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**1. Information on This Operating Instruction**

- The manual is aimed at specialists and semi-skilled personnel.
- Please read the instructions carefully before carrying out any operation and keep the specified order.
- Thoroughly read and understand the information in chapter 2 "Safety Instructions".

If you have any problems or questions, please contact your supplier or contact us directly at:



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# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### 1.1 Pictographs Used

In this manual, pictographs are used as hazard warnings.

Particular information, instructions and restrictions designed for the prevention of personal or substantial property damage:



**WARNING!** Is used to warn you against an imminent danger that may result in personal injury or death.

**IMPORTANT!** Is used to warn you against a possibly hazardous situation that may result in personal, property or environmental damage.

**CAUTION!** Is used to draw your attention to important recommendations to be observed. Disregarding them may result in property damage.



Passages in the text containing **explanations, information or advice** are highlighted with this pictograph.



The following symbol highlights **actions** you have to conduct or **instructions** that have to be strictly observed.

### 1.2 Exclusion of Liability

We accept no liability for any damage or malfunction resulting from incorrect installation, inappropriate use of the device or failure to follow the instructions in this manual.

### 1.3 General Information

Please inspect the transport packaging and the delivered goods immediately upon their receipt to determine their integrity and completeness.

You have purchased an instrument that was manufactured in a high quality standard in our company, which is certified according to DIN ISO 9001. Should a reason for complaint however arise, please return the instrument with a precise description of faults to our factory.

The process transmitter models PTPi and PTDi are manufactured in accordance with the corresponding valid standards. The following operating instruction was composed with due care. It is not possible, however, to take into account all variants and possible cases of application in this operating instruction. If you have any questions regarding a special application, instruments, storage, mounting, operation or difficulties, please contact us as manufacturer or the distributor. With special versions (labelling S on the nameplate), please note the specifications indicated on the delivery note.

Please support us in improving this operating instruction. We will gladly accept your advice.

## 2. Safety Instructions

Please read this operating instruction thoroughly before installing the device.

Disregarding the containing warnings, especially the safety instructions, may result in danger for people, the environment, and the device and the system it is connected to.

The instrument corresponds with the state of engineering at the time of printing. This concerns the accuracy, the operating mode and the safe operation of the device.

In order to guarantee that the device operates safely, the operator must act competently and be conscious of safety issues.

The ARMANO Messtechnik GmbH provides support for the use of its products either personally or via relevant literature. The customer verifies that our product is fit for purpose based on our technical information. The customer performs customer and application specific tests to ensure that the product is suitable for the intended use. With this verification, all hazards and risks are transferred to our customers. Our warranty expires in case of inappropriate use.

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

### Qualified personnel:

- The personnel that is charged for the installation, operation and maintenance of the instrument must hold a relevant qualification. This can be based on training or relevant tuition. The personnel must be aware of this manual and have access to it at all times.
- The electrical connection shall be carried out by a fully qualified electrician only.

### General safety instructions:

- In all work, the existing national regulations for accident prevention and safety at the workplace must be complied with. Any internal regulations of the operator must also be complied with, even if these are not mentioned in this manual.
- Degree of protection according to DIN EN 60529: Ensure that the ambient conditions at the installation location do not exceed the requirements of the specified degree of protection (⇒ chapter 4 "Technical Data").
- Use the device in its perfect technical condition only. Damaged or defective instruments need to be checked immediately and replaced if necessary.
- Only use appropriate tools for mounting, connecting and dismantling the device.
- Nameplates or other information on the device shall neither be removed nor obliterated, since otherwise any warranty and manufacturer responsibility expires.



**IMPORTANT! Disregarding the respective regulations may result in severe personal injuries and / or property damage.**

In order to ensure measurement accuracy and durability of the instrument and to avoid damage, the limit values (⇒ chapter 4 "Technical Data") have to be observed.

In case of visible damage or malfunctions, the instrument must be put out of operation immediately. All parts have to be protected against direct contact during the installation of the instrument and the connections.

### Special safety instructions:

Warnings, which are specifically relevant to individual operating procedures or activities, are to be found at the beginning of the relevant sections of this operating instruction.

## 3. Device Description






The pressure transmitter is suitable for precisely measuring and monitoring differential pressures and positive pressures of liquid as well as gaseous media. A piezoresistive resistance silicon sensor, which is separated from the medium by the membrane and a special manometric liquid, serves as measuring element. The case is made of die-cast aluminum or stainless steel 316 with degree of protection IP66. It is equipped with an integrated LC display (adjustable horizontally/vertically) and can be rotated by 0 – 340° relative to the sensor. The SIL2 version is optionally available. The mounting of chemical seals is possible, e.g. for the petrochemical industry (⇒ model overview 7000 and the data sheets of heading 7, e.g. data sheet 7500).

Each pressure transmitter has a nameplate containing at least the following information: CE mark, manufacturer name, transmitter type, serial number, pressure range, static pressure limit, output signal, supply voltage.



The nameplates of the PTPI and PTDi transmitters in versions compliant with the PED (pressure equipment directive) contain the number of the notified body in addition to CE mark, certificate number: (H1), maximum permissible pressure PS, test pressure PT, minimum/maximum permissible temperature TS.

The instrument version is indicated on the nameplate:

<b>ARMANO</b>		<b>CE</b>
Messtechnik GmbH		
<b>TYPE: PTDi</b>		
 P		0...1,6 MPa
 Tamb		-25...+85 °C
 PS		25MPa
 U		10...55 V DC
		4...20 mA + Hart 5.1
Ser.- No.		12345678
<b>IP66</b>		
Instr.-Nr.: 191202634		

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### 3.1 Intended Use

The PTPi pressure transmitters are designed to measure gauge pressure, vacuum pressure and absolute pressure of gases, vapours and liquids (including corrosive substances).

The differential pressure transmitter models PTDi are used to measure liquids in closed vessels with static pressure up to 25 MPa (32 MPa for special versions) and to measure differential pressures.



The transmitters can be equipped with a number of process connections that allow operation in e.g. corrosive, highly viscous media or operation at high or low temperatures.

In a 2-wire system, the PTPi and PTDi transmitters generate a 4...20 mA output signal with superimposed HART signal. The use of intelligent (smart) electronics enables the regulation of zero point, pressure range, damping, square root extracted characteristics and other functions using a HART communicator or the PC configuration software.

## 4. Technical Data

### 4.1 PTPi, PTDi Common Parameters

Pressure transmitter version	Minimum supply voltage at the pressure transmitter Umin [V] DC	Maximum supply voltage at the pressure transmitter Umax [V] DC
normal	10 <sup>1)</sup>	55

Output signal: 4...20 mA + HART Rev 5.1

Communication with the transmitter to check its configuration parameters is carried out via HART transmission protocol and a signal of 4...20 mA.

For the communication via HART protocol, the current loop requires a certain minimum resistance. This, together with the other resistances, must not exceed the maximum total resistance.

Resistance necessary for communication (HART)  
min. 240 Ω

The maximum values of the permissible Rmax load resistance for the supply voltage of the power supply unit (Usup [V] DC) shall be calculated based on the following formula:

$$R_{max}[\Omega] = \frac{U_{sup}[V] - U_{min}[V]}{0.0225[A]}$$

If the Ro total load resistance in the current loop is given, the minimum supply voltage (Usup[V] DC), required for the use of the power supply, can be calculated likewise.

$$U_{sup}[V] = U_{min}[V] + 0.0225[A] \times R_o[\Omega]$$

whereas: Rmax = maximum permissible load resistance for a specific voltage of the power supply  
Ro = total resistance in the current loop  
Usup = supply voltage

Maximum length of the connection cable:  
1500 m

Update time of the outputs:  
16...480 ms (programmable)

Additional electronic damping:  
0...60 sec

### Materials

membrane	stainless steel 316L (1.4404 / 1.4435) (PED version) or Hastelloy C276
sensor module	stainless steel 316L (1.4404)
liquid filling within the sensor module	silicone oil, chemically inactive liquid for the measurement of oxygen
process connection for PTPi	stainless steel 316L (1.4404) or Hastelloy C276 only for P, GP, CM30x2
case	die-cast aluminum alloy, coated with chemical resistant oxide enamel, or 316L (1.4404)

<sup>1)</sup> minimum supply voltage when the backlight is switched on (backlight cannot be switched off)

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

### Degree of protection

IP66, 67 according to DIN EN 60529  
 IP65 according to DIN EN 60529  
 with PD plug connector

### Permissible ambient conditions

Ambient temperature  
 -40 / +85 °C  
 (for PED version in accordance with metrological parameters according to PED version)

### Accuracy depending on the set range



$\rho_0$  = error for nominal pressure range (0...100 % FSO)  
 $\rho_1$  = error for span (0...10 % FSO)  
 $\rho_1 = 2x \rho_0$

### Medium temperature

-40 / +120 °C for direct measurement  
 (for PED version in accordance with metrological parameters according to PED version)  
 above 120 °C measurement with a cooling element or chemical seal

### Compensated temperature range

-25 / +80 °C  
 -40 / +80 °C for special version

### Relative humidity

max. 98 % with condensation

## 4.2 PTPI – Pressure Ranges and Metrological Parameters

For pressure transmitters with chemical seals, the permissible temperature and corrosive properties of the medium depend on the type of chemical seal.

### Pressure ranges

No.	Nominal measuring range (FSO)		Minimum set range		Turn-down	Max. overpressure (without hysteresis) <sup>3)</sup>			
1	0	-1000 bar	0	- 100 MPa <sup>4)</sup>	10 bar	1 MPa	100:1	1200 bar	120 MPa
2	0	- 600 bar	0	- 60 MPa	6 bar	600 kPa	100:1	1200 bar	120 MPa
3	0	- 300 bar	0	- 30 MPa <sup>2)</sup>	3 bar	300 kPa	100:1	450 bar	45 MPa
4	0	- 160 bar	0	- 16 MPa <sup>2)</sup>	1.6 bar	160 kPa	100:1	450 bar	45 MPa
5	0	- 70 bar	0	- 7 MPa <sup>2)</sup>	0.7 bar	70 kPa	100:1	140 bar	14 MPa
6	0	- 25 bar	0	- 2.5 MPa <sup>2)</sup>	0.25 bar	25 kPa	100:1	50 bar	5 MPa
7	0	- 7 bar	0	- 0.7 MPa <sup>2)</sup>	0.07 bar	7 kPa	100:1	14 bar	1.4 MPa
8	-1	/ +7 bar	-100	/ +70 kPa <sup>2)</sup>	0.07 bar	7 kPa	114:1	14 bar	1.4 MPa
9	-1	/ +1.5 bar	-100	/ +150 kPa <sup>2)</sup>	0.12 bar	12 kPa	20:1	4 bar	400 kPa
10	0	- 2 bar	0	- 200 kPa <sup>2)</sup>	100 mbar	10 kPa	20:1	4 bar	400 kPa
11	0	- 1 bar	0	- 100 kPa <sup>2)</sup>	50 mbar	5 kPa	20:1	2 bar	200 kPa
12	-0.5	/ +0.5 bar	-50	/ +50 kPa <sup>2)</sup>	50 mbar	5 kPa	20:1	2 bar	200 kPa
13	0	- 0.25 bar	0	- 25 kPa <sup>2)</sup>	25 mbar	2.5 kPa	10:1	1 bar	100 kPa
14	-100	/ +100 mbar	-10	/ +10 kPa <sup>2)</sup>	20 mbar	2 kPa	10:1	1 bar	100 kPa
15	-15	/ +70 mbar	-1.5	/ +7 kPa <sup>1)2)</sup>	5 mbar	0.5 kPa	17:1	0.5 bar	50 kPa
16	-25	/ +25 mbar <sup>1)2)</sup>	-2.5	/ +2.5 kPa	2 mbar	0.2 kPa	25:1	1 bar	100 kPa
17	-7	/ +7 mbar <sup>1)2)</sup>	-0.7	/ +0.7 kPa	1 mbar	0.1 kPa	14:1	1 bar	100 kPa
18	0	- 1.3 bar abs	0	- 130 kPa abs	100 mbar abs	10 kPa abs	13:1	2 bar	200 kPa
19	0	- 7 bar abs	0	- 0.7 MPa abs	100 mbar abs	10 kPa abs	70:1	14 bar	1.4 MPa
20	0	- 25 bar abs	0	- 2.5 MPa abs	0.25 bar abs	25 kPa abs	100:1	50 bar	5 MPa
21	0	- 70 bar abs	0	- 7 MPa abs	0.7 bar abs	70 kPa abs	100:1	140 bar	14 MPa
22	0	- 300 bar abs	0	- 30 MPa abs	3 bar abs	300 kPa abs	100:1	450 bar	45 MPa

