

Process pressure transmitter IPT-1\*

GB

4 ... 20 mA  
Version 2.0



Process pressure transmitter IPT-1\*

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### **Supplementary documentation**



#### **Information:**

Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "*Product description*".

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# 1 About this document

## 1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

## 1.2 Target group

This operating instructions manual is directed to trained specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

## 1.3 Symbolism used



### Information, tip, note

This symbol indicates helpful additional information.



**Caution:** If this warning is ignored, faults or malfunctions can result.

**Warning:** If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

**Danger:** If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.



### Ex applications

This symbol indicates special instructions for Ex applications.



### List

The dot set in front indicates a list with no implied sequence.



### Action

This arrow indicates a single action.



### Sequence of actions

Numbers set in front indicate successive steps in a procedure.



### Battery disposal

This symbol indicates special information about the disposal of batteries and accumulators.

## 2 For your safety

### 2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

During work on and with the device the required personal protective equipment must always be worn.

### 2.2 Appropriate use

IPT-1\* Vers. 2.0 is a pressure transmitter for measurement of gauge pressure, absolute pressure and vacuum.

You can find detailed information on the application range in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

### 2.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

### 2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

### 2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

## 2.6 CE conformity

The device fulfills the legal requirements of the applicable EC guidelines. By affixing the CE marking, we confirm successful testing of the product.

## 2.7 Measuring range - permissible process pressure

Due to the application, a measuring cell with a measuring range higher than the permissible pressure range of the process fitting may have been integrated. The permissible process pressure is stated with "Process pressure" on the type label, see chapter 3.1 "*Configuration*". For safety reasons, this range must not be exceeded.

## 2.8 Fulfilment of NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfills the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for malfunction information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components

For further information see [www.namur.de](http://www.namur.de).

## 2.9 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

## 3 Product description

### 3.1 Configuration

#### Scope of delivery

The scope of delivery encompasses:

- IPT-1\* Vers. 2.0 pressure transmitter
- Documentation
  - this operating instructions manual
  - Test certificate for pressure transmitters
  - Operating instructions manual "*Display and adjustment module*" (optional)
  - Supplementary instructions manual "*Plug connector for continuously measuring sensors*" (optional)
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - if necessary, further certificates

#### Constituent parts

The IPT-1\* Vers. 2.0 consists of the components:

- Process fitting with measuring cell
- Housing with electronics, optionally available with plug connector
- Housing cover, optionally available with display and adjustment module

The components are available in different versions.

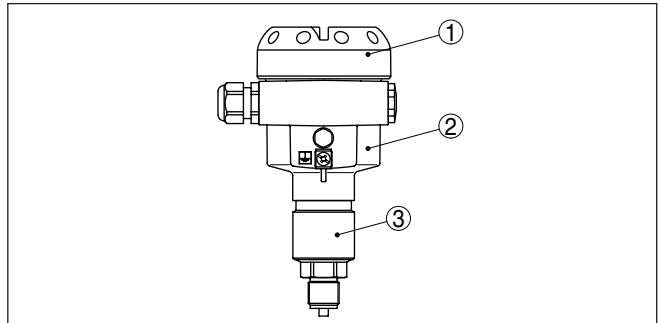


Fig. 1: Example of a IPT-1\* Vers. 2.0 with manometer connection G $\frac{1}{2}$  according to EN 837 and plastic housing

- 1 Housing cover with integrated display and adjustment module (optional)
- 2 Housing with electronics
- 3 Process fitting with measuring cell

#### Type plate

The nameplate contains the most important data for identification and use of the instrument:

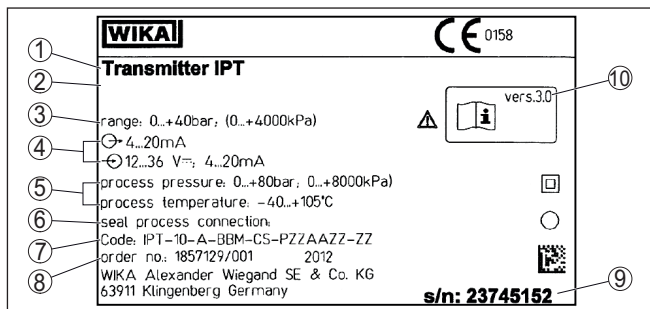


Fig. 2: Layout of the type label (example)

- 1 Instrument type
- 2 Approvals
- 3 Measuring range
- 4 Electronics
- 5 Process pressure
- 6 Seal material/Process temperature
- 7 Product code
- 8 Order number
- 9 Serial number of the instrument
- 10 ID numbers, instrument documentation

### Scope of this operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Software from 3.82.

## 3.2 Principle of operation

### Application area

IPT-1\* Vers. 2.0 is a pressure transmitter for use in the paper, food processing and pharmaceutical industries as well as in water/sewage water plants. Depending on the version, it is used for level, gauge, absolute pressure or vacuum measurement. Measured products are gases, vapours and liquids, also those containing abrasive substances.

### Functional principle

The sensor element is a measuring cell with robust, front-flush (depending on the process fitting), abrasion-resistant ceramic diaphragm. The process pressure causes a capacitance change in the measuring cell via the ceramic diaphragm. This change is converted into an appropriate output signal and outputted as measured value. The measuring cell is also equipped with a temperature sensor. The temperature value can be displayed via the display and adjustment module as well as processed via the signal output (with digital versions).

### Seal concept

As a standard feature, the ceramic measuring cell is equipped with a lateral, recessed seal.

Instruments with double seal have an additional front seal.

Instruments with hygienic fitting are equipped with a gap-free form seal.



#### Voltage supply

4 ... 20 mA two-wire electronics for voltage supply and measured value transmission on the same cable.

The supply voltage range can differ depending on the instrument version. The exact range is stated in chapter "*Technical data*".

The backlight of the display and adjustment module is powered by the sensor. The prerequisite for this is a supply voltage at a certain level. The exact voltage specifications are stated in chapter "*Technical data*".

#### 3.3 Adjustment

The instrument can be adjusted with the following adjustment media:

- With the display and adjustment module

#### 3.4 Packaging, transport and storage

#### Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

#### Transport

Transport must be carried out under consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

#### Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

#### Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

#### Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 ... 85 %

## 4 Mounting

### 4.1 General instructions

#### Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" and on the nameplate.

#### Installation position

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of a display and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the display and adjustment module in four different positions (each displaced by 90°).

#### Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or on cooled or heated vessels.

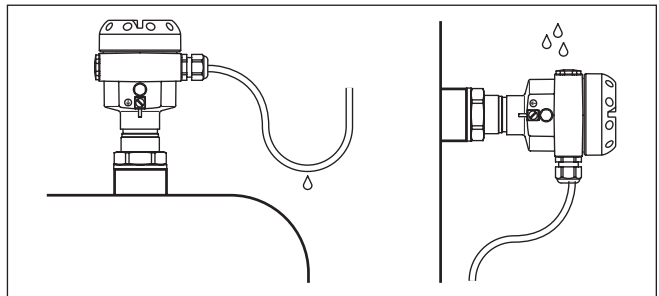


Fig. 3: Measures against moisture penetration

#### Ventilation and pressure compensation

The ventilation of the electronics housing as well as the atmospheric pressure compensation for the measuring cell are realised via a filter element in the area of the cable gland.

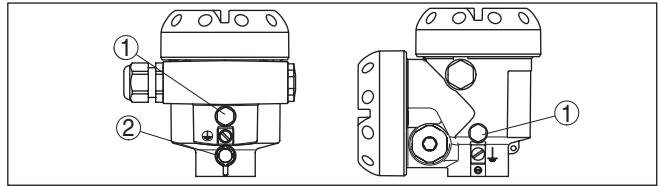


Fig. 4: Position of the filter element

- 1 Filter element
- 2 Blind plug



**Caution:**

Due to the filter effect, the pressure compensation is time delayed. When opening/closing the housing cover quickly, the measured value can change for a period of approx. 5 s by up to 15 mbar.



**Information:**

Make sure that the filter element is always free of buildup during operation. A high-pressure cleaner may not be used for cleaning.

With instrument versions in protection IP 66/IP 68, 1 bar, the ventilation is realised via the capillaries in the permanently connected cable. The filter element is replaced by a blind plug.

**Temperature limits**

Higher process temperatures often mean also higher ambient temperatures. Make sure that the upper temperature limits stated in chapter "Technical data" for the environment of the electronics housing and connection cable are not exceeded.

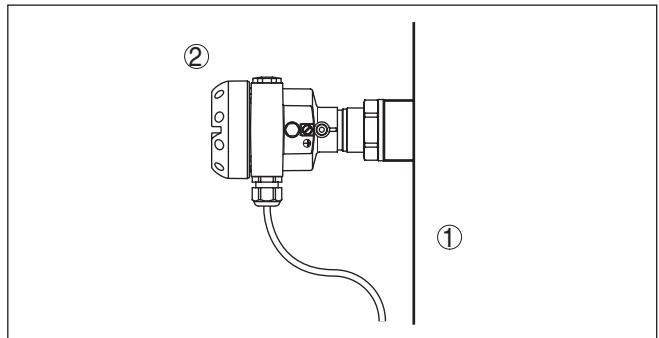


Fig. 5: Temperature ranges

- 1 Process temperature
- 2 Ambient temperature

**4.2 Mounting steps**

**Welding the socket**

For mounting IPT-1\* Vers. 2.0, a welded socket is required. You can find these components in the supplementary instructions manual "Welded socket and seals".

### Sealing/Screwing in threaded versions

Use the seal fitting belonging to the instrument, or in case of NPT connections, a high-resistance sealing material.

→ Screw IPT-1\* Vers. 2.0 into the welded socket. Tighten the hexagon on the process fitting with a suitable wrench. Wrench size, see chapter "*Dimensions*".



#### **Warning:**

The housing must not be used to screw the instrument in! Applying tightening force can damage internal parts of the housing.

