Operating Instructions

# Process pressure transmitter CPT-2x

GB

Profibus PA
Ceramic sensor

Process pressure transmitter CPT-2x

WIKA
Part of your business

# Contents

**Safety instructions for Ex areas**

Take note of the Ex specific safety instructions for Ex applications. These instructions are attached as documents to each instrument with Ex approval and are part of the operating instructions.

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# 1 About this document

## 1.1 Function

This operating instructions provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, the exchange of parts and the safety of the user. 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 personnel. The contents of this manual must be made available to the qualified personnel and implemented.

## 1.3 Symbols 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.

1 **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 documentation must be carried out only by trained, qualified 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

The CPT-2x is a pressure transmitter for process pressure and hydrostatic level measurement.

You can find detailed information about the area of application 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.

## 2.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

## 2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

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.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

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. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

## 2.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

## 2.6 Permissible process conditions

For safety reasons, the instrument must only be operated within the permissible process conditions. You can find detailed information on the process conditions in chapter "*Technical data*" as well as on the type label.

The permissible process pressure range is specified by "MWP" (Maximum Working Pressure) on the type label, see chapter "*Structure*". The MWP takes the element of the measuring cell and processing fitting combination with the weakest pressure into consideration and may applied permanently. The specification refers to a reference temperature of +20 °C (+68 °F). It also applies when a measuring cell with a higher measuring range than the permissible pressure range of the process fitting is installed order-related.

In order to prevent damage to the device, the test pressure may only exceed the specified MWP briefly by 1.5 times at reference temperature. The pressure stage of the process fitting as well as the overload resistance of the measuring cell are taken into consideration here (see chapter "*Technical Data*").

In addition, a temperature derating of the process fitting, e. g. with flanges, can limit the permissible process pressure range according to the respective standard.

## 2.7 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 fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

## 2.8 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code.

# 3 Product description

## 3.1 Configuration

**Scope of delivery**

The scope of delivery encompasses:

- Instrument CPT-2x
- Documentation
  - Operating instructions CPT-2x
  - Characteristics test certificate
  - Instructions for optional instrument features
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates

**Note:**
Optional instrument features are also described in this operating instructions manual. The respective scope of delivery results from the order specification.

**Scope of this operating instructions**

This operating instructions manual applies to the following instrument versions:

- Hardware from 1.0.0
- Software version from 1.2.1

**Note:**
You can find the hardware and software version of the instrument as follows:

- On the type plate of the electronics module
- In the adjustment menu under "*Info*"

**Type label**

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

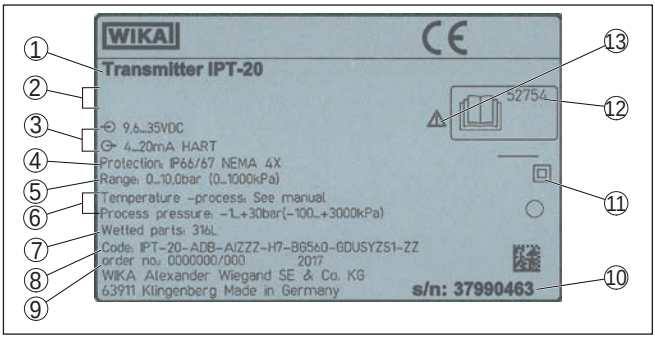



*Fig. 1: Layout of the type label (example)*

*1 Instrument type*
*2 Field for approvals*
*3 Signal output and voltage supply*
*4 Technical data*
*5 Product code*
*6 Order number*
*7 Serial number of the instrument*
*8 Symbol of the device protection class*
*9 ID numbers, instrument documentation*
*10 Reminder to observe the instrument documentation*

## 3.2 Principle of operation

**Application area**

CPT-2x is suitable for applications in virtually all industries. It is used for the measurement of the following pressure types.

- Gauge pressure
- Absolute pressure
- Vacuum

**Measured products**

Measured products are gases, vapours and liquids.

Depending on the process fitting and measurement setup, measured products can be also viscous or contain abrasive substances.

**Measured variables**

The CPT-2x is suitable for the measurement of the following process variables:

- Process pressure
- Level

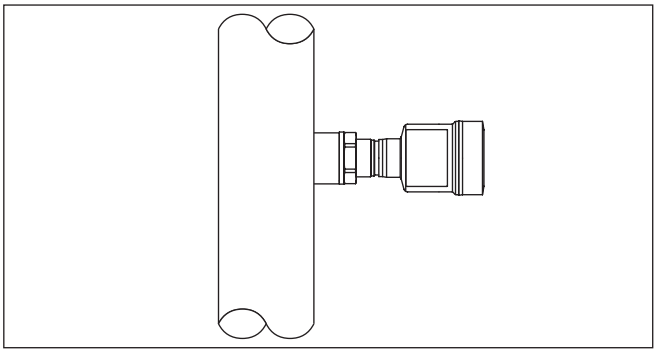


*Fig. 2: Process pressure measurement CPT-2x*

**Measuring system pressure**

Sensor element is the measuring cell with robust ceramic diaphragm. The process pressure deflects the ceramic diaphragm and causes a capacitance change in the measuring cell. This capacitance change is converted into an electrical signal and output as measured value via the output signal.

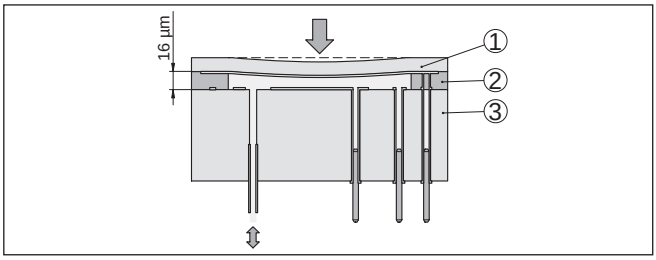



*Fig. 3: Configuration of the ceramic measuring cell*

*1 Process diaphragm*
*2 Glass joint*
*3 Base element*

The measuring cell is available in two sizes: ø 28 mm and ø 17.5 mm.

**Measuring system temperature**

Temperature sensors in the ceramic diaphragm and on the ceramic body of the ø 28 mm measuring cell or on the electronics of the ø 17.5 mm measuring cell detect the current process temperature. The temperature value is output via:

- The display and adjustment module
- The current output or the digital signal output

Extreme process temperature jumps are also immediately detected by the ø 28 mm measuring cell. The values in the ceramic diaphragm are compared with that on the ceramic base body.

Within only a few measuring cycles the intelligent sensor electronics compensates unavoidable measurement deviations due to temperature shocks. Such shocks cause (depending on the set damping) only slight, brief changes to the output signal.

**Pressure types**

The measuring cell design depends on the selected pressure type.

**Relative pressure**: the measuring cell is open to the atmosphere. The ambient pressure is detected in the measuring cell and compensated. It thus has no influence on the measured value.

**Absolute pressure**: the measuring cell is evacuated and encapsulated. The ambient pressure is not compensated and does hence influence the measured value.

**Seal concepts**

The following presentations show examples for the installation of the ceramic measuring cell into the process fitting and the different seal concepts.

**Recessed installation**

The recessed installation is particularly suitable for applications with gases, vapours and clear liquids. The measuring cell seal is positioned laterally as well as in addition in front.

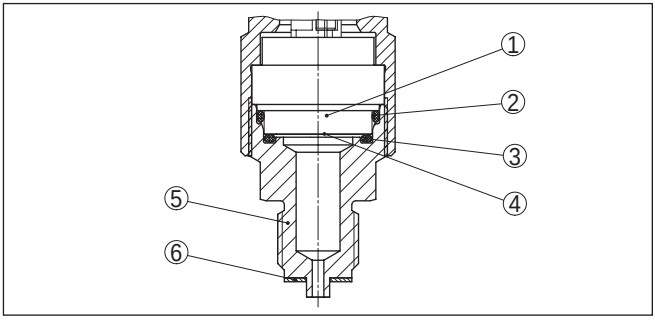



*Fig. 4: Recessed installation of the measuring cell (example: manometer connection G½)*

*1 Measuring cell*
*2 Seal for the measuring cell*
*3 Additional, front seal for measuring cell*
*4 Diaphragm*
*5 Process fitting*
*6 Seal for the process fitting*

**Front-flush mounting with single seal**

The front-flush installation is particularly suitable for applications with viscous and abrasive media and in case of buildup. The measuring cell seal is positioned laterally.

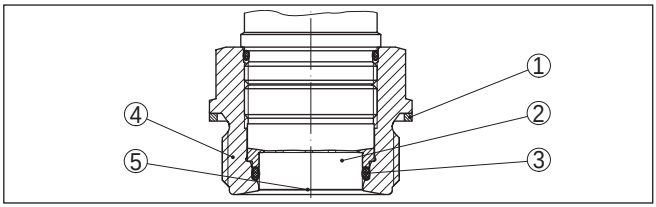



*Fig. 5: Front-flush installation of the measuring cell (example: thread G1½)*

1 *Seal for the process fitting*
2 *Measuring cell*
3 *Seal for the measuring cell*
4 *Process fitting*
5 *Diaphragm*

**Completely front-flush mounting with single seal**

The completely front-flush mounting is particularly suitable for applications in the paper industry. The diaphragm is in the pulp flow, is hence cleaned and protected against buildup.

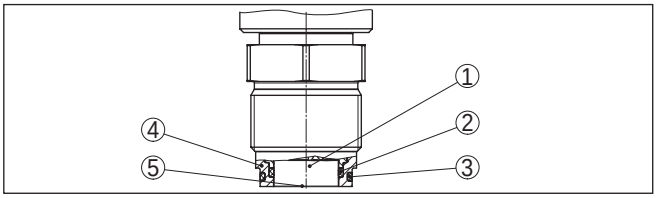



*Fig. 6: Front-flush installation of the measuring cell (example: M30 x 1.5)*

1 *Measuring cell*
2 *Seal for the measuring cell*
3 *Seal for the process fitting*
4 *Process fitting*
5 *Diaphragm*

**Front-flush mounting with double seal**

The front-flush installation is particularly suitable for applications with viscous media. The additional, front sealing protects the glass joint of the measuring cell against chemical attack and the measuring cell electronics against diffusion of aggressive gases from the process.

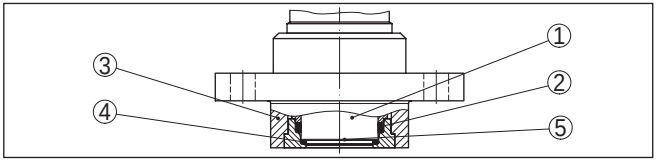



*Fig. 7: Front-flush installation of the measuring cell with double seal (example: flange connection with extension)*

1 *Measuring cell*
2 *Seal for the measuring cell*
3 *Process fitting*
4 *Additional, front seal for measuring cell*
5 *Diaphragm*

**Installation in hygienic fitting**

The front-flush, hygienic installation of the measuring cell is particularly suitable for food applications. The sealings are installed gap-free. The form seal of the measuring cell protects also the glass joint.

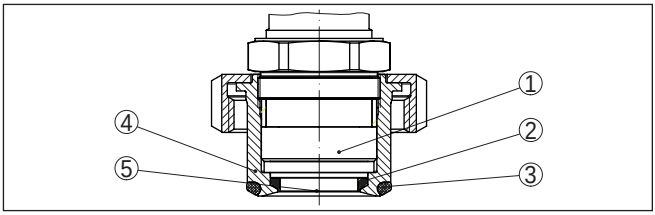



*Fig. 8: Hygienic installation of the measuring cell (example: hygienic fitting with compression nut)*

*1 Measuring cell*
*2 Form seal for the measuring cell*
*3 Gap-free seal for process fitting*
*4 Process fitting*
*5 Diaphragm*

**Installation in hygienic fitting acc. to 3-A**

The front-flush, hygienic installation of the measuring cell acc. to 3A is particularly suitable for food applications. The sealings are installed gap-free. The additional front sealing for the measuring cell protects also the glass joint. A hole in the process fitting is used for leakage detection.

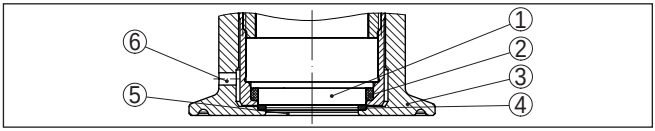



*Fig. 9: Hygienic installation of the measuring cell acc. to 3-A (example: Clamp connection)*

*1 Measuring cell*
*2 Seal for the measuring cell*
*3 Process fitting*
*4 Additional, front seal for measuring cell*
*5 Diaphragm*
*5 Hole for leakage detection*

## 3.3 Supplementary cleaning procedures

The CPT-2x is also available in the version "*Oil, grease and silicone-free*". These instruments have passed through a special cleaning procedure to remove oil, grease and paint-wetting impairment substances (PWIS).

The cleaning is carried out on all wetted parts as well as on surfaces accessible from outside. To keep the purity level, the instruments are immediately packed in plastic foil after the cleaning process. The purity level remains as long as the instrument is kept in the closed original packaging.

**Caution:**
The CPT-2x in this version may not be used in oxygen applications. For this purpose, instruments are available in the special version "*Oil and grease-free for oxygen applications*".

## 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 in due 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 %

**Lifting and carrying**

With instrument weights of more than 18 kg (39.68 lbs) suitable and approved equipment must be used for lifting and carrying.

# 4 Mounting

## 4.1 General instructions

**Process conditions**

Make sure before mounting that all parts of the instrument exposed to the process are suitable for the existing process conditions.

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

- Process pressure
- Process temperature
- Chemical properties of the medium
- Abrasion and mechanical influences

You can find detailed information on the process conditions in chapter "*Technical data*" as well as on the type label.

**Protection against moisture**

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland or plug connector
- When mounting horizontally, turn the housing so that the cable gland or plug connector point downward
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.

**Screwing in**

On devices with a threaded fitting, the hexagon on the process fitting must be tightened with a suitable wrench.

See chapter "*Dimensions*" for wrench size.

**Warning:**
The housing or the electrical connection may not be used for screwing in! Tightening can cause damage, e. g. to the rotation mechanism of the housing.

**Vibrations**

If there is strong vibration at the mounting location, the instrument version with external housing should be used. See chapter "*External housing*".

**Process pressure range - Mounting accessory**

The permissible process pressure range is stated on the type label. The instrument should only be operated with these pressures if the mounting accessory used also fulfils these values. This should be ensured by suitable flanges, welded sockets, tension rings with Clamp connections, sealings, etc.

**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.

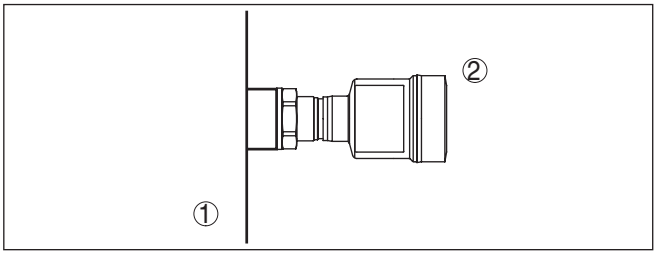



*Fig. 10: Temperature ranges*

*1 Process temperature*
*2 Ambient temperature*

## 4.2 Ventilation and pressure compensation

**Filter element - Position**

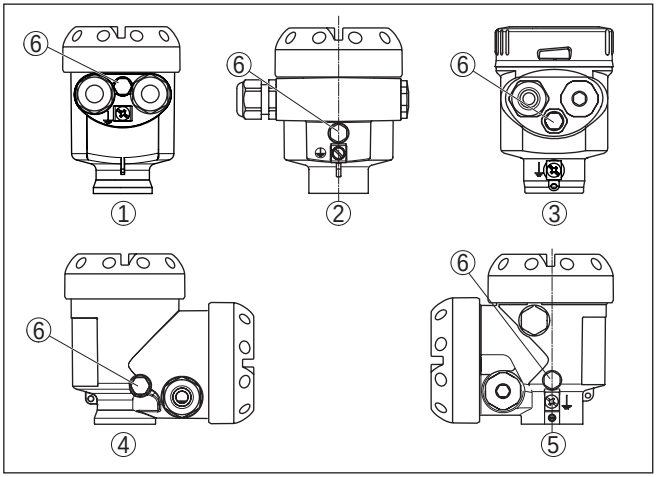



*Fig. 11: Position of the filter element*

*1 Plastic, stainless steel single chamber (precision casting)*
*2 Aluminium - single chamber*
*3 Stainless steel single chamber (electropolished)*
*4 Plastic double chamber*
*5 Aluminium - double chamber*
*6 Filter element*

With the following instruments a blind plug is installed instead of the filter element:

- Instruments in protection IP 66/IP 68 (1 bar) - ventilation via capillaries in non-detachable cable
- Instruments with absolute pressure

**Filter element - Position Ex-d version**

→ Turn the metal ring in such a way that the filter element points downward after installation of the instrument. This provides better protection against buildup.

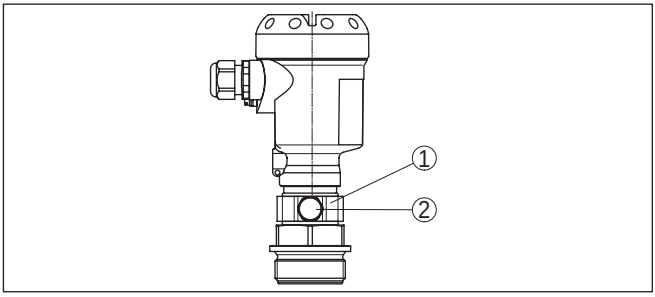



*Fig. 12: Position of the filter element - Ex-d version*

*1 Rotatable metal ring*
*2 Filter element*

Instruments with absolute pressure have a blind plug mounted instead of the filter element.

**Filter element - Position Second Line of Defense**

The Second Line of Defense (SLOD) is a second level of the process separation in form of a gas-tight leadthrough in the housing neck, preventing products from penetrating into the housing.

With these instruments, the process assembly is completely encapsulated. An absolute pressure measuring cell is used so that no ventilation is required.

With relative pressure measuring ranges, the ambient pressure is detected and compensated by a reference sensor in the electronics.

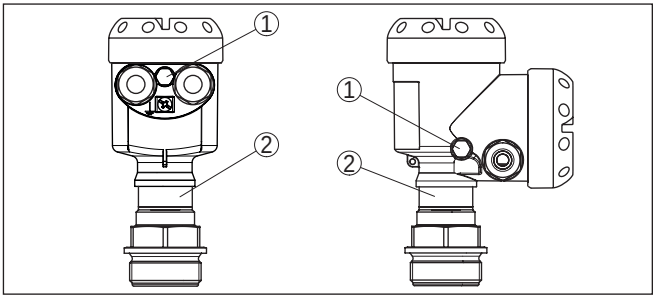



*Fig. 13: Position of the filter element - gastight leadthrough*

*1 Filter element*
*2 Gas-tight leadthrough*

**Filter element - Position IP 69K version**

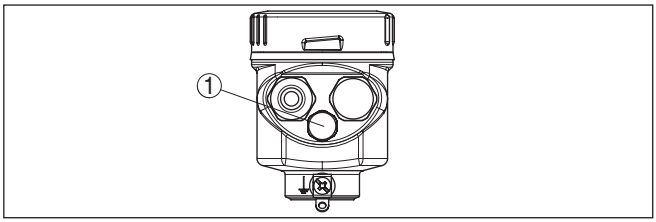



*Fig. 14: Position of the filter element - IP 69K version*

*1 Filter element*

Instruments with absolute pressure have a blind plug mounted instead of the filter element.

