Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Ceraphant T PTC31, PTP31, PTP35

Process pressure
Pressure switch for safe measurement and monitoring of absolute and gauge pressures





Application

Pressure switch for monitoring absolute and gauge pressures in gases, vapours, liquids and dust:

Ceraphant T PTC31
– with ceramic process isolating diaphragm;
Ceraphant T PTP31
– with metallic process isolating diaphragm;
Ceraphant T PTP35
- for hygienic applications

- Finely graduated measuring ranges from vacuum to 400 bar (6000 psi)
- Versions for use in hygienic applications
- Electronic versions
  – one PNP switch output
  – two PNP switch outputs
  – PNP switch output with additional analog output 4...20 mA (active)

Your benefits

This compact pressure switch impresses with the latest in technology being used:

- Integrated switching electronics for decentral and economic process monitoring and control
- Quick and flexible process integration thanks to modular connections
- High reproducibility and long-term stability
- Function check and information on site thanks to LEDs and digital display
- Ceraphire® process isolating diaphragm: corrosion-proof, abrasion-proof and extremely overload-resistant
- Excellent accuracy and briefest response time right to the smallest measuring range
- Operation and visualisation also with personal computer and ReadWin® 2000 or FieldCare®
- Upper part of housing can be rotated by 310°, therefore best readability of measured values in all orientations
- DESINA compliant
- 3A and EHEDG approved

TI00384P/00/EN/16.15
No. 71293586

Endress+Hauser
People for Process Automation

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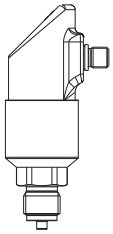
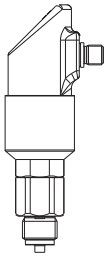
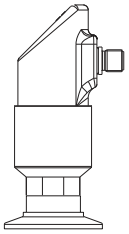
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Function and system design

Device selection

Ceraphant T – product family	PTC31	PTP31	PTP35
	 P01-PTC31xxx-14-xx-xx-xx-001	 P01-PTP31xxx-14-xx-xx-xx-001	 P01-PTP35xxx-14-xx-xx-xx-001
Measuring cell	With capacitive measuring cell and ceramic process isolating diaphragm (Ceraphire®)	With piezoresistive measuring cell and metallic process isolating diaphragm	With piezoresistive measuring cell and metallic process isolating diaphragm for hygienic applications
Field of application	Measurement and monitoring of absolute and gauge pressures	Measurement and monitoring of absolute and gauge pressures	Measurement and monitoring of absolute and gauge pressures in hygienic processes
Process connection	Thread – G ¼ female – G ¼A and G ½A – G ½A, hole 11.4 mm – M12x1,5 – 7/16-20 UNF – ¼ FNPT and ½ MNPT	Thread – G ¼ female – G ¼A and G ½A – G ½A, hole 11.4 mm – M12x1,5 – 7/16-20 UNF – ¼ FNPT and ½ MNPT – G ½A flush mounted	Hygiene – Clamp ½" - 2" – G 1A – Varivent F, N – DIN 11851 – APV inline – SMS 1½"
Measuring range	0 to 0.1 bar (1.5 psi) to 0 to 40 bar (600 psi)	0 to 1 bar (15 psi) to 0 to 400 bar (6000 psi)	0 to 1 bar (15 psi) to 0 to 40 bar (600 psi)
Process temperature	–40°C to +100°C (–40°F to +212°F)	–40°C to +100°C (–40°F to +212°F)	–40°C to +100°C (–40 °F to +212 °F) 135°C (275°F) max. 1 hour

Measuring principle

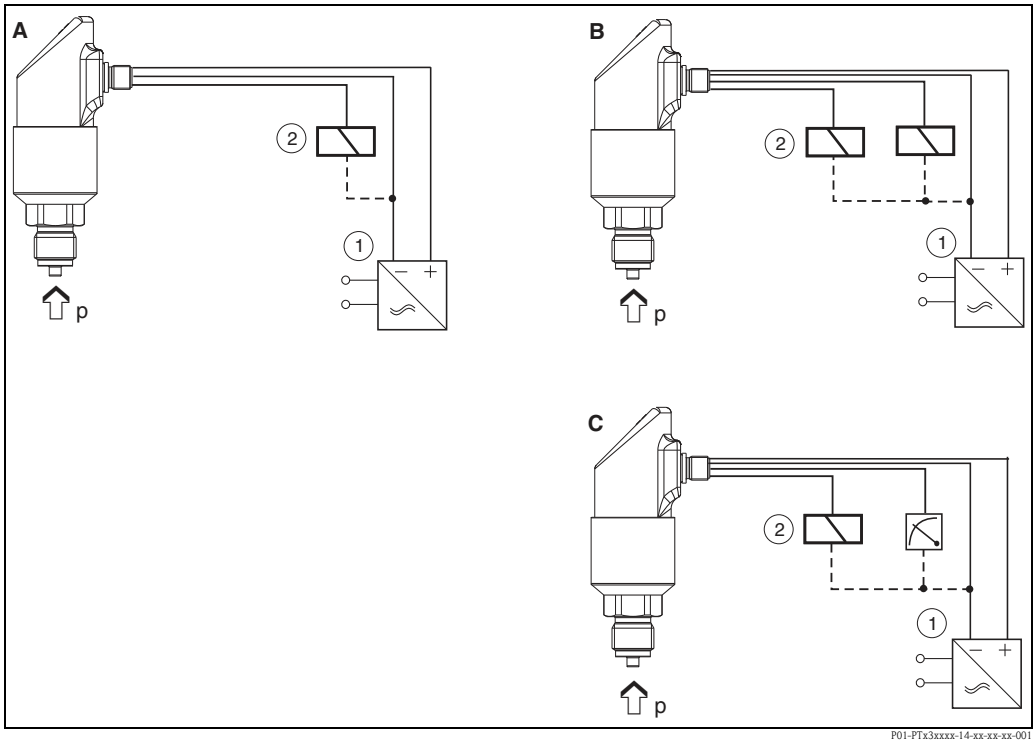
Ceraphant T PTC31

The process pressure acts on the ceramic process isolating diaphragm and the pressure-dependent change in capacitance of the ceramic sensor is measured. A microprocessor evaluates the signal and switches the output or outputs the corresponding measured value.
The ceramic sensor is a dry sensor i.e. no fill fluid is needed for pressure transmission. This means that the sensor can fully support a vacuum. Extremely high durability, on a par with the material Alloy, is achieved through the use of the highly pure material Ceraphire® as a ceramic.

Ceraphant T PTP31 and PTP35

The process pressure acting upon the metallic process isolating diaphragm of the sensor is transmitted to a resistance bridge via a fluid. The change in the output voltage of the bridge is proportional to the pressure and can be measured directly.

Measuring system



A: 1x PNP switch output
B: 2x PNP switch output
C: PNP switch output with additional analog output 4...20 mA (active).

① Transmitter power supply unit
② Load (e.g. programmable logic controller, process control system, relay)

Input

Measured variable

The measured variable for the pressure switch can be selected as either gauge pressure or absolute pressure.

Measuring range

Measuring ranges up to 400 bar (6000 psi), see "Ordering information" section.