### Sealing/Screwing in hygienic fittings

Use the seal suitable for the respective process fitting. You can find the components in the supplementary instructions manual "*Welded socket and seals*".

## 5 Connecting to power supply

### 5.1 Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltage surges are expected, overvoltage arresters should be installed

#### Take note of safety instructions for Ex applications



In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

#### Select power supply

Power supply and current signal are transmitted via the same two-wire connection cable. The supply voltage range can differ depending on the instrument version. The exact range is stated in the "Technical data" in the "Supplement".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN EN 61140 VDE 0140-1.

Keep in mind the following additional factors that influence the operating voltage:

- Output voltage of the power supply unit can be lower under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault message)
- Influence of additional instruments in the circuit (see load values in chapter "Technical data")

#### Select connection cable

The instrument is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use cable with round cross-section. A cable outer diameter of 5 ... 9 mm (0.2 ... 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

#### Cable screening and grounding

If screened cable is necessary, connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the processing side must be made via a ceramic capacitor (e. g. 1 nF, 1500 V). The low-frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.



#### Warning:

Considerable potential differences exist inside galvanic plants as well as vessels with cathodic corrosion protection. Very large equalisation currents can flow through the cable screen when the screen is grounded on both ends. To avoid this, the cable screen must be

connected to ground potential only on one end (inside the switching cabinet) in such applications. The cable screen must **not** be connected to the internal ground terminal in the sensor and the outer ground terminal on the housing **not** to potential equalisation!



### Information:

The metallic parts of the instrument such as transmitter and process fitting are conductively connected with the inner and outer ground terminal on the housing. This connection exists either as a direct metallic contact or via the shielding of the special connection cable on instruments with external electronics. You can find specifications on the potential connections within the instrument in chapter "Technical data".

Select connection cable for Ex applications



Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

Single/Double chamber housing

## 5.2 Connection procedure

Proceed as follows:

1. Unscrew the housing cover
  2. If a display and adjustment module is installed, remove it by turning it to the left.
  3. Loosen compression nut of the cable entry
  4. Remove approx. 10 cm of the cable mantle, strip approx. 1 cm insulation from the individual wires
  5. Insert the cable into the sensor through the cable entry
  6. Lift the opening levers of the terminals with a screwdriver (see following illustration)
  7. Insert the wire ends into the open terminals according to the wiring plan
  8. Press down the opening levers of the terminals, you will hear the terminal spring closing
  9. Check the hold of the wires in the terminals by lightly pulling on them
  10. Connect the screen to the internal ground terminal, connect the outer ground terminal to potential equalisation
  11. Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable
  12. Screw the housing cover back on
- The electrical connection is hence finished.



Fig. 6: Connection steps 6 and 7

### 5.3 Single chamber housing

#### Electronics and connection compartment

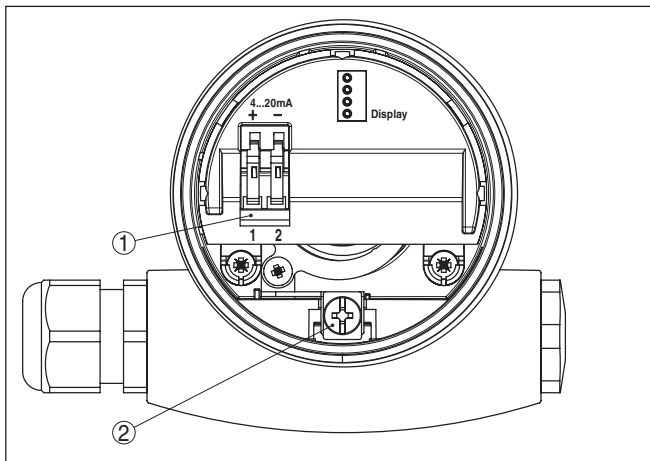


Fig. 7: Electronics and connection compartment, single chamber housing

- 1 Spring-loaded terminals for voltage supply
- 2 Ground terminal for connection of the cable screen

### Wiring plan

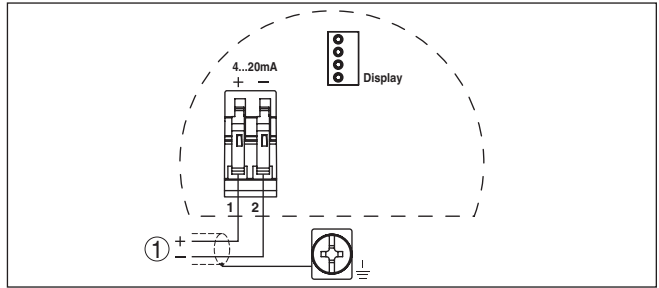


Fig. 8: Wiring plan, single chamber housing

1 Voltage supply/Signal output

### 5.4 Wiring plan, external housing with version IP 68 (25 bar)

#### Overview

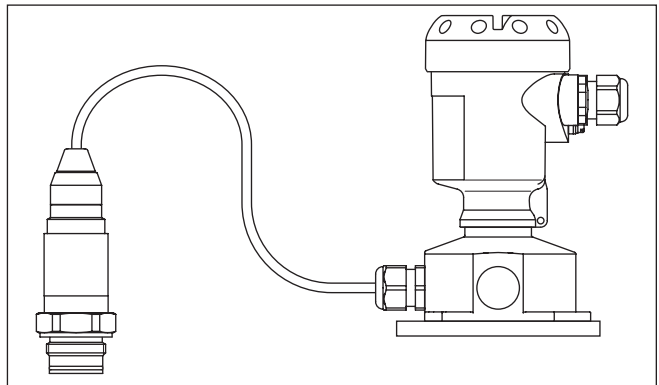


Fig. 9: IPT-1\* Vers. 2.0 in IP 68 version 25 bar and axial cable outlet, external housing



**Electronics and connection compartment for power supply**

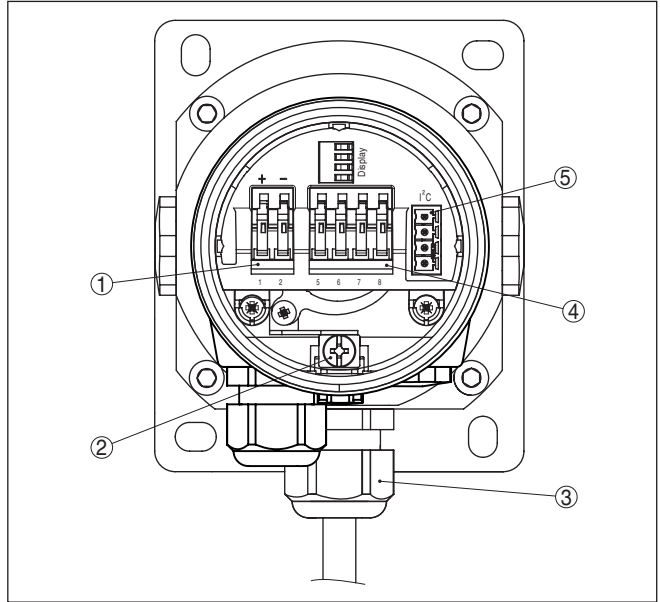


Fig. 10: Electronics and connection compartment

- 1 Spring-loaded terminals for voltage supply
- 2 Ground terminal for connection of the cable screen
- 3 Cable gland to the process component
- 4 For external display and adjustment unit, Slave sensor
- 5 Plug connector for service interface

**Terminal compartment, housing socket**

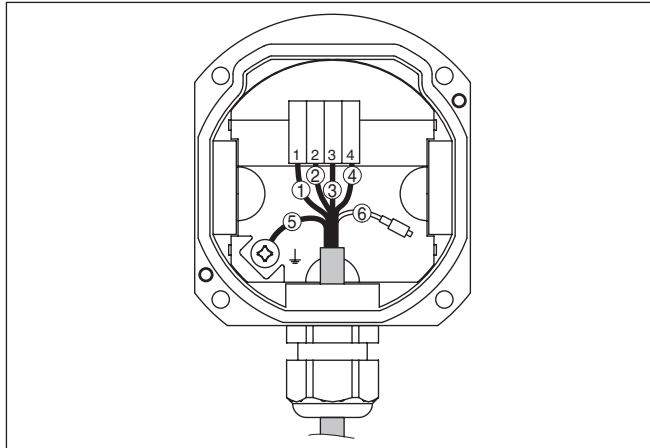


Fig. 11: Connection of the sensor in the housing base

- 1 Brown
- 2 Blue
- 3 Yellow
- 4 White
- 5 Shielding
- 6 Breather capillaries

**Wiring plan external electronics**

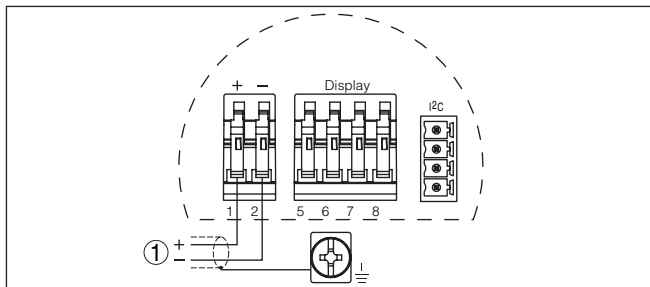


Fig. 12: Wiring plan external electronics

- 1 Voltage supply

**5.5 Switch-on phase**

**Switch-on phase**

After connecting IPT-1\* Vers. 2.0 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the corresponding current is outputted to the cable (the value corresponds to the actual level as well as the settings already carried out, e.g. factory setting).

## 6 Set up with the display and adjustment module

### Function/Configuration

### 6.1 Short description

The display and adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All sensors DPT-10 and IPT-1\*, in the single as well as double chamber housing (optionally in the electronics or connection compartment)
- External display and adjustment unit



#### Note:

You can find detailed information on the adjustment in the operating instructions manual "*Display and adjustment module*".