<sup>1)</sup> pressure transmitter not available with chemical seal

<sup>2)</sup> transmitter available only as ultra-stable (HS) version, not available with SIL2

<sup>3)</sup> overpressure limit may vary for the version according to PED standard

<sup>4)</sup> 0 – 700 bar for pressure transmitters with ½" NPT-M process connection

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### Metrological parameters

#### Accuracy

$\leq \pm 0.075\%$  of the calibrated range  
0.1 % for range no. 16  
special version  
 $\leq \pm 0.05\%$  of the calibrated range

#### Long-term stability

$\leq$  accuracy / 3 years (for nominal measuring range)  
or  
 $\leq 2x$  accuracy / 5 years (for nominal measuring range)  
ultra-stable (HS) version  
 $\leq$  accuracy for 6 years

#### Error due to supply voltage change

max.  $\pm 0.002\%$  (FSO) / 1 V

#### Thermal error

$\leq \pm 0.05\%$  (FSO) / 10 °C  
max.  $\pm 0.1\%$  (FSO) / 10 °C for ranges no. 13, 14, 16

#### Thermal error for the compensation range

max.  $\pm 0.25\%$  (FSO)  
max.  $\pm 0.4\%$  (FSO) for ranges no. 13, 14, 16

### Metrological parameters according to PED version

PTPi transmitters in the versions according to the pressure equipment directive PED can be manufactured with a pressure range from -1 / +400 bar vacuum and overpressure, 0 – 400 bar absolute pressure and an overload limit of PS = 440 bar.

#### Temperature limit:

for options according to H1 modules  
TS min./max.: -40 °C and +100 °C

### Process connections

- M-type connection with M20x1.5 thread  
⇒ figure 5a, available for PED version
- P-type connection with M20x1.5 thread  
⇒ figure 6a, available for PED version
- CM 30x2 plug with flush welded membrane  
⇒ figure 7a
- G connection with G 1/2" thread  
⇒ figure 8a, available for PED version
- GP connection with G 1/2" thread, available for PED version
- CG connection with G 1" thread flush welded membrane ⇒ figure 8e, available for PED version
- RM connection with M20x1.5 thread and cooling element
- RP connection with M20x1.5 thread and cooling element
- G connection with G 1/4" thread, available for PED version
- other connection types upon request



Limitation of the maximum measuring range up to 70 MPa for transmitters with 1/2" NPT-M connections for male threads 1/2" NPT.

The limitation does not apply to the female threads G 1/4".

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

### 4.3 PTDi – Pressure Ranges and Metrological Parameters

#### Pressure ranges

No.	Nominal measuring range (FSO)		Minimum set range		Turn-down	Max. overpressure	Max. static pressure
1	0 – 70 bar	0 – 7 MPa	7 bar	700 kPa	10:1	C-type: 250, 320, 420 bar (PS = 275 bar for PED version) (P-type: 40 bar)	
2	0 – 16 bar	0 – 1.6 MPa	0.16 bar	160 kPa	10:1		
3	0 – 2.5 bar	0 – 250 kPa	0.2 bar	20 kPa	12.5:1		
4	0 – 1 bar <sup>1)</sup>	0 – 100 kPa	50 mbar	5 kPa	20:1		
5	0 – 0.25 bar <sup>1)</sup>	0 – 25 kPa	10 mbar	1 kPa	25:1		
6	-0.5 / +0.5 bar <sup>1)</sup>	-50 / +50 kPa	0.1 bar	10 kPa	10:1		
7	-100 / +100 mbar <sup>1)</sup>	-10 / +10 kPa	10 mbar	1 kPa	20:1		
8	-5 / +70 mbar <sup>1)</sup>	-0.5 / +7 kPa	4 mbar	0.4 kPa	18:1		
9	-25 / +25 mbar <sup>1)</sup>	-2.5 / +2.5 kPa	2 mbar	0.2 kPa	25:1		
10	-7 / +7 mbar <sup>2)</sup>	-0.7 / +0.7 kPa	1 mbar	0.1 kPa	14:1	C-type: 200 bar; P-type: 40 bar 20 bar	

#### Permissible ambient conditions

Ambient temperature

-25 / +85 °C

(for PED version in accordance with metrological parameters according to PED version)

special version

-40 / +85 °C

Medium temperature

-25 / +120 °C

for direct measurement

(for PED version in accordance with metrological parameters according to PED version)

above 120 °C measurement with a transmission tube or chemical seal

Compensated temperature range

-25 / +80 °C

Relative humidity

max. 98 % with condensation

For pressure transmitters with chemical seals, the permissible temperature and corrosive properties depend on the type of chemical seal.

#### Metrological parameters

Accuracy

≤ ±0.075 % (FSO) of the calibrated range

≤ ±0.1 % (FSO) for range no. 10

special version

≤ ±0.05 % of the calibrated range

Long-term stability

≤ accuracy / 3 years

or

≤ 2x accuracy / 5 years

ultra-stable (HS) version

≤ accuracy for 6 years

Error due to supply voltage change

±0.002 % (FSO) / 1 V

Thermal error

≤ ±0.05 % (FSO) / 10 °C for ranges no. 1 – 9

≤ ±0.08 % (FSO) / 10 °C for range no. 10

≤ ±0.25 % (FSO) for the entire compensation range special version

≤ ±0.03 % (FSO) / 10 °C for ranges no. 1 – 9

≤ ±0.1 % (FSO) for the entire compensation range, ranges 1 – 9

Zero shift error for static pressure<sup>3)</sup>

±0.06 % (FSO) / 10 bar for ranges no. 1, 2

±0.01 % (FSO) / 10 bar for ranges no. 3, 4, 5, 6, 7, 9

±0.03 % (FSO) / 10 bar for range no. 8

±0.02 % (FSO) / 10 bar for range no. 10

±0.01 % (FSO) / 10 bar for ranges no. 2, 8

as ultra-stable (HS) version

Cutting-off the square root extracted characteristics up to 10 % of the flow

#### Metrological parameters according to PED version

PTDi transmitters in the versions according to the pressure equipment directive PED can be manufactured with a pressure range -1 / +250 bar, a max. static pressure of 250 bar and an overpressure of PS = 275 bar.

Temperature limit:

for options according to H1 modules

TS min. / max.: -25 °C and +100 °C

<sup>1)</sup> also available as ultra-stable (HS) version

<sup>2)</sup> only available as ultra-stable (HS) version

<sup>3)</sup> the error can be corrected by resetting the pressure transmitter under static pressure conditions

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### Process connections

PTDi connection type C for mounting with a manifold (fig. 9), available for PED version.  
PTDi with single direct chemical seal as in the example (fig. 11) or with other chemical seals according to chemical seal specification.

### 4.4 PTPi, PTDi – Environmental Parameters

#### Electromagnetic compatibility (EMC), stability criterion according to EN 61326-1,2

Electrostatic discharge (ESD):  
EN 61000-4-2  
level 3,  
±6 kV contact  
±8 kV air  
criterion A

Conducted radio frequency:  
EN 61000-4-6  
0.15...80 MHz, 10 V  
criterion A

Radiated electromagnetic field:  
EN 61000-4-3  
80...2000 MHz - 10 V / m  
...2700 MHz - 1 V / m  
criterion A

Electrical fast transient (burst):  
EN 61000-4-4  
±1 kV  
criterion A

Electrical slow transient (surge):  
EN 61000-4-5  
±1 kV  
criterion B

#### Electromagnetic compatibility, interference emission

criterion according to CISPR 16-1, CISPR 16-2,  
class B

Radiated emission:  
distance from the antenna: 3 m  
quasi-peak values:  
0.15...30 MHz, 80 – 52 dB $\mu$ V / m;  
30...2000 MHz, < 54 dB $\mu$ V / m  
Conducted emission:  
quasi-peak values:  
0.01...0.150 MHz, 96 – 50 dB $\mu$ V / m;  
0.150...0.350 MHz, 60 – 50 dB $\mu$ V / m;  
0.35...30 MHz, < 50 dB $\mu$ V / m

### Climatic immunity

Temperature:  
EN 60068-2-1, EN 60068-2-2  
hot: T = 55 °C, RH = max. 55 %  
cold: T = -25 °C

Damp heat cycle:  
EN 60068-2-30  
(T = 55 °C, RH = min. 95 %, 24 h) x 2

Salt mist:  
5 % NaCl, pH 6.5...7.2 at 20 °C  
T = 40 °C, RH = min. 93 %, 28 days

### Mechanical strength

Shocks:  
EN 60068-2-27  
50 g / 11 ms

Sinusoidal vibrations:  
EN 60068-2-6, test Fc  
up to 1.6 mm, 2...25 Hz  
up to 4 g for 25...100 Hz tun

### Insulation strength

550 V AC or 750 V DC, 1 min.  
Ex, marine  
75 V AC or 110 V DC, 1 min.  
normal, PED

### Degree of protection

DIN EN 60529  
IP66, 67

## 5. Construction

### 5.1 Measurement Principle, Structure of the Electronic System

The signal, which is proportional to the pressure, and the temperature of the measuring element are digitised and transmitted to the main module via an optoelectronic isolator. The main module calculates the exact pressure and temperature values from the measured values and indicates them on the LCD module. It also generates an analogue 4...20 mA current output signal as well as a digital signal according to HART standard, superimposed on the current signal. The electrical output is equipped with a noise filter and an overvoltage protection. Fig. 1 shows a block diagram of the pressure transmitter.



# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### 5.2 Pressure Transmitter Housing

The cases of PTPi, PTDi pressure transmitters are made of die-cast aluminum or stainless steel and consist of a body and two screw covers (display and electrical connection). One of them is equipped with a glass window. The case has two openings for the cable entries with thread M20x1.5 or ½" NPT (the unused opening is closed with blind plugs). The case consists of two chambers connected by an electrical bushing. The case is equipped with internal and external ground terminals.

### 5.3 Main Board with Display

The main board and the display are placed in a polycarbonate case. It is inserted into the larger of the two chambers. The display can be rotated 345° in 15° steps. In the second chamber is a connection board with protective devices and EMC filters.

