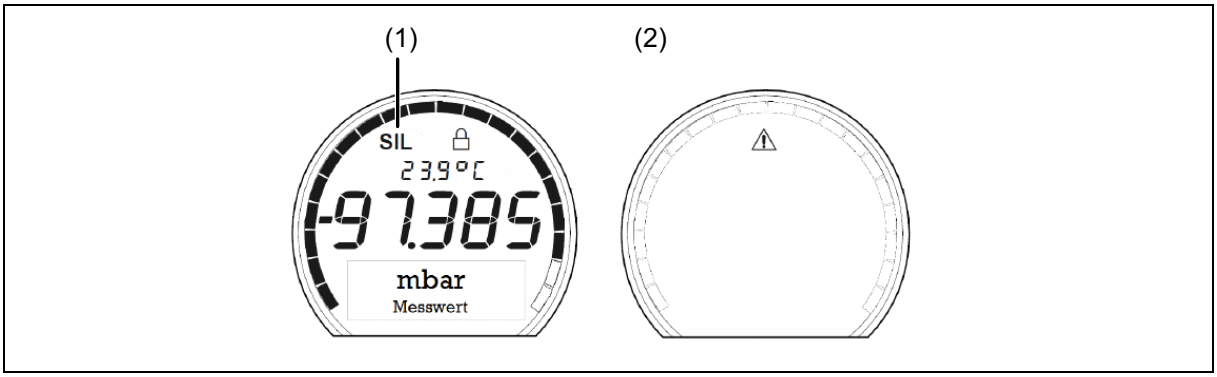
To activate the safety function, you must initiate the validation process on the device.

Make sure that, when using just one device, you only meet the prerequisites for Safety Integrity Level 2 (SIL 2)/Performance Level C (PLc).
To achieve Safety Integrity Level 3 (SIL 3)/Performance Level d (PLd), you must use two devices in a redundant setup.

Make sure that you also observe the "Safety Manual", Page 43 in the operating manual.

You will find the following selection options under menu item "Safety function":

Selection options	Note
Inactive (disabled)	Safety function is disabled.
Validate	Starts the validation process for activating the safety function.
Active	Shows the activated safety function.



(1) Device with activated safety function

(2) Device with activated safety function outside of the operating temperature range of the LCD display <-20 °C/>+85 °C

Starting point: Device is switched on, normal display with main menu, parameters have been transferred to the device according to the value specifications in the startup protocol, the safety function is disabled.

Validating the safety function:

1) Select the menu item "Configuration" by rotating the rotary knob.
2) Give the rotary knob one short press. The submenus appear in the plain text field.
3) Select the submenu item "Device data" by rotating the rotary knob.
4) Give the rotary knob one short press. The functions appear in the plain text field.
5) Select menu item "Safety function" by rotating the rotary knob.
6) Give the rotary knob one short press. The functions appear in the plain text field.
   "Inactive" (disabled) is highlighted in black.
7) Select "Validate" by rotating the rotary knob.
8) Give the rotary knob one short press.
   The device control system activates the write protection for the parameters. The device carries out an automatic check of relevant data and status.

   If the device identifies an error during the validation, an error message appears on the display (see table below). At this point, the device will abort the validation.
   You must first resolve the error and then restart the validation.

   After successful validation, the device activates all of the segments on the display.
9) Give the rotary knob one short press. The device loads all of the safety-relevant parameters from the EEPROM and displays these.
10) Compare each value with the value in the safety protocol and, if correct, confirm by pressing the rotary knob.
11) After confirming the last value, the following message appears: "Confirm: safety function activated".
12) Give the rotary knob one short press. The display switches to "Active". The device show "SIL" in the top left of the display. The safety function is activated.
13) Press rotary knob for three seconds. The display switches back to the normal display or the display returns to the normal display automatically without further entry after 60 seconds.
14) Add the startup protocol for later validations/inspections to your internal documents.

NOTE!

If the device identifies an error during validation, an error message appears on the display. See table below.

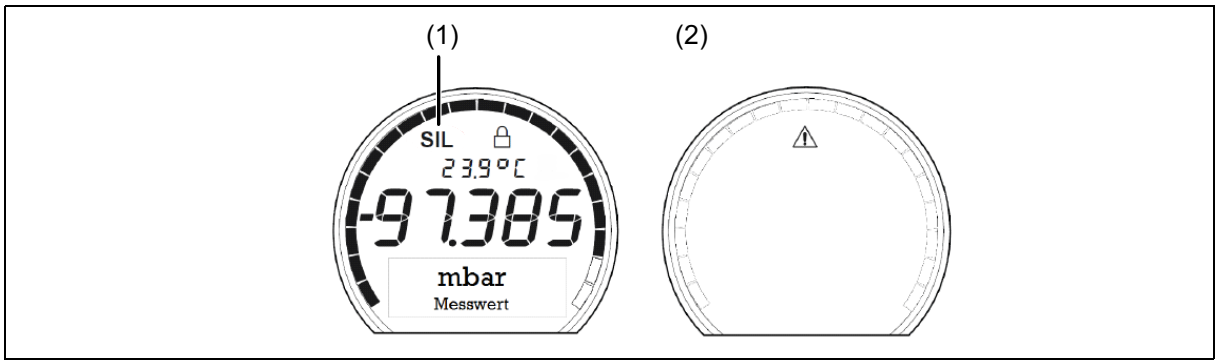
If you interrupt the entry process at any point and do not enter anything further, the display switches back to the normal display after 60 seconds or the timeout time set by you.

Pressing the rotary knob for longer than three seconds takes you back to the previous level.

Error message	Remedy
Device in error state	There is an error that is preventing the safety function from activating. First remove cause of error.
Timeout elapsed	The entry has exceeded the specified operation timeout. The device was unable to complete the validation. Reinitiate the validation process.
Activation canceled	The validation was canceled by the user. Reinitiate the validation process.
Output not act. val. prop.	Check configuration, potentially end "Analog output -> Current sim.", potentially activate "HART® > Current loop".
Output adjustment deviates too much	When the analog output was adjusted, this resulted in too large a deviation to the plant adjustment value. Readjust or reset to default settings.

Error message	Remedy
Output selector invalid	Not all selectable signals are allowed for activating the safety function. Check configuration and correct, if necessary.