### Mount/Dismount display and adjustment module

### 6.2 Insert display and adjustment module

The display and adjustment module can be inserted and removed at any time. It is not necessary to interrupt the voltage supply.

For installation proceed as follows:

1. Unscrew the housing cover
2. Place the display and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
3. Press the display and adjustment module onto the electronics and turn it to the right until it snaps in.
4. Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 13: Insert display and adjustment module



**Note:**

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher cover with an inspection glass is required.

### 6.3 Adjustment system

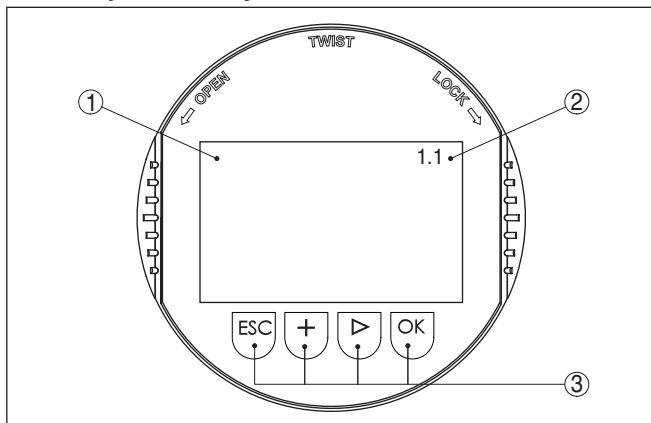


Fig. 14: Display and adjustment elements

- 1 LC display
- 2 Indication of the menu item number
- 3 Adjustment keys

**Key functions**

- **[OK]** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- **[->]** key to select:
  - Menu change
  - Select list entry
  - Select editing position
- **[+]** key:
  - Change value of the parameter
- **[ESC]** key:
  - Interrupt input
  - Jump to the next higher menu

**Adjustment system**

The sensor is adjusted via the four keys of the display and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with **[OK]** will not be saved.

**6.4 Setup steps****Level or process pressure measurement**

IPT-1\* Vers. 2.0 can be used for level as well as for process pressure measurement. Default setting is level measurement. The mode can be changed in the adjustment menu.

Depending on the application only the respective subchapter "Level or process pressure measurement" is of importance. There, you find the individual adjustment steps.

**Level measurement****Parameter adjustment "Level measurement"**

Set up IPT-1\* Vers. 2.0 in the following sequence:

1. Selecting adjustment unit/density unit
2. Carry out a position correction
3. Carry out min. adjustment
4. Carry out max. adjustment

In the menu item "*Adjustment unit*" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi...

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

**Information:**

The steps 1, 3 and 4 are not necessary for instruments which are already preset according to customer specifications!

You can find the data on the type label on the instrument or in the menu items of the min./max. adjustment.

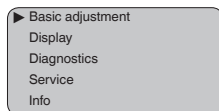
The display and adjustment module enables the adjustment without filling or pressure. Thanks to this, you can carry out your settings already in the workshop without the instrument having to be installed. The actual measured value is also displayed in the menu items for min./max. adjustment.

## Select unit

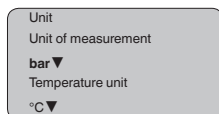
In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

To select the adjustment unit (in the example switching over from bar to mbar), proceed as follows:<sup>1)</sup>

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.



2. Confirm the menu "**Basic adjustment**" with **[OK]**, the menu item "**Unit**" will be displayed.



3. Activate the selection with **[OK]** and select "**Units of measurement**" with **[->]**.
4. Activate the selection with **[OK]** and select the requested unit with **[->]** (in the example mbar).
5. Confirm with **[OK]** and move to position correction with **[->]**.

The adjustment unit is thus switched over from bar to mbar.

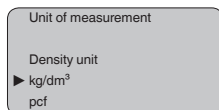


### Information:

When switching over to adjustment in a height unit (in the example from bar to m), the density also has to be entered.

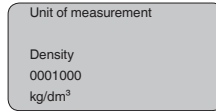
Proceed as follows:

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.
2. Confirm the menu "**Basic adjustment**" with **[OK]**, the menu item "**Units of measurement**" will be displayed.
3. Activate the selection with **[OK]** and select the requested unit with **[->]** (in the example m).
4. Confirm with **[OK]**, the submenu "**Density unit**" appears.



<sup>1)</sup> Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH<sub>2</sub>O, mmH<sub>2</sub>O.

- Select the requested unit, e.g.  $\text{kg}/\text{dm}^3$  with **[->]** and confirm with **[OK]**, the submenu "Density" appears.



- Enter the requested density value with **[->]** and **[+]**, confirm with **[OK]** and move to position correction with **[->]**.

The adjustment unit is thus switched over from bar to m.

Proceed as follows to select the temperature unit:<sup>2)</sup>

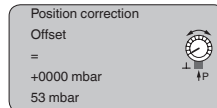
- Activate the selection with **[OK]** and select "**Temperature unit**" with **[->]**.
- Activate the selection with **[OK]** and select the requested unit with **[->]** (e.g. °F).
- Confirm with **[OK]**.

The temperature unit is hence switched over from °C to °F.

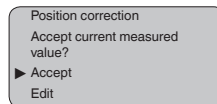
### Carry out a position correction

Proceed as follows:

- Activate in the menu item "Position correction" the selection with **[OK]**.



- Select with **[->]**, e.g. to accept actual measured value.

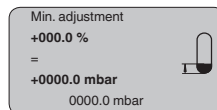


- Confirm with **[OK]** and move to min.(zero) adjustment with **[->]**.

### Carry out min. adjustment

Proceed as follows:

- Edit the % value in the menu item "Min. adjustment" with **[OK]**.



- Set the requested percentage value with **[+]** and **[->]**.
- Confirm with **[OK]** and edit the requested mbar value.
- Set the requested mbar value with **[+]** and **[->]**.
- Confirm with **[+]** and move to max. adjustment with **[->]**.

The min. adjustment is finished.

<sup>2)</sup> Selection options: °C, °F.



**Information:**

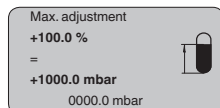
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with **[ESC]** or the displayed limit value can be accepted with **[OK]**.

**Carry out max. adjustment**

Proceed as follows:

1. Edit the % value in the menu item "*Max. adjustment*" with **[OK]**.

**Information:**

The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1 bar = 1000 mbar).

2. Set the requested percentage value with **[->]** and **[OK]**.
3. Confirm with **[OK]** and edit the requested mbar value.
4. Set the requested mbar value with **[+]** and **[->]**.
5. Confirm with **[OK]** and move to the menu overview with **[ESC]**.

The max. adjustment is finished.

**Information:**

For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with **[ESC]** or the displayed limit value can be accepted with **[OK]**.

**Process pressure measurement****Parameter adjustment "Process pressure measurement"**

Set up IPT-1\* Vers. 2.0 in the following sequence:

1. Select application "Process pressure measurement"
2. Select the unit of measurement
3. Carry out a position correction
4. Carrying out zero adjustment
5. Carry out span adjustment

In the menu item "*Adjustment unit*" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi...

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

In the menu items "*zero*" and "*span*" you determine the span of the sensor, the span corresponds to the end value.

**Information:**

The steps 1, 3 and 4 are not necessary for instruments which are already preset according to customer specifications!

You can find the data on the type label on the instrument or in the menu items of the zero/span adjustment.

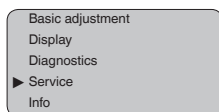
The display and adjustment module enables the adjustment without filling or pressure. Thanks to this, you can carry out your settings already in the workshop without the instrument having to be installed.

The actual measured value is displayed in addition to the menu items for zero/span adjustment.

### Select application "Process pressure measurement"

IPT-1\* Vers. 2.0 is preset to application "Level measurement". Proceed as follows when switching over to application "Process pressure measurement":

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.
2. Select the menu "**Service**" with **[->]** and confirm with **[OK]**.



3. Select the menu item "**Application**" with **[->]** and edit with **[OK]**.



#### Warning:

Note the warning: "Output can change".

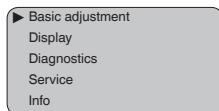
4. Select with **[->]** "OK" and confirm with **[OK]**.
5. Select "**Process pressure**" from the list and confirm with **[OK]**.

### Select unit

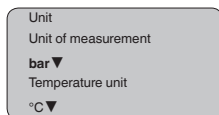
In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

To select the adjustment unit (in the example switching over from bar to mbar), proceed as follows:<sup>3)</sup>

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.



2. Confirm the menu "**Basic adjustment**" with **[OK]**, the menu item "**Unit**" will be displayed.



3. Activate the selection with **[OK]** and select "**Units of measurement**" with **[->]**.

<sup>3)</sup> Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH<sub>2</sub>O, mmH<sub>2</sub>O.

4. Activate the selection with **[OK]** and select the requested unit with **[->]** (in the example mbar).
5. Confirm with **[OK]** and move to position correction with **[->]**.

The adjustment unit is thus switched over from bar to mbar.

Proceed as follows to select the temperature unit:<sup>4)</sup>

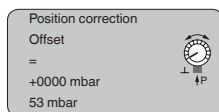
1. Activate the selection with **[OK]** and select "**Temperature unit**" with **[->]**.
2. Activate the selection with **[OK]** and select the requested unit with **[->]** (e.g. °F).
3. Confirm with **[OK]**.

The temperature unit is hence switched over from °C to °F.

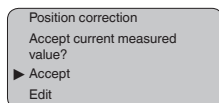
### Carry out a position correction

Proceed as follows:

1. Activate in the menu item "*Position correction*" the selection with **[OK]**.



2. Select with **[->]**, e.g. to accept actual measured value.

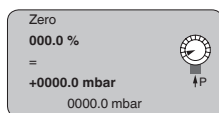


3. Confirm with **[OK]** and move to min.(zero) adjustment with **[->]**.

### Carrying out zero adjustment

Proceed as follows:

1. Edit the mbar value in the menu item "zero" with **[OK]**.



2. Set the requested mbar value with **[+]** and **[->]**.
3. Confirm with **[+]** and move to span adjustment with **[->]**.

