

PFT-2

Two-wire: 4 ... 20 mA

SICK
Sensor Intelligence.



Described product

PFT-2

Manufacturer

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Legal information

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Original document

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1 About this document

1.1 Function

This instruction provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, safety and the exchange of parts. 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 instruction 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, note, tip: This symbol indicates helpful additional information and tips for successful work.



Note: This symbol indicates notes to prevent failures, malfunctions, damage to devices or plants.



Caution: Non-observance of the information marked with this symbol may result in personal injury.



Warning: Non-observance of the information marked with this symbol may result in serious or fatal personal injury.



Danger: Non-observance of the information marked with this symbol results in serious or fatal personal injury.



Ex applications

This symbol indicates special instructions for Ex applications.



List

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



1 Sequence of actions

Numbers set in front indicate successive steps in a procedure.



Disposal

This symbol indicates special instructions for disposal.

2 For your safety

2.1 Authorised personnel

All operations described in this documentation must be carried out only by trained and authorized personnel.

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

2.2 Appropriate use

The PFT-2 is a pressure transmitter for process pressure 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 operating company 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 operating company has to implement suitable measures to make sure the instrument is functioning properly.

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.

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 us. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by us must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed.

2.5 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 (NEC - NFPA 70) (USA).
Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CEC Part I) (Canada).

3 Product description

3.1 Configuration

Constituent parts

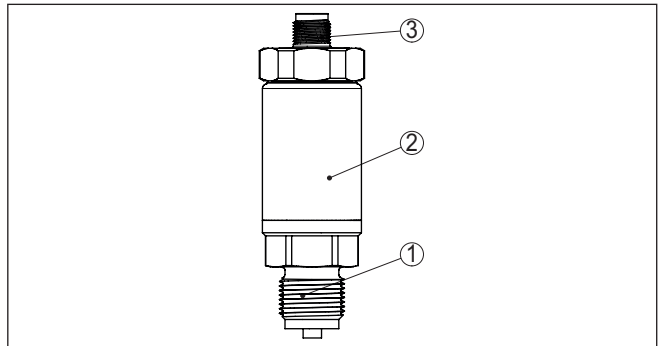


Fig. 1: Components of PFT-2

- 1 Process fitting
- 2 Electronics housing
- 3 Plug connector

Type label

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

- Instrument type
- Information about approvals
- Configuration information
- Technical data
- Serial number of the instrument
- QR code for device identification
- Manufacturer information

SICK Product ID

The SICK Product ID clearly identifies the product. It also serves as the address of the website with information about the product.

The SICK Product ID consists of the host name `pid.sick.com`, the article number (P/N) and the serial number (S/N), each separated by a slash.

The SICK Product ID is indicated as text and QR code on the type plate and/or on the packaging.



Fig. 2: SICK Product ID (Beispiel)

Documents and software

Further information can be found on our homepage.

There you will find the documentation and further information about the device.

3.2 Principle of operation

Application area

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

- Relative pressure (positive)

Measured products

Measured products are gases, vapours and liquids.

Measured variables

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

- Process pressure

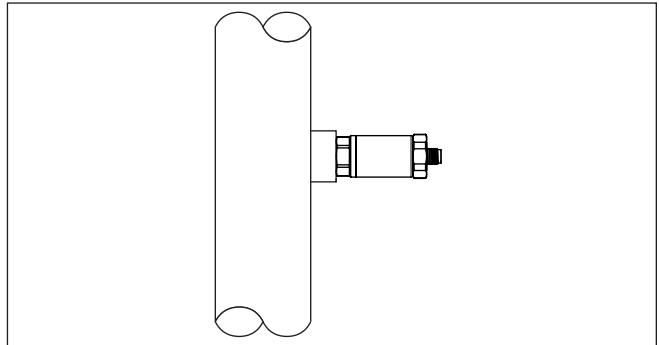


Fig. 3: Process pressure measurement PFT-2

Measuring system

The process pressure acts on the piezoresistive sensor element via the process diaphragm. The process pressure causes a resistance change which is converted into a corresponding output signal and output as measured value.