9.4.3 Deactivating the safety function



(1) Device with activated safety function

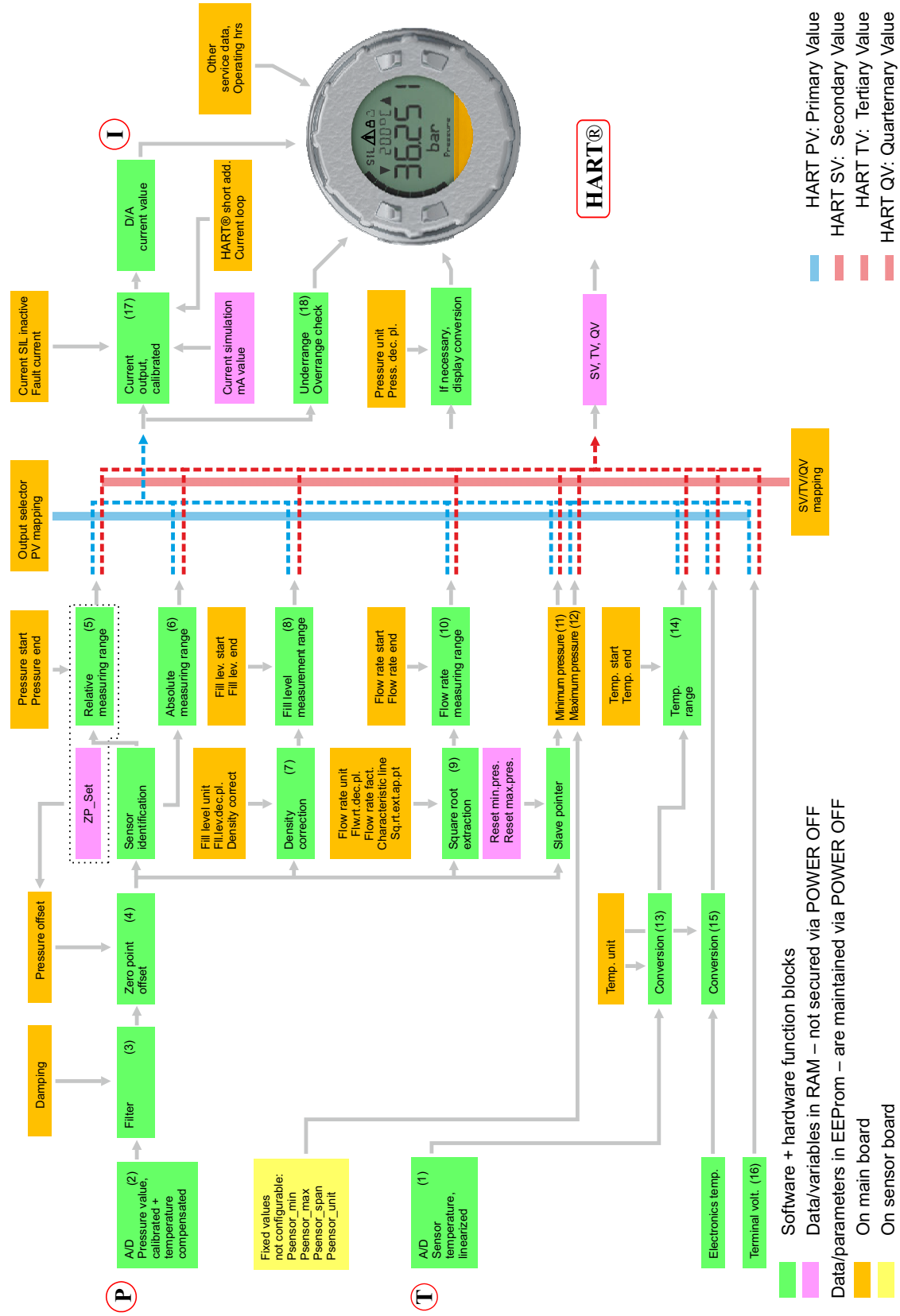
(2) Device with activated safety function outside of the temperature range <-20 °C/>+85 °C

Starting point: Device is switched on, normal display with main menu, the safety function is activated.

Deactivating the safety function:

1) Give the rotary knob one short press.
   The submenus appear in the plain text field.
   "Configurat." is selected.
2) Give the rotary knob one short press.
   "Device data" is selected.
3) Give the rotary knob one short press.
   "Safety func." is selected.
   The bottom row shows "Active"
4) Give the rotary knob one short press.
   The entry "Active" flashes.
5) Turn rotary knob one notch to the left.
   The display switches to "Inactive" (disabled) which flashes.
6) Give the rotary knob one short press.
   The display switches to "Inactive" (disabled).
   The "SIL" symbol goes out.
   The safety function is deactivated.

10.1 Data flow diagram



(1)	Temperature value in degrees C	(2)	Pressure value P in sensor unit
(3)	Pressure P filtered in sensor unit	(4)	Pressure P offset-corrected in sensor unit
(5)	DevVar0 = rel./diff.pressure (can be reset to zero) in %	(6)	DevVar1 = absolute pressure in %
(7)	DevVar5 = fill level in fill level unit	(8)	DevVar5 = fill level in %
(9)	DevVar6 = flow rate in flow rate unit	(10)	DevVar6 = flow rate in %
(11)	DevVar7 = minimum pressure in sensor unit or %	(12)	DevVar8 =maximum pressure in sensor unit or %
(13)	DevVar2 = sensor temp. in temp. unit	(14)	DevVar2 = sensor temp. in %
(15)	DevVar3 = electronics temp. in temp. unit	(16)	DevVar4 = terminal voltage in volt
(17)	Current in mA and as D/A output value	(18)	Output UR/OR flag (outside of 0 to 100 %)

10.2 Description of the configuration options

10.2.1 Configuration

In the "Configuration" menu, you can perform the full parameterization of the device under the individual submenu items. It contains the following submenus:

- Device data
- Display/Operation
- Analog input
- Analog output
- HART®
- Service

NOTE!

If burst mode is active on the device, there could be communication problems when communicating with the setup program. In this case, please deactivate burst mode on the device.

10.2.2 Device data submenu

Menu item	Settings options	Note
safety function	Inactive (disabled) Validate **Active**	Activates the safety function via a validation routine
Language	**German** English French Spanish Russian	Determines the language of the display texts
Language query when power on	No **Yes**	Determines whether query process for selecting the device language is on or off upon each system startup

Menu item	Settings options	Note
Temperature unit	**°C** °F	Determines whether temperature is displayed in Celsius or Fahrenheit. The device automatically converts the temperature values.

10.2.3 Display/Operation submenu

In the "Display/Operation" submenu, you can apply settings relating to the menu features, as well as activate the parameterization and editing protection – see "Parameterization and editing protection", Page 76.

Menu item	Settings options	Note
Normal display	**Pressure** Fill level Flow rate Output current Minimum pressure Maximum pressure	Determines the value shown as standard in the normal display. You can add/deselect the values "Fill level" and "Flow rate" in the output selector.
Contrast	0 to 9 Preset value: **5**	Determines the contrast of the display.
Illumination	Always off Always on **When pressed**	Determines the mode for the backlight of the display.
Illumination timeout	10 to 999 seconds Preset value: **60**	Determines the time frame after which the backlight goes out in "When pressed" mode if you do not operate the rotary knob.
Operation timeout	0 to 999 seconds Preset value: **60**	Determines the time frame after which the display returns to the normal display if you do not operate the rotary knob.
Code	0 to 99999 Preset value: **0**	The entry of a value > 0 activates the parameterization and editing protection

10.2.4 Analog input submenu

The "Analog input" submenu is where you can configure the measuring units and processing measurands for the signals delivered by the sensor.

Menu item	Settings options	Note
Pressure unit	inH_2O inHg ftH_2O mmH_2O mmHG psi bar mbar kg/cm^2 kPa Torr MPa mH_2O Preset value: **bar**	Determines the measuring unit with which the device displays the pressure value on the display; the device automatically converts the pressure value into the desired measurand.
Press. dec. pl.	None One Two Three Preset value: two	Determines the number of decimal places with which the device displays the pressure value on the display
Pressure measurement start	120 % SensorMin to to 120 % SensorMax Default = SensorMin	Determines the measuring range start in the device; pressing the rotary knob twice adopts the currently measured pressure, offset-corrected, for editing; Example: measuring range from -600 to +600 mbar; set measuring range start to -720 mbar
Pressure measurement end	120 % SensorMin to 120 % SensorMax Default = SensorMax	Determines the measuring range end in the device; pressing the rotary knob twice adopts the currently measured pressure, offset-corrected, for editing; Example: measuring range -600 to +600 mbar; set measuring range end to +720 mbar
Damping	0.0 to 100.0 seconds Preset value: **0.0**	Determines the delay time with which the device changes the value on the display when there are pressure fluctuations.