Output

Output signal

DC voltage version: Positive voltage signal (rate depends on power supply voltage) at electronics switch output (PNP). Short-circuit proof version.

- 1x PNP switch output
- 2x PNP switch output
- PNP switch output with additional active analog output 4...20 mA.
  The analog output continuously represents the measuring range configured or specified by the sensor.

Range of adjustment

- Switch output:
  Switch point (SP): 0.5...100 % in increments of 0.1 % (min. 1 mbar * (0.015 psi)) of the upper range limit (URL)
  Switch-back point (RSP): 0...99.5 % in increments of 0.1 % (min. 1 mbar * (0.015 psi)) of the upper range limit (URL)
  Min. distance between SP and RSP: 0.5% URL
  * measuring ranges with negative gauge pressure up to 4 bar (60 psi) in increments of min. 10 mbar (0.15 psi)
- Analog output (if available):
  Lower range value (LRV) and upper range value (URV) can be set anywhere within the sensor range (LRL – URL). Turn down of the analog output up to 4:1 of the upper range limit (URL).
- Damping: can be set anywhere between 0...40 s in increments of 0.1 s
- Factory setting (if no customer-specific settings have been ordered):
  Switch point SP 1: 45 %; Switch-back point RSP 1: 44.5 %
  Switch point SP 2: 55 %; Switch-back point RSP 2: 54.5 %
  Analog output: LRV 0 %; URV 100 %

LRL = Lower Range Limit / URL = Upper Range Limit
LRV = Lower Range Value / URV = Upper Range Value

Switching capacity

DC voltage version:

- Switch status ON: I_a ≤250 mA, switch status OFF: I_a ≤1 mA
- Switching cycles: >10,000,000
- Voltage drop PNP: ≤2 V
- Overload resistance: Automatic load check of switching current;
  max. capacitance load: 14 µF at max. supply voltage (without resistive load)
  max. period length: 0.5 s; min. t_{on}: 40 µs
  Periodic disconnection from a protective circuit in event of overcurrent (f = 2 Hz) and indication of "Warning"

Inductive load

To prevent electrical interference, only operate an inductive load (relays, contactors, solenoid valves) when directly connected to a protective circuit (free-wheeling diode or capacitor).

Signal on alarm

- Analog output
  ≤ 3,6 mA / last current value / ≥21,0 mA adjustable (if setting ≥21.0 mA the output is ≥21.5 mA)
- Switch outputs: In safe state (switch normally open)

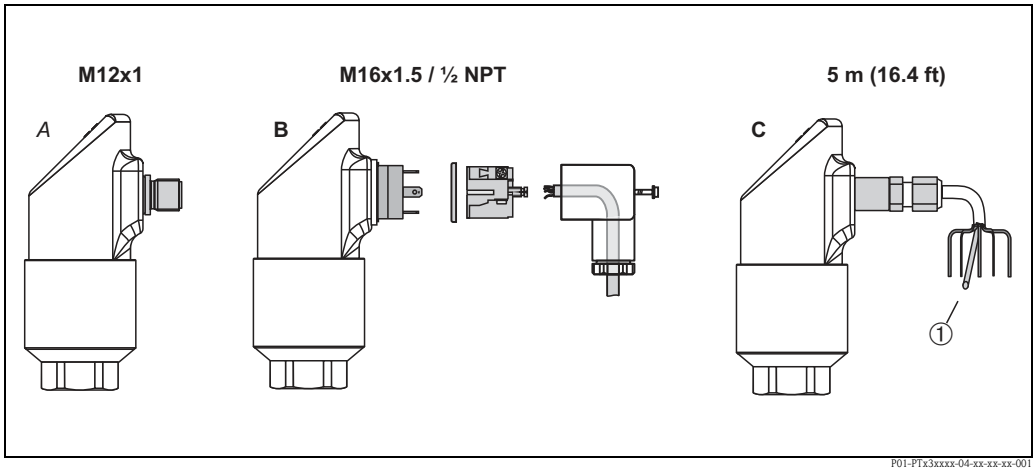
Load

Max. (U_{Supply} –6.5 V) / 0.22 A (analog output)

Power supply

Electrical connection

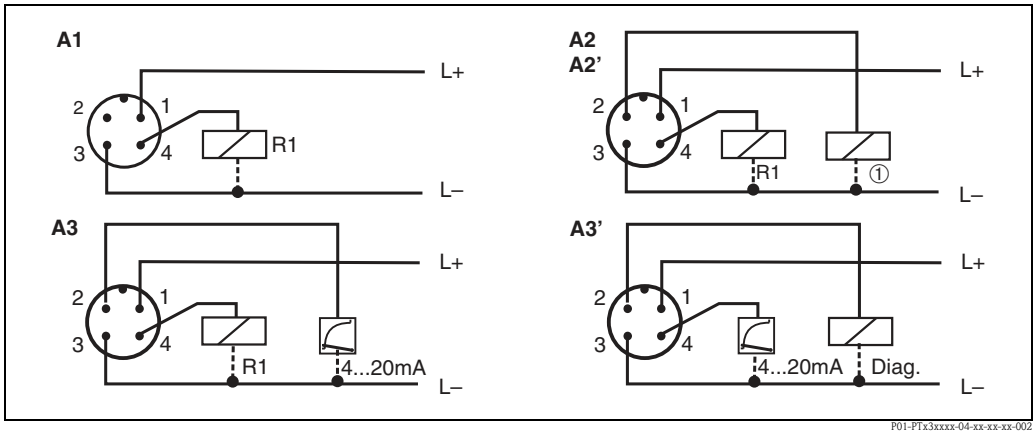
Connector and cable connection



A: M12x1 connector;
B: M16x1.5 or ½ NPT valve plug
C: cable, 5 m (16.4 ft) long, 5-core
① reference pressure supply