The zero adjustment is finished.



#### Information:

The zero adjustment shifts the value of the span adjustment. The span, i.e. the difference between these values, however, remains unchanged.



#### Information:

For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

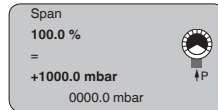
<sup>4)</sup> Selection options: °C, °F.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with **[ESC]** or the displayed limit value can be accepted with **[OK]**.

### Carry out span adjustment

Proceed as follows:

1. Edit the mbar value in the menu item "span" with **[OK]**.



#### Information:

The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1 bar = 1000 mbar).

2. Set the requested mbar value with **[->]** and **[OK]**.
3. Confirm with **[OK]** and move to the menu overview with **[ESC]**.

The span adjustment is finished.



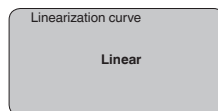
#### Information:

For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with **[ESC]** or the displayed limit value can be accepted with **[OK]**.

### Linearization curve

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "*Display*".



Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the **[->]** key.

### Copy sensor data

This function enables reading out parameter adjustment data as well as writing parameter adjustment data into the sensor via the display and adjustment module. A description of the function is available in the operating instructions manual "*Display and adjustment module*".

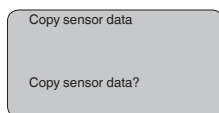
The following data are read out or written with this function:

- Measured value presentation
- Adjustment
- Damping

- Linearization curve
- Sensor-TAG
- Displayed value
- Display unit
- Scaling
- Current output
- Unit of measurement
- Language

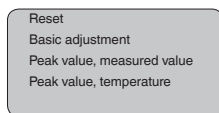
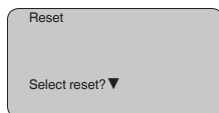
The following safety-relevant data are **not** read out or written:

- SIL
- HART mode
- PIN
- Application



### Reset

The reset function resets all parameters adjusted by the user to the delivery status and the peak values to the actual values.



### Basic adjustment

The "Reset" "Basic adjustment" resets the values of the following menu items:

Menu section	Function	Reset value
Basic settings	Zero/Min. adjustment	Measuring range begin
	Span/Max. adjustment	Measuring range end
	Density	1 kg/l
	Density unit	kg/l
	Damping	1 s
	Linearization	Linear
	Sensor-TAG	Sensor
Display	Displayed value 1	bar
	Displayed value 2	%
	Display unit	Volume/l
	Scaling	0.00 to 100.0

Menu section	Function	Reset value
	Decimal point indication	8888.8
Service	Current output - characteristics	4 ... 20 mA
	Current output - failure	< 3.6 mA
	Current output - min. current	3.8 mA
	Current output - max. current	20.5 mA

The values of the following menu items are *not* reset with "**Reset**":

Menu section	Function	Reset value
Basic settings	Unit of measurement	No reset
	Temperature unit	No reset
	Position correction	No reset
Display	Backlight	No reset
Service	Language	No reset
	Application	No reset

#### Peak value

The min. and max. temperature or pressure values are each reset to the actual value.

#### Optional settings

Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual "*Display and adjustment module*".

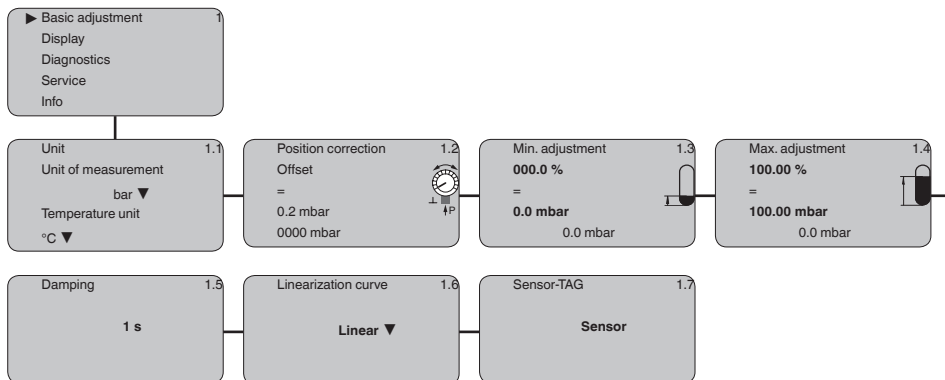
### 6.5 Menu schematic



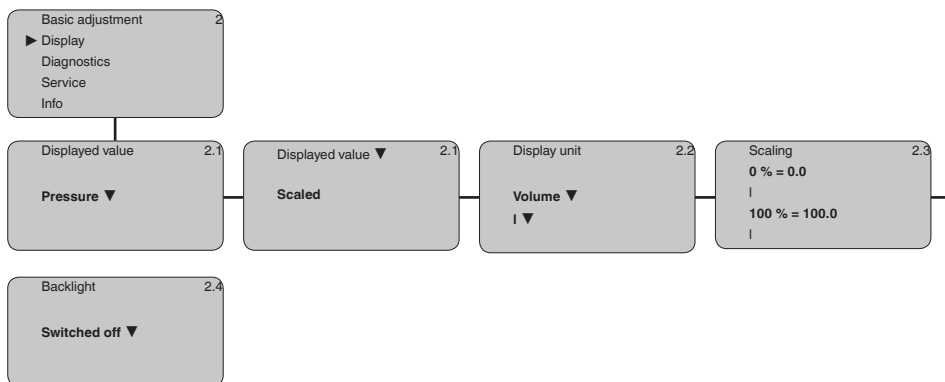
#### Information:

Depending on the version and application, the highlighted menu windows may not always be available.

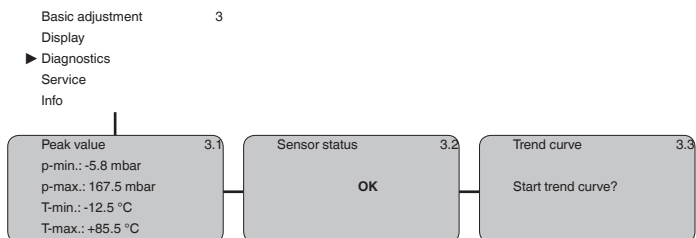
## Basic adjustment



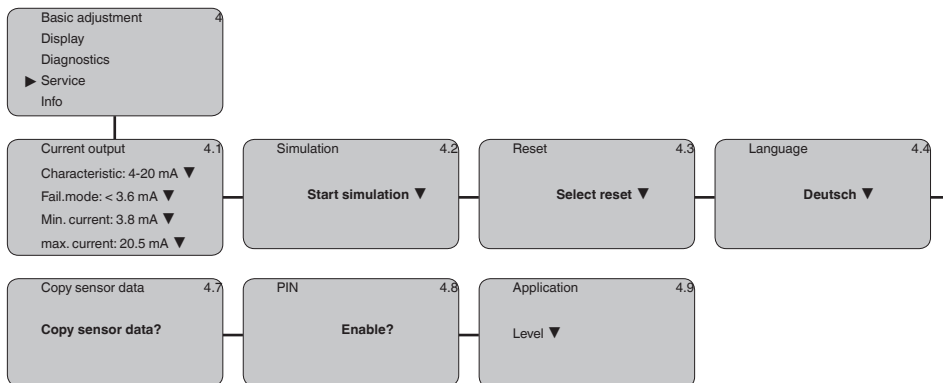
## Display



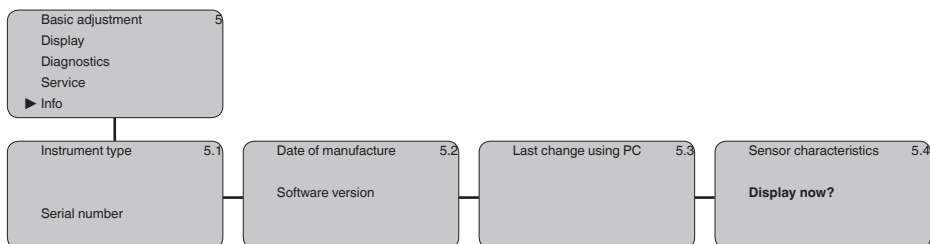
## Diagnostics



### Service



### Info



## 6.10 Saving the parameter adjustment data

We recommend noting the adjusted data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

If IPT-1\* Vers. 2.0 is equipped with a display and adjustment module, the most important data can be read out of the sensor into the display and adjustment module. The procedure is described in the operating instructions manual "*Display and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange the sensor, the display and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".



## 7 Maintenance and fault rectification

### 7.1 Maintenance

#### Maintenance

If the instrument is used properly, no special maintenance is required in normal operation.

In some applications, product buildup on the sensor diaphragm can influence the measuring result. Depending on the sensor and application, take precautions to ensure that heavy buildup, and especially a hardening thereof, is avoided.

#### Cleaning

If necessary, the transmitter has to be cleaned. In this case, make sure that the materials are resistant against the cleaning detergents.

### 7.2 Rectify faults

#### Reaction when malfunctions occur

The operator of the system is responsible for taking suitable measures to rectify faults.

#### Failure reasons

IPT-1\* Vers. 2.0 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

#### Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the display and adjustment module. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with the software PACTware and the suitable DTM. In many cases, the causes can be determined and the faults rectified this way.

#### Check the 4 ... 20 mA signal

Connect a multimeter in the suitable measuring range according to the wiring plan.