Menu item	Settings options	Note
Pressure offset	-10 to +10 % from sensor range Preset value: **0**	Determines the value of the offset correction of the displayed pressure value.
Fill level unit	l hl m^3 ft3 in3 Gal ImpGal kg t lb m cm mm ft In % Text – with a maximum of eight characters Preset value: **l**	Determines the measuring unit with which the device displays the fill level; to be displayed, "Fill level" must be selected in the output selector; The device does not automatically convert fill level values. To covert them, you must correctly edit the "Density correction" parameter.
Fl.lev. txt. unit	8 ASCII characters	Customer-specific text; can only be edited in the setup program; to be displayed, "Fill level" must be selected in the output selector.
Fill lev. dec.pl.	None One Two Three Preset value: **None**	Determines the number of decimal places with which the device displays the fill level on the display; to be displayed, "Fill level" must be selected in the output selector
Fill lev. start	-99999 to +99999 Preset value: **0**	Determines the value for the lowest fill level; pressing the rotary knob twice adopts the currently measured value for editing; to be displayed, "Fill level" must be selected in the output selector

Menu item	Settings options		Note
Fill lev. end	-99999 to +99999 Preset value: **100**		Determines the value for the highest fill level; pressing the rotary knob twice adopts the currently measured value for editing; to be displayed, "Fill level" must be selected in the output selector
Density correction	0.01 to 99.99 Preset value: **1**		Determines the correction value for density correction for the fill level; to be displayed, "Fill level" must be selected in the output selector
Flow rate unit	m^3/s	Nm^3/min	Determines the measuring unit with which the device displays the flow rate; to be displayed, "Flow rate" must be selected in the output selector; The device does not automatically convert flow rate values. To convert them, you must correctly edit the "Flow rate factor" parameter.
	m^3/min	Nm^3/h	
	m^3/h	Nm^3/day	
	m^3/day	Sm^3/s	
	l/s	Sm^3/min	
	l/min	Sm^3/h	
	l/h	Sm^3/day	
	hl/s	SCFS	
	hl/min	SCFM	
	hl/h	SCFH	
	ft^3/s	SCFD	
	ft^3/min	g/s	
	ft^3/h	kg/s	
	ft^3/day	kg/min	
	US Gal/s	kg/h	
	US Gal/m	t/min	
	US Gal/h	t/h	
	US Gal/d	t/day	
	ImpGal/s	oz/s	
	ImpGal/m	oz/min	
	ImpGal/h	lb/s	
	bbl/s	lb/min	
	bbl/min	lb/h	
	bbl/h	ton/min	
	bbl/day	ton/h	
	Nm^3/s	ton/day	
	Text – with a maximum of 8 charactersPreset value: **m^3/s**		
Flw.rt. txt.unit	8 ASCII characters		Customer-specific text; can only be edited in the setup program; to be displayed, "Flow rate" must be selected in the output selector

Menu item	Settings options	Note
Flw. rt. dec. pl.	None One Two Three Preset value: **None**	Determines the number of decimal places with which the device displays the flow rate on the display; to be displayed, "Flow rate" must be selected in the output selector
Flow rate start	-99999 to +99999 Preset value: **0**	Determines the value for the lowest flow rate value; pressing the rotary knob twice adopts the currently measured value for editing; to be displayed, "Flow rate" must be selected in the output selector. As the characteristic line that extracts the square root is saved symmetrically, a bidirectional flow measurement can be issued to the output through input of a negative start value.
Flow rate end	-99999 to +99999 Preset value: **100**	Determines the value for the highest flow rate value; pressing the rotary knob twice adopts the currently measured value for editing; to be displayed, "Flow rate" must be selected in the output selector.
Flow rate fact.	0.001 to 99999 Preset value: **1.000** Decimal places can be edited 0 to 3	Conversion factor for pressure to flow rate, determines the relationship between pressure and flow rate; to be displayed, "Flow rate" must be selected in the output selector
Characteristic line	Linear to start of sq. rt. ext. Off to start of sq. rt. ext. Preset value: **Linear to start of sq. rt. ext.**	Determines the type of characteristic line for the flow measurement; to be displayed, "Flow rate" must be selected in the output selector
Sq. rt. ext. ap. pt.	0 to 99999 Preset value: **0**	Application point of square root extraction in flow rate measuring unit; to be displayed, "Flow rate" must be selected in the flow rate selector. The application point enables creeping quantity suppression with selected flow rate characteristic line for calculation purposes.
Temp. start	-40.00 to +120 °C Preset value: **-40.00**	Determines the measuring range start of the sensor temperature; to be displayed, "Sensor temperature" must be selected in the output selector
Temp. end	-40.00 to +120 °C Preset value: **+120.00**	Determines the measuring range end of the sensor temperature; to be displayed, "Sensor temperature" must be selected in the output selector

The default value depends on the type of sensor used.

10.2.5 Analog output submenu

The analog output submenu is where you can configure the values output via the analog output and shown on the display. You use the "Output selector" menu item (Output select.) to determine which value is displayed in the normal display in addition to the output current, the minimum value, and the maximum value.

Text in the menu	Settings options	Note
Output select.	Rel./dif.press. Absolute pressure Sensor temperature Fill level Flow rate Min. slave pntr. Max. slave pntr. Preset value: Dependent on the installed sensor: **rel./dif.press. or absolute pressure**	Determines the signal to be output at the analog output and activates it, including in the normal display if necessary.
Fault current	Low 3.6 mA High 21.6 mA Preset value: **High 21.6 mA**	Determines the current value that the analog output issues if there is a malfunction.
SIL current disabled	Fault current Actual value Preset value: **fault current**	Determines which current the device outputs when the safety function is disabled.
Current simulation	3.60 to 21.60 mA Preset value: **4.00 mA**	Simulation of the output current This menu item is hidden when a fault current is output.

10.2.6 HART® submenu

In the HART® submenu, you can configure the most important parameters for the communication of the HART® interface with the handheld device or the control center. A detailed configuration can also be performed via the setup program.

NOTE!

If burst mode is active on the device, there could be communication problems when communicating with the setup program. In this case, please deactivate burst mode on the device.

Text in the menu	Settings options	Note
Short address	0 to 63 Preset value: **0**	Determines the short address of the device, in case you operate several devices in a bus configuration.
Current loop	Inactive (disabled) Active Preset value: **Active**	Activates the output current configured under analog output. When "inactive" (disabled), the device constantly emits 4 mA. The setting "inactive" (disabled) prevents the activation of the safety function
Burst mode 1	Inactive (disabled) Active Preset value: **Inactive (disabled)**	Activates the burst telegrams 1 to 3 preconfigured by the setup program. Several can be active simultaneously. In the event of problems with establishing a connection with a HART® master, you can deactivate the burst telegrams here on the device.
Burst mode 2	Inactive (disabled) Active Preset value: **Inactive (disabled)**	
Burst mode 3	Inactive (disabled) Active Preset value: **Inactive (disabled)**	

10.2.7 Service submenu

Text in the menu	Settings options	Note
Minimum pressure	Sensor range	Display of the smallest measured pressure since the last reset operation.
Maximum pressure	Sensor range	Display of the largest measured pressure value since the last reset operation.
Reset min. pres.	No Yes Preset value: **No**	Reset the minimum slave pointer
Reset max. pres.	No Yes Preset value: **No**	Reset the maximum slave pointer
Reset device	Do not reset Only adj. data Default sett. Preset value: **Do not reset**	Resets only the adjustment data or the entire device to the default settings.

NOTE!

If you reset the device, you can choose whether to reset only the adjustment data of the analog output or also the further "Configuration", "HART® configuration", "Slave pointer pressure", "Calibration output", and "Duplicated sensor ID" data.

The values "Operating hours counter", "Last 10 errors", and "Calibration input", remain unaffected by the reset.

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

The following description applies for fill level measurement across all measuring ranges.

With rotary knob operation (Configuration menu)

To switch from the display level to the "Configuration" menu, see "The level concept", Page 69

Carry out the following configuration steps:

Submenu in the menu Configuration	Setting
Analog output – Output selector	Set output selector to "Fill level"
Analog input – Pressure unit	Measuring unit, e.g., mbar
Analog input – Damping	Damping 0; potentially increase value if pressure value fluctuates too much due to wave movement
Analog input – Density correction	Enter density of the medium in the tank before measurement range editing
Analog input – Fill level unit	Select "Fill level" measuring unit for display
Analog input – Fill level start	Measuring range measurement start: 4 mA (Configure when tank empty; here double-click on rotary knob to adopt the current pressure value, then adjust or confirm the editing value)
Analog input – Fill level end	Measuring range measurement end: 20 mA (Configure when tank is full; here double-click on rotary knob to adopt the current pressure value, then adjust or confirm the editing value)

NOTE!