## 4.3 Process pressure measurement

**Measurement setup in gases**

Keep the following in mind when setting up the measuring system:

- Mount the instrument above the measuring point

Possible condensation can then drain off into the process line.

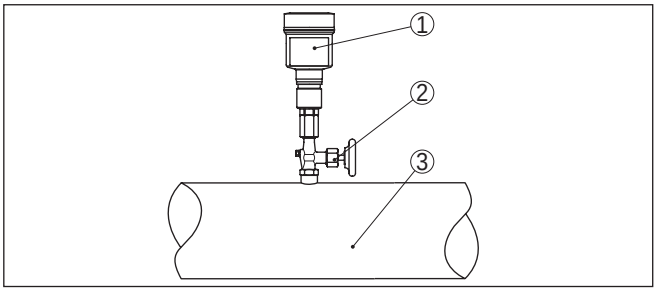



*Fig. 15: Measurement setup for process pressure measurement of gases in pipelines*

*1 CPT-2x*
*2 Blocking valve*
*3 Pipeline*

**Measurement setup in vapours**

Keep the following in mind when setting up the measuring system:

- Connect via a siphon
- Do not insulate the siphon
- Fill the siphon with water before setup

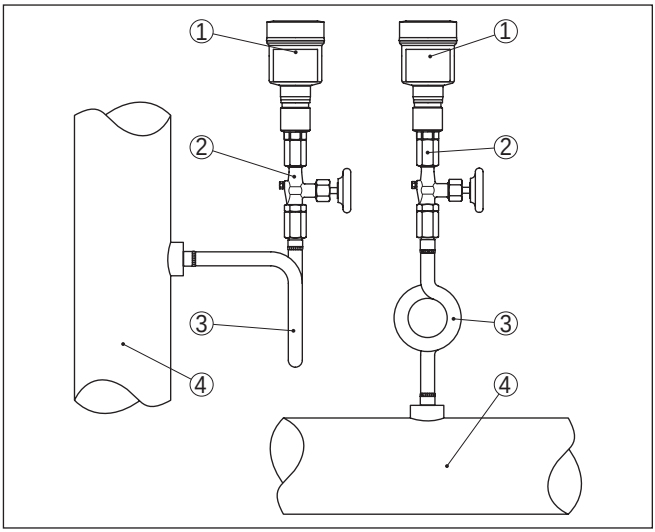



*Fig. 16: Measurement setup with process pressure measurement of gases in pipelines*

*1 CPT-2x*
*2 Blocking valve*
*3 Siphon in U or circular form*
*4 Pipeline*

A protective accumulation of water is formed through condensation in the pipe bends. Even in applications with hot steam, a medium temperature < 100 °C on the transmitter is ensured.

**Measurement setup in liquids**

Keep the following in mind when setting up the measuring system:

- Mount the instrument below the measuring point

The effective pressure line is always filled with liquid and gas bubbles can bubble up to the process line.

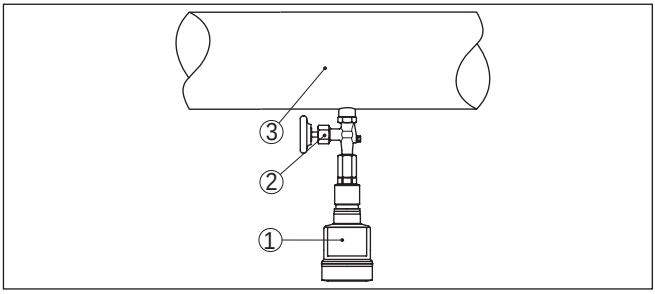



*Fig. 17: Measurement setup for process pressure measurement of liquids in pipelines*

*1 CPT-2x*
*2 Blocking valve*
*3 Pipeline*

## 4.4 Level measurement

**Measurement setup**

Keep the following in mind when setting up the measuring system:

- Mount the instrument below the min. level
- Do not mount the instrument close to the filling stream or emptying area
- Mount the instrument so that it is protected against pressure shocks from the stirrer

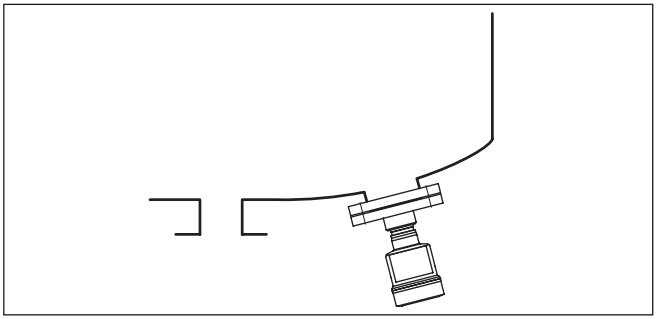


*Fig. 18: Measurement setup for level measurement*

## 4.5 External housing

**Configuration**

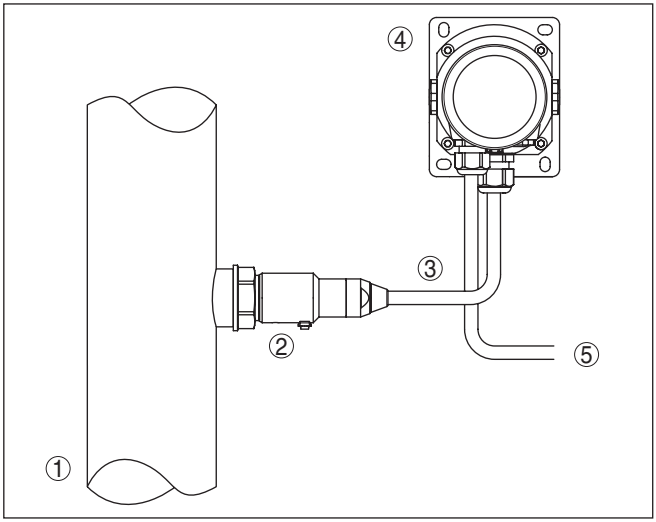



*Fig. 19: Configuration, process module, external housing*

*1 Pipeline*
*2 Process module*
*3 Connection cable process assembly - External housing*
*4 External housing*
*5 Signal cable*

# 5 Connecting to the bus system

## 5.1 Preparing the connection

**Safety instructions**

Always keep in mind the following safety instructions:

- Carry out electrical connection by trained, qualified personnel authorised by the plant operator
- If overvoltage surges are expected, overvoltage arresters should be installed

**Warning:**
Connect only in the complete absence of line voltage.

**Voltage supply**

The voltage supply is provided by a Profibus DP /PA segment coupler.

The voltage supply range can differ depending on the instrument version. You can find the data for voltage supply in chapter "*Technical data*".

**Connection cable**

Connection is made with screened cable according to the Profibus specification. Power supply and digital bus signal are carried over the same two-wire connection cable.

Use cable with round cross section for instruments with housing and cable gland. To ensure the seal effect of the cable gland (IP protection rating), find out which cable outer diameter the cable gland is suitable for.

Use a cable gland fitting the cable diameter.

Make sure that the entire installation is carried out according to the Profibus specification. In particular, make sure that the bus is terminated with suitable terminating resistors.

You can find detailed information of the cable specification, installation and topology in the "*Profibus PA - User and Installation Guideline*" on www.profibus.com.

**Cable screening and grounding**

Make sure that the cable screen and grounding are carried out according to Fieldbus specification. We recommend to connect the cable screening to ground potential on both ends.

In systems with potential equalisation, connect the cable screening directly to ground potential at the power supply unit, in the connection box and at the sensor. The screen in the sensor must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

**Cable glands**

**Metric threads**
In the case of instrument housings with metric thread, the cable glands are screwed in at the factory. They are sealed with plastic plugs as transport protection.

You have to remove these plugs before electrical connection.

**NPT thread**

In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection.

Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

On plastic housings, the NPT cable gland or the Conduit steel tube must be screwed into the threaded insert without grease.

Max. torque for all housings, see chapter "*Technical data*".

## 5.2 Connecting

**Connection technology**

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.

**Information:**
The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

**Connection procedure**

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

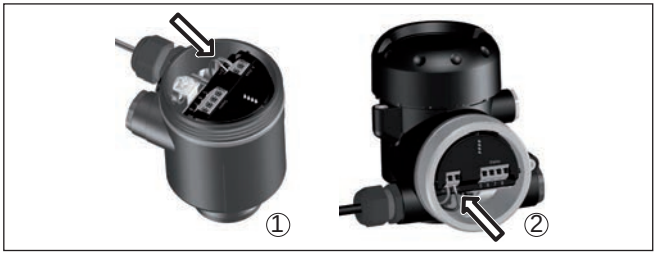



*Fig. 20: Connection steps 5 and 6*

*1 Single chamber housing*
*2 Double chamber housing*

6. Insert the wire ends into the terminals according to the wiring plan

**Information:**
Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "*Technical data - Electromechanical data*".

7. Check the hold of the wires in the terminals by lightly pulling on them
8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
10. Reinsert the display and adjustment module, if one was installed
11. Screw the housing lid back on

The electrical connection is finished.

## 5.3 Single chamber housing

The following illustration applies to the non-Ex, Ex-ia and Ex-d version.

**Electronics and connection compartment**

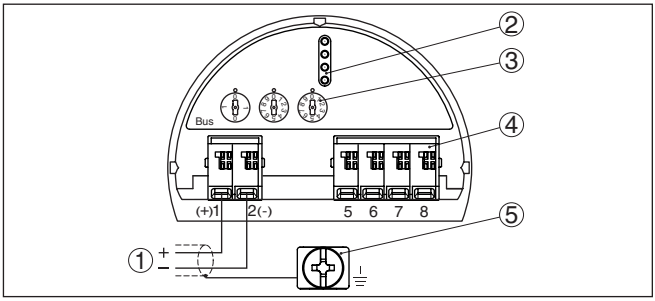



*Fig. 21: Electronics and connection compartment - single chamber housing*

*1 Voltage supply, signal output*
*2 For display and adjustment module or interface adapter*
*3 Selection switch for instrument address*
*4 For external display and adjustment unit*
*5 Ground terminal for connection of the cable screening*

## 5.4 Double chamber housing

The following illustrations apply to the non-Ex as well as to the Ex-ia version.

**Electronics compartment**

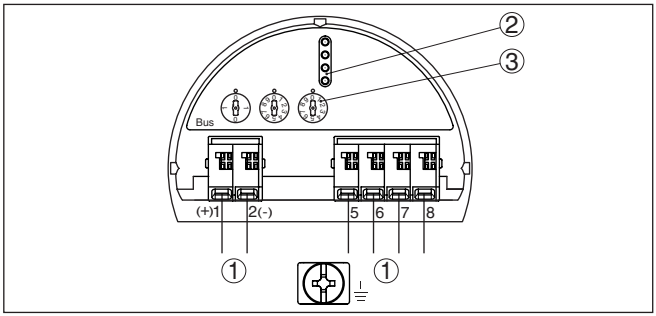



*Fig. 22: Electronics compartment - double chamber housing*

*1 Internal connection to the connection compartment*
*2 Contact pins for the display and adjustment module or interface adapter*
*3 Selection switch for bus address*

**Connection compartment**

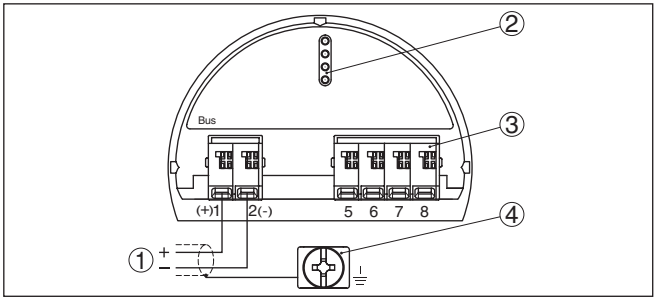



*Fig. 23: Connection compartment - double chamber housing*

*1 Voltage supply, signal output*
*2 For display and adjustment module or interface adapter*
*3 For external display and adjustment unit*
*4 Ground terminal for connection of the cable screening*

## 5.5 Housing IP 66/IP 68 (1 bar)

**Wire assignment, connection cable**

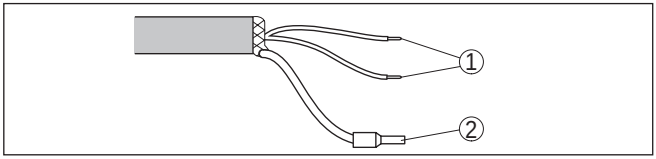



*Fig. 24: Wire assignment in permanently connected connection cable*

*1 Brown (+) and blue (-) to power supply or to the processing system*
*2 Shielding*

## 5.6 External housing with version IP 68 (25 bar)

**Overview**

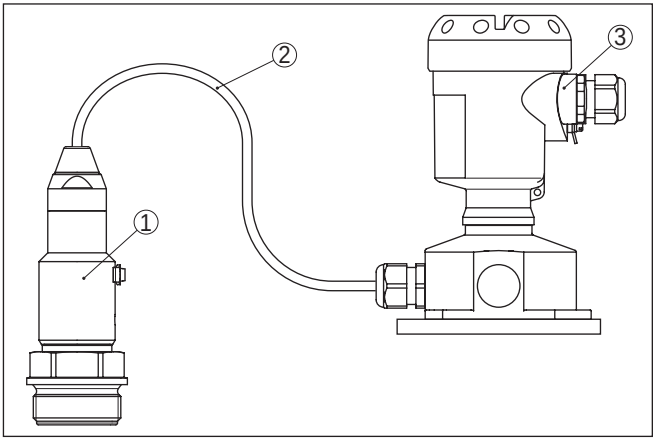



*Fig. 25: CPT-2x in IP 68 version 25 bar with axial cable outlet, external housing*

*1 Transmitter*
*2 Connection cable*
*3 External housing*

**Electronics and connection compartment for power supply**

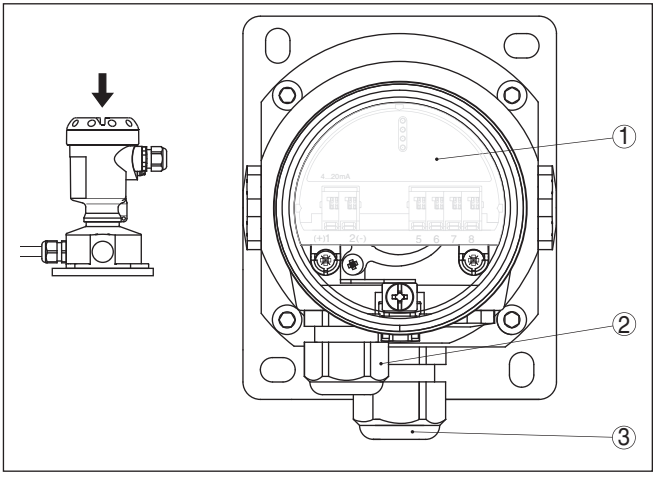



*Fig. 26: Electronics and connection compartment*

*1 Electronics module*
*2 Cable gland for voltage supply*
*3 Cable gland for connection cable, transmitter*

**Terminal compartment, housing socket**

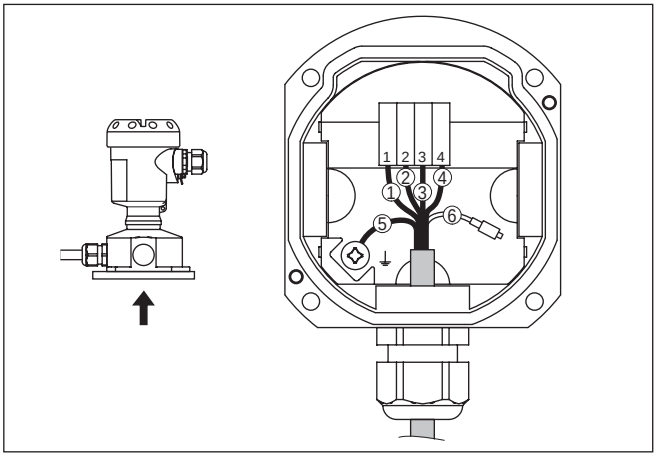



*Fig. 27: Connection of the process component in the housing base*

*1 Yellow*
*2 White*
*3 Red*
*4 Black*
*5 Shielding*
*6 Breather capillaries*

**Electronics and connection compartment**

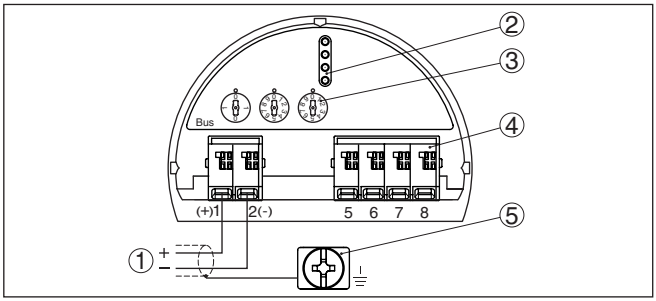



*Fig. 28: Electronics and connection compartment - single chamber housing*

*1 Voltage supply, signal output*
*2 For display and adjustment module or interface adapter*
*3 Selection switch for instrument address*
*4 For external display and adjustment unit*
*5 Ground terminal for connection of the cable screening*

## 5.7 Switch-on phase

After connecting the instrument to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 5 s:

- Internal check of the electronics
- Indication of a status message on the display or PC

- Output signal at instruments with current output jumps to the set fault current

Then the actual measured value is output to the signal cable. The value takes into account settings that have already been carried out, e.g. default setting.