Error code	Cause	Rectification
4 ... 20 mA signal not stable	Level fluctuations	– Set the integration time via the display and adjustment module or PACTware
	No atmospheric pressure compensation	– Check the pressure compensation in the housing and clean the filter element, if necessary
4 ... 20 mA signal missing	Connection to voltage supply wrong	– Check connection according to chapter " <i>Connection steps</i> " and if necessary, correct according to chapter " <i>Wiring plan</i> "
	No power supply	– Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	– Check, adapt if necessary

Error code	Cause	Rectification
Current signal greater than 22 mA or less than 3.6 mA	Electronics module or measuring cell defective	– Exchange the instrument or send it in for repair



In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

### Error messages via the display and adjustment module

Error code	Cause	Rectification
E013	no measured value available <sup>1)</sup>	– Exchange the instrument or send it in for repair
E017	Adjustment span too small	– repeat with modified values
E036	no operable sensor software	– Carry out a software update or send instrument for repair
E041	Hardware error	– Exchange the instrument or send it in for repair

### Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "Set up" may have to be carried out again.

## 7.3 Instrument repair

You can find information for a return shipment under "Service" on our local website.

If a repair is necessary, please proceed as follows:

- Complete one form for each instrument
- If necessary, state a contamination
- Clean the instrument and pack it damage-proof
- Attach the completed form and possibly also a safety data sheet to the instrument

## 8 Dismounting

### 8.1 Dismounting steps



**Warning:**

Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

### 8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the parts to be easily separable.

**WEEE directive 2002/96/EG**

This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects on humans and the environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

## 9 Supplement

### 9.1 Technical data

#### General data

Parameter, pressure	Gauge pressure, absolute pressure, vacuum
Measuring principle	Ceramic-capacitive, dry measuring cell
Communication interface	I <sup>2</sup> C bus

#### Materials and weights

Material 316L corresponds to 1.4404 or 1.4435

##### Materials, wetted parts

- Process fitting 316L, PVDF, Alloy C-22, Alloy C-276, Duplex 1.4462, Titanium Grade 2
- Diaphragm sapphire ceramic® (99.9 % oxide ceramic)
- Joining material diaphragm/Basic element measuring cell Glass solder
- Measuring cell seal FKM (VP2/A, A+P70.16), EPDM (A+P 75.5/KW75F), FFKM (Kalrez 6375, Perlast G75S, Perlast G75B)

##### Material seal process fitting

- Thread G½ (EN 837) Klingersil C-4400
- Thread G1½ (DIN 3852-A) Klingersil C-4400
- M44 x 1.25 (DIN 13) FKM, FFKM, EPDM

##### Surface quality hygienic fittings, typ.

- Surface quality, typ.  $R_a < 0.8 \mu\text{m}$

##### Materials, non-wetted parts

- Electronics housing Plastic PBT (polyester), Alu die-casting powder-coated, 316L
- External housing plastic PBT (Polyester), 316L
- Socket, wall mounting plate external housing plastic PBT (Polyester), 316L
- Seal between base and wall mounting plate EPDM (fixed connected)
- Seal below wall mounting plate EPDM (only with 3A approval)
- Seal, housing cover NBR (stainless steel housing), silicone (Alu/plastic housing)
- Inspection window in housing cover for display and adjustment module Polycarbonate (UL-746-C listed)
- Ground terminal 316Ti/316L
- Ohmic contact Between ground terminal and process fitting
- Connection cable between transmitter and external electronics housing with IP 68 version PUR
- Type label support on connection cable PE hard

– Connection cable with IP 68 1 bar version	PE
Weight approx.	0.8 ... 8 kg (1.764 ... 17.64 lbs), depending on process fitting

**Output variable**

Output signal	4 ... 20 mA
Signal resolution	1.6 $\mu$ A
Failure signal output current	mA value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable)
Max. output current	22 mA
Load	see load diagram under Power supply
Met NAMUR recommendation	NE 43

**Dynamic behaviour output**

Run-up time approx.	10 s
---------------------	------

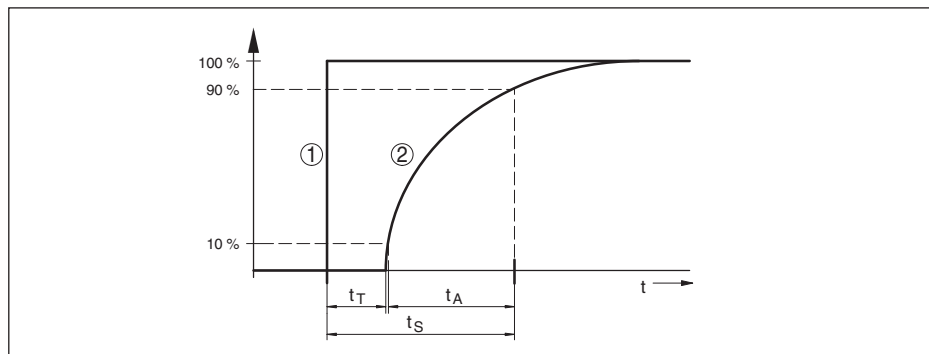


Fig. 15: Sudden change of the process variable.  $t_T$ : dead time;  $t_A$ : rise time;  $t_S$ : jump response time

- 1 Process variable
- 2 Output signal

Dead time	$\leq 150$ ms
Rise time	$\leq 100$ ms (10 ... 90 %)
Step response time	$\leq 250$ ms ( $t_i$ : 0 s, 10 ... 90 %)
Damping (63 % of the input variable)	0 ... 999 s, adjustable

**Input variable**

**Adjustment**

Adjustment range of the min./max. adjustment relating to the nominal measuring range:

- Percentage value -10 ... 110 %
- Pressure value -20 ... 120 %

Adjustment range of the zero/span adjustment relating to the nominal measuring range:

- zero -20 ... +95 %
- span -120 ... +120 %<sup>1)</sup>

– Difference between zero and span      max. 120 % of the nominal range  
 Recommended max. turn down              10 : 1 (no limitation)

**Nominal measuring ranges and overload capability in bar/kPa**

The specifications are only an overview and refer to the measuring cell. Limitations due to the material and version of the process fitting are possible. The specifications on the nameplate apply.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 ... +0.1 bar/0 ... +10 kPa	+15 bar/+1500 kPa	-0.2 bar/-20 kPa
0 ... +0.2 bar/0 ... +20 kPa	+20 bar/+2000 kPa	-0.4 bar/-40 kPa
0 ... +0.4 bar/0 ... +40 kPa	+30 bar/+3000 kPa	-0.8 bar/-80 kPa
0 ... +1 bar/0 ... +100 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
0 ... +2.5 bar/0 ... +250 kPa	+50 bar/+5000 kPa	-1 bar/-100 kPa
0 ... +5 bar/0 ... +500 kPa	+65 bar/+6500 kPa	-1 bar/-100 kPa
0 ... +10 bar/0 ... +1000 kPa	+90 bar/+9000 kPa	-1 bar/-100 kPa
0 ... +25 bar/0 ... +2500 kPa	+130 bar/+13000 kPa	-1 bar/-100 kPa
0 ... +60 bar/0 ... +6000 kPa	+200 bar/+20000 kPa	-1 bar/-100 kPa
-1 ... 0 bar/-100 ... 0 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
-1 ... +1.5 bar/-100 ... +150 kPa	+50 bar/+5000 kPa	-1 bar/-100 kPa
-1 ... +5 bar/-100 ... +500 kPa	+65 bar/+6500 kPa	-1 bar/-100 kPa
-1 ... +10 bar/-100 ... +1000 kPa	+90 bar/+9000 kPa	-1 bar/-100 kPa
-1 ... +25 bar/-100 ... +2500 kPa	+130 bar/+13000 kPa	-1 bar/-100 kPa
-1 ... +60 bar/-100 ... +6000 kPa	+200 bar/+20000 kPa	-1 bar/-100 kPa
-0.05 ... +0.05 bar/-5 ... +5 kPa	+15 bar/+1500 kPa	-0.2 bar/-20 kPa
-0.1 ... +0.1 bar/-10 ... +10 kPa	+20 bar/+2000 kPa	-0.4 bar/-40 kPa
-0.2 ... +0.2 bar/-20 ... +20 kPa	+30 bar/+3000 kPa	-0.8 bar/-80 kPa
-0.5 ... +0.5 bar/-50 ... +50 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
Absolute pressure		
0 ... 0.1 bar/0 ... 10 kPa	15 bar/1500 kPa	0 bar abs.
0 ... 1 bar/0 ... 100 kPa	35 bar/3500 kPa	0 bar abs.
0 ... 2.5 bar/0 ... 250 kPa	50 bar/5000 kPa	0 bar abs.
0 ... 5 bar/0 ... 500 kPa	65 bar/6500 kPa	0 bar abs.
0 ... 10 bar/0 ... 1000 kPa	90 bar/9000 kPa	0 bar abs.
0 ... 25 bar/0 ... 2500 kPa	130 bar/13000 kPa	0 bar abs.
0 ... 60 bar/0 ... 6000 kPa	200 bar/20000 kPa	0 bar abs.