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

10.4 Level measurement configuration without a pressure specification

10.4.1 In closed containers with ± measuring ranges or 0 to 1 bar

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

With rotary knob operation (Configuration menu)

To switch from the display level to the "Configuration" menu, see "The level concept", Page 69

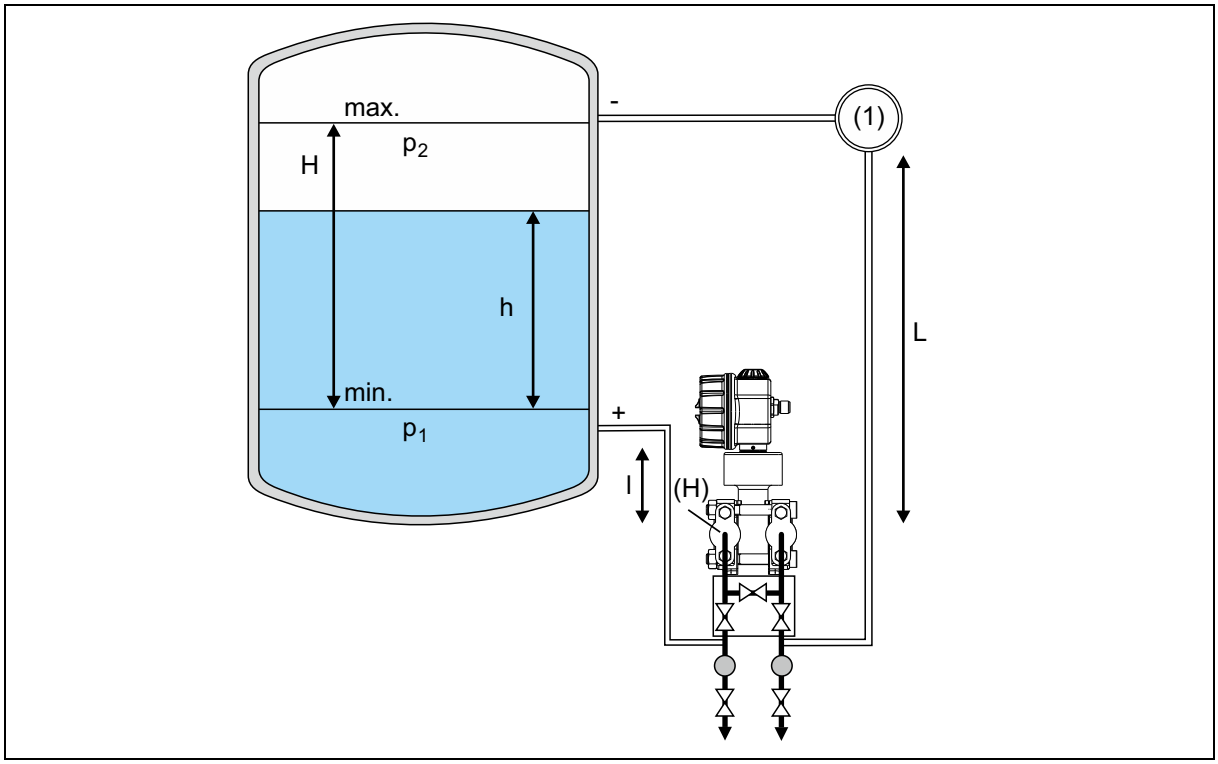
Carry out the following configuration steps:

Submenu in the menu Configuration	Setting
Analog output – Output selector	Set output selector to fill level
Analog input – Fill level unit	Measuring unit, e.g., l (liters)
Analog input – Damping	Damping 0; potentially increase value, if fill level value fluctuates too much due to wave movement
Analog input – Density correction	Enter density of the medium in the tank before measurement range editing
Analog input – Fill level unit	Select "Fill level" measuring unit for display
Analog input – Fill level start	Measuring range measurement start: 4 mA (Configure when tank empty; here double-click on rotary knob to adopt the current fill level value, then adjust or confirm the editing value)
Analog input – Fill level end	Measuring range measurement end: 20 mA (Configure when tank is full; here double-click on rotary knob to adopt the current fill level value, then adjust or confirm the editing value)

NOTE!

Instead of adopting the actual states by double-clicking, you can also theoretically calculate the fill level parameters that are to be configured and enter them over the course of the configuration.

10.4.2 For steam layering with ± measuring ranges



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

Range start (4 mA):

Pressure at measurement start [mbar] = $(L - I) \times \rho_{vap} \times g \times 0.01$

Range end (20 mA):

Pressure at measurement end [mbar] = $(I - L) + H \times \rho_{vap} \times g \times 0.01$

Legend:

H	[mm]	=	Max. fill level
h	[mm]	=	Max. level of the measured liquid, $0 < h \leq H$
L	[mm]	=	Vertical distance from tank to measuring device input (low pressure)
I	[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
Pressure at measurement start	[mbar]	=	(100 - 8000) × 1.00 × 9.81 × 0.01 = -774.99

Pressure at measurement end [mbar] = ([100 - 8000] + 7000) × 1.00 × 9.81 × 0.01 = -88.29

With rotary knob operation (Configuration menu)

To switch from the display level to the "Configuration" menu, see

Carry out the following configuration steps:

Submenu in the menu Configuration	**Setting**
Analog output – Output selector	Set output selector to "Fill level"
Analog input – Fill level unit	Measuring unit, e.g., mM
Analog input – Density correction	Calculate and configure density correction for conversion of internal pressure unit bar to chosen fill level unit, e.g., for mm = rho(iq)/rho(vap) x g x $1e^{-5}$. Enter calculated value
Analog input – Fill level unit	Select "Fill level" measuring unit for display
Analog input – Fill level start	Measuring range measurement start: 4 mA Configure when tank empty; here double-click on rotary knob to adopt the current pressure value, then adjust or confirm the editing value or enter and confirm calculated pressure at measurement start/ density correction
Analog input – Fill level end	Measuring range measurement end: 20 mA Configure when tank full; here double-click on rotary knob to adopt the current pressure value, then adjust or confirm the editing value or enter and confirm calculated pressure at measurement end/ density correction

NOTE!

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

.

10.5 Configuration for flow measurement with pitot tube or standard orifice plate

With rotary knob operation (Configuration menu)

To switch from the display level to the "Configuration" menu, see "The level concept", Page 69

Carry out the following configuration steps:

Submenu in the menu Configuration	Setting
Analog output – Output selector	Set output selector to "Flow rate"
Analog input – Pressure unit	Measuring unit, e.g., mbar
Analog input	Enter damping and offset
Analog input – Flow rate unit	Set e.g., l/min or mass, e.g., kg/h
Analog input – Flw.rt.dec.pl.	Set number of decimal places of the flow rate display
Analog input – flow rate start, flow rate end	As the characteristic line that extracts the square root is saved symmetrically, the device can issue a bidirectional flow measurement to the output through input of a negative start value.
Analog input – flow rate fact.	Flow rate factor, see calculation example below.
Analog input – characteristic line	Set type of characteristic line: Lin. to start/sq.rt.ext., Off to start
Analog input – sq. rt. ext. ap. pt.	Enter square root extraction application point
Display/operation – normal display	Set flow rate

Example calculation for flow rate factor:

Applicable components, e.g.:

- **Differential pressure sensor** with "sensor_unit" bar and sensor range -1 to +1 "bar (sensor_unit" is the unit with which the sensor calculates internally).
  With the differential pressure sensors installed in the JUMO SIRAS P21 DP, this is always the unit "bar"
- **Orifice plate with documented orifice plate constant**
  The constant is provided to you with the documentation that belongs to the orifice plate that is installed.

If the flow is e.g., 23 US gallons per minute, the differential pressure is 8 psi (e.g., if using an orifice plate).

NOTE!