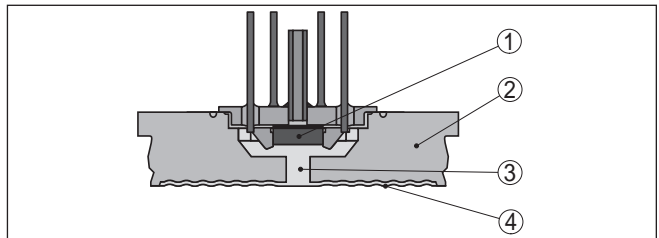


Fig. 4: Configuration of the measuring system with piezoresistive sensor element

- 1 Sensor element
- 2 Base element
- 3 Transmission liquid
- 4 Process diaphragm

Pressure types

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.

Recessed installation

The recessed installation is particularly suitable for applications with gases, vapours and transparent liquids.

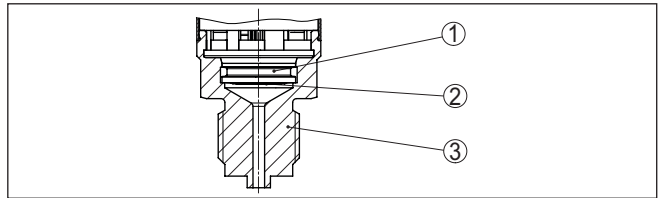


Fig. 5: Recessed installation of the measuring cell (example: thread $G\frac{1}{2}$ (EN 837), manometer connection)

- 1 Measuring cell
- 2 Diaphragm
- 3 Process fitting

3.3 Adjustment

The instrument offers no adjustment options.

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 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 see chapter "*Technical data - Ambient conditions*"
 - Relative moisture 20 ... 85 %

Storage and transport temperature

3.5 Accessories

Suitable accessories can be found on the Internet via the SICK Product ID of the sensor or on www.sick.com.

4 Mounting

4.1 General instructions

Ambient conditions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/BS EN/IEC/ANSI/ISA/UL/CSA 61010-1. It can be used indoors as well as outdoors.

Process conditions



Note:

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*" of the operating instructions or on the type label.

Hence 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

Permissible process pressure (MWP) - Device

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



Note:

In order to prevent damage to the device, a 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*").

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

- 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.

Ventilation and pressure compensation

Ventilation and pressure compensation for PFT-2 are provided by an air-permeable, moisture-blocking filter element.

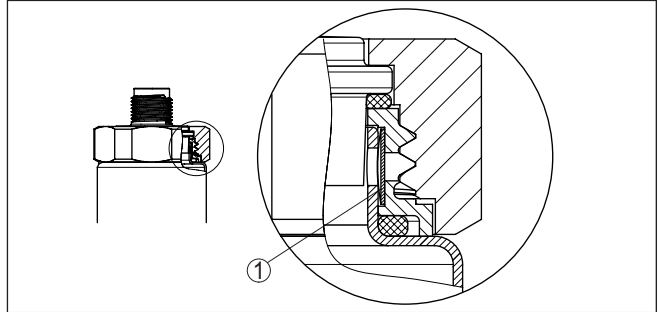


Fig. 6: Position of the filter element

1 Filter element

For effective ventilation, the filter element must always be free of buildup.



Caution:

Do not use a high-pressure cleaner. The filter element could be damaged, which would allow moisture into the housing.

Screwing in

Devices with threaded fitting are screwed into the process fitting with a suitable wrench via the hexagon.

See chapter "Dimensions" for wrench size.



Warning:

The housing or the electrical connection may not be used for screwing in! Depending on the device version, tightening can cause damage, e. g. to the rotation mechanism of the housing.

Permissible process pressure (MWP) - 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.

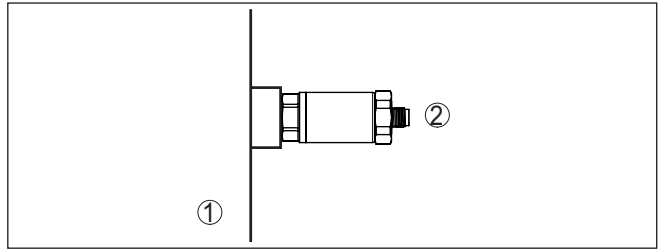


Fig. 7: Temperature ranges

- 1 Process temperature
- 2 Ambient temperature

In gases

4.2 Process pressure measurement

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.