# 6 Set up with the display and adjustment module

## 6.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

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

*Fig. 29: Installing the display and adjustment module in the electronics compartment of the single chamber housing*

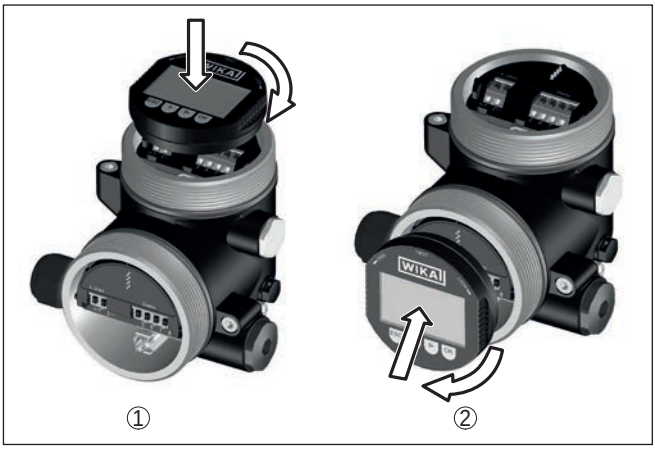



*Fig. 30: Installing the display and adjustment module in the double chamber housing*

*1 In the electronics compartment*
*2 In the connection compartment*

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

## 6.2 Adjustment system

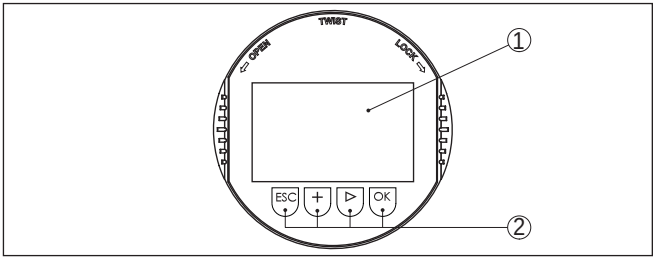



*Fig. 31: Display and adjustment elements*

*1 LC display*
*2 Adjustment keys*

**Key functions**

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key:
  - Change measured value presentation
  - Select list entry
  - Select menu items

  - Select editing position
- ***[+]*** key:
  - Change value of the parameter
- ***[ESC]*** key:
  - Interrupt input
  - Jump to next higher menu

**Adjustment system**

The instrument is operated via the four keys of the display and adjustment module. The individual menu items are shown on the LC display. You can find the function of the individual keys in the previous illustration.

**Time functions**

When the ***[+]*** and ***[->]*** keys are pressed quickly, the edited value, or the cursor, changes one value or position at a time. If the key is pressed longer than 1 s, the value or position changes continuously.

When the ***[OK]*** and ***[ESC]*** keys are pressed simultaneously for more than 5 s, the display returns to the main menu. The menu language is then switched over to "*English*".

Approx. 60 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.

## 6.3 Measured value indication

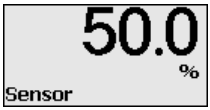
**Measured value indication**

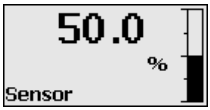
With the ***[->]*** key you can move between three different indication modes.

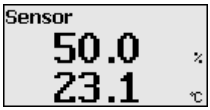
In the first view, the selected measured value is displayed in large digits.

In the second view, the selected measured value and a corresponding bar graph presentation are displayed.

In the third view, the selected measured value as well as a second selectable value, e.g. the temperature, are displayed.



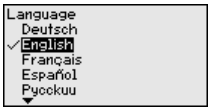




With the "***OK***" key you move (during the initial setup of the instrument) to the selection menu "*Language*".

**Selection language**

In this menu item, you can select the national language for further parameterization.

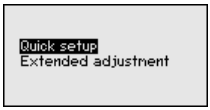



With the "***[->]***" button, you can select the requested language, with "***OK***" you confirm the selection and move to the main menu.

You can change your selection afterwards with the menu item "*Setup - Display, Menu language*".

## 6.4 Parameter adjustment - Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "*Quick setup*" in the start graphic on the display and adjustment module.




Select the individual steps with the ***[->]*** key.

After the last step, "*Quick setup terminated successfully*" is displayed briefly.

The return to the measured value indication is carried out through the ***[->]*** or ***[ESC]*** keys or automatically after 3 s

**Note:**
You can find a description of the individual steps in the quick setup guide of the sensor.

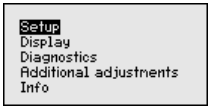
You can find "*Extended adjustment*" in the next sub-chapter.

## 6.5 Parameter adjustment - Extended adjustment

For technically demanding measuring points, you can carry out extended settings in "*Extended adjustment*".


**Main menu**

The main menu is divided into five sections with the following functions:




**Setup:** Settings, for example, to measurement loop name, application, units, position correction, adjustment, AI FB 1 Channel - scaling - damping

**Display:** Settings, e.g., for language, measured value display, lighting

**Diagnosis:** Information, e.g. on instrument status, pointer, measurement reliability, AI FB 1 simulation

**Additional adjustments:** PIN, date/time, reset, copy function

**Info:** Instrument name, hardware and software version, date of manufacture, sensor features

To ensure optimum adjustment of the measurement, the individual submenu items in the main menu "*Setup*" should be selected one

after the other and provided with the correct parameters. The menu items are described in the following.

**Setup - Instrument address**

An address must be assigned to each Profibus PA instrument. Each address may only be assigned once in the Profibus PA network. The sensor is only recognized by the control system if the address is set correctly.

When the instrument is shipped, address 126 is set. This address can be used to test the function of the instrument and to connect it to a Profibus PA network. Then the address must be changed to integrate additional instruments.

The address setting is carried out either via:

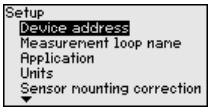
- The address selection switch in the electronics compartment of the instrument (address setting via hardware)
- The display and adjustment module (address setting via software)
- PACTware/DTM (address setting via software)

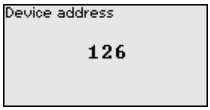
**Hardware addressing**

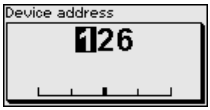
Hardware addressing is effective if an address less than 126 is set with the address selection switches on the electronics module of CPT-2x. In such case, software addressing has no effect - only the set hardware address applies.

**Software addressing**

Software addressing is only effective if address 126 or higher is set on the instrument with the address selection switches.



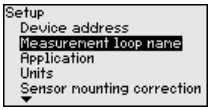

**Setup - Measurement loop name**

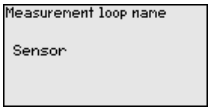
In the menu item "*Sensor TAG*" you edit a twelve-digit measurement loop designation.

You can enter an unambiguous designation for the sensor, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation must be entered for exact identification of individual measuring points.

The available digits include:

- Letters from A … Z
- Numbers from 0 … 9
- Special characters +, -, /, -



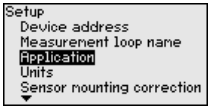

**Setup - Application**

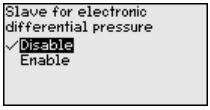
In this menu item you activate/deactivate the slave sensor for electronic differential pressure and select the application.

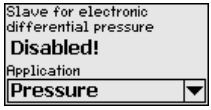
CPT-2x can be used for process pressure and level measurement. Default setting is process pressure measurement. The mode can be changed in this adjustment menu.

If you have connected **no** slave sensor, you confirm this with "*Deactivate*".

Depending on the selected application, different subchapters in the following adjustment steps are important. There you can find the individual adjustment steps.



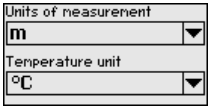



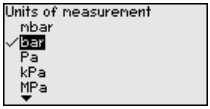

Enter the requested parameters via the appropriate keys, save your settings with ***[OK]*** and jump to the next menu item with the ***[ESC]*** and the ***[->]*** key.

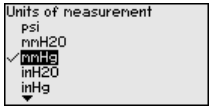
**Setup - Units**

In this menu item, the adjustment units of the instrument are determined. The selection determines the unit displayed in the menu items "*Min. adjustment (Zero)*" and "*Max. adjustment (Span)*".

**Unit of measurement:**



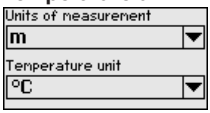



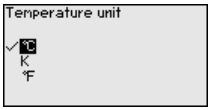




If the level should be adjusted in a height unit, the density of the medium must also be entered later during the adjustment.

In addition, the temperature unit of the instrument is specified. The selection determines the unit displayed in menu items "*Peak value, temperature*" and "in the variables of the digital output signal".

**Temperature unit:**

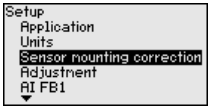


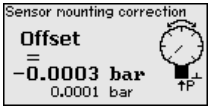



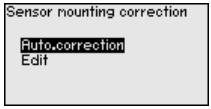

Enter the requested parameters via the appropriate keys, save your settings with ***[OK]*** and jump to the next menu item with the ***[ESC]*** and the ***[->]*** key.

**Setup - Position correction**

Especially with chemical seal systems, the installation position of the instrument can shift (offset) the measured value. Position correction compensates this offset. In the process, the actual measured value is taken over automatically. With relative pressure measuring cells a manual offset can also be carried out.



If the actual measured value should be taken over as correction value during automatic position correction, this value must not be influenced by product coverage or static pressure.

With the manual position correction, the offset value can be determined by the user. Select for this purpose the function "*Edit*" and enter the requested value.

Save your settings with ***[OK]*** and move with ***[ESC]*** and ***[->]*** to the next menu item.

After the position correction is carried out, the actual measured value is corrected to 0. The corrective value appears with an inverse sign as offset value in the display.

The position correction can be repeated as often as necessary. However, if the sum of the corrective values exceeds 20 % of the nominal measuring range, then no position correction is possible.

**Setup - Adjustment**

CPT-2x always measures pressure independently of the process variable selected in the menu item "*Application*". To output the selected process variable correctly, an allocation of the output signal to 0 % and 100 % must be carried out (adjustment).

With the application "*Level*", the hydrostatic pressure, e.g. with full and empty vessel, is entered for adjustment. See following example:

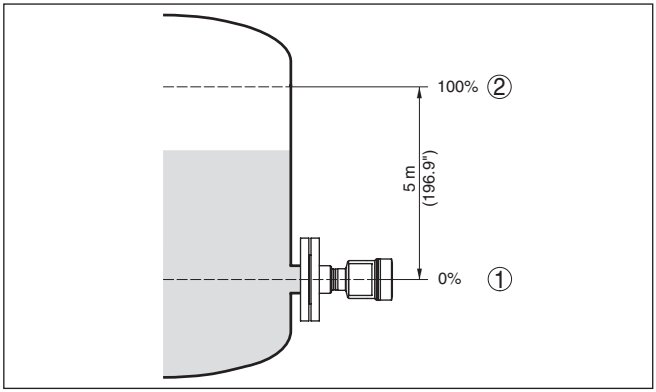



*Fig. 32: Parameter adjustment example "Min./max. adjustment, level measurement"*

*1 Min. level = 0 % corresponds to 0.0 mbar*
*2 Max. level = 100 % corresponds to 490.5 mbar*

If these values are not known, an adjustment with filling levels of e.g. 10 % and 90 % is also possible. By means of these settings, the real filling height is then calculated.

The actual product level during this adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.

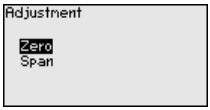
**Note:**
If the adjustment ranges are exceeded, the entered value will not be accepted. Editing can be interrupted with ***[ESC]*** or corrected to a value within the adjustment ranges.

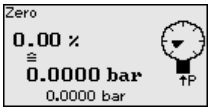
For the other process variables such as e.g. process pressure, differential pressure or flow, the adjustment is performed in like manner.

**Setup - Zero adjustment**

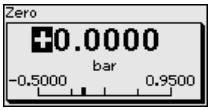
Proceed as follows:

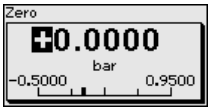
1. Select the menu item "*Setup*" with ***[->]*** and confirm with ***[OK]***. Now select with ***[->]*** the menu item "*Zero adjustment*" and confirm with ***[OK]***.




2. Edit the mbar value with ***[OK]*** and set the cursor to the requested position with ***[->]***.




3. Set the requested mbar value with ***[+]*** and store with ***[OK]***.
4. Go with ***[ESC]*** and ***[->]*** to the span adjustment

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.

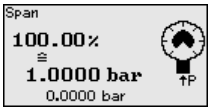
For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

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]***.

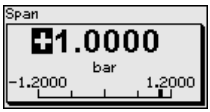
**Setup - Span adjustment**

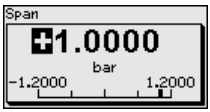
Proceed as follows:

1. Select with ***[->]*** the menu item Span adjustment and confirm with ***[OK]***.


2. Edit the mbar value with ***[OK]*** and set the cursor to the requested position with ***[->]***.



3. Set the requested mbar value with ***[+]*** and store with ***[OK]***.

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

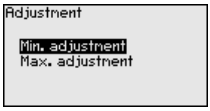
If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

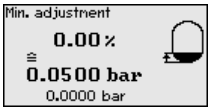
The span adjustment is finished.

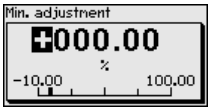
**Setup - Min. adjustment Level**

Proceed as follows:

1. Select the menu item "*Setup*" with ***[->]*** and confirm with ***[OK]***. Now select with ***[->]*** the menu item "*Adjustment*", then "*Min. adjustment*" and confirm with ***[OK]***.








2. Edit the percentage value with ***[OK]*** and set the cursor to the requested position with ***[->]***.
3. Set the requested percentage value (e.g. 10 %) with ***[+]*** and save with ***[OK]***. The cursor jumps now to the pressure value.
4. Enter the pressure value corresponding to the min. level (e.g. 0 mbar).
5. Save settings with ***[OK]*** and move with ***[ESC]*** and ***[->]*** to the max. adjustment.

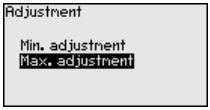
The min. adjustment is finished.

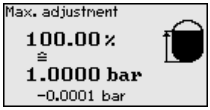
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

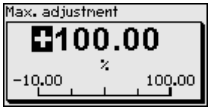
**Setup - Max. adjustment Level**

Proceed as follows:

1. Select with ***[->]*** the menu item Max. adjustment and confirm with ***[OK]***.







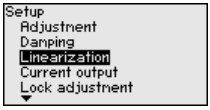

2. Edit the percentage value with ***[OK]*** and set the cursor to the requested position with ***[->]***.
3. Set the requested percentage value (e.g. 90 %) with ***[+]*** and save with ***[OK]***. The cursor jumps now to the pressure value.
4. Enter the pressure value for the full vessel (e.g. 900 mbar) corresponding to the percentage value.
5. Save settings with ***[OK]***

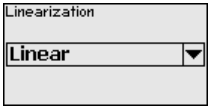
The max. adjustment is finished.

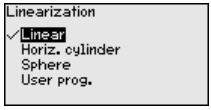
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

**Setup - Linearisation**

A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. The linearization applies to the measured value indication and the current output.

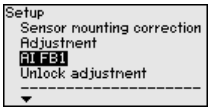


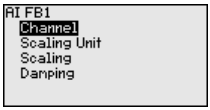




**Setup - AI FB1**

Since the parameter adjustment of the Function Block 1 (FB1) is very comprehensive, it was divided into various submenu items.

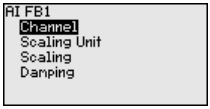


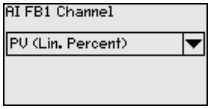



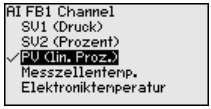

**Setup - AI FB1 - Channel**

In menu item "*Channel*" you determine the input signal for further processing in AI FB 1.

As input signals, the output values of Transducer Block (TB) can be selected.

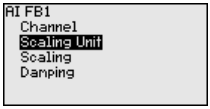


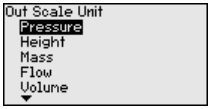



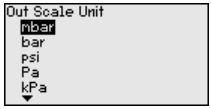




**Setup - AI FB1 - Scaling unit**

In the menu item "*Scaling unit*" you define the scaling variable and scaling unit of the output value of FB 1.

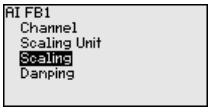


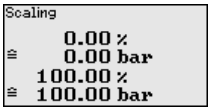



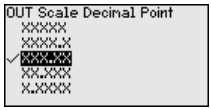




**Setup - AI FB1 - Scaling**

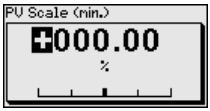
In the menu item "*Scaling*", you assign the min. and max. values of the input signal (Channel) to the respective values of the output (Out Scale). The units correspond to the previous selection.

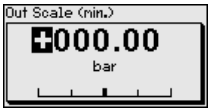


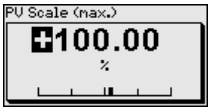




Min. values for PV lin Proc. and Out Scale process pressure in bar:



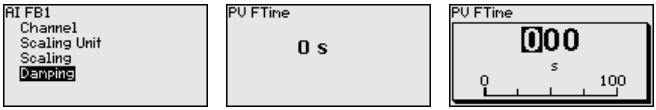

Max. values for PV lin Proc. and Out Scale process pressure in bar:




**Setup - AI FB1 - Damping**

To damp process-dependent measured value fluctuations, you can set a time of 0 … 999 s in this menu item.

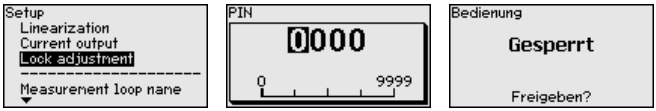
The damping applies to the level and interface measurement.




The default setting is a damping of 0 s.

**Lock/unlock setup - Adjustment**

In the menu item "*Lock/unlock adjustment*" you safeguard the sensor parameters against unauthorized or unintentional modifications.




With active PIN, only the following adjustment functions are possible without entering a PIN:

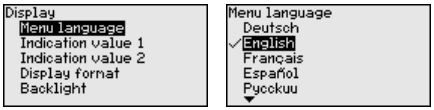
- Select menu items and show data
- Read data from the sensor into the display and adjustment module

Releasing the sensor adjustment is also possible in any menu item by entering the PIN.

**Caution:**
With active PIN, adjustment via PACTware/DTM and other systems is also blocked.

**Display - Language**

This menu item enables the setting of the requested national language.




The following languages are available:

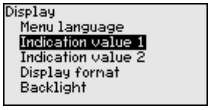
- German
- English
- French
- Spanish
- Russian
- Italian
- Dutch
- Portuguese
- Japanese
- Chinese
- Polish

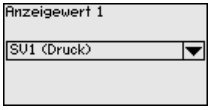
- Czech
- Turkish

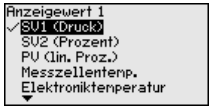
In delivery status, the CPT-2x is set to English.

**Display - Displayed value 1 and 2**

In this menu item, you define which measured value is displayed.



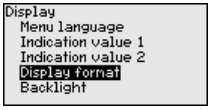



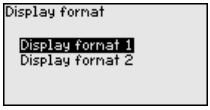



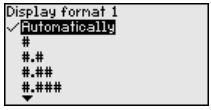

The default setting for the display value is "*Lin. percent*".

**Display - Display format 1 and 2**

In this menu item you define the number of decimal positions with which the measured value is displayed.



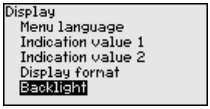




The default setting for the display format is "*Automatic*".

**Display - Backlight**

The display and adjustment module has a backlight for the display. In this menu item you can switch on the lighting. You can find the required operating voltage in chapter "*Technical data*".

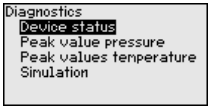


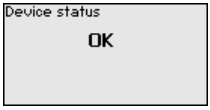


In delivery status, the lighting is switched on.

**Diagnostics - Device status**

In this menu item, the device status is displayed.