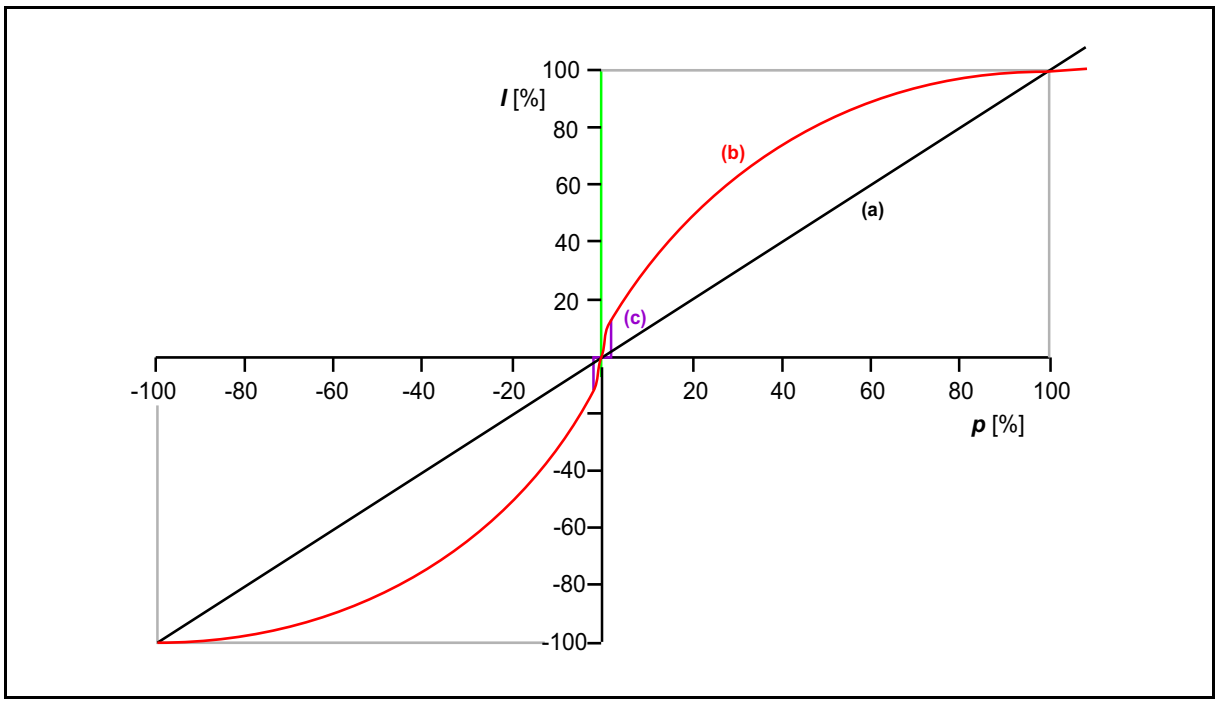
This value pair with number value + physical unit on both sides does not represent a proportional relationship, but is a point on the root characteristic line.

If you wish to configure the flow rate display in hectoliters per hour (hl/h), you get the following conversion factors:

- Pressure units factor: 1 psi = 0.06895 bar, the differential pressure must be converted into the unit "sensor_unit", here in "bar".
- Flow units factor: 1 US gallon per minute = 3.785412 l/min = 2.2712472 hl/h
- The following setpoint, input, and output values of the entire function block square root extraction: at a flow of 23 US gallons per minute = 52.2386856 hectoliters per hour,
  there is a differential pressure of 8 psi; 8 x 0.06895 = 0.5516 bar

The flow rate factor would therefore be:

Flow rate factor = flow rate value²/differential pressure value = 52.2386856²/0.5516 = 4947.2086



I	Output current in %
p	Pressure in %
a	Linear = in proportion to pressure in the case of output selector rel./dif. pressure
b	Linear to sq. rt. ext.
c	SoFF – Off to sq. rt. ext.

NOTE!

For a flow measurement completely without creeping quantity suppression, the application point must be configured to 0. The chosen flow rate characteristic line is subsequently irrelevant.

NOTE!

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

11.1 Maintenance plan

In principle, the device does not require any maintenance. The maintenance work is limited to checking the state of the device and carrying out regular functional tests.

WARNING!

Loss of safety function due to damage to the device!

Damaged devices lead to loss of safety function. This can lead to personal injury or damage to the plant/machine.

- ▶ If the device is damaged, you must exchange it completely.
- ▶ You are only allowed to replace parts that you can order from JUMO as accessory parts.

Pos.	Component	Interval	Required activity
1	Device with activated safety function	- -	Check correct functioning of the safety function. See "Safety Manual", Page 43
2	Pressure connection	Weekly	Check screw connection of the pressure connection for leak tightness. Immediately repair any leaks.
3	Entire device	Monthly	Check for pollutants, state, cable connections, and function. Clean if necessary. On devices with a cable fitting, check that the union nut is tight. Tighten if necessary (0.5 Nm). Immediately address any faults. Replace faulty parts or entire device if necessary.

11.2 Cleaning

Clean the device from the outside with a cloth moistened with water or with a mild cleaning agent. Do not use any aggressive or flammable cleaning agents.

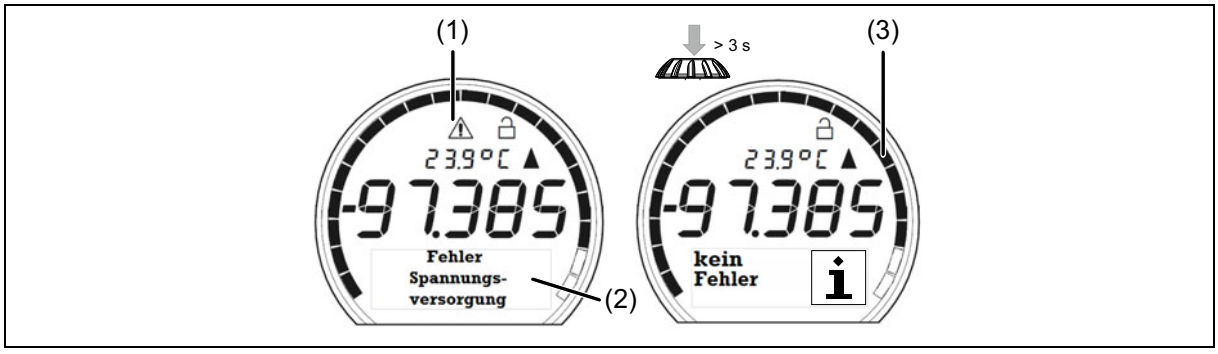
11.3 Overcoming errors and malfunctions

11.3.1 General errors

Error/fault	Possible cause	Remedy
No display	No voltage supply	Switch on voltage supply
No display	Device is faulty	Send the device to the supplier to be repaired.
Rotary knob does not react	Device is faulty	Send the device to the manufacturer to be repaired.
Communication problems with the setup program when burst mode is switched on	Burst-Modus is interfering with communication	Deactivate burst mode on the device

11.3.2 Error list

If there is an error with the device, it will show this in a message on the display. In the upper area of the display, the "warning triangle" is shown. If the display is in normal display mode, you can call up the last ten errors that occurred by giving the rotary knob a long press. If there are no errors, the device shows "No error".



(1) "Warning triangle", there is an error (2) Plain text display for errors

(3) "No error" display

The following table shows the potential error messages for the device in the left-hand column. The middle column shows the cause and the right-hand column provides brief instructions on how to resolve the error.

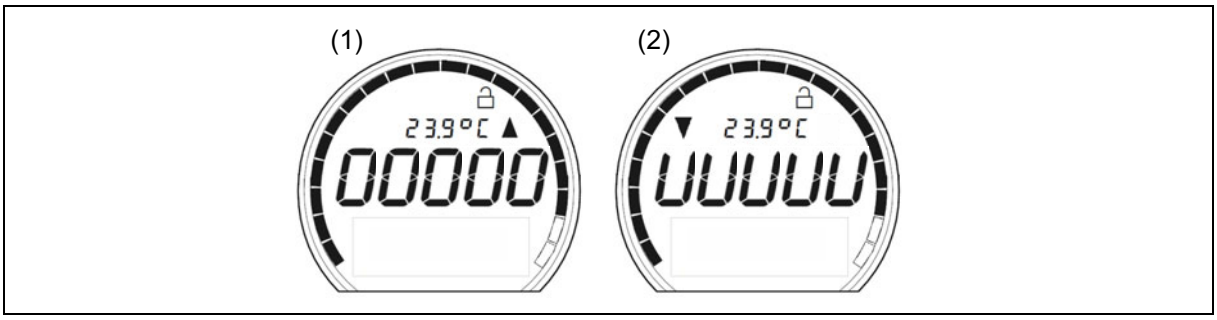
Plain text in the display	**Possible cause**	**Remedy**
A/D converter 1	A/D converter, 1 error	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
A/D converter 2	A/D converter, 2 errors	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Output not AV-prop.	Output is not proportional to actual value	Reconfigure and revalidate
Output selector invalid	The output selector is not configured to a safety-related signal	Reconfigure and revalidate
CPU not adjusted	CPU function group is not adjusted	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
CRC adj. def. CPU	CPU adjustment constants (JUMO default calibration) faulty	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
CRC adj. outp. CPU	CPU adjustment constant (analog output) faulty	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
CRC adjustment sensor	Pressure adjustment constant faulty	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
CRC config. EEPROM	CRC test of configuration in EEPROM returned an error	Reconfigure and restart device. If the error persists, send the device to the manufacturer to be repaired.