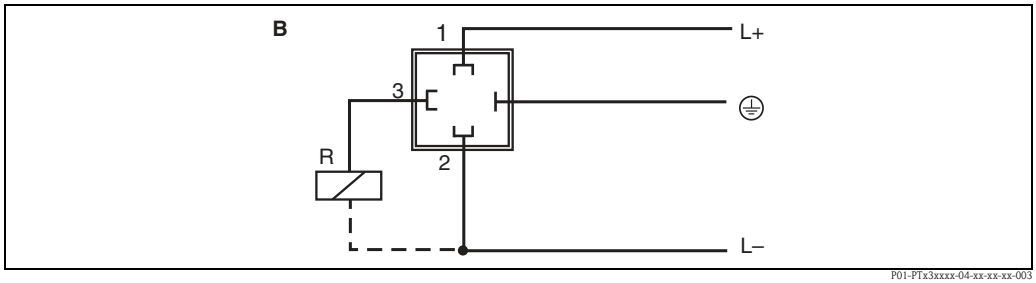
Device connection

- DC voltage version with M12x1 connector



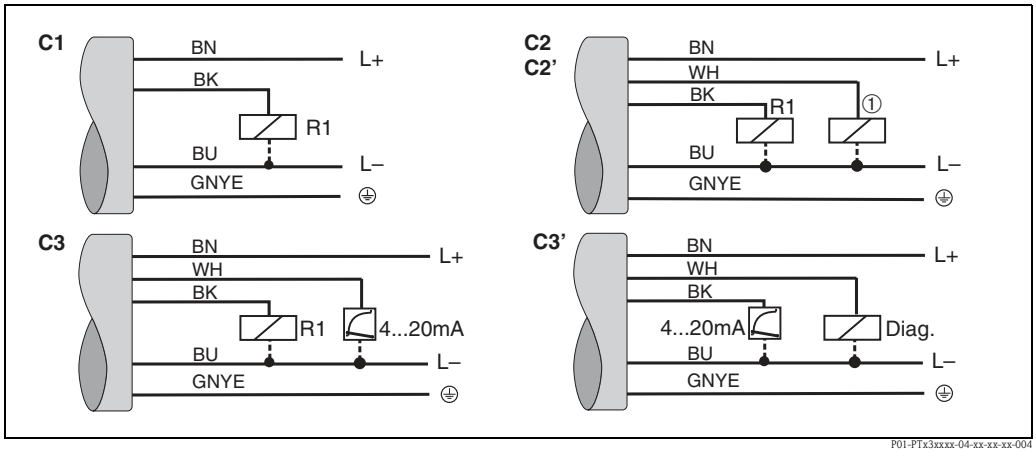
A1: 1x PNP switch output
A2: PNP switch outputs R1 and ① (R2)
A2': PNP switch outputs R1 and ① (diagnosis/break contact with adjustment "DESINA")
A3: PNP switch output with additional analog output
A3': PNP switch output with additional analog output (PIN assignment with "DESINA" setting)

- DC voltage version with M16x1.5 or ½ NPT valve plug



B: 1x PNP switch output

■ DC voltage version with cable



C1: 1x PNP switch output
C2: 2x PNP switch output
C2': PNP switch outputs R1 and ① (diagnosis/break contact with adjustment "DESINA")
C3: PNP switch output with additional analog output
C3': PNP switch output with additional analog output (assignment with "DESINA" setting)

Cable specification: all three connection versions 5-core; 4 x 0.2 mm² (AWG25), PE 0.75 mm² (AWG18)
– Core colours: BN = brown, BK = black, WH = white, BU = blue, GNYE = green/yellow

Supply voltage

■ DC voltage version
12...30 V DC

Current consumption

Without load < 60 mA, with reverse polarity protection

Power supply failure

■ Behaviour in case of overvoltage (>30 V)
The device works continuously without any damage up to 34 V DC.
The specific properties are no longer guaranteed if the supply voltage is exceeded.
No damage is caused to the device in case of a short-term overvoltage up to 1 kV (as per EN 6100-4-5)

■ Behaviour in case of undervoltage
If the supply voltage drops below the minimum value, the device switches off (status as if not supplied with power = switch open).

Performance characteristics

The percentage information in the "Performance characteristics" section refer to the upper range limit (URL).

Reference operating conditions

To DIN IEC 60770 or DIN IEC 61003
T = 25 C (77 °F), relative humidity 45 to 75 %, ambient air pressure 860 to 1060 hPa

Switch output

- Accuracy: deviation <0.5 %
- Non-repeatability: <0.2 %
- Response time: ≤20 ms

Analog output

- Maximum measured error:
  Non-linearity + hysteresis + non-repeatability: ≤0.5 % (as per limit point method)
- Non-linearity: ≤0.2 % (as per limit point method)
- Rise time T_{90}: ≤200 ms
- Settling time T_{99}: ≤400 ms

Influences of air pressure changes

In the case of air pressure changes the following additional measuring errors might occur:
400 bar (6000 psi): max. 0.0275 %
100 bar (1500 psi): max. 0.1 %

Long-term drift

≤0.15 % per year

Long-term reliability

Mean time between failure (MTBF) > 100 years
(calculated according to "British Telecom Handbook of Reliability Data No. 5)

Thermal change

≤ ± 1.5 % (-20 to +45°C (-4 to +113°F))
≤ ± 2.0 % (-40 to +85°C (-40 to +185°F)
≤ ± 2.5 % (-40 to +100°C (-40 to +212°F))

Operating conditions (installation)

Installation instructions

- Any orientation
- Any position-dependent zero shift can be corrected. Offset: ±20 % URL
- Housing can be rotated up to 310 °

Oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:
– All components of the system, such as measuring devices, must be cleaned in accordance with BAM requirements (DIN 19247). (BAM = Federal Institute for Materials Research and Testing).
– Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded in oxygen applications. The maximum temperature T_{max} for oxygen applications is 60°C (140°F).

The devices suitable for gaseous oxygen applications are listed in the following table, indicated by p_{max}.

Order code for devices cleaned for oxygen applications	p_{max} for oxygen applications
PTC31 – * * * ** * ** 6 *, for devices with sensors, nominal value < 10 bar (150 psi)	Overpressure limit (OPL) of sensor[1)]
PTC31 – * * * ** * ** 6 *, for devices with sensors, nominal value ≥10 bar (150 psi)	30 bar (450 psi)

1) → See Page 23 ff "Ordering information", feature 80 "Sensor seal".

Operating conditions (environment)

Ambient temperature range

-20 to +70°C (-4 to +158°F), briefly up to +100°C (212°F)
Extended temperature application range (-40 °C to +85 °C (-40 °F to +185 °F)) with restrictions in optical properties such as display speed and contrast.

Storage temperature

-40 to +85°C (-40 to 185°F)

Degree of protection

- M12x1 connector
  Gauge pressure sensors IP 65; Absolute pressure sensors: IP 66
- M16x1.5 or ½ NPT valve plug
  IP 65
- Cable: IP 66

For applications where the device is installed outdoor or cleaned from outside we recommend the use of a protection cap.

Shock resistance

50 g to DIN IEC 68-2-27 (11 ms)

Vibration resistance

20 g to DIN IEC 68-2-6 (10-2000Hz)

Electromagnetic compatibility

- Interference emission as per EN 61326, class B electrical equipment
- Interference immunity as per EN 61326, appendix A (industrial use)

Operating conditions (Process)

Medium temperature range

- PTC31: –20 °C...+100 °C (-4 °F to +212 °F)
- PTP31: –40°C...+100°C (-40°F to +212°F)
- PTP35: –40°C...+100°C (-40°F to +212°F), +135°C (+275°F) for max. 1 hour

Please also note the temperature limits of the seal in the following table.

Seal	Temperature limits
FKM	–20...+100 °C (-4 °F to +212 °F)
EPDM, FDA-Nummer 21 CFR 177.2600, Class II 3A Sanitary Standard 18, USP Class VI	–20...+100 °C (-4 °F to +212 °F)
FKM for O2 usage (70C3 CO2 - 70 - 0041V)	–10...60 °C (+14 °F to 140 °F)

With applications involving saturated steam, a Ceraphant T with a metallic process isolating diaphragm must be used, or a siphon for temperature isolation should be provided during installation.
Extreme jumps in temperature can result in temporary errors. Temperature compensation takes effect after several minutes. Internal temperature compensation is faster the smaler the temperature jump and the longer the time interval

Limiting medium pressure range

- For overload resistance see "Ordering information" section
- Vacuum resistance
  For ceramic sensor with nominal value >100 mbar (1.5 psi): 0 $mbar_{abs}$ (0 psi)
  For ceramic sensor 100 mbar (1.5 psi): 700 $mbar_{abs}$ (10.5 psi)
  For metallic sensor: 10 $mbar_{abs}$ (0.15 psi) (The vacuum resistance applies for the measuring cell under reference operating conditions.)