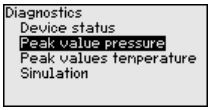



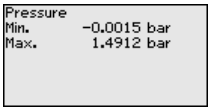

In case of error, e.g. the error code F017, e.g. the error description "*Adjustment span too small*" and a four digit figure are displayed for service purposes. You can find the error codes with description, reason as well as rectification in chapter "*Asset Management*".

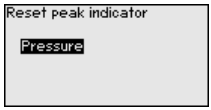
**Diagnostics - Peak values, pressure**

The respective min. and max. measured values are saved in the sensor. The two values are displayed in menu item "*Peak values, pressure*".

In another window you can carry out a reset of the peak values separately.



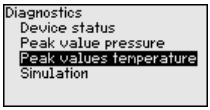



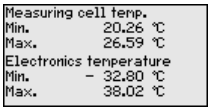



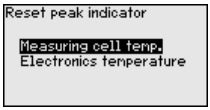
**Diagnostics - Peak values, temperature**

The respective min. and max. measured values of the measuring cell and the electronics temperature are stored in the sensor. In menu item "*Peak value, temperature*", both values are displayed.

In another window you can carry out a reset of the two peak values separately.

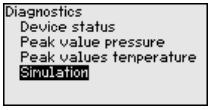


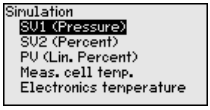



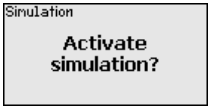



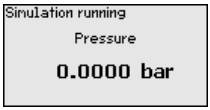

**Diagnosis - Simulation**

In this menu item you simulate measured values. Hence, the signal path can be tested via the bus system to the input card of the control system.

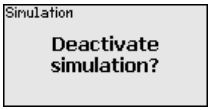







Select the requested simulation variable and set the requested value.

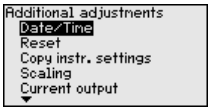
To deactivate the simulation, you have to push the ***[ESC]*** key and confirm the message "*Deactivate simulation*" with the ***[OK]*** key.

**Caution:**
During simulation, the simulated value is output as digital signal. The status message along with the Asset Management function is "*Maintenance*".

**Information:**
The sensor terminates the simulation automatically after 60 minutes.

**Additional settings - Date/ Time**

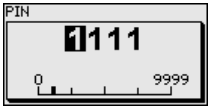
In this menu item, you adjust the internal clock of the sensor. There is no adjustment for summer/winter (daylight saving) time.

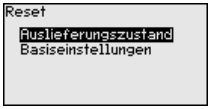




**Additional settings - Reset**

After a reset, certain parameter adjustments made by the user are reset.




The following reset functions are available:

**Delivery status:** Restores the parameter settings at the time of shipment from the factory, incl. the order-specific settings. Any user-

defined linearisation curve as well as the measured value memory are deleted.

**Basic settings:** Resets the parameter settings, incl. special parameters, to the default values of the respective instrument. Any programmed linearisation curve as well as the measured value memory are deleted.

The following table shows the default values of the instrument. Depending on the instrument version or application, all menu items may not be available or some may be differently assigned:

### Reset - Setup

| Menu item | Parameter | Default value |
|---|---|---|
| **Sensor address** | | 126 |
| **Measurement loop name** | | Sensor |
| **Application** | Application | Level |
| | Slave for electronic differential pressure | Deactivated |
| **Units** | Unit of measurement | mbar (with nominal measuring range ≤ 400 mbar)<br>bar (with nominal measuring ranges ≥ 1 bar) |
| | Temperature unit | °C |
| **Position correction** | | 0.00 bar |
| **Adjustment** | Zero/Min. adjustment | 0.00 bar<br>0.00 % |
| | Span/Max. adjustment | Nominal measuring range in bar<br>100.00 % |
| **Linearization** | | Linear |
| **AI FB 1** | Channel | Primary Value |
| | Scaling format | Pressure |
| | Scaling | 0 % corresponds to 0 bar<br>100 % corresponds to measuring range final value |
| | Damping | PV FTime 1 s |
| **Lock adjustment** | | Released |

### Reset - Display

| Menu item | Default value |
|---|---|
| **Menu language** | Selected language |
| **Displayed value 1** | Signal output in % |
| **Displayed value 2** | Ceramic measuring cell: Measuring cell temperature in °C<br>Metallic measuring cell: Electronics temperature in °C |
| **Display format 1 and 2** | Number of positions after the decimal point, automatically |
| **Backlight** | Switched on |

### Reset - Diagnosis

| Menu item | Parameter | Default value |
|---|---|---|
| **Sensor status** | | - |
| **Peak value** | Pressure | Actual measured value |
| | Temperature | Actual temperature values from measuring cell, electronics |
| **Simulation** | | Process pressure |

### Reset - Additional settings

| Menu item | Parameter | Default value |
|---|---|---|
| **PIN** | | 0000 |
| **Date/Time** | | Actual date/Actual time |
| **Copy instrument settings** | | |
| **Special parameters** | | No reset |
| **Scaling** | Scaling size | Volume in l |
| | Scaling format | 0 % corresponds to 0 l<br>100 % corresponds to 0 l |

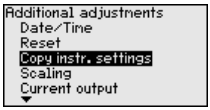
**Additional settings - Copy instrument settings**

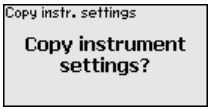
The instrument settings are copied with this function. The following functions are available:

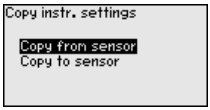
- **Read from sensor:** Read data from sensor and store into the display and adjustment module
- **Write into sensor:** Store data from the display and adjustment module back into the sensor

The following data or settings for adjustment of the display and adjustment module are saved:

- All data of the menu "*Setup*" and "*Display*"
- In the menu "*Additional adjustments*" the items "*Reset, Date/Time*"
- The user-programmable linearization curve




The copied data are permanently saved in an EEPROM memory in the display and adjustment module and remain there even in case of power failure. From there, they can be written into one or more sensors or kept as backup for a possible electronics exchange.

**Note:**
Before the data are saved in the sensor, a safety check is carried out to determine if the data match the sensor. In the process the sensor type of the source data as well as the target sensor are displayed. If the data do not match, a fault message is outputted or the function is blocked. The data are saved only after release.

**Additional settings - Special parameters**

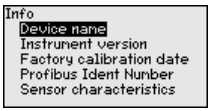
In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

Change the settings of the special parameters only after having contacted our service staff.



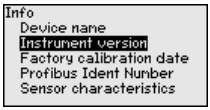
**Info - Instrument name**

In this menu item, you can read out the instrument name and the instrument serial number:



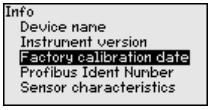

**Info - Instrument version**

In this menu item, the hardware and software version of the sensor is displayed.



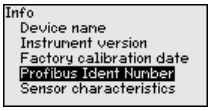

**Info - Factory calibration date**

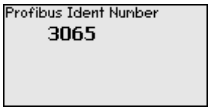
In this menu item, the date of factory calibration of the sensor as well as the date of the last change of sensor parameters are displayed via the display and adjustment module or via the PC.




**Info - Profibus ident number**

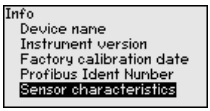
In this menu item, the Profibus ident number of the sensor is displayed.




**Info - Sensor characteristics**

In this menu item, the features of the sensor such as approval, process fitting, seal, measuring range, electronics, housing and others are displayed.




## 6.6 Saving the parameterisation data

**On paper**

We recommended writing down the adjustment data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

**In the display and adjustment module**

If the instrument is equipped with a display and adjustment module, the parameter adjustment data can be saved therein. The procedure is described in menu item "*Copy device settings*".

# 7 Setup with PACTware

## 7.1 Parameter adjustment

The further setup steps with detailed descriptions can be found in the online help of PACTware and the DTMs.

**Note:**
Keep in mind that for the setup of model CPT-2x, the current version of the DTM-Collection must be used.

The latest DTM Collection and PACTware version can be downloaded free of charge via the Internet.

## 7.2 Saving the parameterisation data

We recommend documenting or saving the parameterisation data via PACTware. That way the data are available for multiple use or service purposes.

# 8 Diagnosis, asset management and service

## 8.1 Maintenance

**Maintenance**

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

**Precaution measures against buildup**

In some applications, product buildup on the 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**

The cleaning helps that the type label and markings on the instrument are visible.

Take note of the following:

- Use only cleaning agents which do not corrode the housings, type label and seals
- Use only cleaning methods corresponding to the housing protection rating

## 8.2 Cleaning - hygienic connection with compression nut

**Overview**

The hygienic connection with compression nut can be disassembled and the diaphragm cleaned.

The following graphic shows the structure:

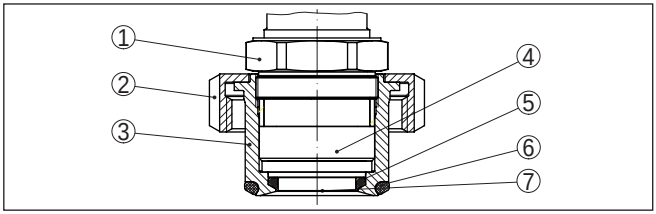



*Fig. 33: CPT-2x, structure of the hygienic connection with compression nut*

*1 Hexagon*
*2 Compression nut*
*3 Process fitting*
*4 Process module*
*5 Form seal for the measuring cell*
*6 O-ring seal for the process fitting*
*7 Diaphragm*

**Procedure**

To do so, proceed as follows:

1. Loosen compression nut and remove the pressure transmitter from the welded socket
2. Remove the O-ring seal for the process fitting
3. Clean the diaphragm with brass brush and cleaning detergent
4. Loosen the hexagon and remove the process component from the process fitting

5. Remove the form seal for the measuring cell and remove it by a new one
6. Screw the process component into the process fitting, tighten the hexagon (wrench size see chapter "*Dimensions*", max. torque see chapter "*Technical data*")
7. Insert new O-ring seal for the process fitting
8. Install the process pressure transmitter in the welded socket, tighten compression nut

The cleaning is finished.

The pressure transmitter is directly ready for operation, a fresh adjustment is not required.

## 8.3 Diagnosis memory

The instrument has several memories available for diagnostic purposes. The data remain there even in case of voltage interruption.

**Measured value memory**

Up to 100,000 measured values can be stored in the sensor in a ring memory. Each entry contains date/time as well as the respective measured value.

Depending on the instrument version, values that can be stored are for example:

- Level
- Process pressure
- Differential pressure
- Static pressure
- Percentage value
- Scaled values
- Current output
- Lin. percent
- Measuring cell temperature
- Electronics temperature

When the instrument is shipped, the measured value memory is active and stores pressure value and measuring cell temperature every 10 s, with electronic differential pressure also the static pressure.

The requested values and recording conditions are set via a PC with PACTware/DTM or the control system with EDD. Data are thus read out and also reset.

**Event memory**

Up to 500 events are automatically stored with a time stamp in the sensor (non-deletable). Each entry contains date/time, event type, event description and value. Event types are for example:

- Modification of a parameter
- Switch-on and switch-off times
- Status messages (according to NE 107)
- Error messages (according to NE 107)

The data are read out via a PC with PACTware/DTM or the control system with EDD.

## 8.4 Asset Management function

**Monitoring and output**

The device is equipped with self-monitoring and diagnostics in accordance with NE 107 and VDI/VDE 2650. The operating status is output via status messages. Depending on instrument type and version, this is done via display and adjustment unit, VEGA Tools app, PACTware/DTM or EDD or LED illuminated ring.

**Status messages**

The status messages are divided into the following categories:

- Failure
- Function check
- Out of specification
- Maintenance requirement

and explained by pictographs:

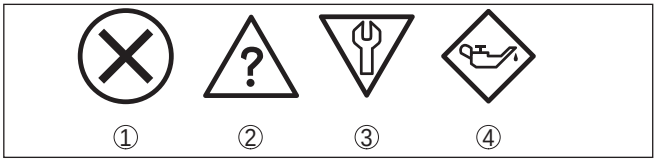



*Fig. 34: Pictographs of the status messages*

*1 Failure - red*
*2 Out of specification - yellow*
*3 Function check - orange*
*4 Maintenance - blue*

**Failure:** Due to a malfunction in the instrument, a fault message is output.

This status message is always active. It cannot be deactivated by the user.

**Function check:** The instrument is being worked on, the measured value is temporarily invalid (for example during simulation).

This status message is inactive by default. It can be activated by the user via PACTware/DTM or EDD.

**Out of specification:** The measured value is unreliable because an instrument specification was exceeded (e.g. electronics temperature).

This status message is inactive by default. It can be activated by the user via PACTware/DTM or EDD.

**Maintenance:** Due to external influences, the instrument function is limited. The measurement is affected, but the measured value is still valid. Plan in maintenance for the instrument because a failure is expected in the near future (e.g. due to buildup).

This status message is inactive by default. It can be activated by the user via PACTware/DTM or EDD.

## Failure

| Code<br>Text message | Cause | Rectification | DevSpec<br>Diagnosis Bits |
|---|---|---|---|
| F013<br>No valid measured value available | ● Gauge pressure or low pressure<br>● Measuring cell defective | ● Exchange measuring cell<br>● Send instrument for repair | Bit 0 |
| F017<br>Adjustment span too small | ● Adjustment not within specification | ● Change the adjustment according to the limit values | Bit 1 |
| F025<br>Error in the linearization table | ● Index markers are not continuously rising, for example illogical value pairs | ● Check linearisation table<br>● Delete table/Create new | Bit 2 |
| F036<br>no operable sensor software | ● Failed or interrupted software update | ● Repeat software update<br>● Check electronics version<br>● Exchanging the electronics<br>● Send instrument for repair | Bit 3 |
| F040<br>Error in the electronics | ● Hardware defect | ● Exchanging the electronics<br>● Send instrument for repair | Bit 4 |
| F041<br>Communication error | ● No connection to the sensor electronics | ● Check connection between sensor and main electronics (with separate version) | Bit 13 |
| F042<br>Communication error Slave | ● No connection to the Slave | ● Check connection between Master and Slave | Bit 28 of Byte 0 … 5 |
| F080<br>General software error | ● General software error | ● Disconnect operating voltage briefly | Bit 5 |
| F105<br>Measured value is determined | ● The instrument is still in the start phase, the measured value could not yet be determined | ● Wait for the end of the switch-on phase | Bit 6 |
| F113<br>Communication error | ● Error in the internal instrument communication | ● Disconnect operating voltage briefly<br>● Send instrument for repair | Bit 12 |
| F260<br>Error in the calibration | ● Error in the calibration carried out in the factory<br>● Error in the EEPROM | ● Exchanging the electronics<br>● Send instrument for repair | Bit 8 |
| F261<br>Error in the instrument settings | ● Error during setup<br>● Error when carrying out a reset | ● Repeat setup<br>● Repeat reset | Bit 9 |

| Code<br>Text message | Cause | Rectification | DevSpec<br>Diagnosis Bits |
|---|---|---|---|
| F264<br>Installation/Setup error | ● Inconsistent settings (e.g.: distance, adjustment units with application process pressure) for selected application<br>● Invalid sensor configuration (e.g.: application electronic differential pressure with connected differential pressure measuring cell) | ● Modify settings<br>● Modify connected sensor configuration or application | Bit 10 |
| F265<br>Measurement function disturbed | ● Sensor no longer carries out a measurement | ● Carry out a reset<br>● Disconnect operating voltage briefly | Bit 11 |

*Tab. 5: Error codes and text messages, information on causes as well as corrective measures*

### Function check

| Code<br>Text message | Cause | Rectification | DevSpec<br>Diagnosis Bits |
|---|---|---|---|
| C700<br>Simulation active | ● A simulation is active | ● Finish simulation<br>● Wait for the automatic end after 60 mins. | Bit 27 |

*Tab. 6: Error codes and text messages, information on causes as well as corrective measures*

### Out of specification

| Code<br>Text message | Cause | Rectification | DevSpec<br>Diagnosis Bits |
|---|---|---|---|
| S600<br>Impermissible electronics temperature | ● Temperature of the electronics in the non-specified range | ● Check ambient temperature<br>● Insulate electronics<br>● Use instrument with higher temperature range | Bit 23 |
| S603<br>Impermissible operating voltage | ● Operating voltage below specified range | ● Check electrical connection<br>● If necessary, increase operating voltage | Bit 26 |
| S605<br>Impermissible pressure value | ● Measured process pressure below or above the adjustment range | ● Check nominal measuring range of the instrument<br>● If necessary, use an instrument with a higher measuring range | Bit 29 |

*Tab. 7: Error codes and text messages, information on causes as well as corrective measures*

### Maintenance

| Code<br>Text message | Cause | Rectification | DevSpec<br>Diagnosis Bits |
|---|---|---|---|
| M500<br>Error in the delivery status | ● The data could not be restored during the reset to delivery status | ● Repeat reset<br>● Load XML file with sensor data into the sensor | Bit 15 |

| Code<br>Text message | Cause | Rectification | DevSpec<br>Diagnosis Bits |
|---|---|---|---|
| M501<br>Error in the non-active linearisation table | ● Index markers are not continuously rising, for example illogical value pairs | ● Check linearisation table<br>● Delete table/Create new | Bit 16 |
| M502<br>Error in the event memory | ● Hardware error EEPROM | ● Exchanging the electronics<br>● Send instrument for repair | Bit 17 |
| M504<br>Error at a device interface | ● Hardware defect | ● Exchanging the electronics<br>● Send instrument for repair | Bit 19 |
| M507<br>Error in the instrument settings | ● Error during setup<br>● Error when carrying out a reset | ● Carry out reset and repeat setup | Bit 22 |

*Tab. 8: Error codes and text messages, information on causes as well as corrective measures*

## 8.5 Rectify faults

**Reaction when malfunction occurs**

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

**Fault rectification**

The first measures are:

- Evaluation of fault messages
- Checking the output signal
- Treatment of measurement errors

A smartphone/tablet with the VEGA Tools app or a PC/notebook with the software PACTware and the suitable DTM offer you further comprehensive diagnostic possibilities. In many cases, the causes can be determined in this way and the faults eliminated.

**Reaction after fault rectification**

Depending on the reason for the fault and the measures taken, the steps described in chapter "*Setup*" must be carried out again or must be checked for plausibility and completeness.

## 8.6 Exchange process module on version IP 68 (25 bar)

On version IP 68 (25 bar), the user can exchange the process module on site. Connection cable and external housing can be kept.

Required tools:

- Hexagon key wrench, size 2

**Caution:**
The exchange may only be carried out in the complete absence of line voltage.

In Ex applications, only a replacement part with appropriate Ex approval may be used.