### 5.4 Sensor Unit

The sensor unit contains a piezoresistive pressure sensor, which is connected to an analogue/digital transmitter via a glass feed-through. The sensor is separated from the medium by a membrane. The pressure is transferred to the sensor via a filling liquid. The sensor units have a process connection as shown in fig. 5a, 6a and 7a. The differential pressure sensor units have two process connections type P or C as shown in fig. 9.

### 5.5 Chemical Seal

For the pressure measurement of viscous, chemically reactive or hot process media, the transmitter can additionally be equipped with various types of chemical seals.

The chemical seal transmits the process pressure via an internal liquid filling between the membrane of the chemical seal and the membrane of the pressure transmitter. Chemical seals can also be connected to the process spatially separated from the measuring instrument. The pressure is then transmitted via capillary line.

## 6. Place of Installation

### 6.1 General Recommendations

The intelligent pressure and differential pressure transmitters can be installed both indoors and outdoors. We recommend mounting pressure transmitters for outdoor use in an additional housing or under a cover.

The place of installation should be selected to allow access to the device and to protect it against mechanical damage. When planning the installation of the pressure transmitters and configuring the impulse lines, the following requirements have to be met:

- The impulse lines should be as short as possible, with a sufficiently large cross-section and free of sharp bends to avoid clogging;
- If the medium is a gas, the pressure transmitters should be installed above the process opening so that condensate flows down towards the process. If the medium is a liquid or if a separating liquid is used, the pressure transmitters should be installed below the process opening where the pressure measurement is carried out.
- The impulse lines should be inclined at least 10 cm / m;
- The levels of the filling fluid in the impulse lines should be the same the difference should be kept constant.
- The impulse lines and the valve connection system should be designed with regard to the measuring conditions and requirements, such as accessibility to the transmitter or points for sampling or flushing.



**If there is a risk that the pressure transmitter may be damaged by external mechanical influences (in extreme cases, this may result in the transmitter being disconnected from the connecting lines, allowing leakage of the medium), appropriate protective measures should be taken for safety reasons and to avoid damage, including flying sparks. If the transmitter cannot be protected properly, an alternative installation location should be sought.**

Please also regard possible installation errors, which can lead to measuring errors, e.g. non-tight connections, sediment clogging in lines that are too small, gas bubbles in a liquid line or liquid column in a gas line.

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### 6.2 Low Ambient Temperature



Suitable measures here can be, for example, the use of a separating liquid mixed with an antifreeze agent or thermal insulation of the exposed parts. At very low temperatures, a heating for these parts should be considered.

This is particularly important for outdoor installations. Protection is achieved by filling the impulse lines with a mixture of ethylene glycol and water or another liquid whose solidification point does not exceed the ambient temperature. The thermal insulation can protect the housing and the lines of the transmitter from temporary low temperatures only. If the temperatures are very low, the transmitter and impulse lines should be heated.

### 6.3 High Medium Temperature

With the PTPi, PTDi transmitters, media with temperatures up to 120 °C can be measured (PED version ⇒ chapter 4 "Technical Data").

To protect the sensor module from temperatures higher than 120 °C, long impulse lines are used to dissipate the heat and reduce the temperature of the sensor module.

If it is not possible to use impulse lines with the required length, the transmitters PTPi, PTDi should be used with chemical seals.

### 6.4 Electrostatic Hazards

Paint on the housing, plastic nameplates and Teflon on the chemical seal are non-conductive layers on conductive surfaces. Pressure transmitters with these surfaces should not be installed in areas with dust explosion risks, but in areas without the possibility of electrostatic charging, especially through contact with electrically conductive dust.

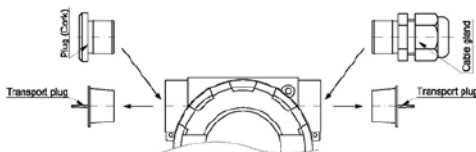
### 6.5 Mechanical Vibrations / Shocks, Corrosive Media

The pressure transmitters should work properly with vibration amplitudes up to 1.6 mm and accelerations up to 4 g. If strong vibrations are transmitted via the pressure line and disturb the measurement, elastic impulse lines or transmitters with a chemical seal and capillary line should be used.



The pressure transmitters should not be installed in places where the membrane, made of stainless steel 316L (1.4404/1.4435), would be exposed to the risk of corrosion due to the medium. If possible, use transmitters with membranes made of Hastelloy C276 or use other protective means (e.g. by using a separating liquid or transmitters with chemical seal for the measurement of aggressive media).

## 7. Installation and Mechanical Connections



Pressure transmitters with 1/2" NPT thread can be supplied with mounted transport plugs instead of plug and screwed cable gland.

In this case, remove the transport plugs and install the corresponding cable gland and plug before installing the transmitter.

The PTPi, PTDi pressure transmitters can be operated in any position.



When mounting on an object with a high-temperature medium, it is recommended to install the transmitter in a horizontal or downwards position so that the transmitter is kept away from the rising hot air.

For the small pressure ranges, the measured value can be influenced by the transmitter position, by the configuration of the impulse lines or by the way they are filled with liquid. This error can be corrected using the zero-setting function.

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

### 7.1 PTPI Installation and Connections

The PTPI transmitters can be mounted directly on rigid impulse lines.

For the various process connections with thread spigot, suitable screw holes must be used (⇒ fig. 5a to 8e and DIN EN 837-1).

Suitable adapters are also available for process connections for hygienic applications (e.g. clamps).

Sealings are available for every pressure transmitter with connection types P, CM30x2, CG1, CG½ and GP. The sealing material is selected on the basis of pressure, temperature and type of medium.

Screw the pressure transmitters with a torque suitable for the seal type and the measured pressure.

Using gauge holder brackets, the PTPI pressure transmitter can be installed on walls or on horizontal or vertical pipes.

### 7.2 PTDi Installation and Connections

The PTDi transmitters can be mounted directly on rigid impulse lines.

To install the basic version of the pressure transmitter, two M20x1.5 connections (P-type connection) are necessary, e.g. straight C-type connecting elements with nuts. If elastic impulse lines are used, the pressure transmitter should be additionally fastened to a pipe, panel or supporting construction.

The PTDi can be installed on a Ø 25 mm pipe using a Ø 25 mm fastener or on a flat surface using an angle bracket (⇒ fig. 11).



**The device must not be pressurised until it has been ensured that the pressure range and the seals of the device are suitable for the process pressure, that the seals are installed correctly and that the process connections are tightened properly.**

**Attempts to loosen the screws or to fasten the connecting tubes to a transmitter under pressure may cause the medium to leak and cause hazards for the personnel.**

**When disassembling the pressure transmitter, it is necessary to separate it from the process pressure or to reduce the pressure to atmospheric level and to take particular care and precautions with media that are highly reactive, corrosive, explosive or in any other way dangerous for the personnel.**

**If necessary, rinse this part of the system.**



Pressure transmitters with flange-type chemical seal have to be installed on the corresponding counter flanges of the system.

It is recommended that the user adapts the material of the fittings to the pressure, temperature, flange material and seal to ensure tightness of the flange connection in the expected operating conditions.

For the flanges in the transmitters PTPI, PTDi, please use screws according to ISO 261.

## 8. Electrical Connection

### 8.1 General Recommendations

We recommend using twisted pair cabling for the signal lines. If pressure transmitter and signal cable are exposed to strong electromagnetic interference, shielded twisted pair cables should be used. The signal lines must not run next to power supply cables or near large electrical consumers.

The devices used together with the pressure transmitters should be resistant to electromagnetic interference from the transmission line in accordance with the compatibility requirements. It is also advantageous to use noise filters on the primary side of the transformers, the power supplies for the transmitters and devices used in conjunction with them.



Moisture or rising dampness within the pressure transmitter can cause damage.

Cable glands must be installed in such a way that the degree of protection IP66 is maintained. Avoid water running in the direction of the cable entry.

### 8.2 Electrical Connections for PTPI, PTDi



The PTPI, PTDi transmitters must be connected as shown in fig. 2a – 2d. In PTPI, PTDi transmitters, a 240 Ω resistor is permanently fitted in series in the transmitter's circuit and short-circuited with a jumper between <SIGNAL-> and <TEST-> as shown in fig. 2a and 2b. If the resistance in the current loop is smaller than 240 Ω, the jumper must be disassembled to enable HART communication.

### 8.3 Overvoltage Protection

The pressure transmitters can be damaged due to overvoltages caused by connection errors or atmospheric electrical discharge.

Protection against overvoltage between the wires of the transmission line is provided by TVS diodes, which are installed in all pressure transmitter types (⇒ table, column 2).

1	2
Type of pressure transmitter	Protection between wires (TVS diodes) nominal voltage
PTPI, PTDi	68 V DC

### 8.4 Earthing

The transmitters are equipped with internal and external ground terminals.

## 9. Settings and Regulation

PTPI, PTDi pressure transmitters are factory calibrated to the range specified in the order or to the basic range. After installation, the transmitter's zero point may shift and require adjustment.

This applies especially in cases where the measuring range is small, the impulse lines are filled with a separating liquid or when PTPI, PTDi transmitters are used with chemical seals and capillary line.

### 9.1 Set Range, Nominal Measuring Range, Definitions

The maximum pressure or differential pressure range, which can be measured by the pressure transmitter, is called "nominal measuring range" (⇒ chapter 4 "Technical Data" specification of the pressure ranges).

The span of the nominal measuring range is the difference between upper and lower limits of the nominal measuring range.

The internal characteristic conversion curve for the nominal measuring range is saved in the memory of the pressure transmitter. This is the reference curve used when making any adjustments that affect the output signal of the pressure transmitter.

When the transmitter is used, the term "set range" is used. The set range is the range, whose lower endpoint corresponds to an output current of 4 mA and whose upper endpoint corresponds to a current of 20 mA (or 20 mA and 4 mA with inverted conversion curve).

The set range can cover the entire nominal measuring range or only a part of it.

The width of the set range is the difference between its upper and lower endpoint.

Within the nominal measuring range of the pressure values, the pressure transmitter can be set to any measuring range, subject to the limitations listed in the table in chapter 4.

### 9.2 Configuration and Calibration

The pressure transmitter has functions for setting and changing metrological and identification parameters. The configurable metrological parameters that affect the output current of the transmitter include:

- unit in which the measured pressure is expressed on the display
- upper endpoint of the set range
- lower endpoint of the set range
- time constant
- type of characteristic curve: linear or square root extracted

Parameters of an informational nature, which cannot be changed, are:

- upper limit of the nominal measuring range
- lower limit of the nominal measuring range
- smallest adjustable range (minimum range)

Other identification parameters that do not affect the output signal are: device address, device type code, factory identification code, factory device code, number of preambles (3 – 20), UCS, TSD, program version, electronics version, flags, serial number, label tag, description tag, date tag, message, record number, sensor module number.

It is possible to carry out a “zeroing procedure”, e.g. to compensate for the measurement deviation caused by a position change during the device installation. The pressure transmitter can also be calibrated by measuring the input pressure with a standard device. These process and zero point adjustments are called “calibration”.

The pressure transmitters are configured and calibrated using a factory-owned communicator, HART communicators or a PC with HART / RS-232 interface and an own configuration software.

Together with the configuration software, an “INTERVAL LINEARISATION” software is supplied to enable the input of a non-linear characteristic curve with 21 data points to the pressure transmitter.