Pressure specifications

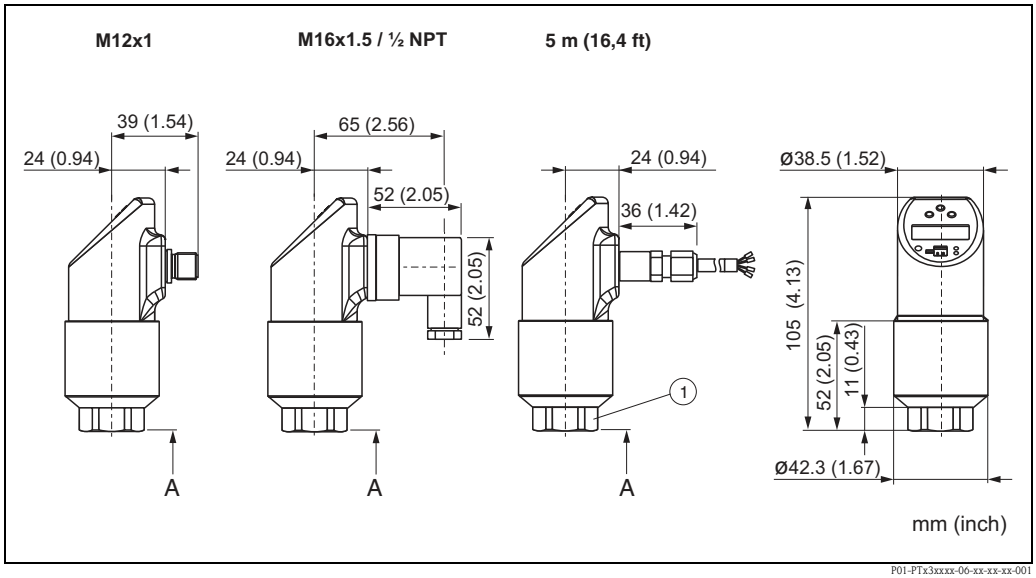
The maximum pressure for the measuring device is dependent on the weakest element with regard to pressure, see the following sections "Ordering information: Measuring range" and "Mechanical construction"

The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (-68°F) and may be applied to the device for an unlimited time.
The test pressure (Over Pressure Limit OPL) corresponds to 1.5 times the MWP and may be applied for a limited time only in order to avoid lasting damage.
Avoid steam hammering! Steam hammering can cause zero point drift.
Recommendation: Residue (such as condensation or drops of water) can remain at the process isolating diaphragm after CIP cleaning and lead to local steam hammering if immediately steam is introduced. In practice, drying the process isolating diaphragm (e.g. by blowing off excess moisture) has proven to be a successful way of avoiding steam hammering.

Mechanical construction

Design, dimensions

Dimensions



P01-PTx3xxxx-06-xx-xx-xx-001

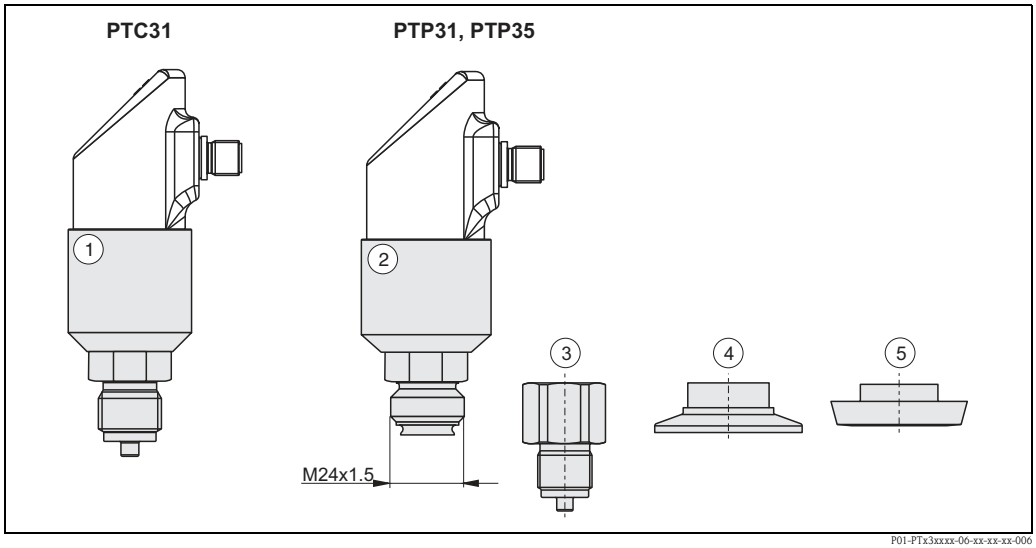
M12x1 connector as per IEC 60947-5-2

M16x1.5 or ½ NPT valve plug as per DIN 43650A/ISO 4400

Cable 5 m (16 ft) long, cable outer diameter 7.7 mm (0.3 in); cores 4 x 0.2 mm² (AWG 24), PE 0.75 mm² (AWG 18)
reference pressure hose with outer diameter 2.5 mm (0.1 in)

① Across flats AF 27 mm(for 400 bar (6000 psi) sensor AF 32 mm)
A = height dimension of process connections – see next diagrams

Process connection



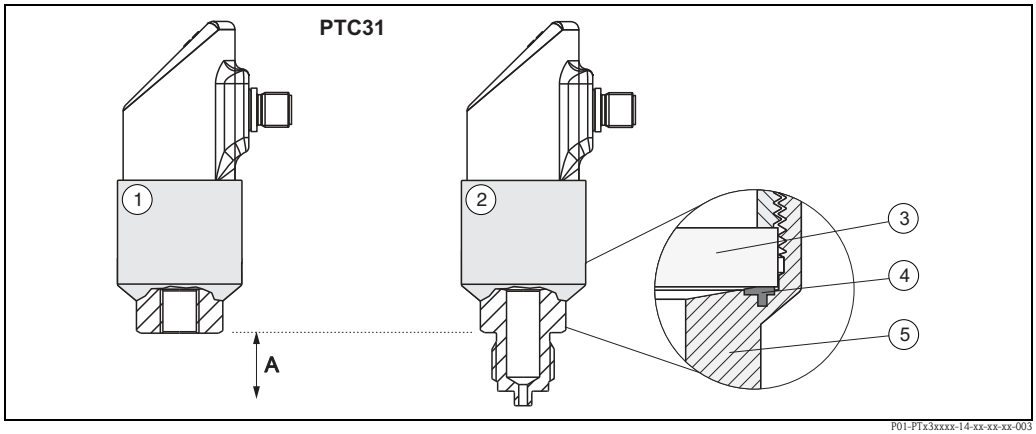
P01-PTx3xxxx-06-xx-xx-xx-006

PTC31: sensor module ① with process connection.

PTP31/35: sensor module ② with M24x1.5 adapter thread for adapters with process connection.