**Caution:**
During exchange, protect the inner side of the parts against contamination and moisture.

Proceed as follows when carrying out the exchange:

1. Losen the fixing screw with the hexagon key wrench
2. Carefully detach the cable assembly from the process module

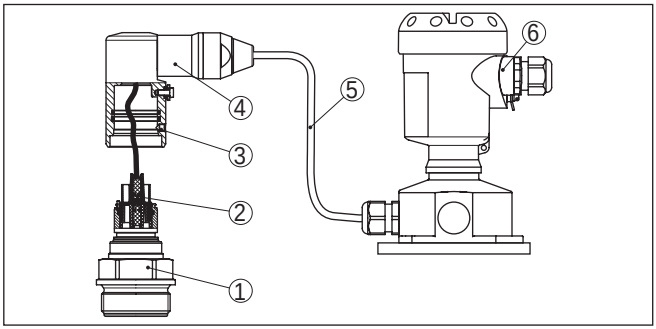



*Fig. 35: CPT-2x in IP 68 version, 25 bar and lateral cable outlet, external housing*

*1 Process module*
*2 Plug connector*
*3 Fixing screw*
*4 Cable assembly*
*5 Connection cable*
*6 External housing*

3. Loosen the plug connector
4. Mount the new process module on the measuring point
5. Plug the connector back in
6. Mount the cable assembly on the process module and turn it to the desired position
7. Tighten the fixing screw with the hexagon key wrench

The exchange is finished.

## 8.7 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

# 9 Dismount

## 9.1 Dismounting steps

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

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

## 9.2 Disposal

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

**WEEE directive**
The instrument does not fall in the scope of the EU WEEE directive. Article 2 of this Directive exempts electrical and electronic equipment from this requirement if it is part of another instrument that does not fall in the scope of the Directive. These include stationary industrial plants.

Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points.

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

# 10 Supplement

## 10.1 Technical data

**Note for approved instruments**

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

| **Materials and weights** | |
|---|---|
| **Materials, wetted parts** | |
| Process fitting | 316L, PVDF, Alloy C22 (2.4602), Alloy C276 (2.4819), Duplex steel (1.4462), Titanium Grade 2 |
| Diaphragm | Sapphire-ceramic® (> 99.9 % $Al_2O_3$ ceramic) |
| Joining material measuring cell | Glass (with double and form seal, non-wetted parts) |
| Measuring cell seal | |
| – Standard (O-ring seal) | FKM (VP2/A, A+P 70.16), EPDM (A+P 70.10-02), FFKM (Kalrez 6375, Perlast G75S, Perlast G75B) |
| – Hygienic fitting with compression nut (form seal) | FKM (ET 6067), EPDM (EPDM 7076), FFKM (Chemraz 535), FEPM (Fluoraz SD890) |
| Seal for process fitting (in the scope of delivery) | |
| – Thread G½ (EN 837), G1½ (DIN 3852-A) | Klingersil C-4400 |
| – Thread M44 x 1.25 (DIN 13), M30 x 1.5 | FKM, FFKM, EPDM |
| – Hygienic connection with compression nut | FKM, EPDM, FFKM, FEPM |
| Surface quality, hygienic fittings, typ. | |
| – Process fitting | $R_a$ < 0.8 µm |
| – Diaphragm | $R_a$ < 0.5 µm |
| **Materials, non-wetted parts** | |
| Sensor housing | |
| – Housing | Plastic PBT (Polyester), Aluminium AlSi10Mg (powder-coated, basis: Polyester), 316L |
| – Cable gland | PA, stainless steel, brass |
| – Cable gland: Seal, closure | NBR, PA |
| – Seal, housing lid | Silicone SI 850 R, NBR silicone-free |
| – Inspection window housing cover | Polycarbonate (UL-746-C listed), glass[1)] |
| – Ground terminal | 316L |
| External housing - deviating materials | |
| – Housing and socket | Plastic PBT (Polyester), 316L |
| – Socket seal | EPDM |

[1)] Glass with Aluminium and stainless steel precision casting housing

| | |
|---|---|
| – Seal below wall mounting plate[2)] | EPDM |
| – Inspection window housing cover | Polycarbonate (UL-746-C listed) |
| Ground terminal | 316Ti/316L |
| Connection cable with IP 68 (25 bar)[3)] | |
| – Cable cover | PE, PUR |
| – Type label support on cable | PE hard |
| Connection cable with IP 68 (1 bar)[4)] | PE, PUR |
| **Weights** | |
| Total weight CPT-2x | approx. 0.8 … 8 kg (1.764 … 17.64 lbs), depending on process fitting and housing |

## Torques

| | |
|---|---|
| Max. torque for process fitting | |
| – G½, G¾ | 30 Nm (22.13 lbf ft) |
| – Fittings according to 3A with exchangeable sealing | 20 Nm (14.75 lbf ft) |
| – Hygienic fitting with compression nut (hexagon) | 40 Nm (29.50 lbf ft) |
| – G1, M30 x 1.5 | 50 Nm (36.88 lbf ft) |
| – G1 for PASVE | 100 Nm (73.76 lbf ft) |
| – G1½ | 200 Nm (147.5 lbf ft) |
| Max. torque for screws | |
| – PMC 1", PMC 1¼" | 2 Nm (1.475 lbf ft) |
| – PMC 1½" | 5 Nm (3.688 lbf ft) |
| Max. torque for NPT cable glands and Conduit tubes | |
| – Plastic housing | 10 Nm (7.376 lbf ft) |
| – Aluminium/Stainless steel housing | 50 Nm (36.88 lbf ft) |

## Input variable

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

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

| Nominal range | Overload capability | |
|---|---|---|
| | Maximum pressure | Minimum pressure |
| Gauge pressure | | |
| 0 … +0.025 bar/0 … +2.5 kPa<br>(only for measuring cell ø 28 mm) | +5 bar/+500 kPa | -0.05 bar/-5 kPa |

[2)] Only for 316L with 3A approval
[3)] Between transmitter and external electronics housing.
[4)] Fix connected to the sensor.

| Nominal range | Overload capability | |
|---|---|---|
| | Maximum pressure | Minimum pressure |
| 0 … +0.1 bar/0 … +10 kPa | +15 bar/+1500 kPa | -0.2 bar/-20 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 | +125 bar/+12500 kPa | -1 bar/-100 kPa |
| 0 … +60 bar/0 … +6000 kPa | +200 bar/+20000 kPa | -1 bar/-100 kPa |
| 0 … +100 bar/0 … +10000 kPa<br>(only for measuring cell ø 28 mm) | +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 | +40 bar/+4000 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 | +125 bar/+12500 kPa | -1 bar/-100 kPa |
| -1 … +60 bar/-100 … +6000 kPa | +200 bar/+20000 kPa | -1 bar/-100 kPa |
| -1 … +100 bar/-100 … +10000 kPa<br>(only for measuring cell ø 28 mm) | +200 bar/+20000 kPa | -1 bar/-100 kPa |
| -0.025 … +0.025 bar/-2.5 … +2.5 kPa | +5 bar/+500 kPa | -0.05 bar/-5 kPa |
| -0.05 … +0.05 bar/-5 … +5 kPa | +15 bar/+1500 kPa | -0.2 bar/-20 kPa |
| -0.2 … +0.2 bar/-20 … +20 kPa | +20 bar/+2000 kPa | -0.4 bar/-40 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 | 125 bar/12500 kPa | 0 bar abs. |
| 0 … 60 bar/0 … 6000 kPa | 200 bar/20000 kPa | 0 bar abs. |
| 0 … 100 bar/0 … +10000 kPa<br>(only for measuring cell ø 28 mm) | 200 bar/20000 kPa | 0 bar abs. |

### Nominal measuring ranges and overload capacity in psi

| Nominal range | Overload capability | |
|---|---|---|
| | Maximum pressure | Minimum pressure |
| Gauge pressure | | |

| Nominal range | Overload capability | |
|---|---|---|
| | Maximum pressure | Minimum pressure |
| 0 … +0.4 psig (only for measuring cell ø 28 mm) | +75 psig | -0.7 psig |
| 0 … +1.5 psig | +225 psig | -3 psig |
| 0 … +5 psig | +375 psig | -11.50 psig |
| 0 … +15 psig | +525 psig | -14.51 psig |
| 0 … +30 psig | +725 psig | -14.51 psig |
| 0 … +75 psig | +975 psig | -14.51 psig |
| 0 … +150 psig | +1350 psig | -14.51 psig |
| 0 … +300 psig | +1900 psig | -14.51 psig |
| 0 … +900 psig | +2900 psig | -14.51 psig |
| 0 … +1450 psig (only for measuring cell ø 28 mm) | +2900 psig | -14.51 psig |
| -14.5 … 0 psig | +525 psig | -14.51 psig |
| -14.5 … +20 psig | +600 psig | -14.51 psig |
| -14.5 … +75 psig | +975 psig | -14.51 psig |
| -14.5 … +150 psig | +1350 psig | -14.51 psig |
| -14.5 … +300 psig | +1900 psig | -14.51 psig |
| -14.5 … +900 psig | +2900 psig | -14.51 psig |
| -14.5 … +1500 psig (only for measuring cell ø 28 mm) | +2900 psig | -14.51 psig |
| -0.7 … +0.7 psig | +75 psig | -2.901 psig |
| -3 … +3 psig | +225 psi | -5.800 psig |
| -7 … +7 psig | +525 psig | -14.51 psig |
| Absolute pressure | | |
| 0 … 1.5 psi | 225 psig | 0 psi |
| 0 … 15 psi | 525 psi | 0 psi |
| 0 … 30 psi | 725 psi | 0 psi |
| 0 … 75 psi | 975 psi | 0 psi |
| 0 … 150 psi | 1350 psi | 0 psi |
| 0 … 300 psi | 1900 psi | 0 psi |
| 0 … 900 psi | 2900 psi | 0 psi |
| 0 … 1450 psi (only for measuring cell ø 28 mm) | 2900 psi | 0 psi |

## Adjustment ranges

Specifications refer to the nominal measuring range, pressure values lower than -1 bar cannot be set

Min./Max. adjustment:

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

| | |
|---|---|
| Zero/Span adjustment: | |
| – Zero | -20 … +95 % |
| – Span | -120 … +120 % |
| – Difference between zero and span | max. 120 % of the nominal range |
| Max. permissible Turn Down | Unlimited (recommended 20 : 1) |

**Switch-on phase**

| | |
|---|---|
| Run-up time with operating voltage $U_B$ | |
| – ≥ 12 V DC | ≤ 9 s |
| – < 12 V DC | ≤ 22 s |

**Output variable**

| | |
|---|---|
| Output signal | digital output signal, Profibus protocol |
| Transmission rate | 31.25 Kbit/s |
| Instrument address | 126 (default setting) |
| Damping (63 % of the input variable) | 0 … 999 s, adjustable |
| Profibus PA profile | 3.02 |
| Number of FBs with AI (function blocks with analogue input) | 3 |
| Default values | |
| – 1. FB | Primary Value (pressure linearized in %) |
| – 2. FB | Secondary Value 1 (pressure) |
| – 3. FB | Secondary Value 2 (pressure in %) |
| Current value | |
| – Non-Ex, Ex-ia and Ex-d instruments | 12 mA, ±0.5 mA |

**Dynamic behaviour output**

Dynamic characteristics depending on medium and temperature

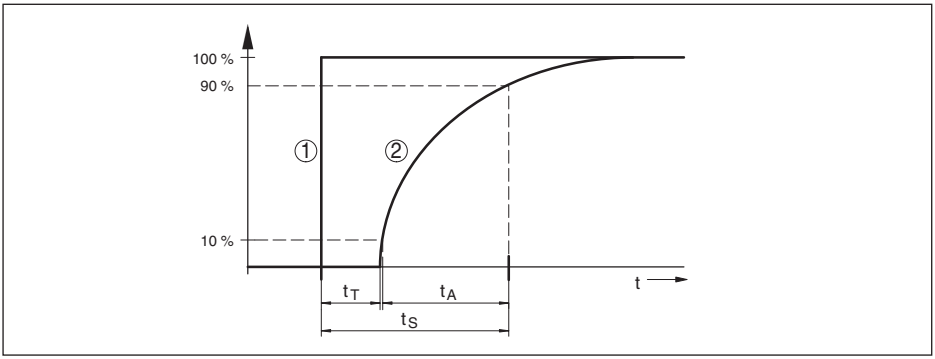



*Fig. 36: Behaviour in case of sudden change of the process variable. $t_T$: dead time; $t_A$: rise time; $t_S$: jump response time*

*1 Process variable*
*2 Output signal*

| | CPT-2x | CPT-2x - IP 68 (25 bar) |
|---|---|---|
| Dead time | ≤ 25 ms | ≤ 50 ms |
| Rise time (10 … 90 %) | ≤ 55 ms | ≤ 150 ms |
| Step response time (ti: 0 s, 10 … 90 %) | ≤ 80 ms | ≤ 200 ms |

Damping (63 % of the input variable) 0 … 999 s, adjustable via menu item "*Damping*"

**Additional output parameter - Measuring cell temperature**

Range -60 … +150 °C (-76 … +302 °F)

Resolution < 0.2 K

Deviation

- Range of 0 … +100 °C (+32 … +212 °F) ±2 K
- Range of -60 … 0 °C (-76 … +32 °F) and +100 … +150 °C (+212 … +302 °F) typ. ±4 K

Output of the temperature values

- Indication: Via the display and adjustment module
- Analogue: Via the current output, the additional current output
- Digital: Via the digital output signal (depending on the electronics version)

**Reference conditions and influencing 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 (according to IEC 60770-1)**

Specifications refer to the set span. Turn down (TD) is the ratio: nominal measuring range/set span.

| Accuracy class | Non-linearity, hysteresis and repeatability with TD 1 : 1 up to 5 : 1 | Non-linearity, hysteresis and repeatability with 5 : 1 |
|---|---|---|
| 0.05 % | < 0.05 % | < 0.01 % x TD |
| 0.1 % | < 0.1 % | < 0.02 % x TD |
| 0.2 % | < 0.2 % | < 0.04 % x TD |

**Influence of the product temperature**

**Thermal change zero signal and output span through product temperature**

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

The thermal change of the zero signal and output span corresponds to the temperature error $F_T$ in chapter "*Calculation of the total deviation (according to DIN 16086)*".

**Basic temperature error $F_T$**

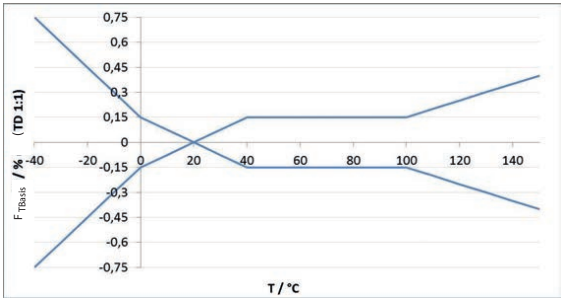



*Fig. 37: Basic temperature error $F_{TBasis}$ at TD 1 : 1*

The basic temperature error in % from the above graphic can increase due to the additional factors, depending on the measuring cell version (factor FMZ) and the Turn Down (factor FTD). The additional factors are listed in the following tables.

**Additional factor through measuring cell version**

| **Measuring cell version** | **Measuring cell standard, depending on the accuracy class** | | |
|---|---|---|---|
| | **0.05 %, 0.1 %** | **0.2 % (with measuring range 0.1 $bar_{abs}$)** | **0.2 %**<br>**0.05 %, 0.1 % with measuring range 25 mbar** |
| Factor FMZ | 1 | 2 | 3 |

**Additional factor through Turn Down**

The additional factor FTD through Turn down is calculated according to the following formula:

$F_{TD} = 0.5 \times TD + 0.5$

In the table, example values for typical Turn downs are listed.

| **Turn Down** | **TD 1 : 1** | **TD 2.5 : 1** | **TD 5 : 1** | **TD 10 : 1** | **TD 20 : 1** |
|---|---|---|---|---|---|
| Factor FTD | 1 | 1.75 | 3 | 5.5 | 10.5 |

## Long-term stability (according to DIN 16086)

Applies to the respective **digital** signal output (e.g. HART, Profibus PA) as well as to **analogue** current output 4 … 20 mA under reference conditions. Specifications refer to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

| Time period | Measuring cell ø 28 mm | | Measuring cell ø 17.5 mm | |
|---|---|---|---|---|
| | All measuring ranges | Measuring range 0 … +0.025 bar (0 … +2.5 kPa) | All process fittings | Process fitting G½ (ISO 228-1) |
| One year | < 0.05 % x TD | < 0.1 % x TD | < 0.1 % x TD | < 0.25 % x TD |
| Five years | < 0.1 % x TD | < 0.2 % x TD | < 0.2 % x TD | < 0.5 % x TD |
| Ten years | < 0.2 % x TD | < 0.4 % x TD | < 0.4 % x TD | < 1 % x TD |

## Ambient conditions

| Version | Ambient temperature | Storage and transport temperature |
|---|---|---|
| Standard version | -40 … +80 °C (-40 … +176 °F) | -60 … +80 °C (-76 … +176 °F) |
| Version IP 66/IP 68 (1 bar) | -20 … +80 °C (-4 … +176 °F) | -20 … +80 °C (-4 … +176 °F) |
| Version IP 68 (25 bar) with connection cable PUR | -20 … +80 °C (-4 … +176 °F) | -20 … +80 °C (-4 … +176 °F) |
| Version IP 68 (25 bar), connection cable PE | -20 … +60 °C (-4 … +140 °F) | -20 … +60 °C (-4 … +140 °F) |

## Process conditions

### Process temperature[5)]

| Measuring cell seal | | Sensor version | |
|---|---|---|---|
| | | Standard | Extended temperature range[6)] |
| FKM | VP2/A | -20 … +130 °C (-4 … +266 °F) | -20 … +150 °C (-4 … +302 °F) |
| | A+P 70.16 | -40 … +130 °C (-40 … +266 °F) | - |
| | Endura V91A | -40 … +130 °C (-40 … +266 °F) | -40 … +150 °C (-40 … +302 °F) |
| | ET 7067 | -20 … +130 °C (-4 … +266 °F) | - |
| | V70SW | - | -10 … +150 °C (14 … +302 °F) |
| EPDM | A+P 70.10-02 | -40 … +130 °C (-40 … +266 °F) | -40 … +150 °C (-40 … +302 °F) |
| | ET 7056 | -40 … +130 °C (-40 … +266 °F) | - |
| | E70Q | - | -40 … +150 °C (-40 … +302 °F) |
| | Fluoraz SD890 | -5 … +130 °C (-22 … +266 °F) | - |
| FFKM | Kalrez 6375 | -20 … +130 °C (-4 … +266 °F) | -20 … +150 °C (-4 … +302 °F) |
| | Perlast G75S | -15 … +130 °C (-4 … +266 °F) | -15 … +150 °C (5 … +302 °F) |
| | Perlast G75B | -15 … +130 °C (-4 … +266 °F) | -15 … +150 °C (5 … +302 °F) |
| | Perlast G92E | -15 … +130 °C (-4 … +266 °F) | -15 … +150 °C (5 … +302 °F) |
| | Chemraz 535 | -30 … +130 °C (-22 … +266 °F) | - |

### Temperature derating

5) With process fitting PVDF, process temperature max. 100 °C (212 °F).
6) Measuring cell ø 28 mm