### Transmitter configuration using the buttons on the device and the local menu

Local menu structure. Local configuration of the pressure transmitters.

When the local configuration option is enabled, the operator can change the pressure transmitter settings using the buttons below the display. These buttons can be accessed after opening the display cover. Then, you can also change the display position (⇒ fig. 4).

When the local configuration option is enabled, the operator can change the pressure transmitter settings using the buttons below the display.

To enter changes in the local setting mode, press and hold one of the buttons for about 4 seconds. If the message ERR\_L16 is displayed after pressing the button, the local configuration of the pressure transmitter is disabled.

The HART communicator or a PC must be used for switching on (⇒ HART command 132, 133).

The buttons are marked with the following symbols:

[↑] [↓] [■]

After pressing any of the buttons for 4 seconds, the menu item: “EXIT” appears in the display.

If you confirm this message by pressing and holding the button [■] for 1 sec, you exit the menu “Setting”. You can navigate in the menu as follows.

Press the button [↑] to scroll up.

Press the button [↓] to scroll down.

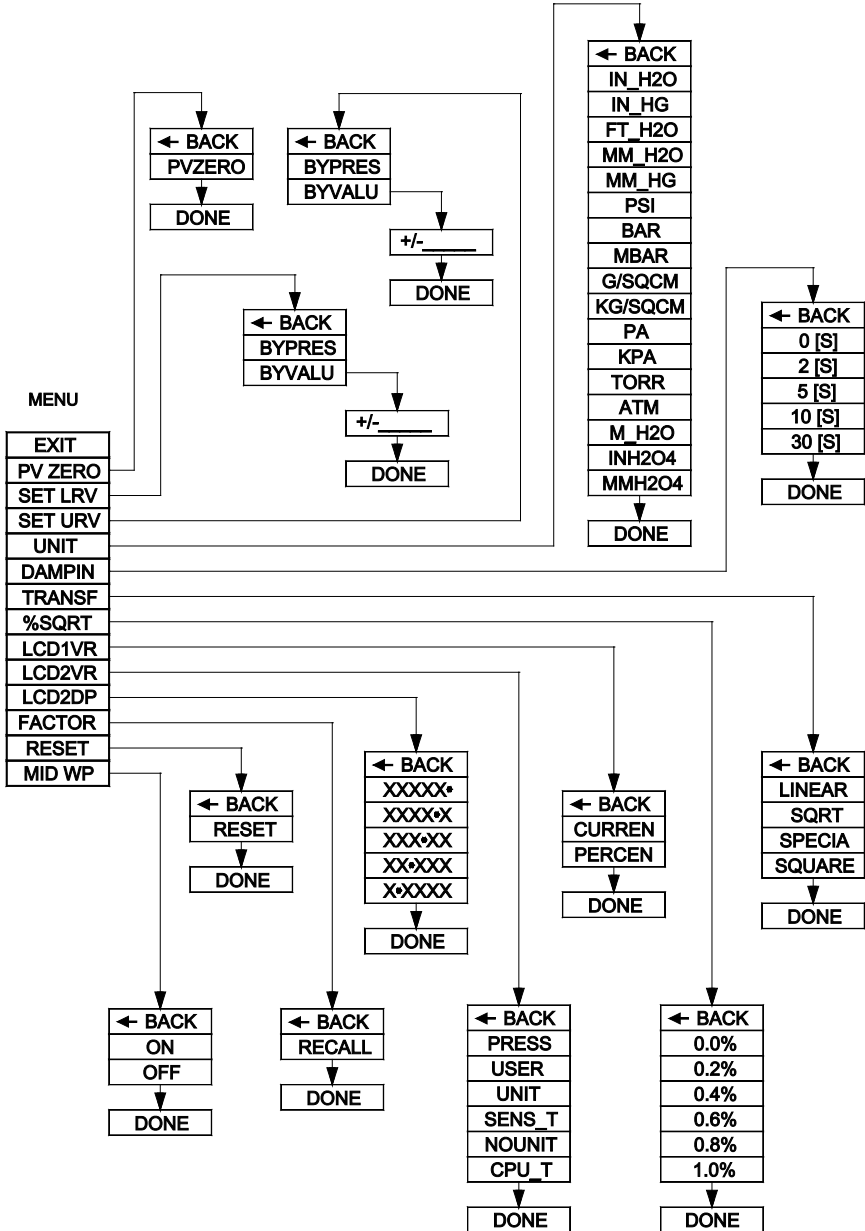
Press the button [■] to confirm the selection and to make changes.

If you do not perform any operation in the menu for more than 2 minutes, the menu is automatically exited and the display returns to the indication of the process variable.

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

The menu structure of the PTPi and PTDi is shown below:



The selected unit should be confirmed by pressing the button [□].

After confirming the parameter, the pressure transmitter confirms acceptance of the command with the message "DONE" or reports the error number. With the command "← BACK", you enter to the higher menu level.

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

### Descriptions:

Local Menu	Submenu	Information
<b>EXIT</b>		return from the local menu to normal operation of the pressure transmitter
<b>PVZERO</b>		pressure zero adjustment
<b>SETLRV</b>	<i>BYPRES</i>	set the lower measuring value (no change of the measuring range)
	<i>BYVALU</i>	set by the pre-set pressure
	<i>+/- _____</i>	set by entering a number; the current value is indicated and you enter the editing mode
<b>SETURV</b>		select and confirm the sign of the value to be entered. Select, one digit after the other, a 5-digit number with or without decimal point; after confirming the last digit, the device confirms the acceptance of the entry with the message "DONE" or reports an error number; the unit of the value is selected in "UNIT"
<b>SETURV</b>		set the upper measuring value (change of the measuring range)
<b>UNIT</b>		menu process variable units
	<i>IN_H2O</i>	inch of water at a temperature of 20 °C (68 °F)
	<i>IN_HG</i>	inch of mercury at a temperature of 20 °C (68 °F)
	<i>FT_H2O</i>	foot of water at a temperature of 20 °C (68 °F)
	<i>MM_H2O</i>	mm of water at a temperature of 20 °C (68 °F)
	<i>MM_HG</i>	mm of mercury at a temperature of 0 °C (32 °F)
	<i>MBAR</i>	millibar
	<i>G/SQCM</i>	gram per square centimetre
	<i>KG/SQCM</i>	kilogram per square centimetre, technical atmosphere
	<i>KPA</i>	kilopascal
	<i>TORR</i>	torr (mmHg)
	<i>ATM</i>	physical atmosphere
	<i>M_H2O</i>	meter of water at a temperature of 4 °C (39.2 °F)
<i>MPA</i>	megapascal	
<i>INH2O4</i>	inch of water at a temperature of 4 °C (39.2 °F)	
<i>MMH2O4</i>	mm of water at a temperature of 4 °C (39.2 °F)	
<b>DAMPIN</b>		set the damping
<b>TRANSF</b>		set the type of output current characteristic
	<i>LINEAR</i>	linear
	<i>SQRT</i>	square root extracted
	<i>SPECIA</i>	user-specific
<b>% SQRT</b>	<i>SQUARE</i>	square
<b>LCD 1 VR</b>		square root extracted characteristic with setting of the switch-off point
		assign a process variable indicated on LCD 1
<b>LCD 2 VR</b>	<i>CURREN</i>	LCD 1 indicates the current (in mA) in the current loop
	<i>PERCEN</i>	LCD 1 indicates the percentage value of the output signal – in %
		assign a process variable indicated on LCD 2
	<i>PRESS</i>	LCD 2 indicates the pressure value
<b>LCD 2 DP</b>	<i>USER</i>	LCD 2 indicates the units of the user; the scaling of the user range and record of the user units can be carried out using a computer or communicator, see →HART command no. 244.245
	<i>SENS_T</i>	LCD 2 indicates the current temperature of the pressure sensor
	<i>CPU_T</i>	LCD 2 indicates the current temperature of the transmitter CPU – in °C
<b>FACTOR</b>		set the position of the decimal point on LCD 2; if the value to be displayed on LCD 2 cannot be indicated properly due to the position of the decimal point, it is indicated by four flashing dots ••••; in this case, enter the local menu setting and move the decimal point to the right
<b>RESET</b>		reset to factory settings (please note: current and pressure calibration will be deleted)
<b>MID_WP</b>		reboot of the pressure transmitter
		lock the recording / change of parameters related to the transmitter metrology
	<i>ON</i>	activation of the lock
	<i>OFF</i>	deactivation of the lock

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### Local menu, reporting errors

When executing some functions in the local menu, a message may appear on the LCD 2 screen. The error message indicates that a command in the local menu has not been executed.

A brief description of the messages is given below:

#### ERR\_L07

[in\_write\_protected\_mode] This error occurs when an attempt is made to change the settings in the local menu and the transmitter is protected.

To properly change the settings using the local menu, in the pressure transmitter the support for the local menu has to be enabled and the write protection has to be disabled. These parameters can be changed using the HART communicator or the PC configuration software.

Default setting:

- local menu support enabled
- write protection disabled

#### ERR\_L09

[applied\_process\_too\_high] This error occurs when certain parameters (pressure) are too high. Zero adjustment or a check of the settings is necessary.

#### ERR\_L10

[applied\_process\_too\_low] This error occurs when certain parameters (pressure) are too low. Zero adjustment or a check of the settings is necessary.

#### ERR\_L14

[span\_too\_small] This error occurs when the measuring range is smaller than permissible due to a change of the set range.

#### ERR\_L16

[access\_restricted] This error occurs when the local menu of the pressure transmitter is disabled and the user tries to access the local menu support. Please enable the local menu via HART communicator or PC configuration software.

Warning! ERR\_L16 can also occur when trying to zero the absolute pressure transmitter.

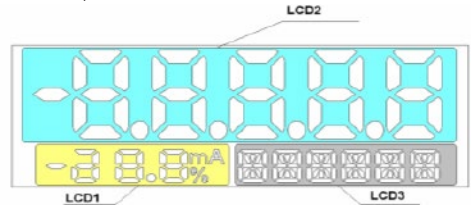
#### WNG\_L 14

[WARNING! New Lower Range Value Pushed!] This error occurs when the change of the set upper range value (URV) will cause a change of the set lower range value (LRV).

### Local LC display

Changes of the indication options in the local menu can be made with the buttons, the HART communicator or the PC software. If required, it is also possible to switch off the indication. The function "Display off" is only available with the HART communicator or PC software.

The PTPi, PTDi transmitter indication:



There, 3 main indications are visible:

#### LCD 1

The current or percentage indication of the pre-set range. According to the indication configuration, the current value in 4...20 mA current loop or the percentage value of the output signal will be displayed.

#### LCD 2

Field for indicating the digital value measured by the pressure sensor, re-scaling the values according to process variable unit or user unit, as well as sensor temperature (medium), CPU temperature (ambient), menu messages and other alarm and information messages. When displaying the digital pressure value and the scaled pressure value, the indication can be preceded by a "-" sign. The position of the decimal point can be set in the local menu, via HART communicator or PC configuration software. The PTPi, PTDi transmitters allow the re-scaling of the pressure values to user specific units. Enter those values into the PC software that correspond to the beginning and the end of the set range and select the name of the unit. After activating the user mode, the scaled value is indicated in the display.