**Nominal measuring ranges and overload capacity in psi**

The specifications are only an overview and refer to the measuring cell. Limitations due to the material and version of the process fitting are possible. The specifications on the nameplate apply.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 ... +1.450 psig	+217.6 psig	-2.900 psig
0 ... +2.901 psig	+290.1 psig	-5.802 psig
0 ... +5.802 psig	+435.1 psig	-11.60 psig
0 ... +14.50 psig	+507.6 psig	-14.5 psig
0 ... +36.26 psig	+725 psig	-14.50 psig
0 ... +72.52 psig	+942.7 psig	-14.50 psig
0 ... +14.50 psig	+1305 psig	-14.50 psig
0 ... +362.6 psig	+1885 psig	-14.50 psig
0 ... +870.2 psig	+2901 psig	-14.50 psig
-14.5 ... 0 psig	+507.6 psig	-14.50 psig
-14.5 ... +21.76 psig	+725.2 psig	-14.5 psig
-1 ... +72.52 psig	+942.7 psig	-14.5 psig
-14.50 ... +145.0 psig	+1305 psig	-14.50 psig
-1 ... +362.6 psig	+1885 psig	-14.5 psig
-1 ... +870.2 psig	+2901 psig	-14.50 psig
-0.725 ... +0.725 psig	+217.6 psig	-2.901 psig
-1.450 ... +1.450 psig	+290.1 psig	-5.801 psig
-2.901 ... +2.901 psig	+435.1 psig	-11.60 psig
-7.252 ... +7.252 psig	+507.6 psig	-14.50 psig
Absolute pressure		
0 ... 1.405 psi	217.6 psi	0 psi
0 ... 14.5 psi	507.6 psi	0 psi
0 ... 36.26 psi	725.2 psi	0 psi
0 ... 72.52 psi	942.7 psi	0 psi
0 ... 145.0 psi	1305 psi	0 psi
0 ... 362.6 psi	1885 psi	0 psi
0 ... 870.2 psi	2901 psi	0 psi

### Reference conditions and actuating variables (according to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1

- Temperature +15 ... +25 °C (+59 ... +77 °F)
- Relative humidity 45 ... 75 %
- Air pressure 860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psig)

Determination of characteristics Limit point adjustment according to IEC 61298-2

Characteristic curve Linear

Reference installation position upright, diaphragm points downward

Influence of the installation position < 0.2 mbar/20 Pa (0.003 psig)

**Deviation determined according to the limit point method according to IEC 60770<sup>2)</sup>**

Applies to **digital** interfaces (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

Deviation

- Turn down 1 : 1 up to 5 : 1 < 0.075 %
- Turn down > 5 : 1 < 0.015 % x TD

Deviation with absolute pressure measuring range 0.1 bar

- Turn down 1 : 1 up to 5 : 1 < 0.25 %
- Turn down > 5 : 1 < 0.05 % x TD

**Influence of the product or ambient temperature****Thermal change zero signal and output span**

Applies to the **digital** signal output (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 ... 20 mA and refers to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

Thermal change zero signal and output span, reference temperature 20 °C (68 °F):

- In the compensated temperature range 0 ... +100 °C (+32 ... +212 °F) < (0.05 % + 0.1 % x TD)
- Outside the compensated temperature range < (0.05 % + 0.15 % x TD)

Thermal change zero signal and output span with absolute pressure measuring range 0.1 bar, reference temperature 20 °C (68 °F):

- In the compensated temperature range 0 ... +100 °C (+32 ... +212 °F) < (0.1 % + 0.1 % x TD)
- Outside the compensated temperature range < (0.15 % + 0.15 % x TD)

**Thermal change, current output**

Applies also to the **analogue** 4 ... 20 mA current output and refers to the set span.

Thermal change, current output < 0.05 %/10 K, max. < 0.15 %, each with -40 ... +80 °C (-40 ... +176 °F)

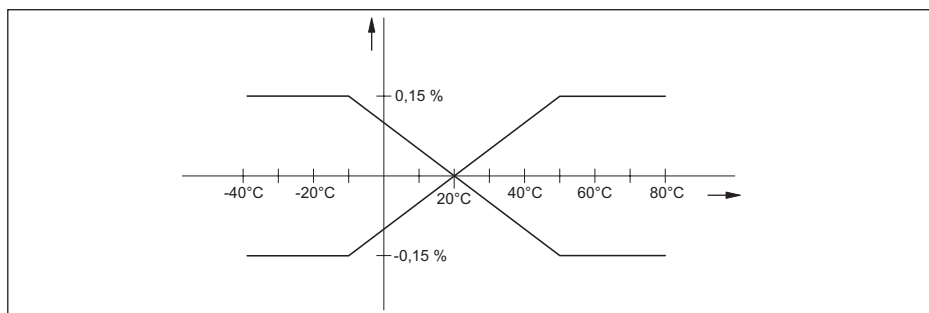


Fig. 16: Thermal change, current output



**Long-term stability (according to DIN 16086 and IEC 60770-1)**

Applies to **digital** HART interface as well as to **analogue** current output 4 ... 20 mA under reference conditions. Specifications refer to the set span. Turn down (TD) is the relation nominal measuring range/set span.

Long-term drift of the zero signal:

- For one year < 0.05 % x TD
- For five years < 0.1 % x TD
- For ten years < 0.2 % x TD

**Ambient conditions**

Ambient, storage and transport temperature

- Standard version -40 ... +80 °C (-40 ... +176 °F)
- Versions IP 66/IP 68 (1 bar) and IP 68 (25 bar), connection cable PUR -20 ... +80 °C (-4 ... +176 °F)
- Version IP 66/IP 68 (1 bar), connection cable PE -20 ... +60 °C (-4 ... +140 °F)

**Process conditions**

The specifications of the pressure stage and product temperature are used as an overview. The specifications on the type label are applicable.

Pressure stage, process fitting

- Thread 316L, depending on connection PN 10, PN 60, PN 160
- Thread Aluminium PN 25
- Thread PVDF PN 10
- Hygienic fittings 316L, depending on connection PN 6, PN 10, PN 25, PN 40 (PN 40 only with DRD and DIN 11851)
- Flange 316L PN 16, PN 40, 150 lbs, 300 lbs, 600 lbs
- Flange with extension 316L without PN specification, PN 16, PN 40 or 150 lbs, 300 lbs, 600 lbs
- Flange flattened on both sides 316L PN 10
- Flange PVDF PN 16

Product temperature depending on the measuring cell seal<sup>3)</sup>

Measuring cell seal	Product temperature - standard version	Product temperature - version with extended temperature range
FKM (VP2/A)	-20 ... +120 °C (-4 ... +248 °F)	-20 ... +150 °C (-4 ... +302 °F)
FKM (A+P 70.16)	-40 ... +120 °C (-40 ... +248 °F)	-
EPDM (A+P 75.5/KW75F)	-40 ... +120 °C (-40 ... +248 °F) 1 h: 140 °C/284 °F cleaning temperature	-40 ... +150 °C (-40 ... +302 °F)
EPDM (ET 7056)	-40 ... +120 °C (-40 ... +248 °F) 1 h: 140 °C/284 °F cleaning temperature	-
FFKM (Kalrez 6375)	-20 ... +120 °C (-4 ... +248 °F)	-20 ... +150 °C (-4 ... +302 °F)

Measuring cell seal	Product temperature - standard version	Product temperature - version with extended temperature range
FFKM (Perlast G75S)	-15 ... +120 °C (-4 ... +248 °F)	-15 ... +150 °C (5 ... +302 °F)
FFKM (Perlast G75B)	-15 ... +120 °C (-4 ... +248 °F)	-15 ... +150 °C (5 ... +302 °F)

Vibration resistance mechanical vibrations with 4 g and 5 ... 100 Hz<sup>4)</sup>

Shock resistance Acceleration 100 g/6 ms<sup>5)</sup>

**Electromechanical data - version IP 66/IP 67**

Cable entry/plug<sup>6)</sup>

- Single chamber housing
  - 1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind plug M20 x 1.5
  - or:
  - 1 x closing cap ½ NPT, 1 x blind plug ½ NPT
  - or:
  - 1x plug (depending on the version), 1x blind stopper M20x1.5
  - or:
  - 2 x blind plug M20 x 1,5

Spring-loaded terminals for wire cross-section < 2.5 mm<sup>2</sup> (AWG 14)

**Electromechanical data - version IP 68**

Connection cable between IP 68 instrument and external housing:

- Configuration four wires, one suspension wire, one breather capillary, screen braiding, metal foil, mantle
- Wire cross-section 0.5 mm<sup>2</sup> (AWG 20)
- Wire resistance < 0.036 Ω/m (0.011 Ω/ft)
- Standard length 5 m (16.40 ft)
- Max. length 180 m (590.5 ft)
- Min. bending radius at 25 °C/77 °F 25 mm (0.985 in)
- Diameter approx. 8 mm (0.315 in)
- Colour Blue

Cable entry/plug<sup>7)</sup>

- External housing
  - 1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind plug M20 x 1.5
  - or:
  - 1x plug (depending on the version), 1x blind stopper M20x1.5

Spring-loaded terminals for wire cross-section up to 2.5 mm<sup>2</sup> (AWG 14)

**Display and adjustment module**

- Voltage supply and data transmission through the sensor
- Indication LC display in dot matrix
- Adjustment elements 4 keys

Protection rating

- unassembled IP 20
- mounted into the sensor without cover IP 40

Material

- Housing ABS
- Inspection window Polyester foil

**Voltage supply**

Operating voltage

- Non-Ex instrument 12 ... 36 V DC
- Ex-ia instrument 12 ... 30 V DC
- Ex-d instrument 18 ... 36 V DC

Operating voltage with illuminated display and adjustment module

- Non-Ex instrument 20 ... 36 V DC
- Ex-ia instrument 20 ... 30 V DC
- Ex-d instrument 20 ... 36 V DC

Permissible residual ripple

- < 100 Hz  $U_{ss} < 1\text{ V}$
- 100 Hz ... 10 kHz  $U_{ss} < 10\text{ mV}$

Load see diagram

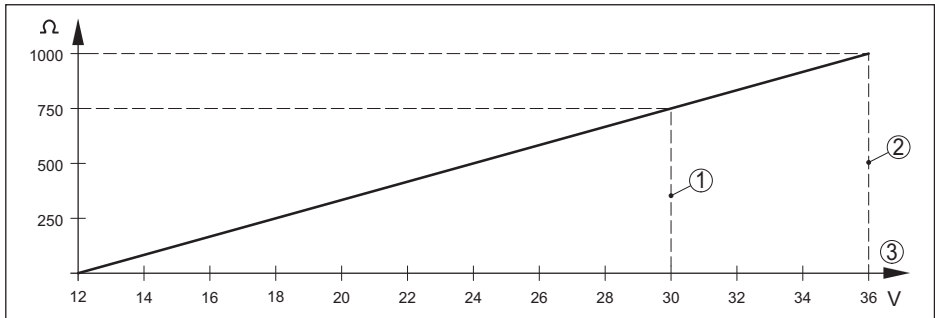


Fig. 17: Voltage diagram

- 1 Voltage limit Ex-ia instrument
- 2 Voltage limit non-Ex/Ex-d instrument
- 3 Operating voltage

**Electrical protective measures**

Protection rating

- Housing, standard IP 66/IP 67<sup>9)</sup>
- Process component in IP 68 version IP 68 (25 bar)
- External housing IP 65

Overvoltage category III

Protection class II

## Functional safety (SIL)

The functional safety is already activated ex factory on instruments with SIL qualification. For instruments without SIL qualification ex factory, the functional safety must be activated by the user via the display and adjustment module for applications according to SIL.