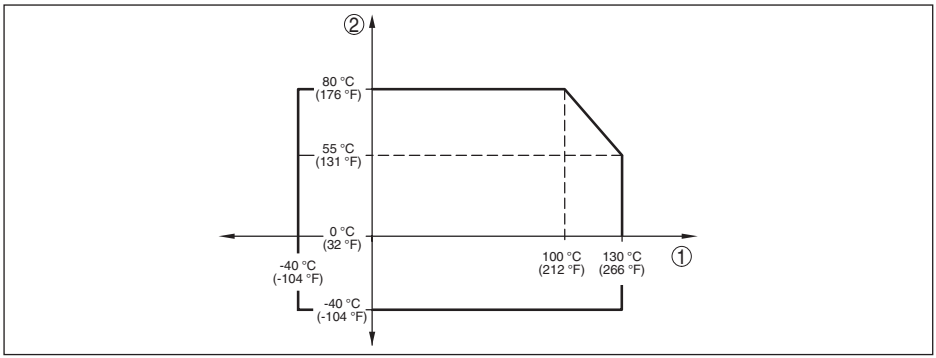



*Fig. 38: Temperature derating CPT-2x, version up to +130 °C (+266 °F)*

*1 Process temperature*
*2 Ambient temperature*

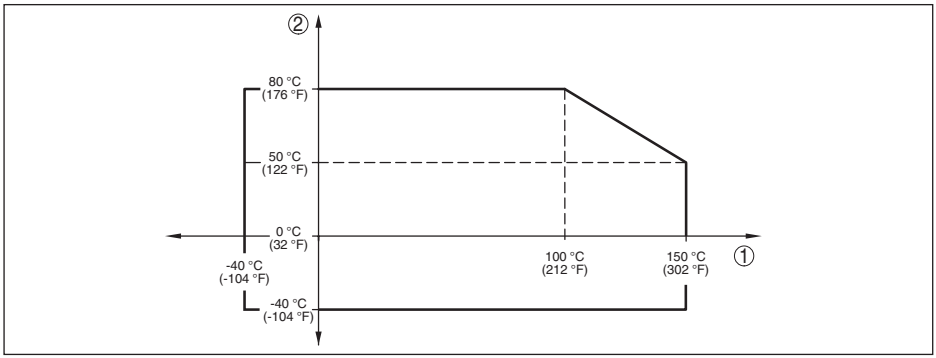



*Fig. 39: Temperature derating CPT-2x, version up to +150 °C (+302 °F)*

*1 Process temperature*
*2 Ambient temperature*

**SIP process temperature (SIP = Sterilization in place)**

Applies to instruments configurations suitable for vapour, i.e. material measuring cell seal EPDM or FFKM (Perlast G75S).

| | |
|---|---|
| Vapour stratification up to 2 h | +150 °C (+302 °F) |

**Process pressure**

| | |
|---|---|
| Permissible process pressure | see specification "*process pressure*" on the type label |

**Mechanical stress**[7)]

| | |
|---|---|
| Vibration resistance | 4 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance) |
| Shock resistance | 50 g, 2.3 ms according to EN 60068-2-27 (mechanical shock)[8)] |

7) Depending on the instrument version.
8) 2 g with housing version stainless steel double chamber

## Electromechanical data - version IP 66/IP 67 and IP 66/IP 68 (0.2 bar)[9)]

Options of the cable entry

- Cable entry: M20 x 1.5; ½ NPT
- Cable gland: M20 x 1.5, ½ NPT (cable ø see below table)
- Blind plug: M20 x 1.5; ½ NPT
- Closing cap: ½ NPT

| Material cable gland/Seal insert | Cable diameter | | | |
|---|---|---|---|---|
| | 5 … 9 mm | 6 … 12 mm | 7 … 12 mm | 10 … 14 mm |
| PA/NBR | ● | ● | – | ● |
| Brass, nickel-plated/NBR | ● | ● | – | – |
| Stainless steel/NBR | – | – | ● | – |

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire: 0.2 … 2.5 mm² (AWG 24 … 14)
- Stranded wire with end sleeve: 0.2 … 1.5 mm² (AWG 24 … 16)

## Electromechanical data - version IP 66/IP 68 (1 bar)

Connection cable, mechanical data

- Configuration: Wires, breather capillaries, strain relief, screen braiding, metal foil, mantle
- Standard length: 5 m (16.4 ft)
- Min. bending radius: 25 mm (0.984 in) with 25 °C (77 °F)
- Diameter: approx. 8 mm (0.315 in)
- Colour - version PE: Black
- Colour - version PUR: Blue

Connection cable, electrical data

- Wire cross-section: 0.5 mm² (AWG 20)
- Wire resistance R': 0.037 Ω/m (0.012 Ω/ft)

## Electromechanical data - version IP 68 (25 bar)

Connection cable transmitter - external housing, mechanical data

- Configuration: Wires, strain relief, breather capillaries, screen braiding, metal foil, mantle[10)]
- 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)
- Material: PE, PUR
- Colour: Black, blue

[9)] IP 66/IP 68 (0.2 bar), only with absolute pressure.
[10)] Breather capillaries not with Ex-d version.

| | |
|---|---|
| Connection cable transmitter - external housing, electrical data | |
| – Wire cross-section | 0.5 mm² (AWG 20) |
| – Wire resistance | 0.037 Ω/m (0.012 Ω/ft) |

| **Display and adjustment module** | |
|---|---|
| Display element | Display with backlight |
| Measured value indication | |
| – Number of digits | 5 |
| Adjustment elements | |
| – 4 keys | ***[OK]***, ***[->]***, ***[+]***, ***[ESC]*** |
| Protection rating | |
| – unassembled | IP 20 |
| – Mounted in the housing without lid | IP 40 |
| Materials | |
| – Housing | ABS |
| – Inspection window | Polyester foil |
| Functional safety | SIL non-reactive |

| **Interface to the external display and adjustment unit** | |
|---|---|
| Data transmission | Digital (I²C-Bus) |
| Connection cable | Four-wire |

| **Sensor version** | **Configuration, connection cable** | | |
|---|---|---|---|
| | **Cable length** | **Standard cable** | **Screened** |
| 4 … 20 mA/HART<br>Modbus | 50 m | ● | – |
| Profibus PA, Foundation Fieldbus | 25 m | – | ● |

| **Integrated clock** | |
|---|---|
| Date format | Day.Month.Year |
| Time format | 12 h/24 h |
| Time zone, factory setting | CET |
| Max. rate deviation | 10.5 min/year |

| **Additional output parameter - Electronics temperature** | |
|---|---|
| Range | -40 … +85 °C (-40 … +185 °F) |
| Resolution | < 0.1 K |
| Deviation | ±3 K |
| Output of the temperature values | |
| – Indication | Via the display and adjustment module |
| – Analogue | Via the current output, the additional current output |

| | |
|---|---|
| – Digital | Via the digital output signal (depending on the electronics version) |

**Voltage supply**

| | |
|---|---|
| Operating voltage $U_B$ | |
| – Non-Ex instrument | 9 … 32 V DC |
| – Ex-d instrument | 9 … 32 V DC |
| – Ex-ia instrument - Power supply FISCO model | 9 … 17.5 V DC |
| – Ex-ia instrument - Power supply ENTITY model | 9 … 24 V DC |
| Operating voltage $U_B$ with lighting switched on | |
| – Non-Ex instrument | 13.5 … 32 V DC |
| – Ex-d instrument | 13.5 … 32 V DC |
| – Ex-ia instrument - Power supply FISCO model | 13.5 … 17.5 V DC |
| – Ex-ia instrument - Power supply ENTITY model | 13.5 … 24 V DC |
| Number of sensors per DP/PA segment coupler, max. | |
| – Non-Ex | 32 |
| – Ex | 10 |

**Potential connections and electrical separating measures in the instrument**

| | |
|---|---|
| Electronics | Not non-floating |
| Reference voltage[11)] | 500 V AC |
| Conductive connection | Between ground terminal and metallic process fitting |

**Electrical protective measures[12)]**

| Housing material | Version | Protection acc. to IEC 60529 | Protection acc. to NEMA |
|---|---|---|---|
| Plastic | Single chamber | IP 66/IP 67 | Type 4X |
| | Double chamber | | |
| Aluminium | Single chamber | IP 66/IP 67<br>IP 66/IP 68 (0.2 bar)<br>IP 68 (1 bar) | Type 4X<br>Type 6P<br>- |
| | Double chamber | IP 66/IP 67<br>IP 66/IP 68 (0.2 bar) | Type 4X<br>Type 6P |
| Stainless steel (electro-polished) | Single chamber | IP 66/IP 67<br>IP 69K | Type 4X |

[11)] Galvanic separation between electronics and metal housing parts
[12)] Protection rating IP 66/IP 68 (0.2 bar) only in conjunction with absolute pressure.

| Housing material | Version | Protection acc. to IEC 60529 | Protection acc. to NEMA |
|---|---|---|---|
| Stainless steel (precision casting) | Single chamber | IP 66/IP 67<br>IP 66/IP 68 (0.2 bar)<br>IP 68 (1 bar) | Type 4X<br>Type 6P<br>- |
| | Double chamber | IP 66/IP 67<br>IP 66/IP 68 (0.2 bar) | Type 4X<br>Type 6P |
| Stainless steel | Transmitter, version with external housing | IP 68 (25 bar) | - |

| | |
|---|---|
| Connection of the feeding power supply unit | Networks of overvoltage category III |
| Altitude above sea level | |
| – by default | up to 2000 m (6562 ft) |
| – with connected overvoltage protection | up to 5000 m (16404 ft) |
| Pollution degree[13)] | 2 |
| Protection rating (IEC/EN 61010-1) | II |

**Approvals**

Instruments with approvals can have deviating technical data (depending on the version). For such instruments, the corresponding approval documents must be noted.

## 10.2 Communication Profibus PA

### Instrument master file

The instrument master file (GSD) contains the characteristic data of the Profibus PA instrument. These data are, e.g. the permissible transmission rates as well as information on diagnostics values and the format of the measured value output by the PA instrument.

A bitmap file is also provided for the Profibus network planning tool. This file is installed automatically when the GSD file is integrated. The bitmap file is used for symbolic indication of the PA instrument in the configuration tool.

### ID number

Each Profibus instrument gets an unambiguous ident number (ID number) from the Profibus user organisation (PNO). This ID number is also included in the name of the GSD file. Optionally in addition to this manufacturer-specific GSD file, PNO also provides a general so-called profile-specific GSD file. If the general GSD file is used, the sensor must be set to the profile-specific ident number via the DTM software. By default, the sensor operates with the manufacturer-specific ID number. When using the instruments on a segment coupler SK-2 or SK-3, no special GSD files are required.

The following table shows the instrument ID and the GSD file names.

[13)] When used with fulfilled housing protection.

| Instrument ID | | GSD file name | |
|---|---|---|---|
| **WIKA** | **Instrument class in profile 3.02** | **WIKA** | **Profile-specific** |
| 0F93 HEX | 0x9702 | WI0x6b0F93.GSD | PA139760.GSD (Multi_ Variable) |

## Cyclical data traffic

The master class 1 (e.g. PLC) cyclically reads out measured values from the sensor during operation. The below block diagram below shows which data can be accessed by the PLC.

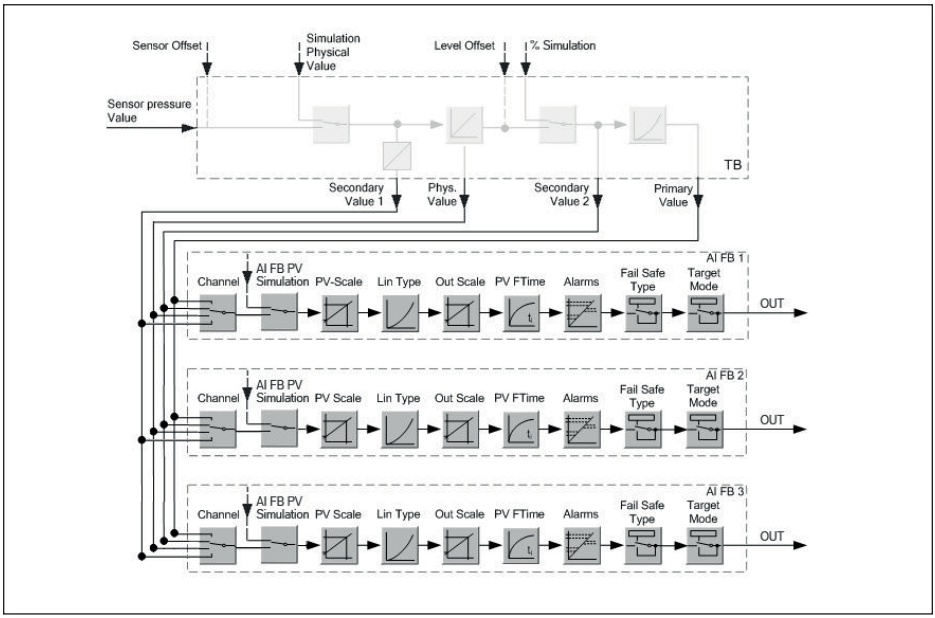



*Fig. 40: CPT-2x: Block diagram with AI FB 1 … AI FB 3 OUT values*

*TB Transducer Block*
*FB Function Block*
*AI Analogue Input*

## Module of the PA sensors

For the cyclic data traffic, CPT-2x provides the following modules:

- AI FB1 (OUT)
  - Out value of the AI FB1 after scaling
- AI FB2 (OUT)
  - Out value of the AI FB2 after scaling
- AI FB3 (OUT)
  - Out value of the AI FB3 after scaling
- Free Place
  - This module must be used if a value in the data telegram of the cyclical data traffic should not be used (e.g. replacement of temperature and Additional Cyclic Value)

A maximum of three modules can be active. By means of the configuration software of the Profibus master you can determine the configuration of the cyclical data telegram with these modules. The procedure depends on the respective configuration software.

**Note:**

The modules are available in two versions:

- Short for Profibus master supporting only one "Identifier Format" byte, e.g. Allen Bradley
- Long for Profibus master only supporting the "Identifier Format" byte, e.g. Siemens S7-300/400

## Examples of telegram configuration

In the following you will see how the modules can be combined and how the appendant data telegram is structured.

**Example 1**

- AI FB1 (OUT)
- AI FB2 (OUT)
- AI FB3 (OUT)

| Byte-No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Format | IEEE-754-Floating point value | | | | Status | IEEE-754-Floating point value | | | | Status | IEEE-754-Floating point value | | | | Status |
| Value | AI FB1 (OUT) | | | | AI FB1 | AI FB2 (OUT) | | | | AI FB2 | AI FB3 (OUT) | | | | AI FB3 |

**Example 2**

- AI FB1 (OUT)
- Free Place
- Free Place

| Byte-No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Format | IEEE-754-Floating point value | | | | Status |
| Value | AI FB1 (OUT) | | | | AI FB1 |

**Note:**

Bytes 6-15 are not used in this example.

## Data format of the output signal

| Byte4 | Byte3 | Byte2 | Byte1 | Byte0 |
|---|---|---|---|---|
| Status | Value (IEEE-754) | | | |

*Fig. 41: Data format of the output signal*

The status byte corresponds to profile 3.02 "Profibus PA Profile for Process Control Devices" coded. The status "Measured value OK" is coded as 80 (hex) (Bit7 = 1, Bit6 … 0 = 0).

The measured value is transferred as a 32 bit floating point number in the IEEE-754 format.

| Byte n | | | | | | | | Byte n+1 | | | | | | | | Byte n+2 | | | | | | | | Byte n+3 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| VZ | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ | $2^{-1}$ | $2^{-2}$ | $2^{-3}$ | $2^{-4}$ | $2^{-5}$ | $2^{-6}$ | $2^{-7}$ | $2^{-8}$ | $2^{-9}$ | $2^{10}$ | $2^{11}$ | $2^{12}$ | $2^{13}$ | $2^{14}$ | $2^{15}$ | $2^{16}$ | $2^{17}$ | $2^{18}$ | $2^{19}$ | $2^{20}$ | $2^{21}$ | $2^{22}$ | $2^{-23}$ |
| Sign Bit | Exponent | | | | | | | Significant | | | | | | | | Significant | | | | | | | | Significant | | | | | | | |

$$\text{Value} = (-1)^{VZ} \bullet 2^{(\text{Exponent} - 127)} \bullet (1 + \text{Significant})$$

*Fig. 42: Data format of the measured value*

## Coding of the status byte associated with the PA output value

You can find further information for the coding of the status byte in the Device Description 3.02 on www.profibus.com.

| Status code | Description according to Profibus standard | Possible cause |
|---|---|---|
| 0 x 00 | bad - non-specific | Flash-Update active |
| 0 x 04 | bad - configuration error | ● Adjustment error<br>● Configuration error with PV-Scale (PV-Span too small)<br>● Unit irregularity<br>● Error in the linearization table |
| 0 x 0C | bad - sensor failure | ● Hardware error<br>● Converter error<br>● Leakage pulse error<br>● Trigger error |
| 0 x 10 | bad - sensor failure | ● Measured value generation error<br>● Temperature measurement error |
| 0 x 1f | bad - out of service constant | "Out of Service" mode switched on |
| 0 x 44 | uncertain - last unstable value | Failsafe replacement value (Failsafe-Mode = "Last value" and already valid measured value since switching on) |
| 0 x 48 | uncertain substitute set | ● Switch on simulation<br>● Failsafe replacement value (Failsafe-Mode = "Fsafe value") |
| 0 x 4c | uncertain - initial value | Failsafe replacement value (Failsafe-Mode = "Last valid value" and no valid measured value since switching on) |
| 0 x 51 | uncertain - sensor; conversion not accurate - low limited | Sensor value < lower limit |
| 0 x 52 | uncertain - sensor; conversion not accurate - high limited | Sensor value > upper limit |
| 0 x 80 | good (non-cascade) - OK | OK |
| 0 x 84 | good (non-cascade) - active block alarm | Static revision (FB, TB) changed (10 sec. active, after the parameter of the static category has been written) |

| Status code | Description according to Profibus standard | Possible cause |
|---|---|---|
| 0 x 89 | good (non-cascade) - active advisory alarm - low limited | Lo-Alarm |
| 0 x 8a | good (non-cascade) - active advisory alarm - high limited | Hi-Alarm |
| 0 x 8d | good (non-cascade) - active critical alarm - low limited | Lo-Lo-Alarm |
| 0 x 8e | good (non-cascade) - active critical alarm - high limited | Hi-Hi-Alarm |

## 10.3 Calculation of the total deviation

The total deviation of a pressure transmitter indicates the maximum measurement error to be expected in practice. It is also called maximum practical deviation or operational error.