#### LCD 3

Information field. During standard operation, it is intended for continuous indication of the pressure transmitter's basic unit or of the user unit. If errors occur during operation of the pressure transmitter, here also the error number is displayed. In the local menu operation mode it indicates the setting selection options. It is also used to indicate errors related to the execution of commands in the local change of settings menu.



# Operating Instructions

## Process Pressure Transmitters PTPI and PTDI

The local display is equipped with a background lighting. Figure 4 shows how to change the display position by rotation.



**Warning! Exceeding the nominal measuring range of the pressure transmitter by 50 % upwards or downwards is indicated by "o u E r" or "u n d E r" in LCD 2. Such a situation most often occurs when a differential pressure transmitter is overloaded, when a blockage or leakage in one of the capillaries is caused by the static pressure, which is large compared to the pressure range.**



**After configuration it is important to protect the transmitters with the HART command [247]. During operation, the pressure transmitter should be protected against changes. This prevents accidental or intentional changes to the configuration data. The protection function can be accessed via HART communicator or PC configuration software, as well as by using the DD or DMT program libraries.**

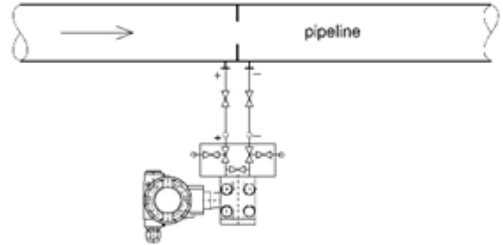
### Remote configuration

Remote configuration is possible via HART communicator or PC configuration software. The measuring circuit should comply with fig. 2.

### Configuration of the PTDI pressure transmitter for flow measurement with an orifice plate

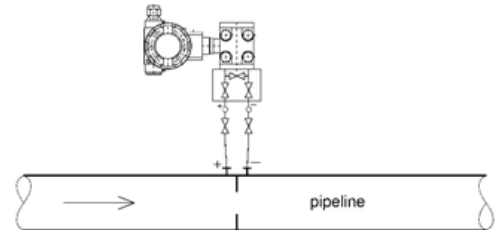
It is important to position the transmitter properly, depending on the type of medium to be measured, otherwise this may have negative effects on the measurement.

Mounting diagram for liquid and vapour flow:



The pressure transmitter should be located below the pipeline. This prevents the formation of air bubbles in the connecting line.

Mounting diagram for gas flow:



The pressure transmitter should be located above the pipeline. This allows condensate to flow into the pipeline.

Function describing the relationship between mass flow and pressure difference:

$$Q_m = \sqrt{2\rho\Delta p}$$

Function describing the relationship between volume flow and pressure difference:

$$Q_v = \sqrt{\frac{2\Delta p}{\rho}}$$

$\rho$  – density of the medium  
 $\Delta p$  – differential pressure

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

Orifice flow meters are based on the square root output signal of the differential pressure transmitters.

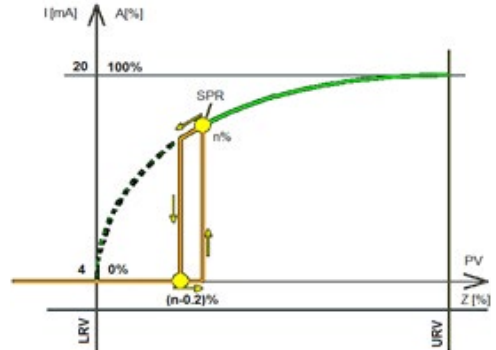
For flow measurement, you should:

- install the PTDi pressure transmitter on the flow measurement station with orifice plate;
- zero the transmitter at the installation location; either via HART communicator or PC configuration software, or with the local keypad;
- set the square root output signal and the decimal point [in % FS]; either via HART communicator or PC configuration software, or with the local keypad (only up to 1 %).

For pressure transmitters with software version 1.9 or higher, the switch-off point setting means that with a pressure increase from 0 to the set switch-off point (n % FS), the output signal is zero (4 mA). From the set switch-off point, the output characteristics for the analogue output and the linear characteristics for the HART digital output are changed. If the pressure drops below the n % minus 0.2 % (hysteresis) point, the elementary characteristic of the processing is switched to zero. As an example, the switch-off algorithm of the analogue output signal is shown in the following figure.

Description:

I [mA]	analogue output signal; loop current [4...20 mA] or A [%]
n %	switch-off point at the square root output transmitter signal
PV or Z [%]	axis of the process variable in the user unit or in percentage of the set range
LRV	lower range value; the lower value of the set pressure range (corresponds to the 4 mA current output signal)
URV	upper range value; the upper value of the set pressure range (corresponds to the 20 mA current output signal)



PTDi pressure transmitter analogue output signal with set switch-off point in n %

### Example device configuration:

Transmitter configuration parameters

- nominal measuring range 0...100 kPa
- set measuring range 0...50 kPa
- switch-off point 5 % of the set range

Assemble the measuring system according to figure 2 and run the PC software:

- Set the zero point of the transmitter
  - tab page: Basic Commands → Zeroing
- Set the width of the transmitter to 0...50 kPa
  - tab page: Common Parameters → Lower Range Value and Upper Range Value
- Set the square root output signal of the transmitter
  - tab page: Common Parameters → Transfer Function
- Enter 5 in the field Parameter Inflection Point
  - tab page: Common Parameters → Start point rad
- Save the data in the pressure transmitter (button: Write Parameters)

The switch-off point function will be executed at 5 % of the set range when the pressure increases or at 4.8 % of the set range when the pressure decreases.

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

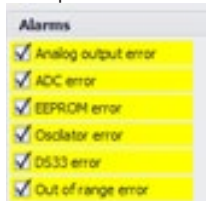
### 9.3 Alarms

The alarms indicate if operating parameters of the pressure transmitter (maximum temperature, pressure) are exceeded and if any electronic components have failures.

You can view the diagnostic checklist of the alerts with the PC software after reading the transmitter parameters. In this way, the values of the alarm current in the current loop can also be set to <3.7 (low) or >21.5 mA (high).

Due to extensive diagnostic measures, the alarms have been grouped by type to simplify the user interface. The user can decide which type of alarm triggers the alarm current in the current loop. We recommend to operate the transmitter with the alarm current function enabled.

Example:



The user can also set the limits of the alarm signaling: > 21.5 mA (high alarm) or < 3.7 mA (low alarm).

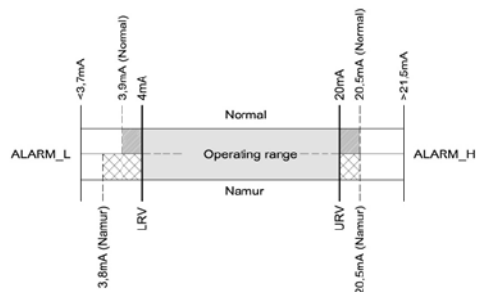
Example:



Exceeding the nominal pressure by more than 50 % is signalled in the display with OVER "ouEr" or UNDER "undEr".

The pressure transmitters PTPI generate a process variable analogue signal in the range  $\geq 3.8 - 3.9 \text{ mA} \dots \leq 20.5 \text{ mA}$ . Depending on the setting, this signal can be proportional or inversely proportional to the measured pressure or pressure difference. This current is read by a logic controller connected to the current loop line, which monitors whether the signal supplied is present:

- within the pressure or differential pressure range between lower range value (LRV) and upper range value (URV)
  - range ( $\geq 4.0 \text{ mA} \dots \leq 20.0 \text{ mA}$ ) with simple characteristics (4...20 mA)
  - range ( $\leq 20.0 \text{ mA} \dots \geq 4.0 \text{ mA}$ ) with inverse characteristic (20...4 mA)
- within the pressure or differential pressure range below the lower range value (LRV)
  - range ( $\geq 3.9 \text{ mA} \dots < 4.0 \text{ mA}$ ) for normal mode with simple characteristics (4...20 mA)
  - range ( $\geq 3.8 \text{ mA} \dots < 4.0 \text{ mA}$ ) for Namur mode with simple characteristics (4...20 mA)
  - or
  - range  $> 20.0 \text{ mA} \dots \leq 20.5 \text{ mA}$  for normal mode with inverse characteristic (20...4 mA)
  - range  $> 20.0 \text{ mA} \dots \leq 20.5 \text{ mA}$  for Namur mode with inverse characteristic (20...4 mA)
- within the pressure or differential pressure range above the upper range value (URV)
  - range ( $> 20.0 \text{ mA} \dots \leq 20.5 \text{ mA}$ ) for normal mode with simple characteristics (4...20 mA)
  - range ( $> 20.0 \text{ mA} \dots \leq 20.5 \text{ mA}$ ) for Namur mode with simple characteristics (4...20 mA)
  - or
  - range ( $\geq 3.9 \text{ mA} \dots < 4.0 \text{ mA}$ ) for normal mode with inverse characteristic (20...4 mA)
  - range ( $\geq 3.8 \text{ mA} \dots < 4.0 \text{ mA}$ ) for Namur mode with inverse characteristic (20...4 mA)
  - or
  - range ( $< 3.7 \text{ mA}$ ) for alarm signal type "L"
  - range ( $> 21.5 \text{ mA}$ ) for alarm signal type "H"



# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### 10. Maintenance / Cleaning, Storage and Transport



#### **CAUTION! Material damage and loss of warranty!**

Any modifications or interventions in the device, made by the customer, might damage important parts or components. Such intervention leads to the loss of any warranty and manufacturer's responsibility!

→ Never modify the device or perform any repairs yourself.

#### **Maintenance:**

Regular inspections should be carried out in accordance with the regulations applicable to the user. During the inspection, the pressure connections should be checked for loose connections and leakages, the electrical connections should be checked for tightness and condition of the seals, the cable glands and the chemical seal should be checked for tarnishing and corrosion.

#### **Further Inspections:**

If the pressure transmitters are installed in a location where they may be exposed to mechanical damage, overpressure, hydraulic impulses or overvoltage, or where the membrane might be endangered by sedimentation, crystallisation or erosion, inspections should be carried out as required.

If you notice that a signal in the transmission line is missing or its value is incorrect, the line and its connecting terminals should be checked.

Check whether the values for supply voltage and load resistance are correct.

If the line is working properly, check the function of the pressure transmitter.

#### **Cleaning:**

- Clean the device with a dry or slightly dampened soft cloth.
- Do not use any sharp objects or aggressive agents for cleaning.



**CAUTION! Never use sharp or hard objects or ultrasonic baths when cleaning the pressure connection, as these destroy the sensor!**

#### **Spare parts:**

Parts of the pressure transmitters that may be subject to wear or damage and need to be replaced: sealing of the cover.

#### **Storage and transport:**



**Pressure transmitters are sensitive sensors and have to be handled with due care.**

- Use the original packaging or comparable packaging for storage/for transport. Especially the protection cap should not be removed from the process connection and the plug connector until the installation of the device.
- Avoid impacts or strong vibrations.
- Protect the device against damage caused by external influences.
- During storage, the specified temperature limits must not be exceeded.

### 11. Dismounting and Disposal



#### **WARNING! Risk of injury!**

Never remove the device from a system in operation.

Make sure that the system is switched off professionally.

#### **Before dismounting:**

Check before dismounting, whether the system

- is switched off,
- is in a safe and currentless state,
- is unpressurised and cooled down.

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### Dismounting:

- Pay attention to potentially leaking media. Take appropriate precautions to collect them.
- Please clean the process connection before attaching the protection cap.
- In case of contamination of the transmitter with physiologically, chemically or ecologically harmful substances, please mark this before return or storage and choose a suitable packaging.