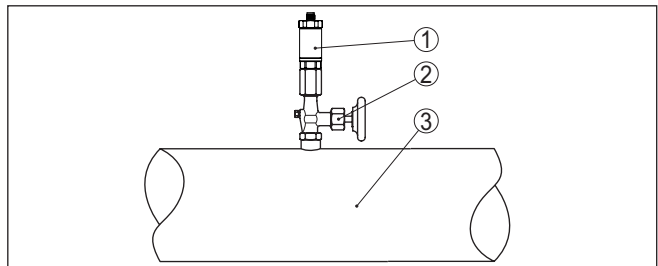


Fig. 8: Measurement setup for process pressure measurement of gases in pipelines (example)

- 1 PFT-2
- 2 Blocking valve
- 3 Pipeline

In vapours

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

- Connect via a siphon

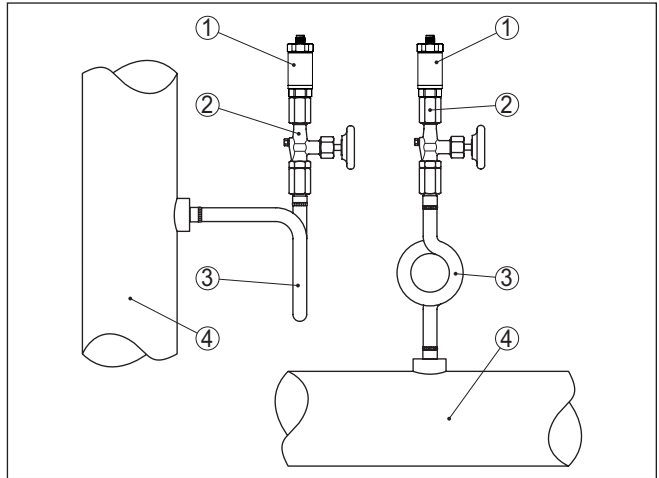


Fig. 9: Measurement setup for process pressure measurement of gases in pipelines (example)

- 1 PFT-2
- 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.

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.

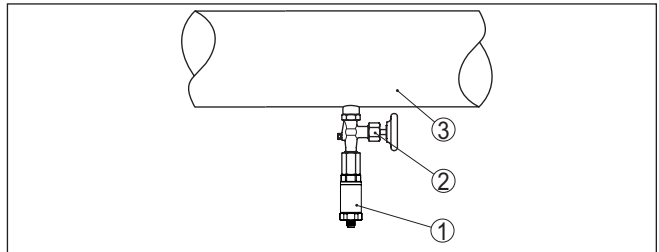


Fig. 10: Measurement setup for process pressure measurement of liquids in pipelines (example)

- 1 PFT-2
- 2 Blocking valve
- 3 Pipeline

5 Connecting to power supply

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:

Only connect or disconnect in de-energized state.

Voltage supply

The data for power supply are specified in chapter "*Technical data*".



Note:

Power the instrument via an energy-limited circuit (power max. 100 W) acc. to IEC 61010-1, e.g.

- Class 2 power supply unit (acc. to UL1310)
- SELV power supply unit (safety extra-low voltage) with suitable internal or external limitation of the output current
- PELV power supply unit (protective low voltage) with suitable internal or external limitation of the output current

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

- Lower output voltage of the power supply unit under nominal load (e.g. with a sensor current of 20.5 mA or 22 mA in case of fault signal)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

Connection cable

Use cable with round cross section. Depending on the plug connection, you have to select the outer diameter of the cable respectively so that the seal effect of the cable gland is ensured.

Depending on the connection method or signal output, the device is connected with standard two, three or four-wire cable without shielding.

M12 x 1 plug

5.2 Wiring plan

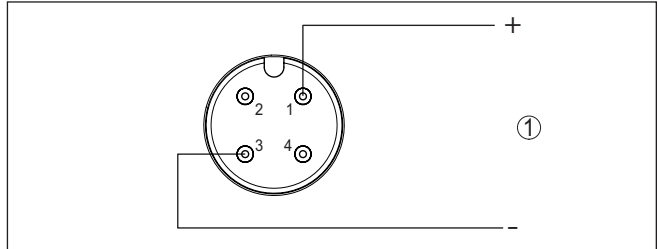


Fig. 11: Wiring plan - two-wire 4 ... 20 mA - M12 x 1 plug

1 Voltage supply and signal output

Contact, plug connector	Function/Polarity
1	Voltage supply, signal output/+
2	Free
3	Voltage supply, signal output/-
4	Free

5.3 Switch-on phase

After switching on, the device first carries out a self-check:

- Internal check of the electronics
- The output signal jumps to the set fault current

The current measured value is then output on the signal cable.