According to DIN 16086, the total deviation $F_{total}$ is the sum of the basic deviation $F_{perf}$ and the long-term stability $F_{stab}$:

$F_{total} = F_{perf} + F_{stab}$

The basic deviation $F_{perf}$ consists of the thermal change of the zero signal and the output span $F_T$ as well as the deviation $F_{KI}$:

$F_{perf} = \sqrt{((F_T)^2 + (F_{KI})^2)}$

The thermal change of zero signal and output span $F_T$ is specified in chapter "*Technical data*". The basic temperature error $F_T$ is shown in a graphic. Depending on the measuring cell version and Turn down, this value must be multiplied with the additional factors FMZ and FTD:

$F_T$ x FMZ x FTD

Also these values are specified in chapter "*Technical data*".

This applies for a digital signal output through HART, Profibus PA or Foundation Fieldbus.

With a 4 … 20 mA output, the thermal change of the current output $F_a$ must be added:

$F_{perf} = \sqrt{((F_T)^2 + (F_{KI})^2 + (F_a)^2)}$

To provide a better overview, the formula symbols are listed together below:

- $F_{total}$: Total deviation
- $F_{perf}$: Basic deviation
- $F_{stab}$: Long-term stability
- $F_T$: Thermal change of zero signal and output span (temperature error)
- $F_{KI}$: Deviation
- $F_a$: Thermal change of the current output
- FMZ: Additional factor measuring cell version
- FTD: Additional factor Turn down

## 10.4 Practical example

**Data**

Pressure measurement in the pipeline 4 bar (400 KPa)

Product temperature up to 50 °C

CPT-2x with measuring range 10 bar, deviation < 0.2 %, process fitting G1½ (measuring cell ø 28 mm)

### 1. Calculation of the Turn down

TD = 10 bar/4 bar, TD = 2.5 : 1

### 2. Determination temperature error $F_T$

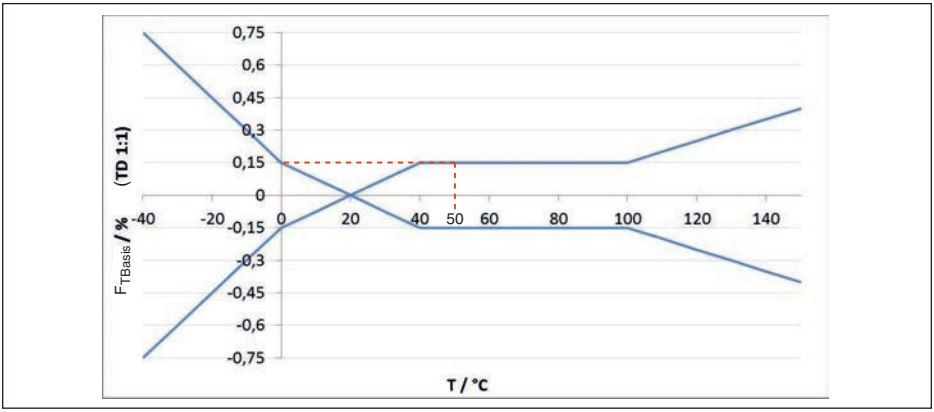



*Fig. 43: Determination of the basic temperature error for the above example: $F_{TBasis}$ = 0.15 %*

| Measuring cell version | Measuring cell standard, depending on the accuracy class | | |
|---|---|---|---|
| | 0.05 %, 0.1 % | 0.2 % (0.1 $bar_{abs}$) | 0.2 % |
| Factor FMZ | 1 | 2 | 3 |

*Tab. 25: Determination of the additional factor measuring cell for above example: $F_{MZ}$ = 3*

| Turn Down | TD 1 : 1 | TD 2.5 : 1 | TD 5 : 1 | TD 10 : 1 | TD 20 : 1 |
|---|---|---|---|---|---|
| Factor FTD | 1 | 1.75 | 3 | 5.5 | 10.5 |

*Tab. 26: Determination of the additional factor "turn down" for the above example: $F_{TD}$ = 1.75*

$F_T = F_{TBasis} \times F_{MZ} \times F_{TD}$

$F_T = 0.15\ \% \times 3 \times 1.75$

$F_T = 0.79\ \%$

### 3. Determination of deviation and long-term stability

The required values for deviation $F_{KI}$ and long-term stability $F_{stab}$ are available in the technical data:

| Accuracy class | Non-linearity, hysteresis and non-repeatability | |
|---|---|---|
| | TD ≤ 5 : 1 | TD > 5 : 1 |
| 0.05 % | < 0.05 % | < 0.01 % x TD |
| 0.1 % | < 0.1 % | < 0.02 % x TD |
| 0.2 % | < 0.2 % | < 0.04 % x TD |

*Tab. 27: Determination of the deviation from table: $F_{KI}$ = 0.2 %*

| Time period | Measuring cell ø 28 mm | | Measuring cell ø 17.5 mm | |
|---|---|---|---|---|
| | **All measuring ranges** | **Measuring range 0 … +0.025 bar (0 … +2.5 kPa)** | **All process fittings** | **Process fitting G½ (ISO 228-1)** |
| One year | < 0.05 % x TD | < 0.1 % x TD | < 0.1 % x TD | < 0.25 % x TD |
| Five years | < 0.1 % x TD | < 0.2 % x TD | < 0.2 % x TD | < 0.5 % x TD |
| Ten years | < 0.2 % x TD | < 0.4 % x TD | < 0.4 % x TD | < 1 % x TD |

*Tab. 28: Determination of the long-term stability from the table, consideration for one year: $F_{stab}$ = 0.05 % x TD*

### 4. Calculation of the total deviation - digital signal outputs

**1. step: Basic deviation $F_{perf}$**

$F_{perf} = \sqrt{((F_T)^2 + (F_{KI})^2)}$

$F_T = 0.79\ \%$

$F_{KI} = 0.2\ \%$

$F_{perf} = \sqrt{(0.79\ \%)^2 + (0.2\ \%)^2)}$

$F_{perf} = 0.81\ \%$

**2. step: Total deviation $F_{total}$**

$F_{total} = F_{perf} + F_{stab}$

$F_{perf}$ = 0.81 % (result of step 1)

$F_{stab} = (0.05\ \%\ x\ TD)$

$F_{stab} = (0.05\ \%\ x\ 2.5)$

$F_{stab} = 0.125\ \%$

$F_{total} = 0.81\ \% + 0.125\ \% = 0.94\ \%$

The example shows that the measurement error in practice can be considerably higher than the basic deviation. Reasons are temperature influence and Turn down.

## 10.5 Dimensions

### Plastic housing

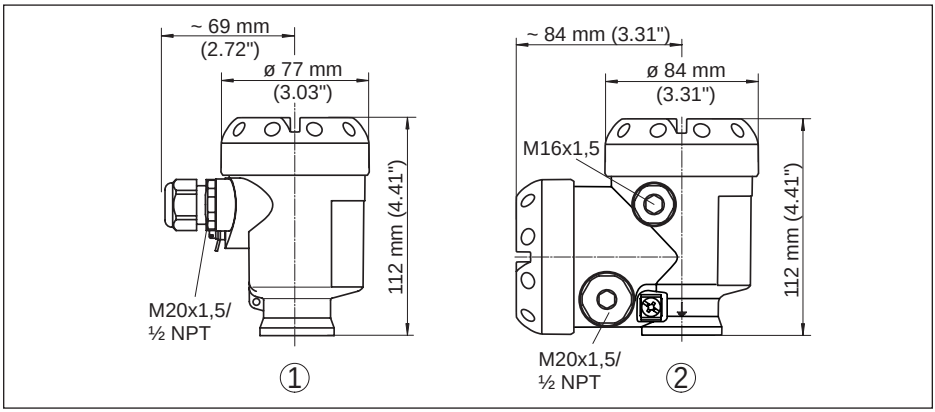



*Fig. 44: Housing versions in protection IP 66/IP 67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Plastic single chamber*
*2 Plastic double chamber*

### Aluminium housing

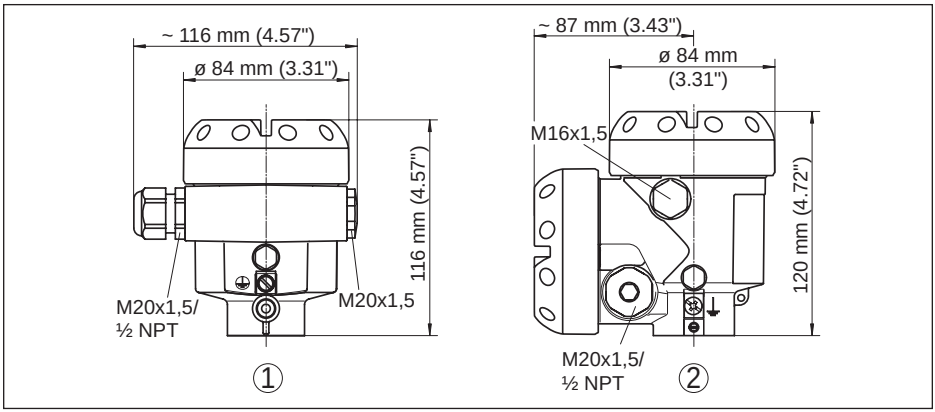



*Fig. 45: Housing versions in protection IP 66/IP 67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Aluminium - single chamber*
*2 Aluminium - double chamber*

### Aluminium housing with protection rating IP 66/IP 68 (1 bar)

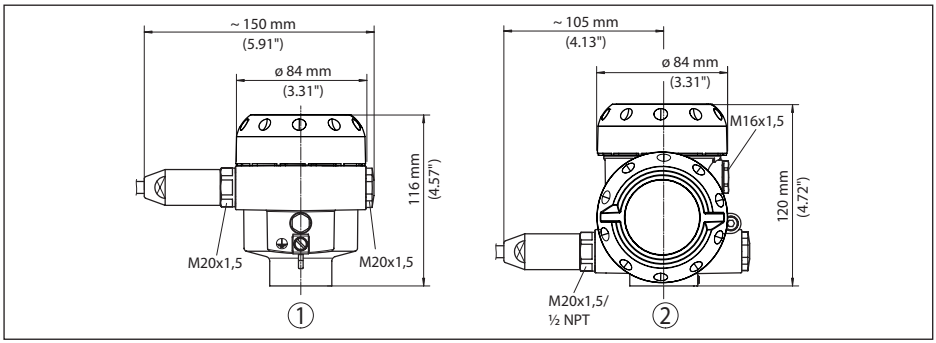



*Fig. 46: Housing version with protection rating IP 66/IP 68 (1 bar), (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Aluminium - single chamber*
*2 Aluminium - double chamber*

### Stainless steel housing

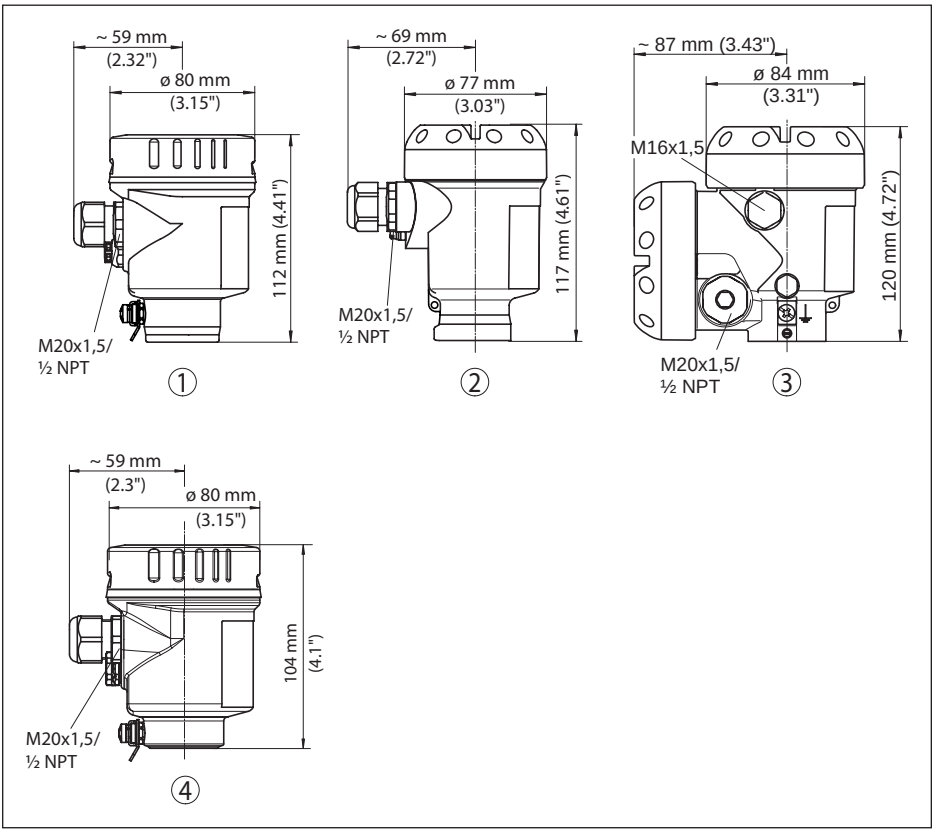



*Fig. 47: Housing versions in protection IP 66/IP 67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Stainless steel single chamber (electropolished)*
*2 Stainless steel single chamber (precision casting)*
*3 Stainless steel double chamber housing (precision casting)*

### Stainless steel housing with protection rating IP 66/IP 68 (1 bar)

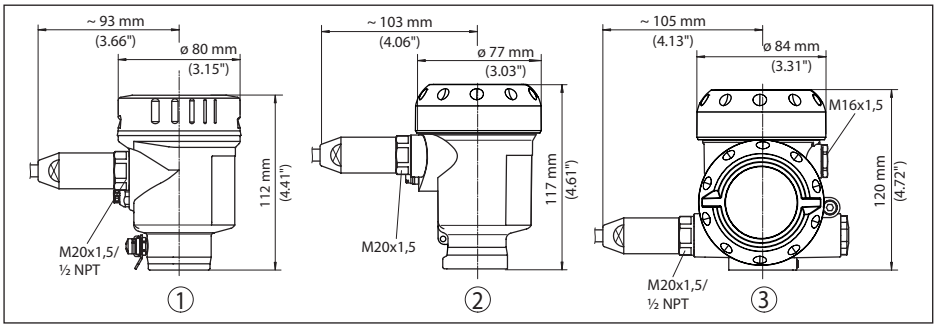



*Fig. 48: Housing version with protection rating IP 66/IP 68 (1 bar), (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Stainless steel single chamber (electropolished)*
*2 Stainless steel single chamber (precision casting)*
*3 Stainless steel double chamber housing (precision casting)*

### Stainless steel housing with protection rating IP 69K

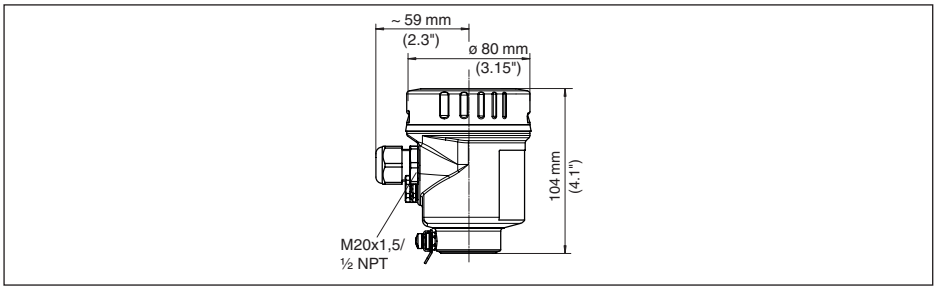



*Fig. 49: Housing version with protection rating IP 69K (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Stainless steel single chamber (electropolished)*

## External housing with IP 68 (25 bar) version

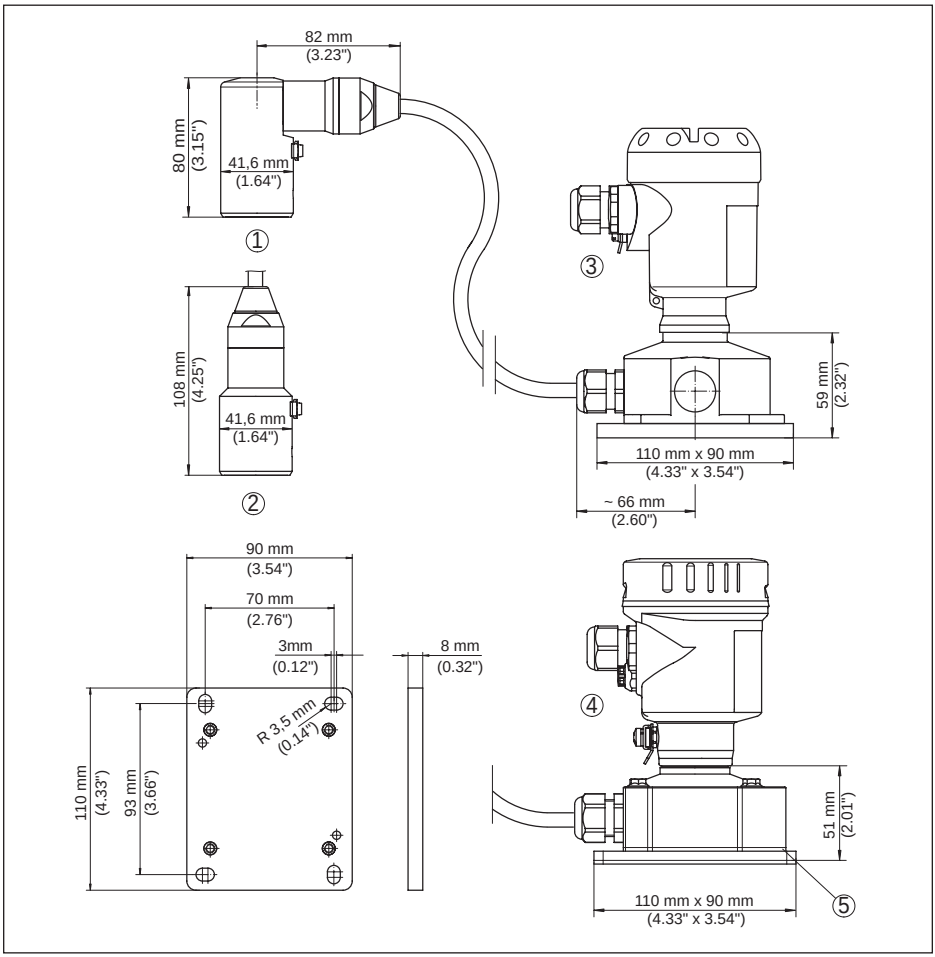



*Fig. 50: IP 68 version with external housing*

1 *Lateral cable outlet*
2 *Axial cable outlet*
3 *Plastic housing*
4 *Stainless steel housing, electropolished*