### Disposal:

In compliance with the directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE), the device must be disposed of separately as electrical and electronic waste. Please regard legal regulations of the country of distribution.



### **NO DOMESTIC WASTE!**

The device comprises various materials. It shall not be disposed of together with domestic waste.

- Bring the device to your local recycling plant

or

- send the device back to your supplier or to the ARMANO Messtechnik GmbH.

## 12. CE Conformity

**CE** The CE marking of the instruments certifies the conformity with prevailing EU directives for placing products on the market within the European Union. The following directives apply:

EN 61326-1:2013 (EMC) and  
2014/68/EU (PED)

The corresponding declaration of conformity is enclosed or available upon request.

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

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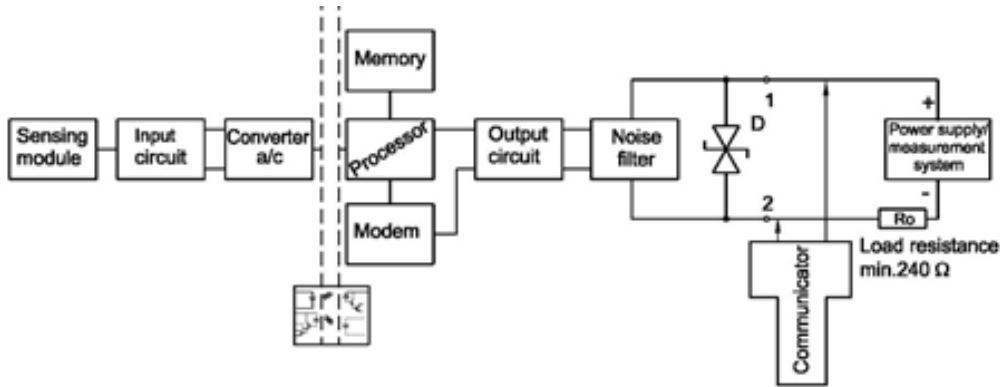


Fig. 1 block diagram – PTPI, PTDi pressure transmitters

#### Electrical connections of the communicator to the transmitter measuring lines

For successful communication with the pressure transmitter, the resistance in the measuring circuit, behind the connected device for communication, should be higher than 240 Ω. If necessary, activate the additional resistance (in the pressure transmitter) in the line. The connecting paths of the communicator to the measuring circuit are shown in diagrams. When increasing the resistance in the current loop, make sure that the maximum load resistance is not exceeded (⇒ chapter 4 "Technical Data").

#### Connection of the PTPI, PTDi pressure transmitters

Make the connection as shown in figure 2a. If it is necessary to enable (remote) communication with the pressure transmitter, a communicator can also be connected.

Optional connection configurations to communication devices are shown in the following figures.

#### Communicator connection to a control cabinet

To ensure remote communication with a communicator, it is necessary to ensure that the resistance  $R_o$  between the communicator and the power supply is in the range between 240 and 1100 Ω.

# Operating Instructions

## Process Pressure Transmitters PTPI and PTDi

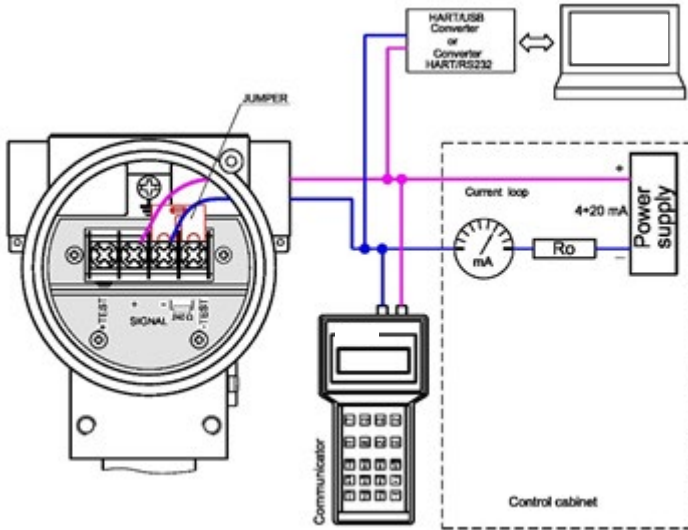
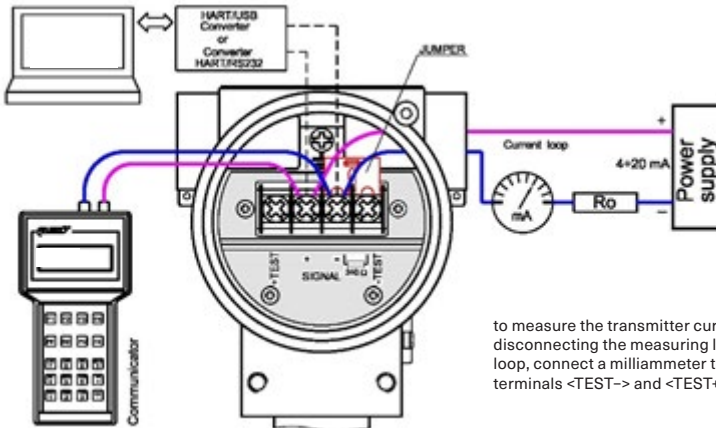


Fig. 2 electrical connections for PTPI, PTDi pressure transmitters

Fig. 2a the connection of the pressure transmitter and communicator to the control cabinet for power supply (if the resistance in the current loop is higher than  $240 \Omega$ )

### Communicator connection to the pressure transmitter terminals

To ensure local communication by connecting a communicator to the transmitter terminals, it is necessary to ensure that the resistance  $R_o$  between the transmitter terminals and the power supply is in the range between 240 and  $1100 \Omega$ . If so, connect the communicator to the terminals <-> <->, as shown in figure 2b.



to measure the transmitter current without disconnecting the measuring loop / current loop, connect a milliammeter to the control terminals <TEST-> and <TEST+>

Fig. 2b the connection of the pressure transmitter and communicator to the <SIGNAL+><SIGNAL-> transmitter terminals if the resistance in the current loop is higher than  $240 \Omega$

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

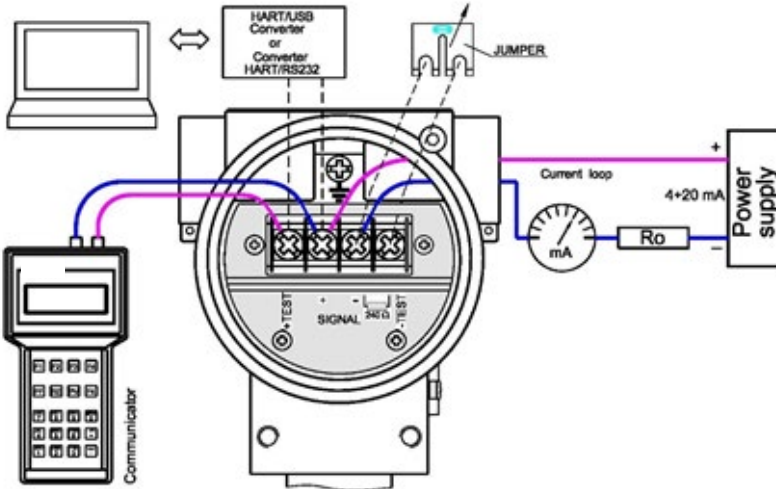


Fig. 2c the connection of the pressure transmitter and communicator to the <SIGNAL+><TEST+> transmitter terminals if the resistance in the current loop is smaller than  $240\ \Omega$

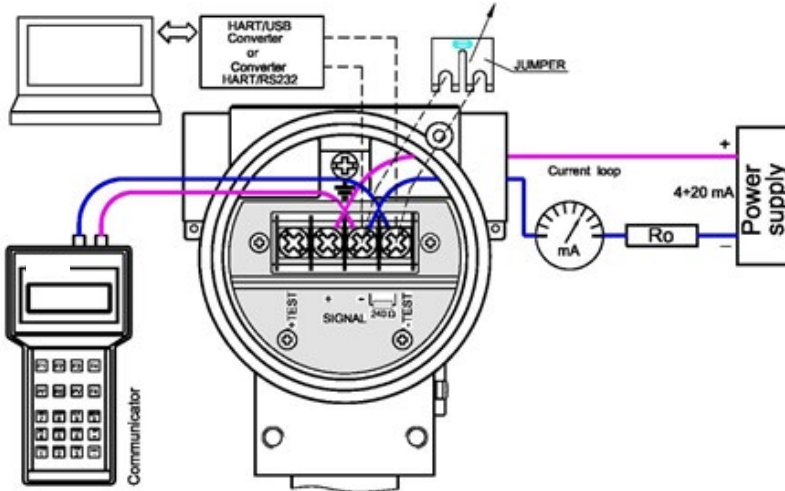


Fig. 2d the connection of the pressure transmitter and communicator to the <SIGNAL+><SIGNAL-> transmitter terminals if the resistance in the current loop is smaller than  $240\ \Omega$

If  $R_o$  in the current loop is smaller than  $240\ \Omega$ , you have to connect the  $240\ \Omega$  resistor with the current loop by removing the jumper from the terminals <SIGNAL-> and <TEST->. After completion of the local communication activities, the terminals <SIGNAL-> and <TEST-> must be closed again by installing the factory-fitted jumper.



# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

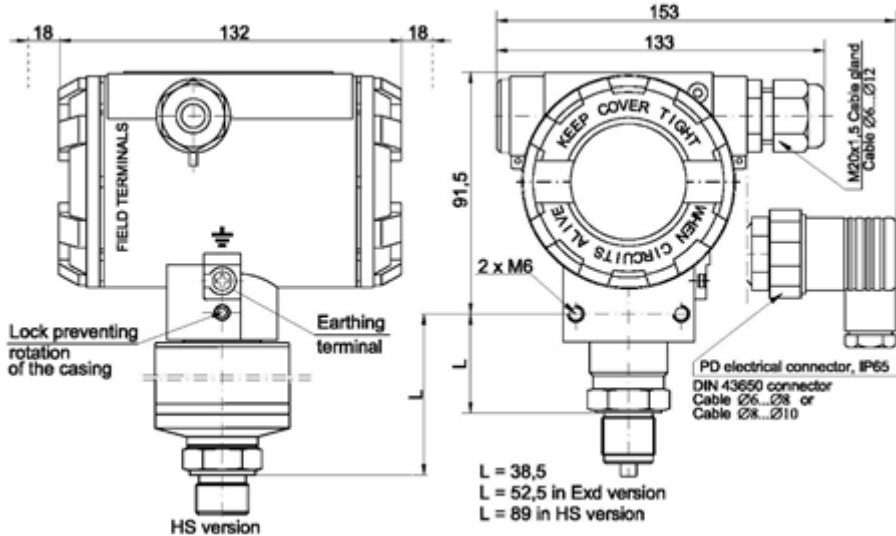


Fig. 3 PTPi pressure transmitter

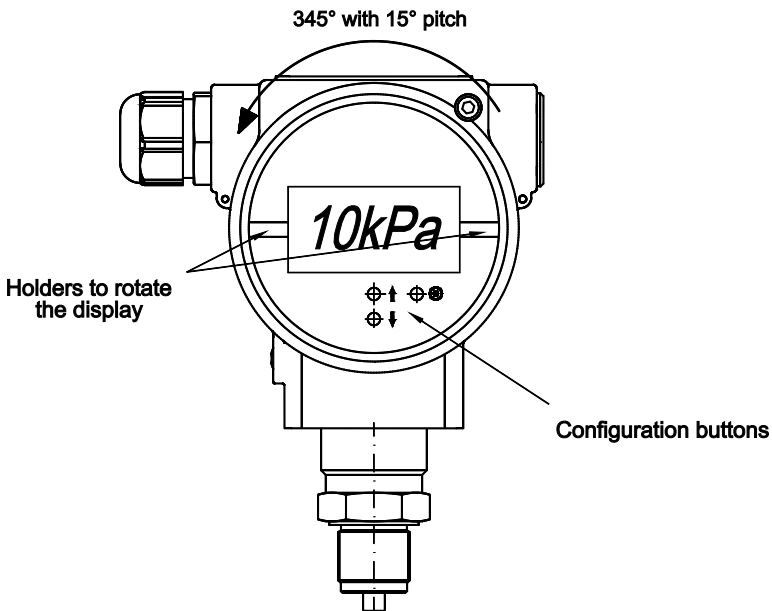


Fig. 4 PTPi, PTDi – display rotation option, configuration buttons

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

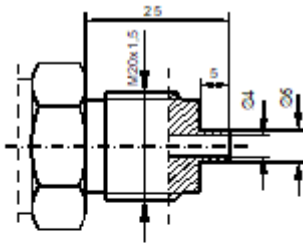


Fig. 5a connection M-type with thread M20x1.5

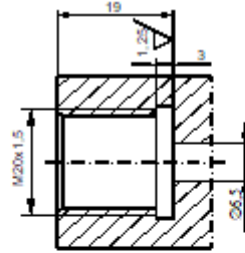


Fig. 5b socket for M-type plug connector

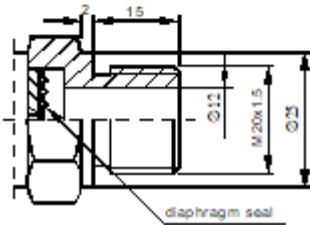


Fig. 6a connection P-type with thread M20x1.5

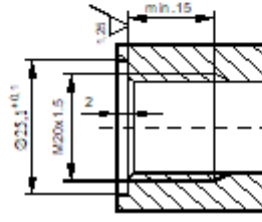


Fig. 6b socket for P-type plug connector

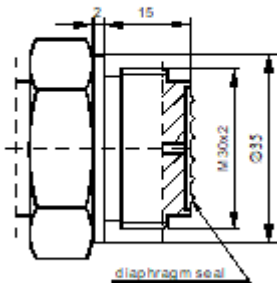


Fig. 7a CM 30x2 plug connector with flush welded membrane with thread M30x2

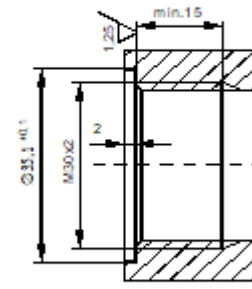


Fig. 7b socket for CM 30x2 plug connector

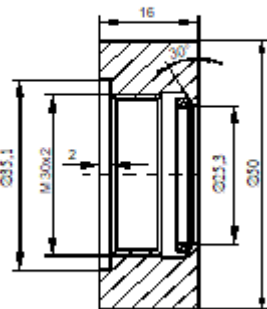


Fig. 7c socket for CM 30x2 plug connector sealing: Teflon  
order code socket CM 30x2



The ring in figure 7c must be welded with the word TOP facing upwards.

Fig. 5 plug connector M-type with thread M20x1.5

Fig. 6 plug connector P-type with thread M20x1.5

Fig. 7 plug connector CM 30x2 with flush welded membrane with thread M30x2

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

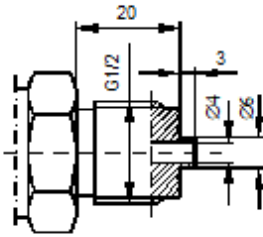


Fig. 8a connection G 1/2 with thread G 1/2"

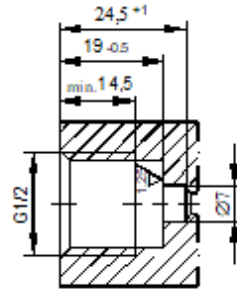


Fig. 8b socket for connection G 1/2"

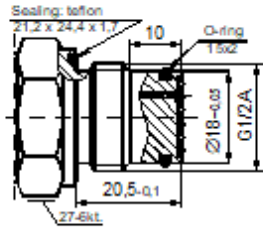


Fig. 8c connection CG 1/2 with flush welded membrane with thread G 1/2"

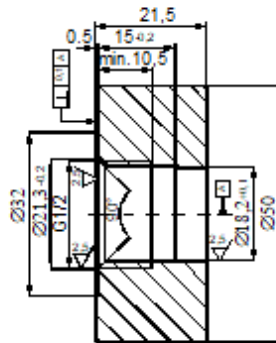


Fig. 8d socket for connection CG 1/2 order code socket – CG 1/2"

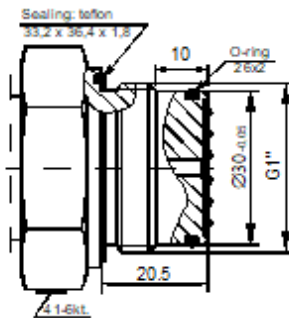


Fig. 8e connection CG 1 with flush welded membrane with thread G 1"

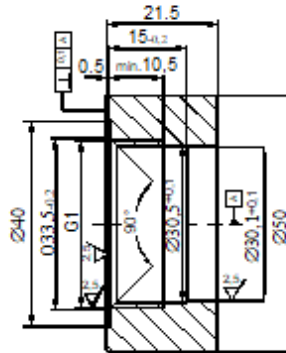


Fig. 8f socket for connection CG 1 order code socket – CG 1"

Fig. 8 process connection G 1/2" and G 1"

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

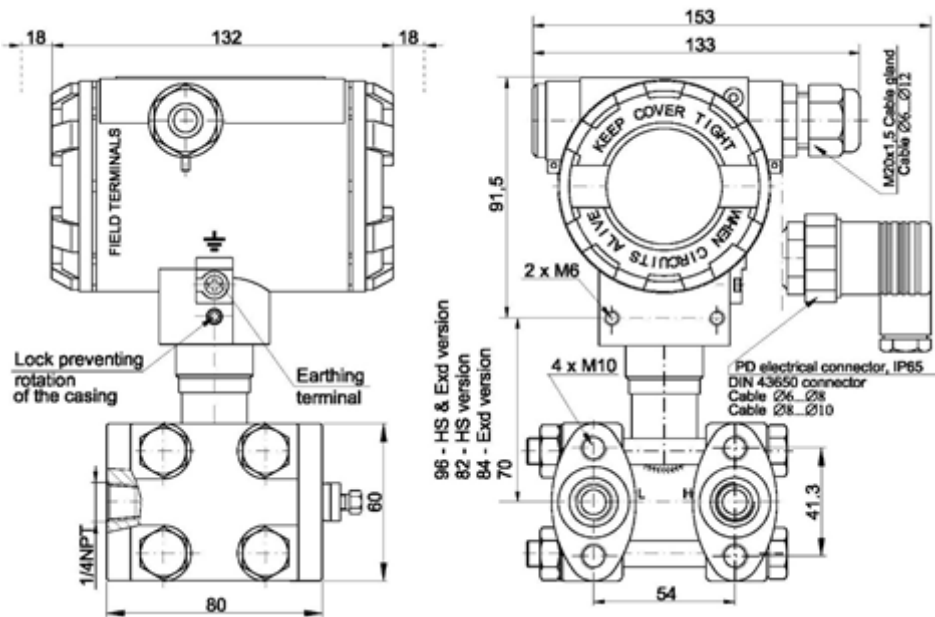


Fig. 9 differential pressure transmitter PTDi with process connection type C

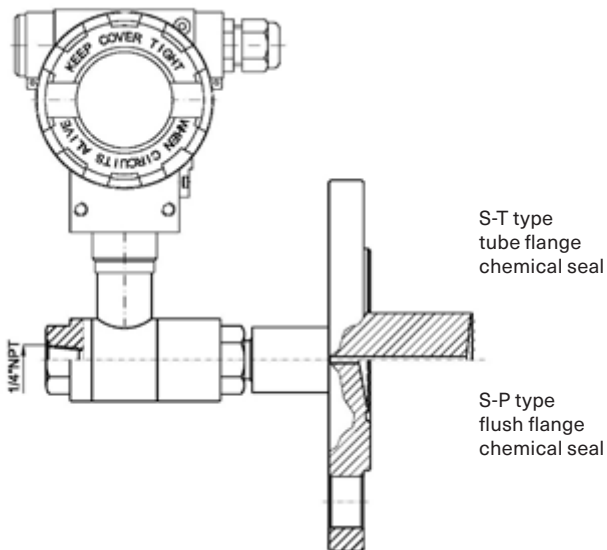
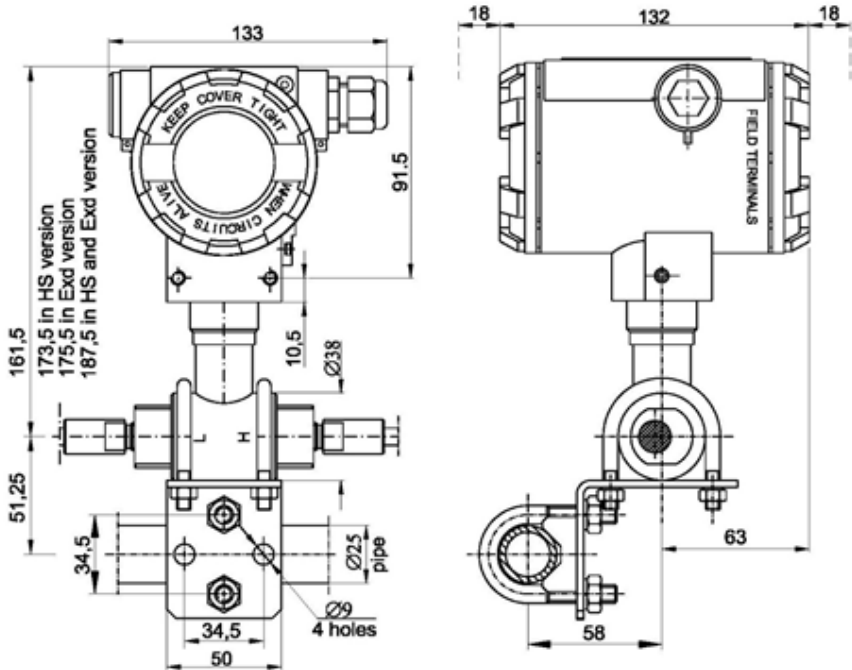