Adapter (mounted onto sensor module at the factory, 400 bar (6000 psi) thread adapter welded onto sensor module)
③ Adapter with thread connection
④ Adapter with clamp connection (except ½" clamp)
⑤ Adapter with hygienic connection (except G 1A)

Process connection PTC31
Sensor module with ceramic process isolating diaphragm

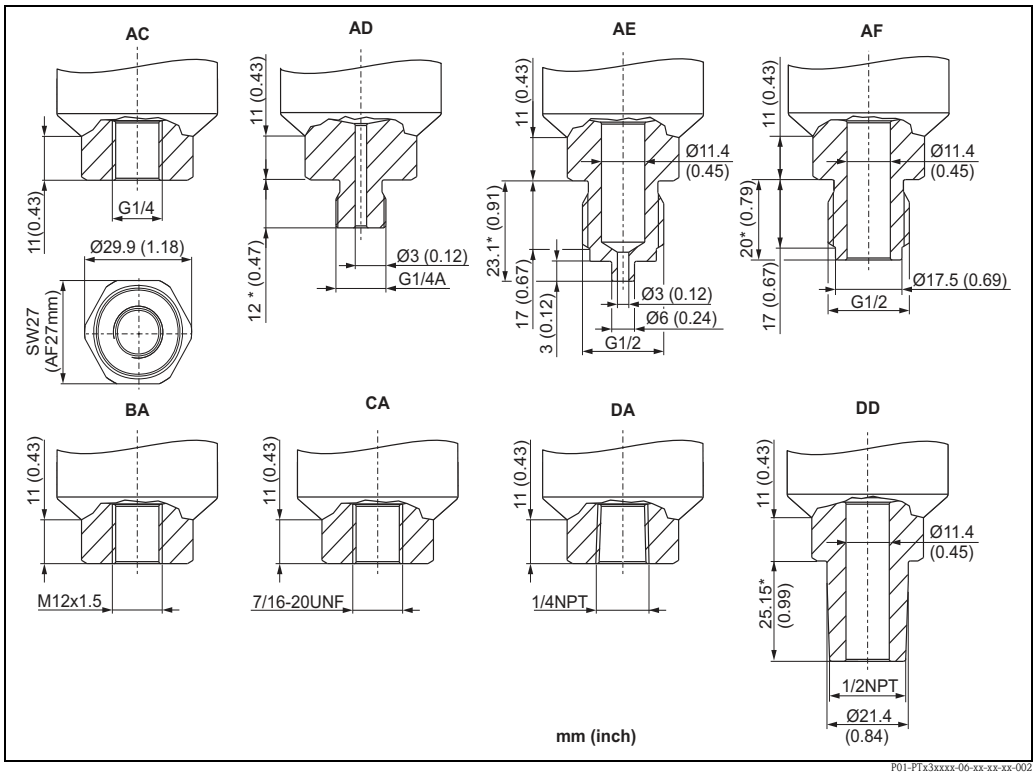


PTC31; sensor module with process connection
① with internal thread
② with external thread

"Seal" detail: ③ Ceraphire ceramic sensor, ④ moulded seal, in contact with process, ⑤ sensor module

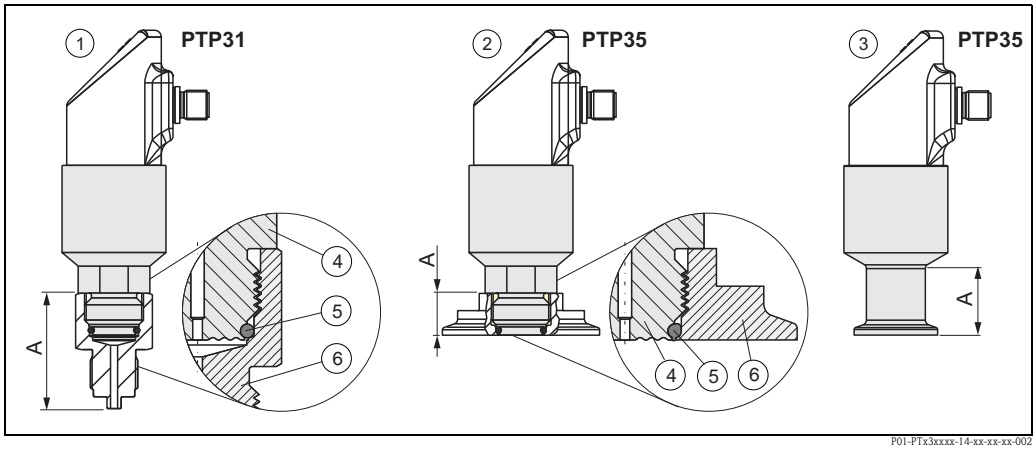
*Dimension A: see the following dimension drawings (dimension with *)*

Thread connections



Process connection versions (see also "Ordering information" section)
AC: thread ISO 288, G¼ (female)
AD: thread ISO 288, G¼A
AE: thread ISO 288, G½A
AF: thread ISO 288, G½A, bore 11 mm (0.43 in)
BA: Thread DIN 13, M12x1.5
CA: thread 7/16-20 UNF (SAE)
DA: thread ANSI ¼ FNPT
DD: thread ANSI ½ MNPT