Plain text in the display	Possible cause	Remedy
CRC trimming CPU	CPU adjustment constants (sensor trimming) faulty	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
CRC pre-adj. sensor	Pressure pre-adjustment constant faulty	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
D/A converter	D/A converter error	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
EEPROM access sensor	An error occurred during sensor EE-PROM reading/writing	Restart device and check configuration and correct if necessary. If the error persists, send the device to the manufacturer to be repaired.
EEPROM access CPU	An error occurred when reading/writing the CPU EEPROM	Check configuration and correct, if necessary. Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Electron. temp.	Electronics temperature error	Adjust the device temperature to the valid range and restart. If the error persists, send the device to the manufacturer to be repaired.
Config. invalid	The configuration is faulty	Check configuration and correct, if necessary. Restart the device. If the error persists, send the device to the manufacturer to be repaired.
LCD version	No suitable display driver was found.	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Measured value error	An error occurred when calculating the measured value	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Program sequence	Program sequence faulty	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
RAM faulty	An error occurred in the random access memory (RAM)	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Reference measurem.	Reference measurement error	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Reference Low-Gain invalid	Low-Gain reference measurement is invalid	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Reference High-Gain invalid	Reference High-Gain is invalid	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Tab error	CPU tab error	Restart the device. If the error persists, send the device to the manufacturer to be repaired.

Plain text in the display	Possible cause	Remedy
ROM faulty	An error has occurred in the read-only memory (ROM).	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Sensor replacement	The sensor was replaced In principle, only the manufacturer is allowed to replace the sensor!	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Signal analog output	Analog output signal deviates from the specification	Check whether the analog output signal is being tapped. Reset the error in the menu and restart the device. If the error persists, send the device to the manufacturer to be repaired.
Analog part voltage	Error detected when measuring the 5-V voltage supply (analog part)	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Digital part voltage	Error detected when measuring the 3.3-V voltage supply (digital part)	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Stack error	Stack error	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Analog output VCC	Error detected when measuring the analog output voltage supply	Restart the device. If the error persists, send the device to the manufacturer to be repaired.
Output adjustment deviates	Output adjustment constants of the analog output deviate too much from the default adjustment	Recalibrate analog output, e.g., via HART handheld device or reset to default setting: Configuration > Service > Reset device > Only adj. data

11.3.3 Measured value errors

Measured value errors appear in the area of the measured value display through use of the five 7-segment displays.



(1) Measuring range overflow (2) Measuring range underflow

Plain text in the display	Possible cause	Remedy
- - - - -	Value invalid	Restart the device. If the error persists, send the device to the manufacturer to be repaired
- - 4 - -	Division by ZERO	Restart the device. If the error persists, send the device to the manufacturer to be repaired
- - 6 - -	Error with terminal temperature/ compensation signal	Adjust the compensation signal that is used in the value calculation to a valid range If the error persists, send the device to the manufacturer to be repaired
- - 7 - -	Probe short circuit	Check sensor configuration Check sensor for short circuit Send the faulty device to the manufacturer to be repaired.
- - 8 - -	Probe break	Check sensor configuration Check sensor for damage Send the faulty device to the manufacturer to be repaired.
- - 9 - -	Timeout during value determination	Restart the device. If the error persists, send the device to the manufacturer to be repaired
O O O O O	Measuring range overflow; Configured maximum measured valued exceeded	Check sensor configuration/ check measuring chain
U U U U U	Measuring range underflow; Configured minimum measured value undershot	Check sensor configuration/ check measuring chain

11 Maintenance

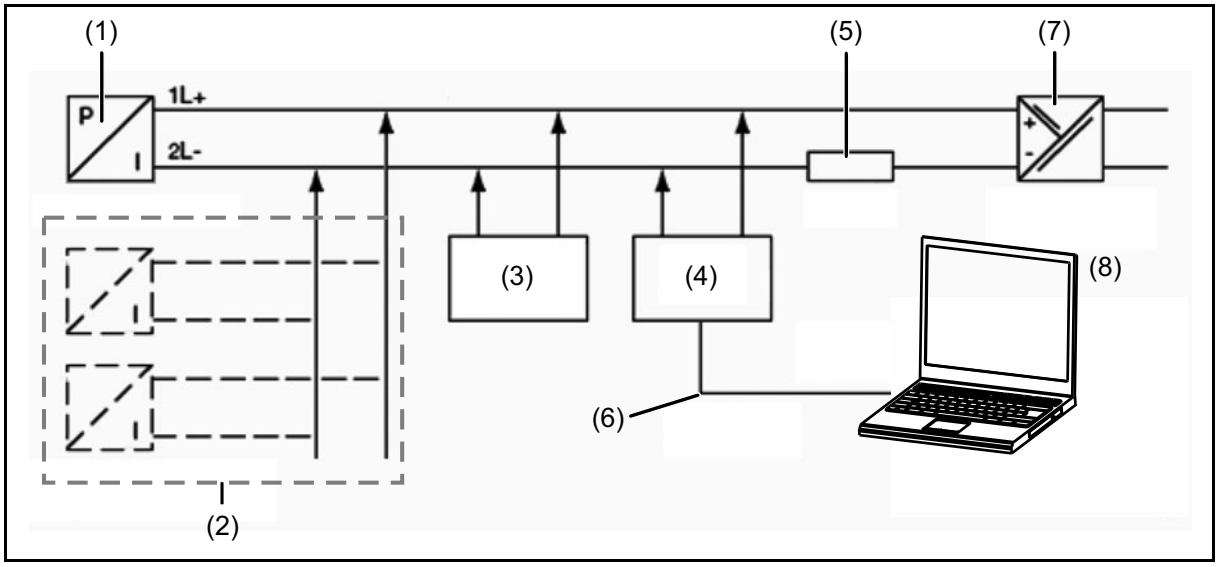
The device features a HART® interface according to the HART® 7 specification. You will find a corresponding entry on the nameplate: 4 to 20 mA HART®.
The HART® signal is modulated as a pure AC component with approx. 0.5 mA to the 4 to 20 mA current that is simultaneously transmitted.
This gives the two-wire connection three functions:

- Voltage supply
- Analog value output
- HART® interface connection

NOTE!

When the safety function is activated, communication only takes place in "Read-Only" mode. If you want to execute HART® write commands, you must deactivate the safety function.

In addition to the JUMO setup program, you can also execute the configuration with other HART® master programs. You can connect your PC/Notebook to the device using a HART® modem. You can connect a HART® communicator directly to the device interfaces.
A maximum of two HART® masters with identification marking as primary/secondary master are allowed.
See the following connection diagram:



(1)	Pressure transmitter	(2)	Other transmitters; with HART® 7, max. 63 devices
(3)	HART® communicator	(4)	HART® modem
(5)	Total burden ≤ (U_B - 12.5 V) / 0.024 A, with HART® additionally min. 250 Ω, max. 1100 Ω	(6)	RS232 or USB connection
(7)	Voltage supply 12.5 to 36 V	(8)	PC or Notebook with setup program

12.1 Device identification

Manufacturer	JUMO GmbH & Co. KG
Manufacturer ID	24716 (0x608C)
Device type	JUMO SIRAS P21
Device ID	58515 (0xE493)
HART® protocol version	7
Device version	1

Number of device variables	9
Physical layers supported	FSK
Device category	Transmitter without galvanic isolation

12.2 Variable codes

The process pressure transmitter supports nine device variables, four mappable dynamic variables as well as the fixed measurands percentage value and milliampere value.