**CPT-2x, threaded fitting not front-flush**

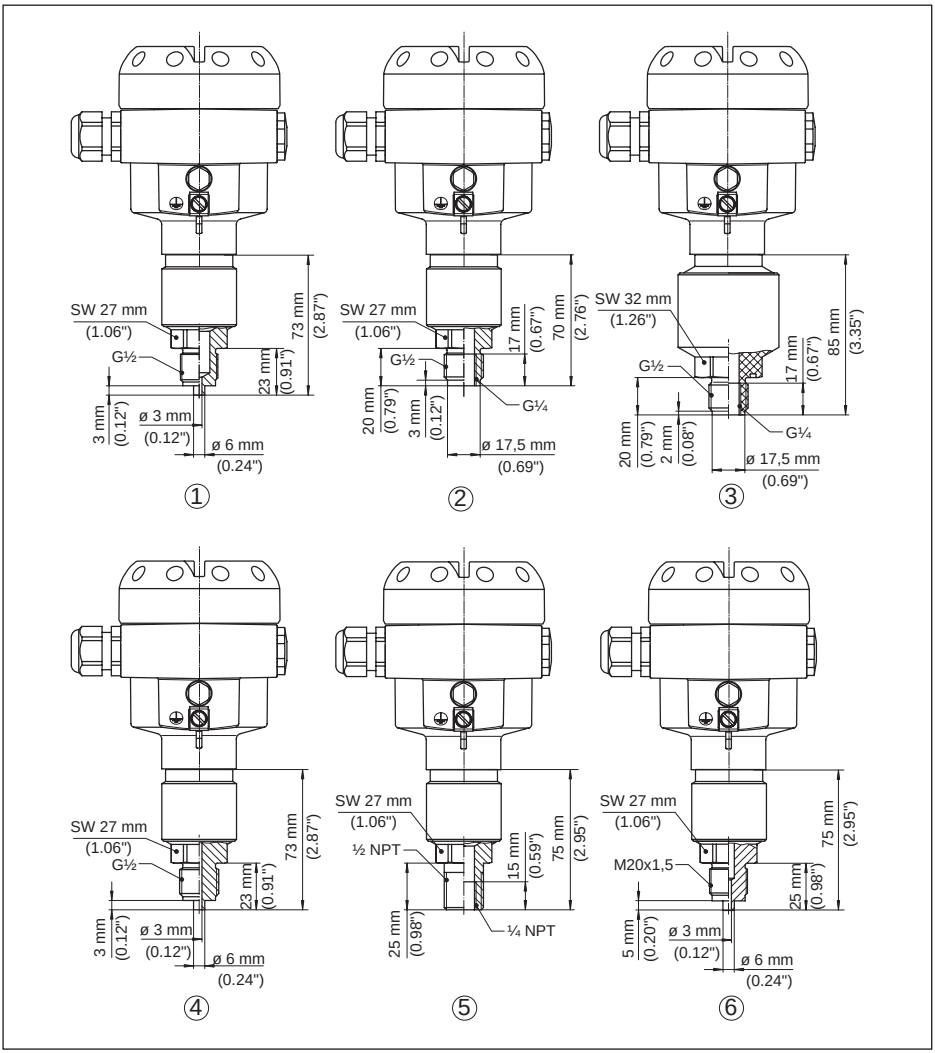



*Fig. 51: CPT-2x, threaded fitting not front-flush*

1 *G½ manometer connection (EN 837)*
2 *G½ A inside G¼ (ISO 228-1)*
3 *G½ A inside G¼ A PVDF (ISO 228-1)*
4 *G½ manometer connection (EN 837) volume-reduced*
5 *½ NPT inside ¼ NPT*
6 *M20 x 1.5 manometer connection (EN 837)*

**Notes:**

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

**CPT-2x, threaded fitting front-flush**

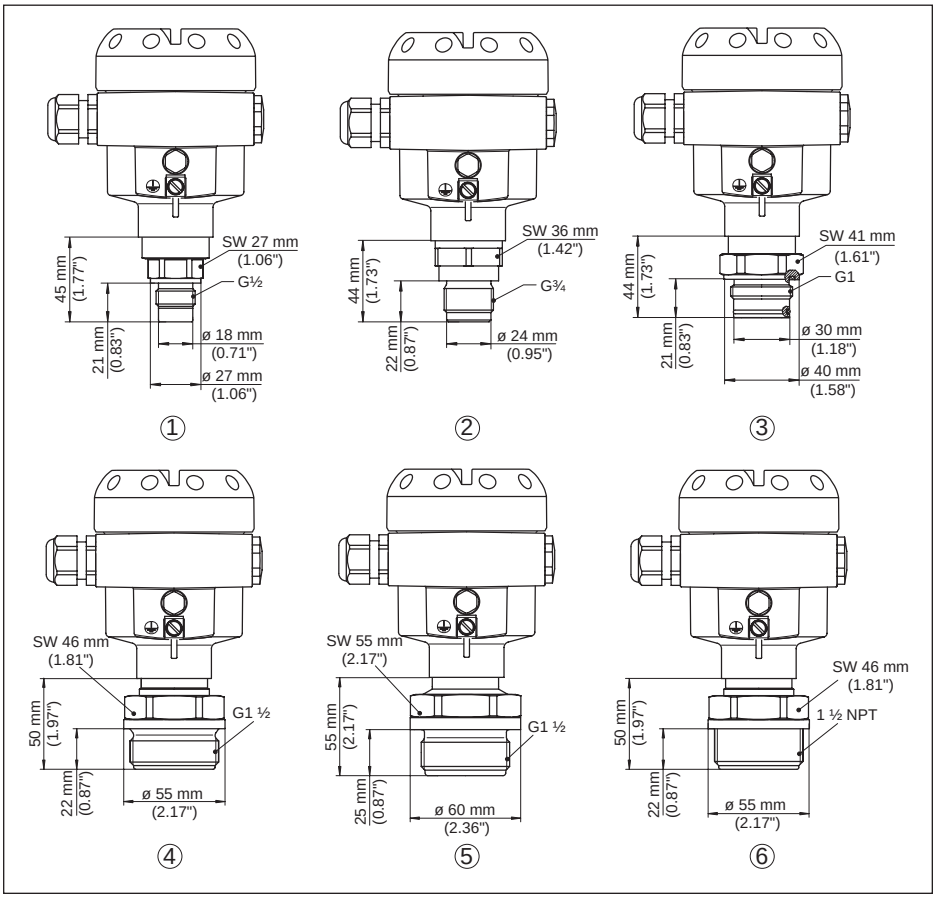



*Fig. 52: CPT-2x, threaded fitting front-flush*

*1 G½ (ISO 228-1)*
*2 G¾ (DIN 3852-E)*
*3 G1 A (ISO 228-1)*
*4 G1½ (DIN 3852-A)*
*5 G1½ A PVDF (DIN 3852-A-B)*
*6 1½ NPT (ASME B1.20.1)*

For the version with temperature range up to 150 °C/302 °F, the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

**CPT-2x, hygienic fitting**

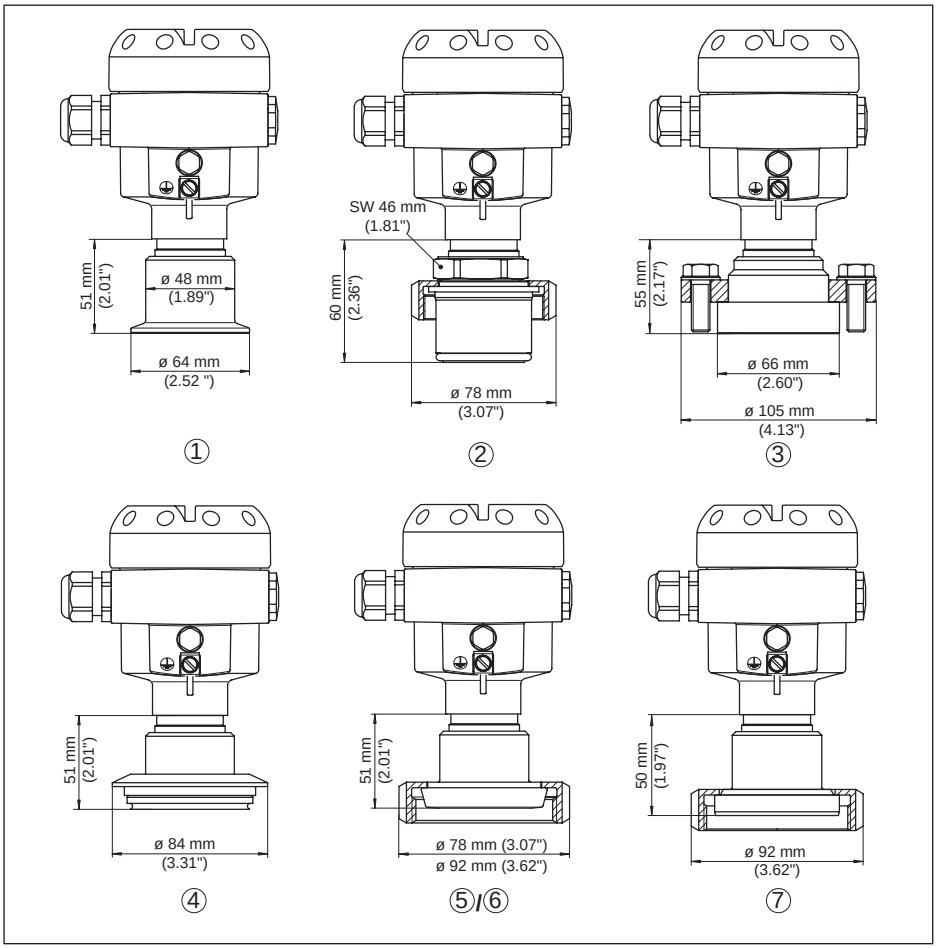


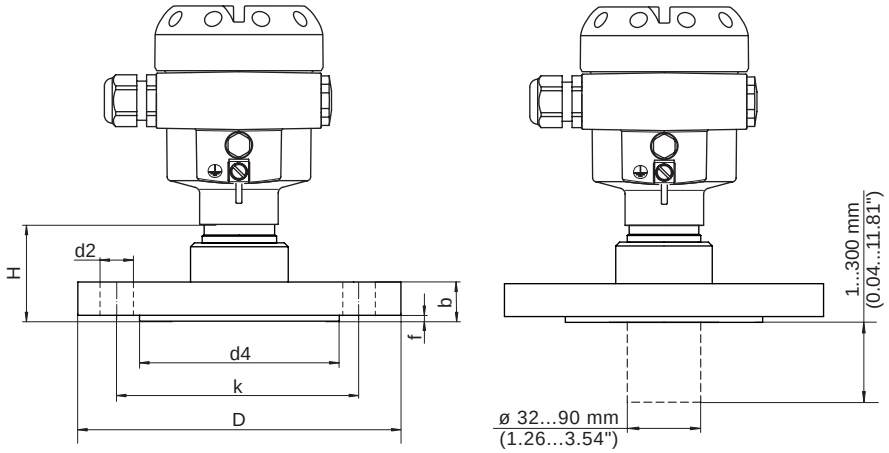

*Fig. 53: CPT-2x, hygienic fitting*

1 *Clamp 2"*
2 *Hygienic connection with compression nut F40*
3 *DRD*
4 *Tuchenhagen Varivent DN 32*
5 *Slotted nut DN 40 according to DIN 11851*
6 *Slotted nut DN 50 according to DIN 11851*
7 *Slotted nut DN 50 according to DIN 11864-1*

For the version with temperature range up to 150 °C/302 °F, the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

**CPT-2x, flange connection**




| mm | DN | PN | D | b | k | d2 | d4 | f | H |
|---|---|---|---|---|---|---|---|---|---|
| ① | 40 | 40 | 150 | 18 | 110 | 4xø18 | 88 | 3 | 50 |
| | 50 | 40 | 165 | 20 | 125 | 4xø18 | 102 | 3 | 50 |
| | 80 | 40 | 200 | 24 | 160 | 8xø18 | 138 | 3 | 51 |
| ② | 2" | 150 lbs | 152,4 | 19,1 | 120,7 | 4xø19,1 | 91,9 | 3,2 | 51 |
| | 3" | 150 lbs | 190,5 | 23,9 | 152,4 | 8xø19,1 | 127 | 3,2 | 51 |

| inch | DN | PN | D | b | k | d2 | d4 | f | H |
|---|---|---|---|---|---|---|---|---|---|
| ① | 40 | 40 | 5.91" | 0.71" | 4.33" | 4xø 0.71" | 3.46" | 0.12" | 1.97" |
| | 50 | 40 | 6.50" | 0.79" | 4.92" | 4xø 0.71" | 4.02" | 0.12" | 1.97" |
| | 80 | 40 | 7.87" | 0.95" | 6.30" | 8xø 0.71" | 5.43" | 0.12" | 2.01" |
| ② | 2" | 150 lbs | 6" | 0.75" | 4.75" | 4xø 0.75" | 3.62" | 0.13" | 2.01" |
| | 3" | 150 lbs | 7.5" | 0.94" | 6" | 8xø 0.75" | 5" | 0.13" | 2.01" |

*Fig. 54: CPT-2x, flange connection*

*1 Flange connection according to DIN 2501*
*2 Flange connection according to ASME B16.5*

For the version with temperature range up to 150 °C/302 °F, the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

**CPT-2x, extension fitting**

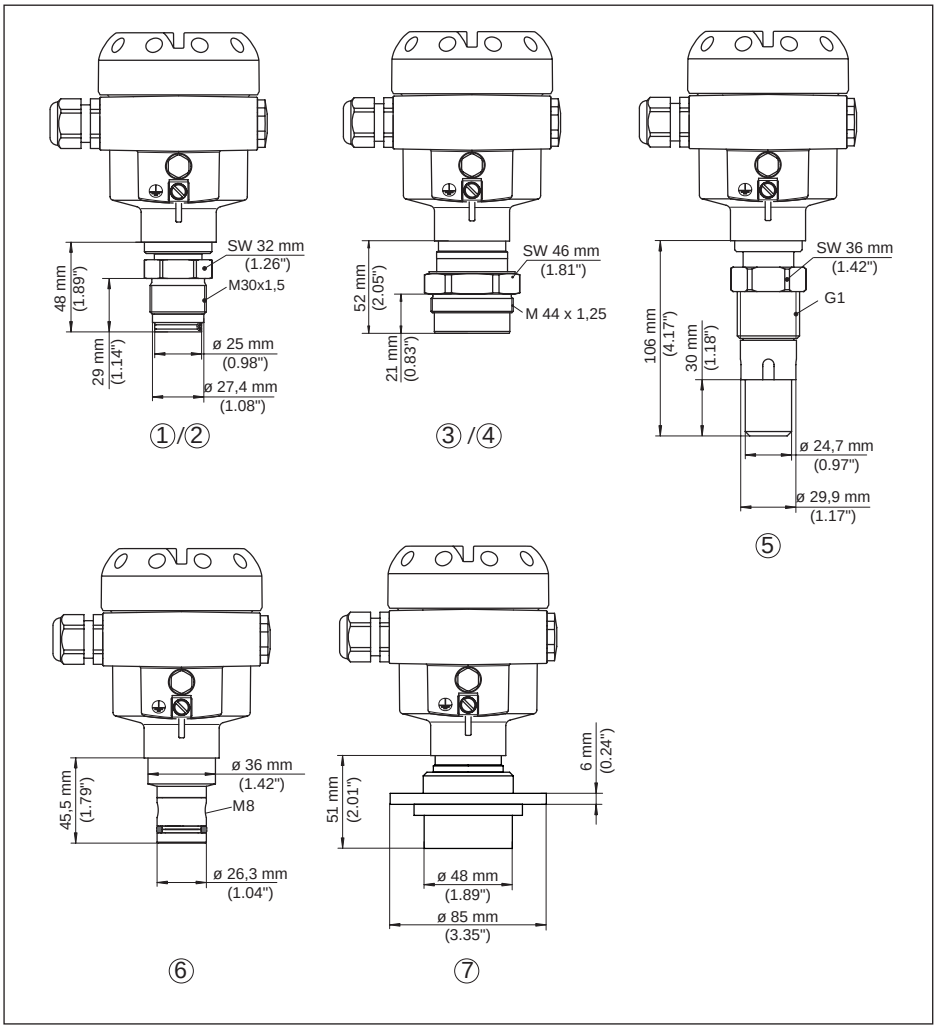



*Fig. 55: CPT-2x, extension fitting*

1 *M30 x 1.5 DIN 13; completely front-flush*
2 *M30 x 1.5 DIN 13; for headbox*
3 *M44 x 1.25 DIN 13; pressure screw: Aluminium*
4 *M44 x 1.25 DIN 13; pressure screw: 316L*
5 *G1, ISO 228-1 suitable for PASVE*
6 *PMC 1" front-flush PN 6*
7 *DN 48 with tension flange*

For the version with temperature range up to 150 °C/302 °F, the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

**CPT-2x, connection acc. to IEC 61518**

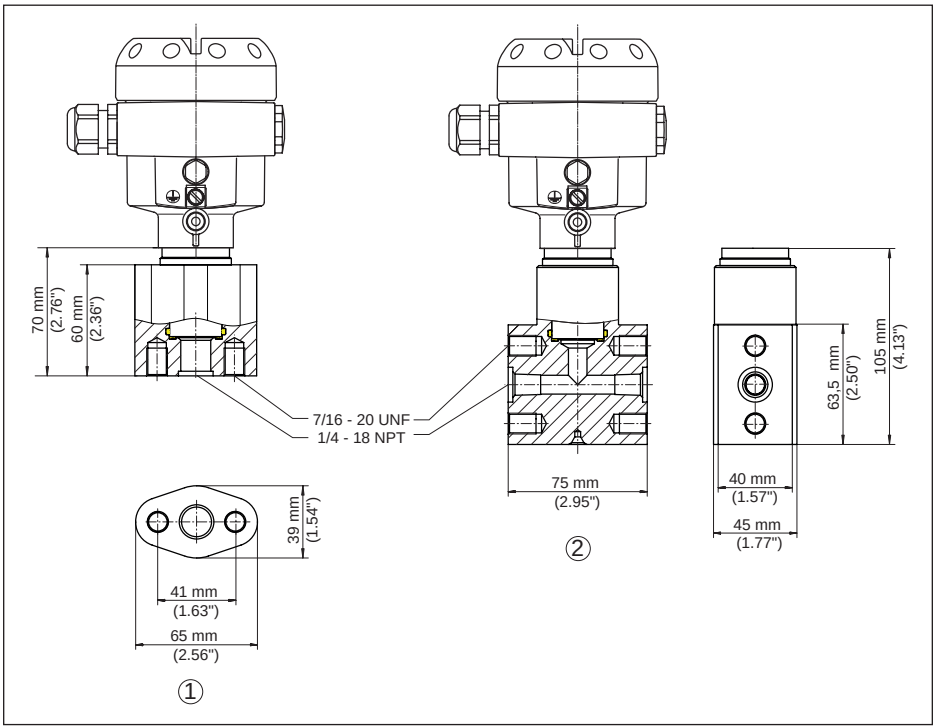



*Fig. 56: CPT-2x, connection acc. to IEC 61518*

*1 Oval flange adapter*
*2 Top flange*

For the version with temperature range up to 150 °C/302 °F, the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

## 10.6 Trademark

All the brands as well as trade and company names used are property of their lawful proprietor/ originator.

# INDEX

## Notes

## Notes

## 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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