6 Diagnostics and servicing

6.1 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

6.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

The device offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measures are:

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

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.

6.3 Diagnosis, fault messages

4 ... 20 mA signal

Connect a multimeter in the suitable measuring range according to the wiring plan. The following table describes possible errors in the current signal and helps to eliminate them:

Error	Cause	Rectification
4 ... 20 mA signal missing	Electrical connection faulty	Check connection, correct, if necessary
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low, load resistance too high	Check, adapt if necessary
Current signal greater than 22 mA, less than 3.6 mA	Sensor electronics defective	Replace device or send in for repair depending on device version

6.4 Return of devices

Do not return devices without consulting SICK service.



Note:

For efficient processing and a quick determination of the cause, please enclose the following with the return:

- Details of a contact person
- Description of the application
- Description of the error that has occurred

Please use the document "*Return form and declaration of no objection*", which you can find under the downloads on the corresponding product website.

7 Dismounting and disposal

7.1 Dismount device

1. Switch off operating voltage for the device.
2. Disconnect all connection cables from the device.
3. If the device is to be replaced, mark the position and orientation on the bracket or the surrounding area.
4. Detach the device from the holder.

7.2 Dispose device

A device that has become unusable must be disposed of in an environmentally friendly manner in accordance with the applicable country-specific waste disposal regulations.



Note:

Disposal of batteries, electrical and electronic devices

- In accordance with international regulations, batteries, rechargeable batteries and electrical and electronic devices must not be disposed of with household waste.
- The owner is legally obliged to return these devices to the appropriate public collection centres at the end of their service life.



This symbol on the product, its packaging or in this document indicates that a product is subject to the specified regulations.

8 Certificates and approvals

8.1 Conformity

On www.sick.com you can find conformity declarations, certificates and current operating instructions of the product. For this purpose, enter the article number of the product in the search field (article number: see type plate entry in the field "P/N" or "Ident. no.").

Additional information:

- Model-specific online data sheets for instrument versions with technical data, dimensional drawings and diagrams
- Dimensional drawings or 3D CAD dimensional models in various electronic formats
- Further publications in relation to the sensors described here (e.g. IO-Link)
- Accessories publications

Due to the design of its process fittings, the device does not subject of EU pressure device directive if it is operated at process pressures ≤ 200 bar.

8.2 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 43 – Signal level for fault information from measuring transducers

For further information see www.namur.de.

9 Supplement

9.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery 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.

All approval documents can be downloaded from our homepage.

Materials and weights

Materials, wetted parts

Process fitting, measuring diaphragm	316L
Seal for process fitting (in the scope of delivery)	
– Thread G $\frac{1}{2}$ (EN 837), manometer connection	Klingersil C-4400
– Thread G $\frac{1}{2}$, inside G $\frac{1}{4}$ (ISO 228-1)	Klingersil C-4400

Materials, non-wetted parts

Electronics housing	316L
M12 x 1 plug connector	
– Contact support	PA
– Contacts	CuZn, nickel layer and 0.8 μ m gold-plated
Weight	approx. 0.25 kg (0.55 lbs)

Torques

Process fitting	Max. torque
Thread G $\frac{1}{2}$ (EN 837), manometer connection	50 Nm (36.88 lbf ft)
Thread G $\frac{1}{2}$, inside G $\frac{1}{4}$ (ISO 228-1)	
Thread G $\frac{1}{2}$ (ISO 228-1), front-flush	30 Nm (22.13 lbf ft)
Thread G1 (ISO 228-1), front-flush	

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.¹⁾

Nominal measuring ranges and overload capability in bar/kPa

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
0 ... +0.4 bar/0 ... +5.8 psi	+4 bar/+58 psi	-1 bar/-14.5 psi
0 ... +1 bar/0 ... +14.5 psi	+4 bar/+58 psi	-1 bar/-14.5 psi
0 ... +2.5 bar/0 ... +36.3 psi	+10 bar/+145.0 psi	-1 bar/-14.5 psi