Functional safety according to IEC 61508-4

- Single channel architecture (1oo1D) up to SIL2
- double channel diversitary redundant architecture (1oo2D) up to SIL3

You will find detailed information in the Safety Manual of the instrument series.

## Approvals

Depending on the version, instruments with approvals can have different technical data. For these instruments, please note the corresponding approval documents. They are included in the scope of delivery.

## 9.2 Dimensions

The double chamber housings are only available for Ex-d version with instruments with 4 ... 20 mA signal output.

### Plastic housing

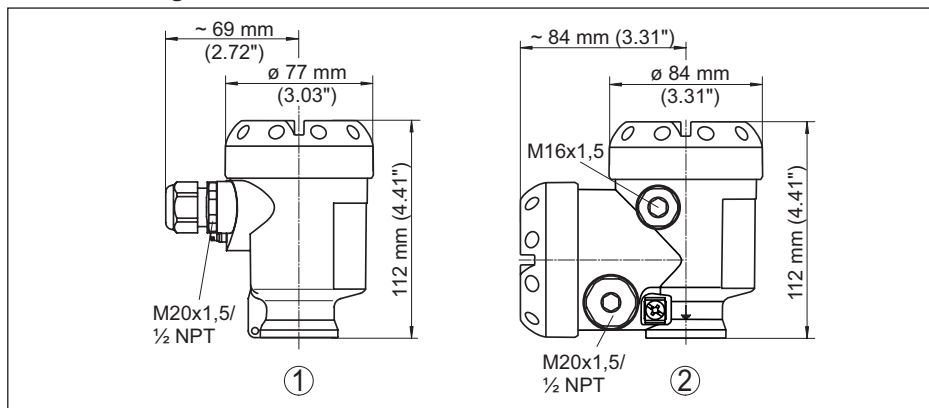


Fig. 18: Housing versions in protection IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

- 1 Single chamber version
- 2 Double chamber version

### Aluminium housing

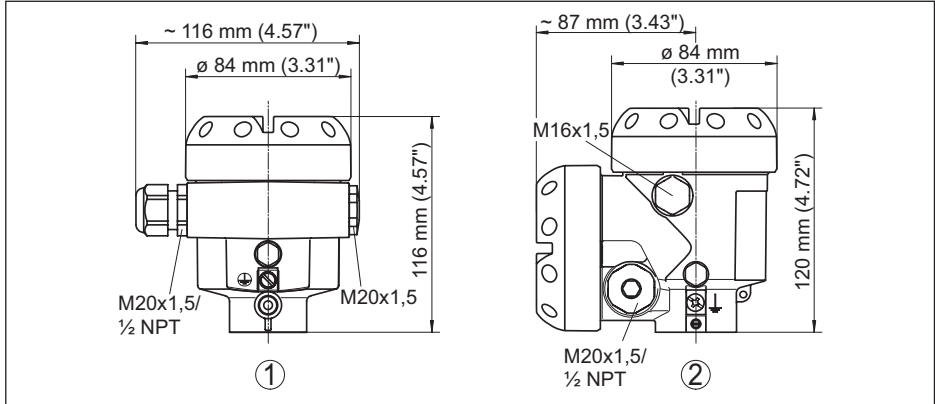


Fig. 19: Housing versions in protection IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

- 1 Single chamber version
- 2 Double chamber version

### Stainless steel housing

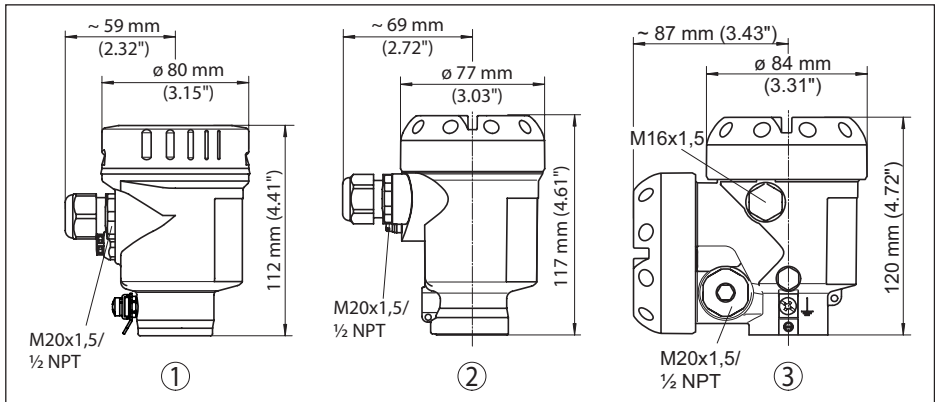


Fig. 20: Housing versions in protection IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

- 1 Single chamber version, electropolished
- 2 Single chamber version, precision casting
- 3 Double chamber version, precision casting

### External housing with IP 68 version

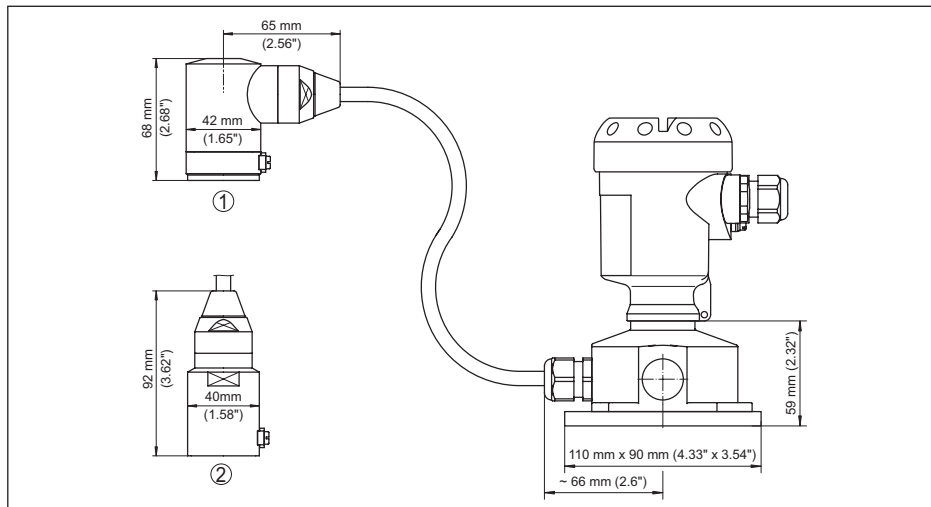


Fig. 21: IP 68 version with external housing

- 1 Lateral cable outlet
- 2 Axial cable outlet

### IPT-1\* Vers. 2.0 - standard version

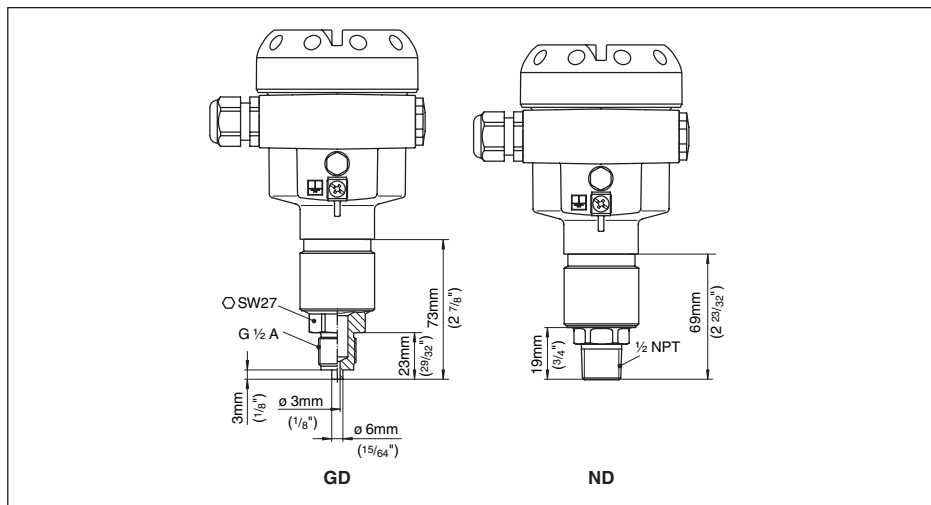


Fig. 22: IPT-1\* Vers. 2.0 GD = G 1/2 A manometer connection EN 837, ND = 1/2 NPT