Process connection PTP
Sensor module with metallic process isolating diaphragm

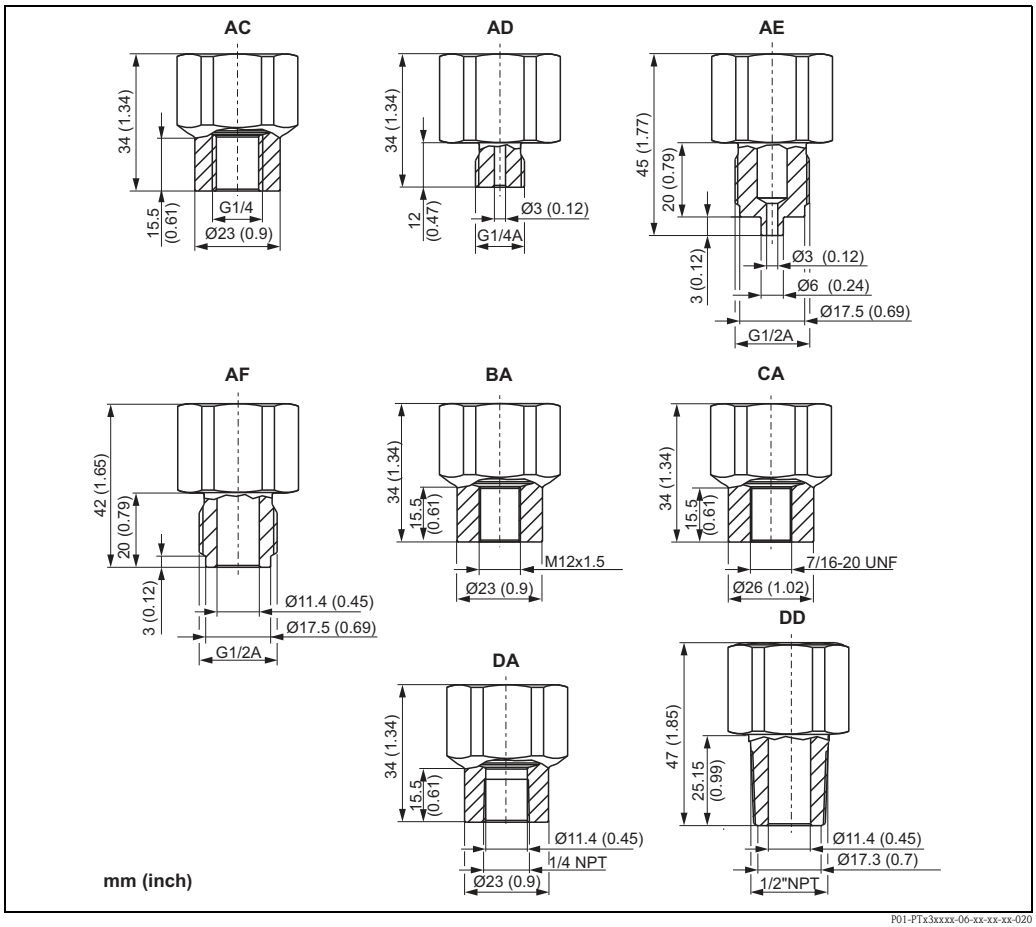


① *Sensor module with adapter thread for adapters with thread connection*
② *Sensor module with adapter thread for adapters with clamp or hygiene connection*
③ *Sensor module with clamp or hygiene connection (only versions DA, BA, BB)*

"Seal" detail: ④ sensor module, ⑤ Standard O-ring, in contact with process, ⑥ adapter

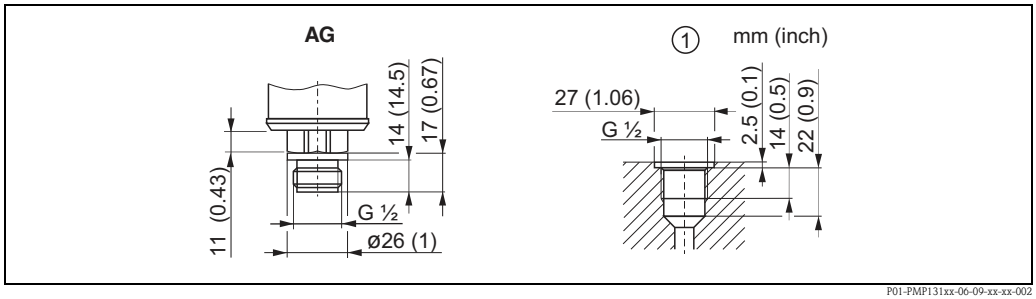
*Dimension A: see the following dimension drawing (dimension with *). For 400 bar (6000 psi) sensor see also Page 12.*

Process connection PTP31 Thread connections



Process connection versions: sensor module with adapter (see also "Ordering information" section)
AC: thread ISO 228, G¼ (female)
AD: thread ISO 228, G¼A
AE: thread ISO 228, G½A
AF: thread ISO 228, G½A, bore 11 mm (0.43 in)
BA: Thread DIN 13, M12x1.5
CA: thread 7/16-20 UNF (SAE)
DA: thread ANSI ¼ FNPT
DD: thread ANSI ½ MNPT

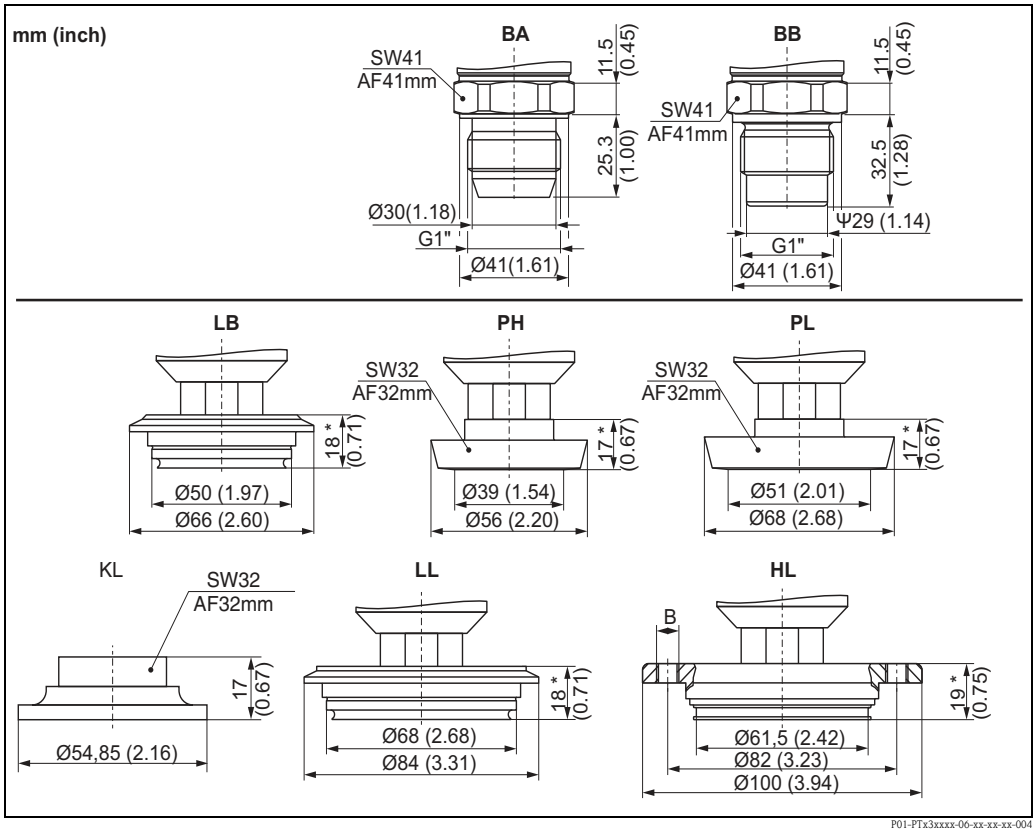
Process connection PTP31 Flush-mounted nozzle



Process connection PTP31; Version AG. Diameter of the process isolation diaphragm 17.2 mm (0.68 in).

AG: Thread ISO 228 G ½, seal DIN 3852 flush-mounted, Weld-in adapter 52002643
①: Dimensions for tapped hole G ½ as per DIN 3852-11 form X

Process connection PTP35 Hygiene connections

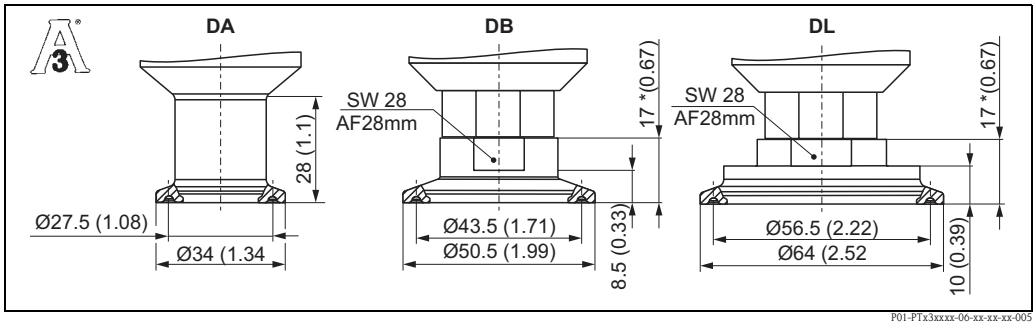


Process connection versions. Diameter of the process isolation diaphragm 17.2 mm (0.68 in).
BA: thread ISO 228 G1A, metallic taper seal
BB: thread ISO 228 G1A (EHEDG, 3A), O-ring seat seal