¹⁾ Data on overload capability apply for reference temperature.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
0 ... +5 bar/0 ... +72.5 psi	+20 bar/+290 psi	-1 bar/-14.5 psi
0 ... +10 bar/0 ... +145.0 psi	+40 bar/+580 psi	-1 bar/-14.5 psi
0 ... +25 bar/0 ... +362.6 psi	+120 bar/+1740.5 psi	-1 bar/-14.5 psi
0 ... +60 bar/0 ... +870.2 psi	+200 bar/+2900 psi	-1 bar/-14.5 psi
0 ... +100 bar/0 ... +1450.4 psi	+200 bar/+2900 psi	-1 bar/-14.5 psi

Switch-on phase

Start-up time with operating voltage $U_b \leq 1$ s
 Starting current for run-up time ≤ 3.6 mA

Output variable - two-wire 4 ... 20 mA

Output signal 4 ... 20 mA - passive
 Connection technology Two-wire
 Range of the output signal 3.8 ... 20.5 mA
 Signal resolution 5 μ A
 Fault signal output current 3.6 mA
 Load See load resistance under Power supply
 Transferred measured value Pressure

Dynamic behaviour output

Dynamic characteristics - Current output²⁾

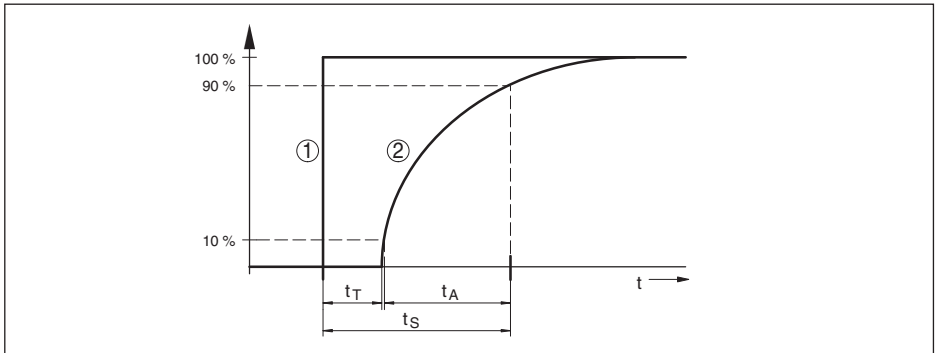


Fig. 12: Behaviour the current output in case of sudden change of the process variable. t_T : dead time; t_A : rise time; t_S : jump response time

- 1 Process variable
- 2 Output signal

Size	Time
Dead time	≤ 30 ms
Rise time (10 ... 90 %)	approx. 15 ms

²⁾ Depending on medium and temperature

Size	Time
Step response time (ti: 0 s, 10 ... 90 %)	approx. 45 ms

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

Reference conditions according to DIN EN 61298-1

– Temperature	+18 ... +30 °C (+64 ... +86 °F)
– Relative humidity	45 ... 75 %
– Air pressure	860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psi)
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	≤ 5 mbar/0.5 kPa (0.073 psig)

Deviation (according to IEC 60770)³⁾

Deviation	< 0.5 %
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Influence of the medium or ambient temperature

Average temperature coefficient of the zero signal ⁴⁾	< 0.15 %/10 K
------------------------------------------------------------------	---------------

Long-term stability (according to DIN 16086)

Long-term drift of the zero signal ⁵⁾	< 0.15 %/year
--------------------------------------------------	---------------

Ambient conditions

Ambient temperature	-40 ... +70 °C (-40 ... +158 °F)
Storage and transport temperature	-40 ... +70 °C (-40 ... +158 °F)

Mechanical environmental conditions

Vibrations (oscillations)	Class 4M8 acc. to IEC 60721-3-4 (5 g, 4 ... 200 Hz)
Impacts (mechanical shock)	Class 6M4 acc. to IEC 60721-3-6 (50 g, 2.3 ms)
Impact resistance	IK06 acc. to IEC 62262

Process conditions

Process temperature	-40 ... +100 °C (-40 ... +212 °F)
Permissible process pressure	see specification "MWP" on the type label ⁶⁾

³⁾ Relating to the nominal measuring range, incl. non-linearity, hysteresis and non-reproducibility.

⁴⁾ In the compensated temperature range of -40 ... +100 °C (-40 ... +212 °F), reference temperature 20 °C (68 °F).

⁵⁾ Relating to the nominal measuring range.