The following table describes the variable numberings that you require for the commands 9, 33, 50, 51, 52, 53, 54, 105, and 107.

Variable code	Designation	Class	Unit
0	Relative/differential pressure A "lively" value is only available if a corresponding sensor is connected, otherwise a constant error value	65 = pressure	Dependent on the current measuring unit for pressure. See chapter 10.2 "Description of the configuration options", Page 82
1	Absolute pressure A "lively" value is only available if a corresponding sensor is connected, otherwise a constant error value	65 = pressure	Dependent on the current measuring unit for pressure. See chapter 10.2 "Description of the configuration options", Page 82
2	Sensor temperature	64 = temperature	Dependent on the current measuring unit for temperature. See chapter 10.2 "Description of the configuration options", Page 82
3	Electronics temperature	64 = temperature	Dependent on the current measuring unit for temperature. See chapter 10.2 "Description of the configuration options", Page 82
4	Voltage supply	83 = electrical potential	58 = volt
5	Fill level A value derived from the measured pressure	68 = volume 71 = mass 69 = length	Dependent on the current measuring unit for fill level: See chapter 10.2 "Description of the configuration options", Page 82
6	Flow rate This is a value derived from the pressure A "lively" value is only available if a corresponding differential pressure sensor is connected, otherwise a constant error value	66 = volumetric flow rate, 103 = volumetric liquid flow rate/s, 104 = volumetric liquid flow rate/min, 105 = volumetric liquid flow rate/h, 72 = flow rate mass	Dependent on the current measuring unit for flow rate. See chapter 10.2 "Description of the configuration options", Page 82

Variable code	Designation	Class	Unit
7	Slave pointer, minimum pressure This is a value derived from the pressure	65 = pressure	Dependent on the current measuring unit for pressure. See chapter 10.2 "Description of the configuration options", Page 82
8	Slave pointer, maximum pressure This is a value derived from the pressure	65 = pressure	Dependent on the current measuring unit for pressure. See chapter 10.2 "Description of the configuration options", Page 82

Fixed measurands

Variable code	Designation	Class	Unit
244	Percent	0 = not classified	57 = percent
245	Current	84 = current	39 = mA

Dynamic variables

Variable code	Designation	Class	Unit
246	Primary variable (PV) Default mapped to Code 0 or 1 = pressure, appropriate for the connected sensor	Dependent on the current mapping and configuration	Dependent on the current mapping and configuration: = voltages and various volume, mass, length, flow rate, pressure, and temperature measuring units. See chapter 10.2 "Description of the configuration options", Page 82
247	Secondary variable (SV) default mapped to Code 2 = sensor temperature	As for PV	As for PV
248	Third variable (TV) default mapped to Code 3 = electronics temperature	As for PV	As for PV
249	Quaternary variable (QV) default mapped to Code 4 = voltage supply	As for PV	As for PV

12.3 HART® commands

Command	Designation	Request data	Response data (plus 2 status bytes)
Universal commands (0 to 30 as well as 38 and 48)			
0	Read unique identifier	None	22 bytes includes the long address

Com-mand	Designation	Request data	Response data (plus 2 status bytes)
1	Read primary variable	None	1 byte unit code PV 4 bytes PV as float
2	Read current and percent	None	4 bytes current as float 4 bytes percent as float
3	Read current and dynamic variables	None	4 bytes current as float 1 byte unit code PV 4 bytes pressure PV as float 1 byte unit code SV 4 bytes temp SV as float 1 byte unit code TV 4 bytes pressure TV as float 1 byte unit code QV 4 bytes QV as float
6	Write polling address	1 byte short address 1 byte LoopCurr_active	As request
7	Read loop configuration	None	1 byte short address 1 byte LoopCurr_active
8	Read dynamic variable classifications	None	1 byte class PrimV 1 byte class SecV 1 byte class ThirdV 1 byte class QuadV
9	Read device variables with status	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 ExtendedDevStatus 8 bytes info about DevVar [8 bytes info about DevVar] [8 bytes info about DevVar] [8 bytes info about DevVar] [8 bytes info about DevVar] [8 bytes info about DevVar] [8 bytes info about DevVar] [8 bytes info about DevVar] 4 bytes TimeStamp
11	Read unique identifier by TAG	6 bytes TAG no.	Same as command 0
12	Read message	None	24 bytes message
13	Read TAG + descriptor + date	None	6 bytes TAG no. 12 bytes description 3 bytes date
14	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	Read output info	None	1 byte alarm code 1 byte linear

Com-mand	Designation	Request data	Response data (plus 2 status bytes) 1 byte PV unit code 4 bytes PV MR_End 4 bytes PV MR_Beg 4 bytes PV_Damp 1 byte code write lock 1 byte manufacturer code 1 byte AnalogChannelFlag
16	Read final assembly number	None	3 bytes assembly number
17	Write message	24 bytes message	As request
18	Write TAG + descriptor + date	6 bytes TAG no. 12 bytes description 3 bytes calibration date	As request
19	Write final assembly number	3 bytes assembly number	As request
20	Read long TAG	None	32 bytes long TAG
21	Read unique identifier by long TAG	32 bytes long TAG	Same as command 0
22	Write long TAG	32 bytes long TAG	As request
Common Practice Commands (32 to 121, except 38 and 48)[a]			
33	Read device variables	1 byte DevVarCode [1 byte DevVarCode] [1 byte DevVarCode] [1 byte DevVarCode]	6 bytes info about DevVar [6 bytes info about DevVar] [6 bytes info about DevVar] [6 bytes info about DevVar]
34	Write PV damping value	4 bytes P04_Damp	As request
35	Write PV range values	1 byte unit code 4 bytes PV-MR_End 4 bytes PV-MR_End	As request
36	Set PV upper range value	None	None
37	Set PV lower range value	None	None
38	Reset configuration changed flag	2 bytes ConfigChCnt	2 bytes ConfigChCnt
40	Fixed current mode	4 bytes current simulation in mA (0 = Current generator mode off)	As request
41	Perform self test	None	None
42	Perform device reset	None	None
45	Trim loop current zero	4 bytes measured mA as float	As request
46	Trim loop current gain	4 bytes measured mA as float	As request

Com-mand	Designation	Request data	Response data (plus 2 status bytes)
48	Read additional device status	None	6 bytes dev specific status 1 byte ExtendedDevStatus 1 byte dev operating mode 1 byte standardized status
50	Read dynamic variable assignments (mapping)	None	1 byte DevVarCode PV 1 byte DevVarCode SV 1 byte DevVarCode TV 1 byte DevVarCode QV
51	Write dynamic variable assignments (mapping)	1 byte DevVarCode PV [1 byte DevVarCode SV] [1 byte DevVarCode TV] [1 byte DevVarCode QV]	1 byte DevVarCode PV 1 byte DevVarCode SV 1 byte DevVarCode TV 1 byte DevVarCode QV
52	Set device variable zero	1 byte DevVarCode	1 byte DevVarCode
53	Write device variable units	1 byte DevVarCode 1 byte unit code	As request
54	Read device variable info	1 byte DevVarCode	27 bytes info about DevVar
59	Write number of response preambles	1 byte number preambles	As request
103	Write burst period	1 byte BurstMsgNr 4 bytes BurstMinUpdTime 4 bytes BurstMaxUpdTime	As verified request
104	Write burst trigger	1 byte BurstMsgNr 1 byte BurstTrigMode 1 byte BurstTrigClass 1 byte BurstTrigUnits 4 bytes BurstTrigValue	As request
105	Read burst mode configuration	[1 byte BurstMsgNr]	1 byte BurstActive 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