## IPT-1\* Vers. 2.0 - front-flush diaphragm

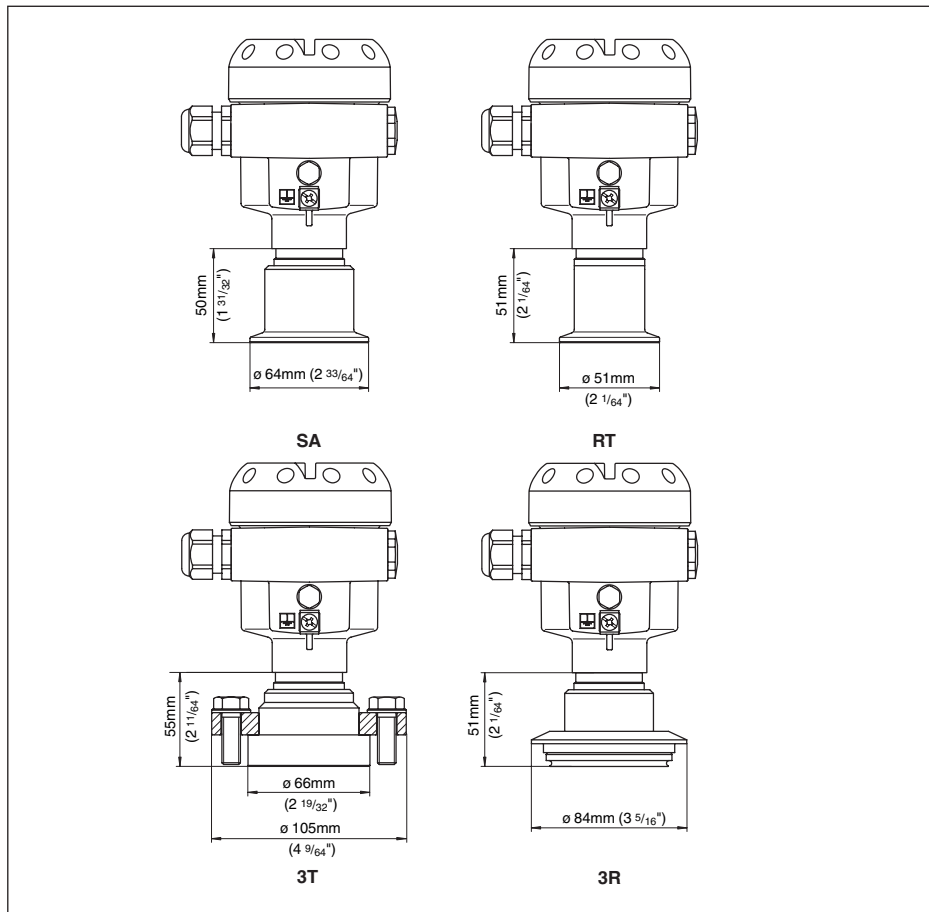


Fig. 23: IPT-1\* Vers. 2.0 SA = Tri-Clamp 2", RT = Tri-Clamp 1½", 3T = DRD, 3R = Varivent Form F

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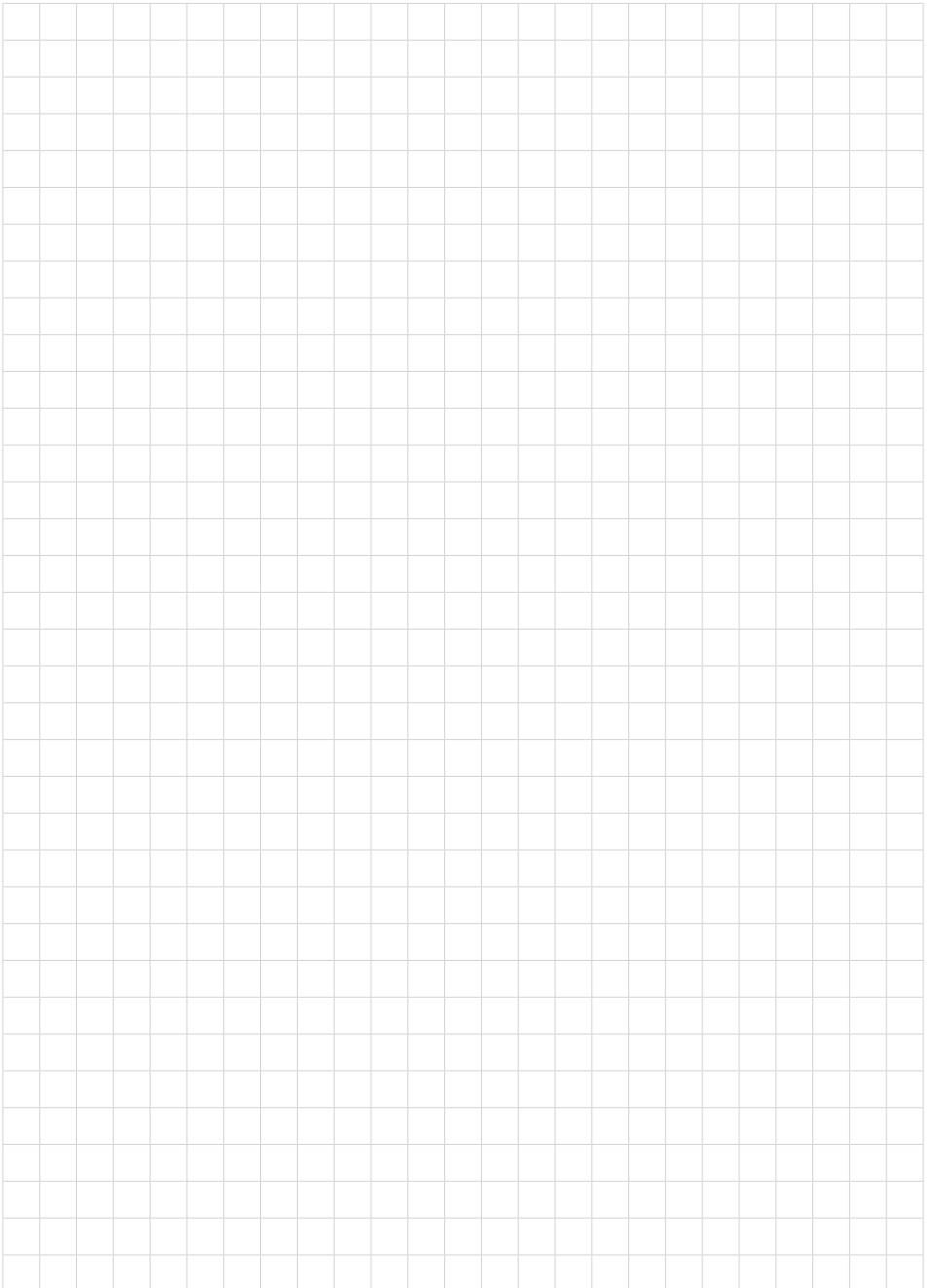
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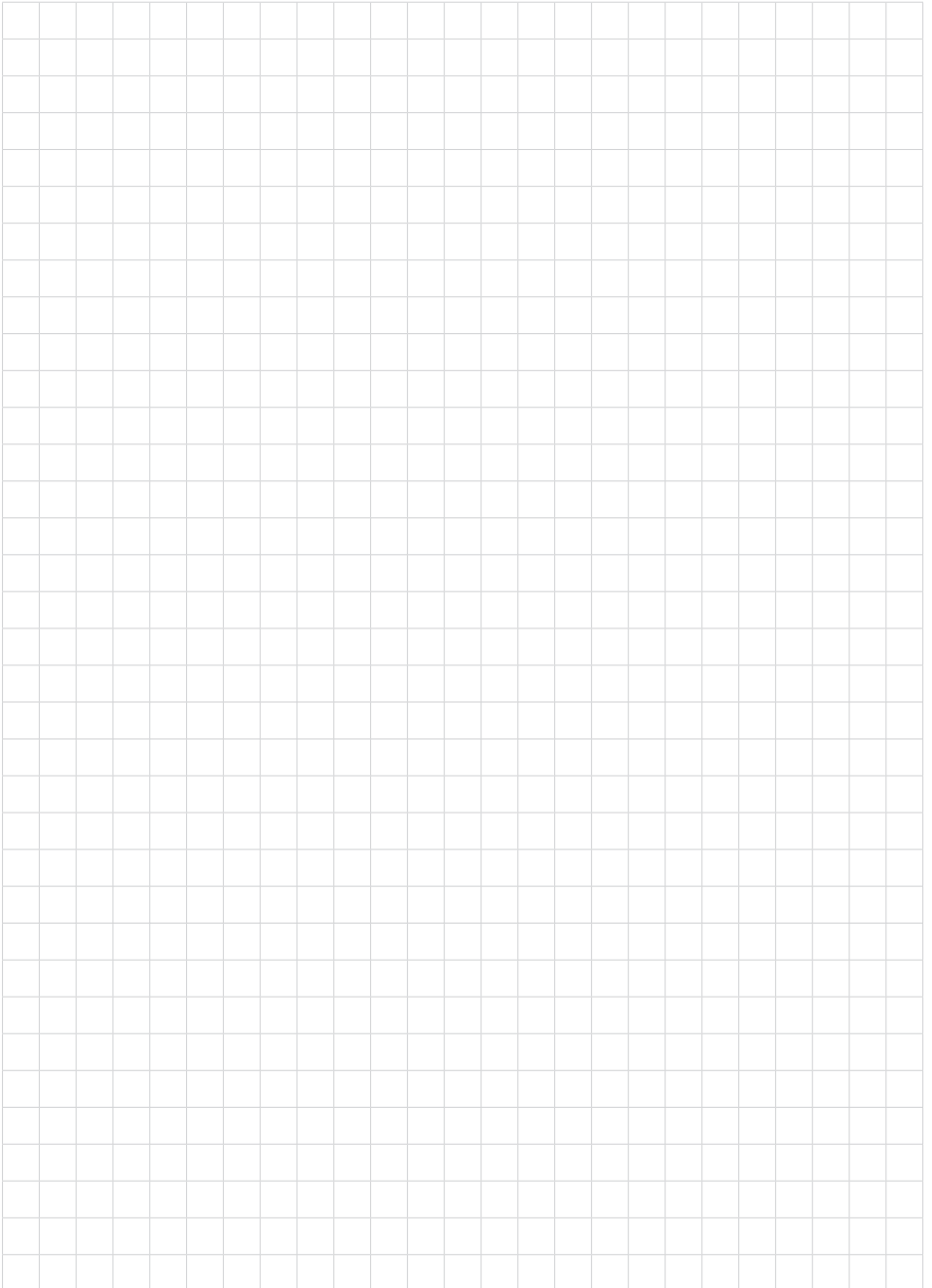
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A large grid of graph paper, consisting of approximately 20 columns and 30 rows of small squares, intended for taking notes.

Printing date:



All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.



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