⁶⁾ MWP: Maximum Working Pressure

Electromechanical data

Round plug connector 4-pole with M12 x 1 screw connection

Voltage supply

Operating voltage U_B 12 ... 35 V DC
 Reverse voltage protection Integrated
 Permissible residual ripple
 – for U_N 12 V DC ($12 \text{ V} < U_B < 18 \text{ V}$) $\leq 0.7 V_{\text{eff}}$ (16 ... 400 Hz)
 – for U_N 24 V DC ($18 \text{ V} < U_B < 35 \text{ V}$) $\leq 1.0 V_{\text{eff}}$ (16 ... 400 Hz)
 Load resistor
 – Calculation $(U_B - U_{\text{min}})/0.022 \text{ A}$
 – Example - $U_B = 24 \text{ V DC}$ $(24 \text{ V} - 12 \text{ V})/0.022 \text{ A} = 545 \Omega$

Electrical protective measures

Potential separation Electronics potential free up to 500 V AC

Protection rating

Connection technology	Protection according to EN 60529/IEC 529	Protection according to UL 50
M12 x 1 plug	IP66/IP67	Type 4X

Altitude above sea level 5000 m (16404 ft)

Protection class III

Pollution degree 2

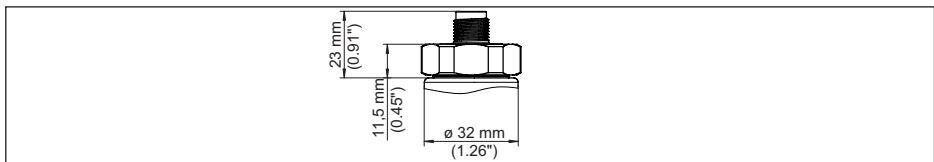
9.2 Dimensions**Housing and connections**

Fig. 13: PFT-2 housing

PFT-2, threaded fitting not front-flush

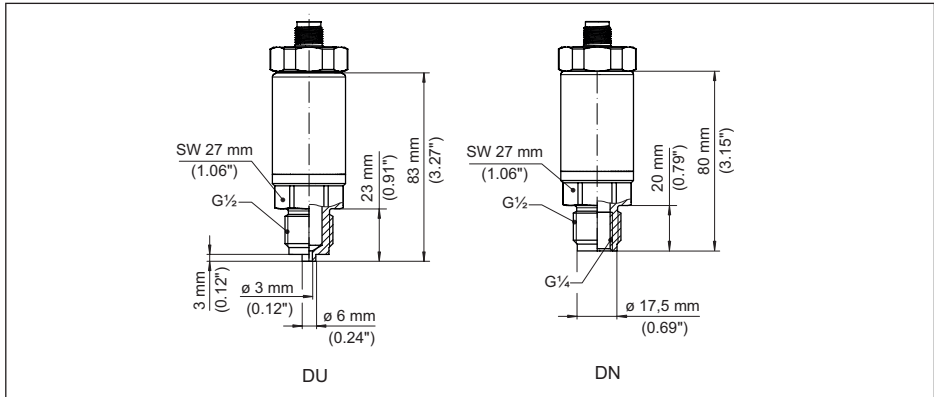


Fig. 14: PFT-2, threaded fitting not front-flush

DU Thread G $\frac{1}{2}$ (EN 837), manometer connection

DN Thread G $\frac{1}{2}$, inside G $\frac{1}{4}$ (ISO 228-1)