Command	Designation	Request data	Response data (plus 2 status bytes)
107	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 BurstMsgNr]	8 bytes BurstDevVarCode 1 byte BurstMsgNr
108	Write burst mode command number	1 byte BurstCmd or 2 bytes BurstCmd16Bit 1 byte BurstMsgNr	As request
109	Burst mode control	1 byte Burst_Active [1 byte BurstMsgNr]	As request
Device-specific commands (128 to 253)			
128	Write offset	1 byte unit code 4 bytes offset pressure	As request
129	Read offset	None	1 byte unit code pressure 4 bytes offset pressure
130	Reset min/max value	1 byte both/min/max	As request
131	Read min/max value	None	4 bytes maximum pressure 4 bytes minimum pressure in pressure unit
132	Write FlowConfig	4 bytes Press2Flow_Factor 1 byte FlowUnit 1 byte characteristic line 4 bytes sq. rt. ext. ap. pt.	As request
133	Read FlowConfig	None	4 bytes Press2Flow_Factor 1 byte FlowUnit 1 byte characteristic line 4 bytes sq. rt. ext. ap. pt.
134	Write AnaOutConfig	1 byte fault current 1 byte Current_SIL_inactive	As request
135	Read AnaOutConfig	None	1 byte fault current 1 byte Current_SIL_inactive
136	Write LevelConfig	4 bytes density correction 1 byte LevelUnit	As request
137	Read LevelConfig	None	4 bytes density correction 1 byte LevelUnit
140	Write LanguageConfig	1 byte language 1 byte language query	As request

Com-mand	Designation	Request data	Response data (plus 2 status bytes)
141	Read LanguageConfig	None	1 byte language 1 byte language query
142	Write DisplayConfig	1 byte NormalDisp 1 byte contrast 1 byte illumination 2 bytes TimeoutLight 2 bytes timeout	As request
143	Read DisplayConfig	None	1 byte NormalDisp 1 byte contrast 1 byte illumination 2 bytes TimeoutLight 2 bytes timeout
144	Read service data	None	4 bytes operating hours 4 bytes slave pntr. SensorTemp max 4 bytes slave pntr. SensorTemp min 4 bytes slave pntr. electr. temp max 4 bytes slave pntr. electr. temp min
146	Write pressure range	1 byte pressure unit code 4 bytes pressure-MR_End 4 bytes pressure-MR_Beg	As request
147	Read pressure range	None	1 byte pressure unit code 4 bytes pressure-MR_End 4 bytes pressure-MR_Beg
148	Write level range	1 byte level unit code 4 bytes Level-MR_End 4 bytes Level-MR_Beg	As request
149	Read level range	None	1 byte level unit code 4 bytes Level-MR_End 4 bytes Level-MR_Beg
150	Write flow range	1 byte flow unit code 4 bytes Flow-MR_End 4 bytes Flow-MR_Beg	As request
151	Read flow range	None	1 byte flow unit code 4 bytes Flow-MR_End 4 bytes Flow-MR_Beg
152	Write SensorTemp range	1 byte temp. unit code 4 bytes SensTemp-MR_End 4 bytes SensTemp-MR_Beg	As request
153	Read SensorTemp range	None	1 byte temp. unit code 4 bytes SensTemp-MR_End

Command	Designation	Request data	Response data (plus 2 status bytes)
			4 bytes SensTemp-MR_Beg

[a] The commands 38 and 48 have only been universal commands since HART® 7. In earlier versions they were Common Practice Commands.

12.4 Burst mode commands

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

The following commands are available:

Command	Designation
1	Primary variable
2	Loop current and percent of range
3	Dynamic variables and loop current
9	Device variables with status
33	Device variables
48	Additional device status

12 HART® 7 specification

12.5 Performance data

The parameters that are listed below determine the performance of the device.

Telegram length

The maximum telegram length of up to 100 bytes occurs with this HART® 7 device with command 9 (71 bytes payload including 2 status 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 operating parameter "Current sim."
- Constant current mode (multidrop mode): in bus operation, current can be set to constant 4 mA (HART® command 6) or operating parameter "Current loop".

Write protection

You can protect the device against unintentional overwriting of the configuration parameters by activating the safety function.

- On the device, by activating the safety function
  - you cannot activate the safety function via the setup program or HART® commands
- Temporarily, as long as you edit parameters in the configuration level

13.1 Declaration of conformity

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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 861

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*
JUMO SIRAS P21 DP	403024	403024

Produktbeschreibung
Product description / Description du produit
Industrieller Druckmessumformer mit Sicherheitsfunktion.

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.

13 Certificates

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1. Richtlinie
Directive / Directive

Name — EMC 2014/30/EU
Name / Nom

Konformitätsbewertungsverfahren — Mod. A
Conformity assessment procedure / Procédure d'évaluation de la conformité

Datum der Erstanbringung des CE-Zeichens auf dem Produkt — 2022
Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit

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

Referenz *Reference / Référence*	Ausgabe *Edition / Édition*	Bemerkung *Comment / Remarque*
EN 60730-1	2016+A1:2019	The edition 2011 is met for presumption of conformity.
EN 60730-2-6	2016+A1:2020	The edition 2008 is met for presumption of conformity.

Gültig für Typ
Valid for Type / Valable pour le type
403024/...

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2. Richtlinie
Directive / Directive

Name — RoHS 2011/65/EU
Name / Nom

Konformitätsbewertungsverfahren — Mod. A
Conformity assessment procedure / Procédure d'évaluation de la conformité

Datum der Erstanbringung des CE-Zeichens auf dem Produkt — 2022
Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit

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Angewendete Normen/Spezifikationen

Standards/Specifications applied / Normes/Spécifications appliquées

Referenz *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

403024/...

Aussteller
Issued by / Etabli par

JUMO GmbH & Co. KG

Ort, Datum
Place, date / Lieu, date

Fulda, 2022-07-22

Rechtsverbindliche Unterschriften
Legally binding signatures / Signatures juridiquement valable

Bereichsleitung Globaler Vertrieb
i. V. Markus Belmer

Qualitätsbeauftragter und Leiter Qualitätswesen
i. V. Harald Gienger

13 Certificates

13.2 Examination certificate

WILL BE INSERTED AS SOON AS AVAILABLE

13.3 SIL & PL

TÜV NORD

DAkkS Deutsche Akkreditierungsstelle D-ZE-11074-01-00

Certificate

No. SEBS-A.084722/14 V1.0

TÜV NORD Systems GmbH & Co. KG hereby certifies

JUMO GmbH & Co.KG
Moritz-Juchheim-Straße 1
36039 Fulda

for the safety related pressure transmitter

JUMO SIRAS P21 AR/DP

meets the requirements listed in the below listed standards

- **DIN EN 61508/-1/-2/-3: 2011, SIL 2/3**
- **DIN EN ISO 13849-1: 2016, PL c/d**
- **DIN EN ISO 13849-2: 2013**

Certificationprogram Leittechnik (SEB-ZE-SEECERT-VA-320-20, Rev. 5.1/4.19)

Base of certification is the report SEBS-A.084722/14TB in the valid version.

This certificate entitles the usage of the adjacent conformity mark.

Valid until: 2027-07-07
File reference: 8111338760

Hamburg, 2022-07-07

B. Pfuff

Bianca Pfuff

Voluntary Certification
TÜV NORD
TÜV NORD Systems GmbH & Co. KG
Safety Approved
JUMO SIRAS P21 AR/DP
DIN EN 61508/-1/-2/-3:2011, SIL2/3
DIN EN ISO 13849-1:2016, PL c/d
DIN EN ISO 13849-2:2013
SEBS-A.084722/14

Certification Body SEECERT
TÜV NORD Systems GmbH & Co. KG
Große Bahnstraße 31, 22525 Hamburg, Germany

13 Certificates

13.4 China RoHS

RoHS Exempt 						
产品组别 Product group: 403024	产品中有害物质的名称及含量 China EEP Hazardous Substances Information					
部件名称 Component Name: SIRAS P21 DP						
	铅 （Pb）	汞 （Hg ）	镉 （Cd）	六价铬 （Cr(VI)）	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
印刷电路组件 printed circuit assemblies	X	○	○	○	○	○

本表格依据SJ/T 11364的规定编制。
This table is prepared in accordance with the provisions SJ/T 11364.
○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
Indicate the hazardous substances in all homogeneous materials for the part are below the limit of the GB/T 26572.

×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。
Indicate the hazardous substances in at least one homogeneous material of the part exceed the limit of the GB/T 26572.

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