Fig. 10 example: differential pressure transmitter PTDi with a chemical seal

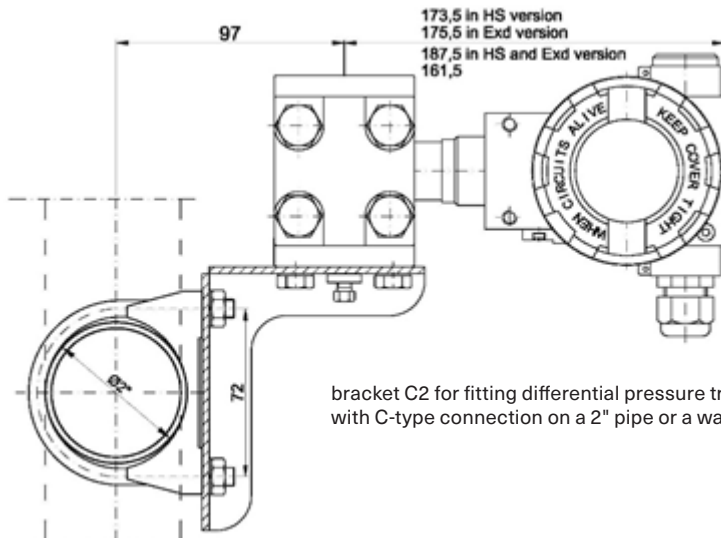
# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi



mounting kit ("bracket Ø 25") for fitting differential pressure transmitters with P-type connection on a Ø 25 pipe

Fig. 11 example: installation of the PTDi pressure transmitter with external membrane



bracket C2 for fitting differential pressure transmitters with C-type connection on a 2" pipe or a wall

Fig. 12 example: PTDi pressure transmitter on a vertical or horizontal pipe

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

bracket C2 for fitting differential pressure transmitters with a manifold on a 2" pipe

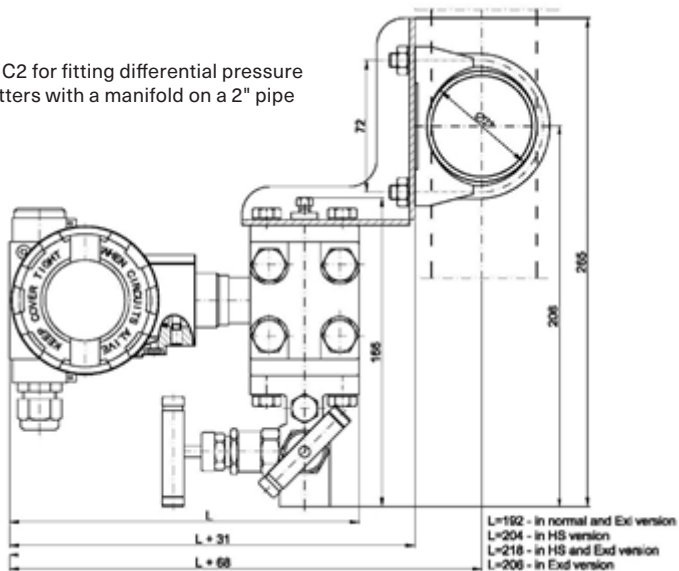
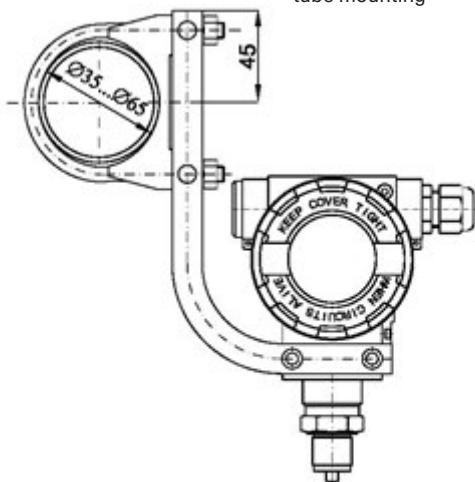


Fig. 13 example: mounting PTDi pressure transmitters with a manifold on a 2" pipe

tube mounting



wall mounting

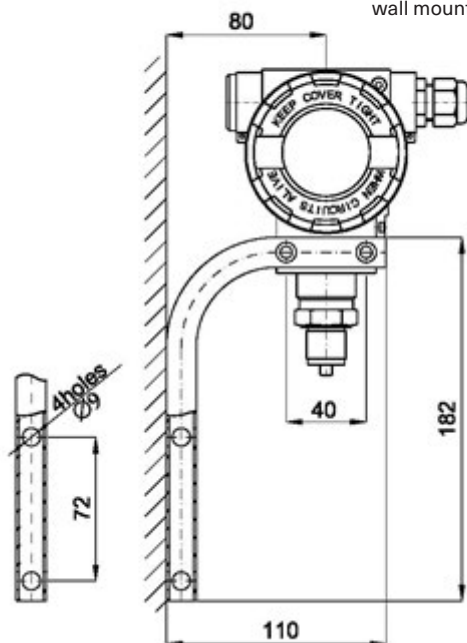


Fig. 14 example: mounting PTPi, PTDi pressure transmitters

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

Close the cover tightly by loosening the screw

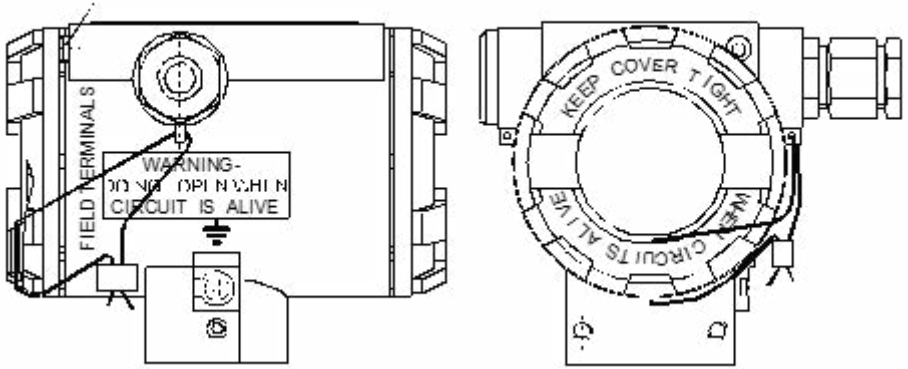


Fig. 15 sealing the housing of PTPi, PTDi pressure transmitters

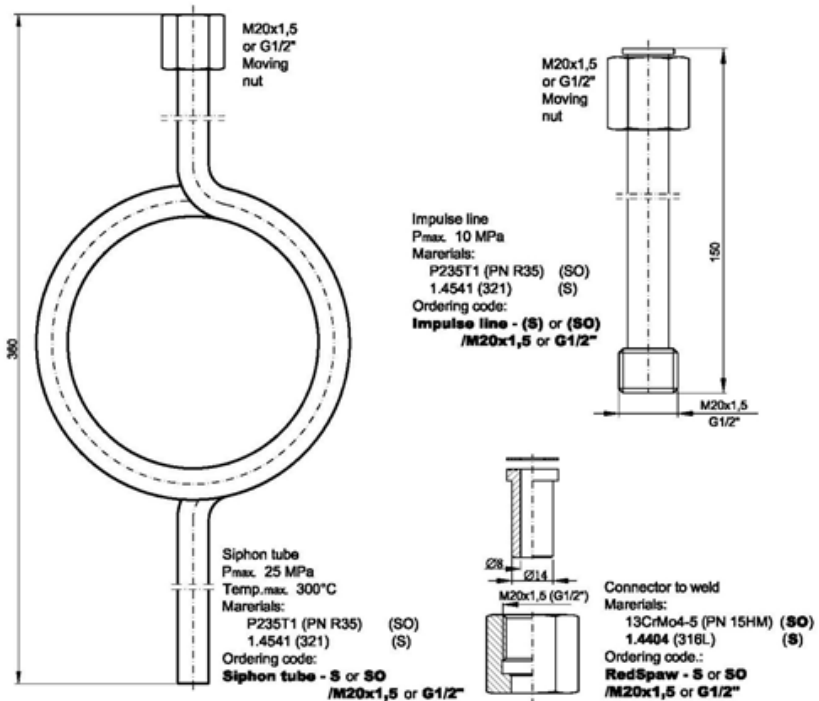


Fig. 16 additional equipment for the installation of pressure transmitters

# Operating Instructions

## Process Pressure Transmitters PTPi and PTDi

### 14. Declaration of Conformity

#### EU-Konformitätserklärung

#### EU Declaration of Conformity

Für die nachfolgend bezeichneten Erzeugnisse

We hereby declare for the following named goods

**DRUCKMESSUMFORMER**  
Typ PTPi  
gemäß Datenblatt 9711

**PRESSURE TRANSMITTER**  
Model PTPi  
according to data sheet 9711

**DRUCKMESSUMFORMER**  
Typ PTFi  
gemäß Datenblatt 9712

**PRESSURE TRANSMITTER**  
Model PTFi  
according to data sheet 9712

**DIFFERENZDRUCKMESSUMFORMER**  
Typ PTDi  
gemäß Datenblatt 9721

**DIFFERENTIAL PRESSURE TRANSMITTER**  
Model PTDi  
according to data sheet 9721

wird hiermit erklärt, dass sie den wesentlichen Schutzanforderungen entsprechen, die in nachfolgend bezeichneten Richtlinien festgelegt sind:

that they meet the essential protective requirements, which have been fixed in the following directives:

**RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES** vom 26. Februar 2014 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit – kurz: **EMV-Richtlinie**  
Konformitätsbewertungsverfahren: Modul A  
Angewandte Norm: EN 61326-1:2013

**DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL** from February 26, 2014 on the approximation of the laws of the Member States relating to the electromagnetic compatibility – short: **EMC Directive**  
Conformity assessment procedure: Module A  
Applied standard: EN 61326-1:2013

**RICHTLINIE 2011/65/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES** vom 08. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten – kurz: **RoHS-Richtlinie**  
Konformitätsbewertungsverfahren: Modul A, gemäß dem Beschluss Nr. 768/2008/EC  
Angewandte Norm: EN 50581:2012

**DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL** from June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment – short: **RoHS Directive**  
Conformity assessment procedure: Module A, according to Decision No. 768/2008/EC  
Applied standard: EN 50581:2012

Des Weiteren fallen diese Geräte mit einem Druckmessbereich  $>0,5$  bar als „druckhaltende Ausrüstungsteile“ unter die:

Moreover, these instruments with a pressure range  $>0.5$  bar are, as pressure equipment parts, subject to

**RICHTLINIE 2014/68/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES** vom 15. Mai 2014 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend Druckgeräte – kurz: **Druckgeräterichtlinie**

**DIRECTIVE 2014/68/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL** from May 15, 2014 on the approximation of the laws of the Member States relating to pressure equipment – short: **Pressure Equipment Directive**

Die Geräte werden nach geltender guter Ingenieurpraxis ausgelegt und gefertigt.  
Mit Messbereichen ab 0 – 200 bar wurden sie folgendem Konformitätsbewertungsverfahren unterzogen:

These instruments are designed and manufactured according to sound engineering practice.  
Versions with pressure ranges from 0 – 200 bar are subjected to the following conformity assessment procedure:

#### Modul A „Interne Fertigungskontrolle“

#### Module A “Internal Production Control”

Soweit zutreffend erstreckt sich die CE-Kennzeichnung dann auch auf diese Richtlinie

As far as they are concerned, the CE-marking then also applies to this directive.

Diese Erklärung wird verantwortlich für den Hersteller:  
This declaration is issued under the sole responsibility of the manufacturer:

**ARMANO Messtechnik GmbH**

abgegeben durch/by  
Grünhain-Beierfeld, 2021-04-14

**Bernd Vetter**  
Geschäftsführender Gesellschafter / Managing Director

**ARMANO**

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