PFT-2, threaded fitting front-flush

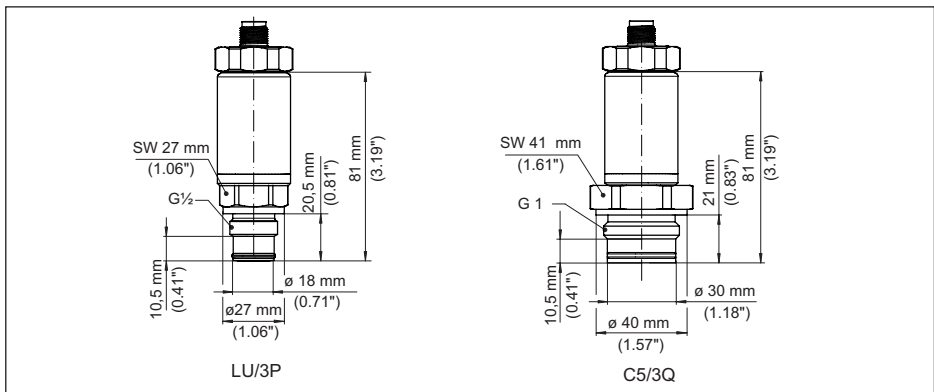


Fig. 15: PFT-2, threaded fitting front-flush

LU/3P

Thread G $\frac{1}{2}$ (ISO 228-1); front-flush, with O-ring

C5/3Q

Thread G1 (ISO 228-1), front-flush

9.3 Licences

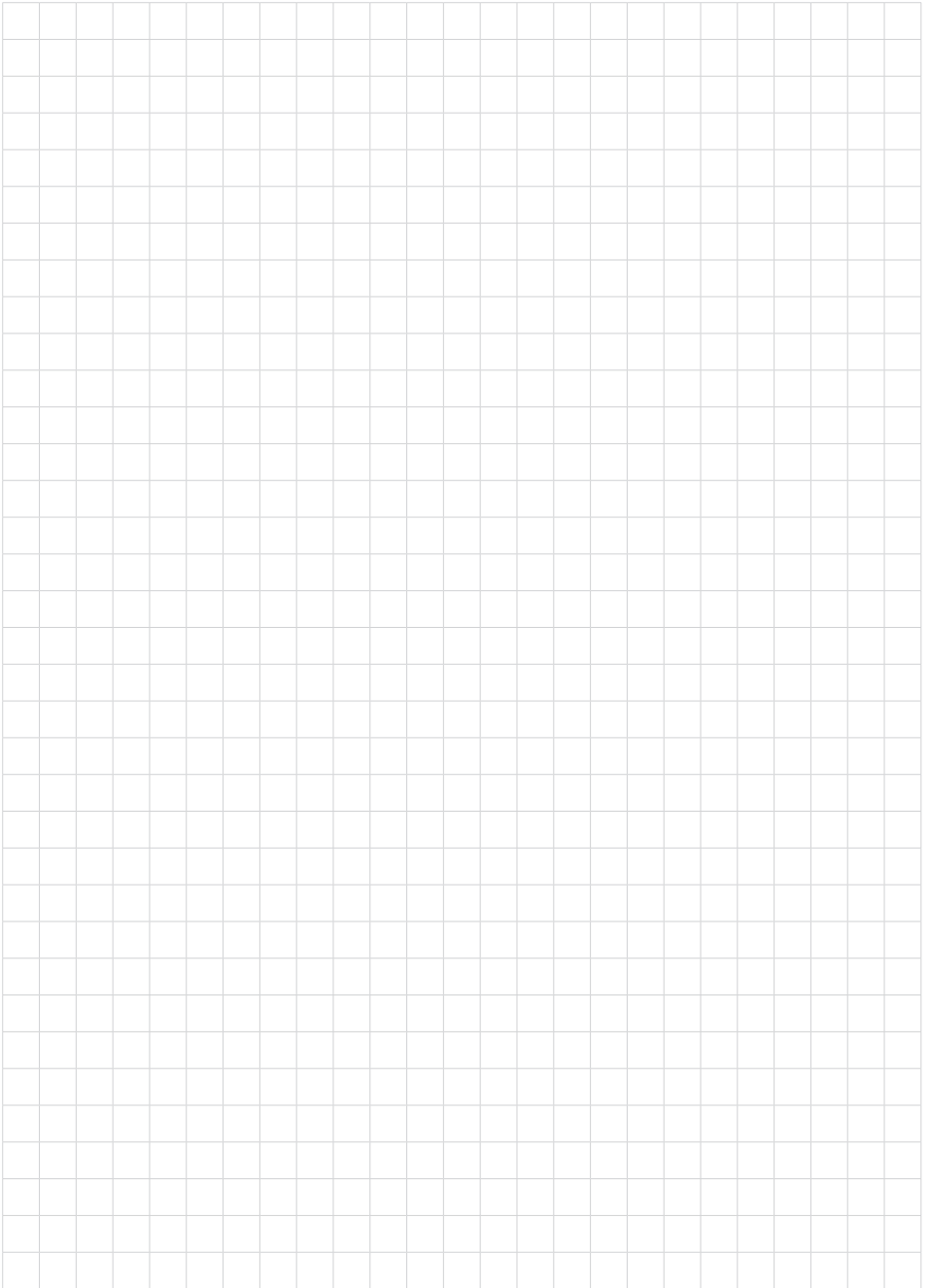
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