Process connection versions (sensor module with adapter). Diameter of the process isolation diaphragm 17.2 mm (0.68 in).
LB: Varivent F pipe DN 25-32, PN 40 (EHEDG, 3A)
LL: Varivent N pipe DN 40-162, PN 40 (EHEDG, 3A)
PH: DIN 11851, DN 40, PN 40 (including slotted nut) (EHEDG, 3A)
PL: DIN 11851, DN 50, PN 25 (including slotted nut) (EHEDG, 3A)
HL: APV inline, DN 50, PN 40, (B = bores 6 x Ø8.6 + 2 x M8 thread) (EHEDG, 3A)
KL: SMS 1½ PN 25, 316L (EHEDG, 3A)

See also "Ordering information" section

Process connection PTP35 Clamp connections



Process connection version Diameter of the process isolation diaphragm 17.2 mm (0.68 in).
DA: Clamp ISO 2852 DN 22 (¾") or DN 20 (DIN 32676) (EHEDG, 3A)

Process connection versions (sensor module with adapter). Diameter of the process isolation diaphragm 17.2 mm (0.68 in).
DB: Tri-Clamp ISO 2852 DN 25...DN 38 (1"...1½") or DN 25...DN 40 (DIN 32676) (EHEDG, 3A)
DL: Tri-Clamp ISO 2852 DN 40...DN51 (2") or DN 50 (DIN 32676) (EHEDG, 3A)

See also "Ordering information" section

PTP31 with 400 bar (6000 psi) sensor

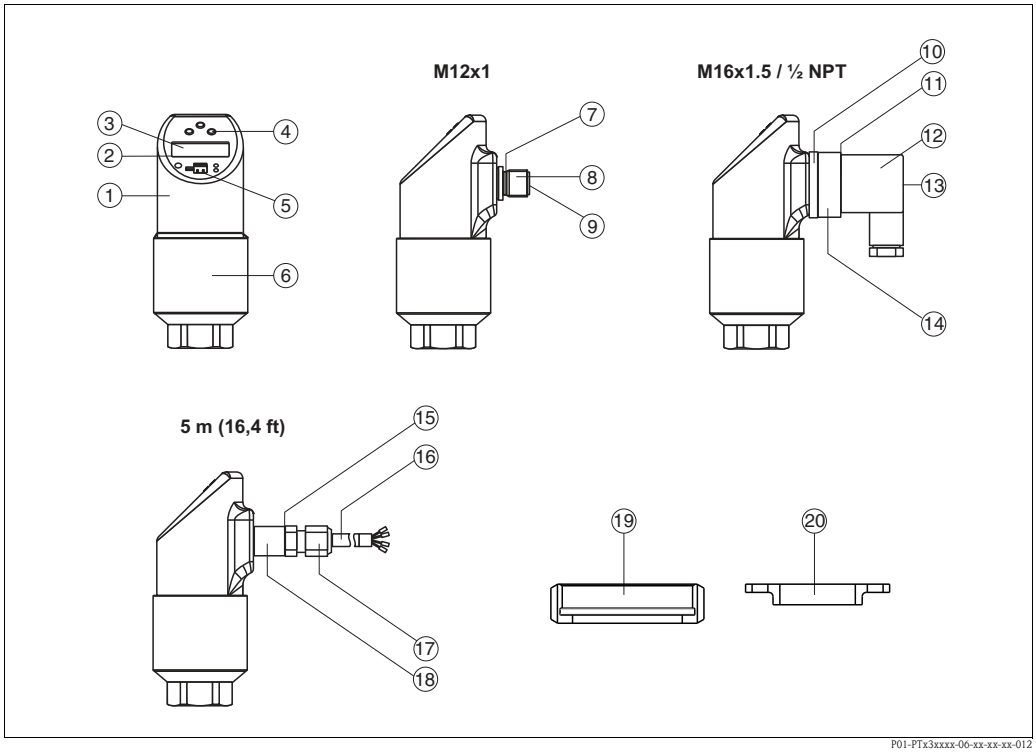
- Across flats on sensor module AF 32 mm
- Sensor module welded to thread adapter
- For ¼ NPT thread connections, M12x1.5, 7/16–20UNF: dimension A 5 mm (0.2 in) longer
  For ½ NPT thread connections, G ½A: dimension A 1 mm (0.04 in) longer

Weight

- PTC31: approx. 0.32 kg (0.71 lbs)
- PTP31: approx. 0.37 kg (0.82 lbs)
- PTP35: approx. 0.58 kg (1.28 lbs) with clamp process connection 1...1½"

Material (not wetted)

Housing



Front view, left-hand side view

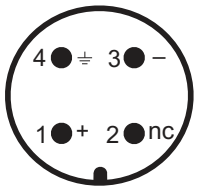
Item number	Component part	Material
1	Housing F25	AISI 316 L (1.4404) with electropolished surface R_a ≤ 0,8 µm (31,5 µin)
2	Seal between display and housing	Closed-cell acrylate adhesive
3	Dispay	PC-FR LEXAN 943A
4	Keys	PC-FR LEXAN
5	CDI cover	TPE SANTOPRENE 151-60
6	Sensor jack	1.4435
7	O ring	FKM
8	M-12 jack	316L (1.4404/1.4435)
9	Inner jack	PA; contacts CuZn nickel-plated
10	Valve jack	316L (1.4404/1.4435)
11	Seal jack	NBR
12	ISO plug	PA
13	Screw	V2A
14	Jack	PBT-FR
15	O ring	EPDM
16	Cable	PUR/UL 94 V0
17	Cable gland	PA
18	M16 jack	316L (1.4404/1.4435)
19	Coupling nut SMS 11861	1.4307
20	Coupling nut DRD	1.4301

Filling oil

Filling oil for PTP31 and PTP35: synthetic oil, FDA number 21 CFR 178.3570

Devices with M12 plug

PIN assignment for M12 connector



PIN	Meaning
1	Signal +
2	Not assigned
3	Signal –
4	Earth

Endress+Hauser offers the following accessories for devices with an M12 plug:
Plug-in jack M12x1, straight
- Material: body PA; slotted nut CuZn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 52006263

Plug-in jack M12x1, elbowed
- Material: body PBT/PA; slotted nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 71114212

Cable 4x0.34 mm² (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
- Material: body PUR; slotted nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP67
- Order number: 52010285

Material (wetted)

Note!
Process wetted device components are listed in the "Mechanical construction" (→ 🖹 11) and "Ordering Information" (→ 🖹 23) sections.

TSE Certificate of Suitability

The following applies to all process wetted device components:
- They do not contain any materials derived from animals.
- No auxiliaries or operating materials derived from animals are used in production or processing.

Process connection

- Process connection: AISI 316L (1.4435)
  Surfaces in contact with the process for PTP35 $R_a \leq 0{,}8$ µm (31,5 µin)
- "Clamp connections" and "Hygienic connections" (see also "Ordering information" section):
  AISI 316L (DIN/EN material number 1.4435)

Process isolating diaphragm

- PTC31: Ceraphire® (99,9 % Al_2O_3). The US Food & Drug Administration (FDA) has no objections to the use of ceramics made from aluminum oxide as a surface material in contact with foodstuffs. This declaration is based on the FDA certificates of our ceramic suppliers.
- PTP31/35: AISI 316L (1.4435)

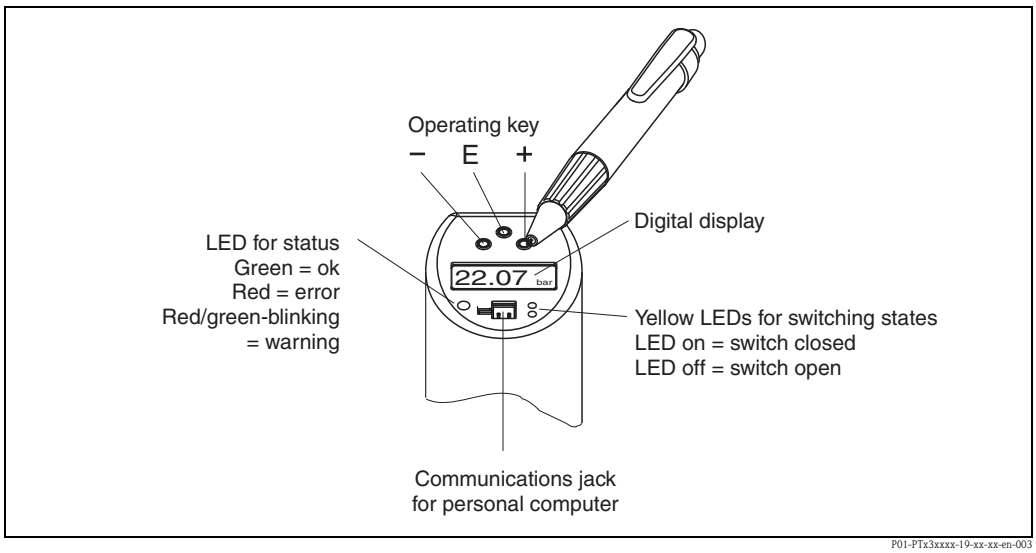
Seals

- FKM
- EPDM: FDA number 21 CFR 177.2600, Class II 3A Sanitary Standard 18, USP Class VI,
- FKM for O_2 applications (70C3 CO2-70-0041V)

Human interface

Operating elements

Position and meaning of display and operating elements.



The background illumination of the digital display indicates the status of the device: white = ok; red = error

On-site operation

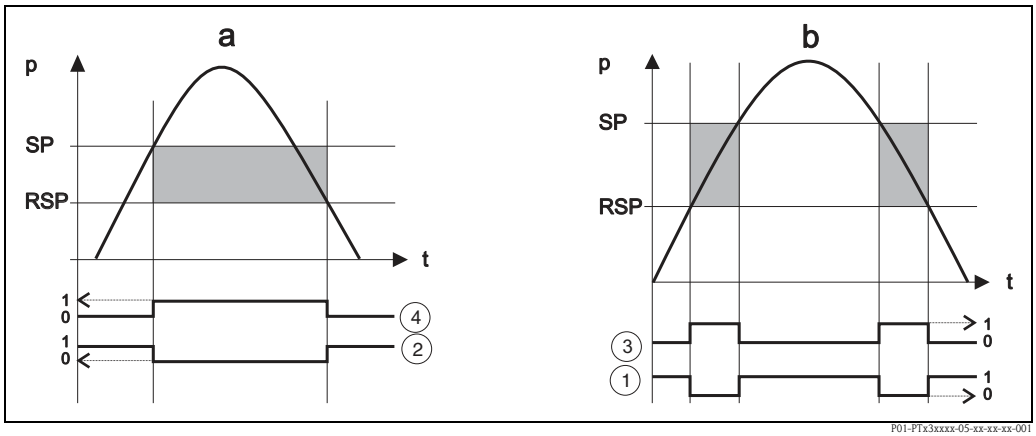
Menu-guided operation using operating keys.

Function group	Operating options
BASE (basic functions)	Selection of unit: bar, psi, kPa/MPa
	Offset: ±20 % URL
	Damping display value, output signal: anywhere between 0...40 s (in increments of 0.1 s)
	Display: – Display of measured value or configured switch point – Rotation of display by 180° – Switching off display
	Behaviour according to DESINA: The PIN assignment of the M12 connector is in accordance with the guidelines of DESINA (DESINA = distributed and standardised installation technology for machine tools and manufacturing systems)
OUT (Configuration of 1st output)	Output function: – Hysteresis function or window function – NC contact or NO contact (see next diagram) – Analog output 4...20 mA
	Switch point: – Input value – Acceptance of applied value Switch point anywhere between 0.5...100 % URL (in increments of 0.1 %, min. 0.001 bar (0.015 psi))
	Switch-back point: – Input value – Acceptance of applied value Switch-back point anywhere between 0...99.5 % URL (in increments of 0.1 %, min. 0.001 bar (0.015 psi))
	Switch output delay: anywhere between 0...99 s (in increments of 0.1 s)

Function group	Operating options
OUT 2 (Configuration of 2nd output, only for corresponding electronics version)	Output function: – Hysteresis function or window function – NC contact or NO contact (see next diagram) – Analog output 4...20 mA
	Switch point 2: – Input value – Acceptance of applied value Switch point anywhere between 0.5...100 % URL (in increments of 0.1 %, min. 0.001 bar (0.015 psi))
	Switch-back point 2: – Input value – Acceptance of applied value Switch-back value anywhere between 0...99.5 % URL (in increments of 0.1 %, min. 0.001 bar (0.015 psi))
	Switch output delay: anywhere between 0...99 s (in increments of 0.1 s)
4-20 (configuration of analog output, only for corresponding electronic version)	Lower range value (LRV) and upper range value (URV) of analog output: – Input value – Acceptance of applied value Anywhere within sensor range (in increments of 0.1 %); turn down up to 4 : 1
	Setting of error current: choice of ≤3.6 mA / ≥21.0 mA / last current value
SERV (service functions)	Resetting of all settings to factory settings
	Static Revision Counter (configuration counter; increases by one with every change in configuration)
	Locking by means of freely selectable code
	Display of last error to occur
	Simulation of switch output and analog output
	Display of max. measured pressure value
	Display of min. measured pressure value
Note	Measuring ranges with negative gauge pressure up to 4 bar (60 psi) in increments of min. 0.01 mbar (0.15 psi)

Functions of switch output

- Hysteresis function
  The hysteresis function enables two-point control via a hysteresis. Depending on the pressure p, the hysteresis can be set via the switch point SP and the switch-back point RSP.
- Window function
  The window function enables the monitoring of a process pressure range.
  The hysteresis of the switch points SP and RSP is less than 0.1 % URL. Under rough EMC conditions quick switching is possible if the measured value is near to SP or RSP. Setting a damping of 0.1 s will avoid this effect.
- NO contact or NC contact
  This switch function is freely selectable.

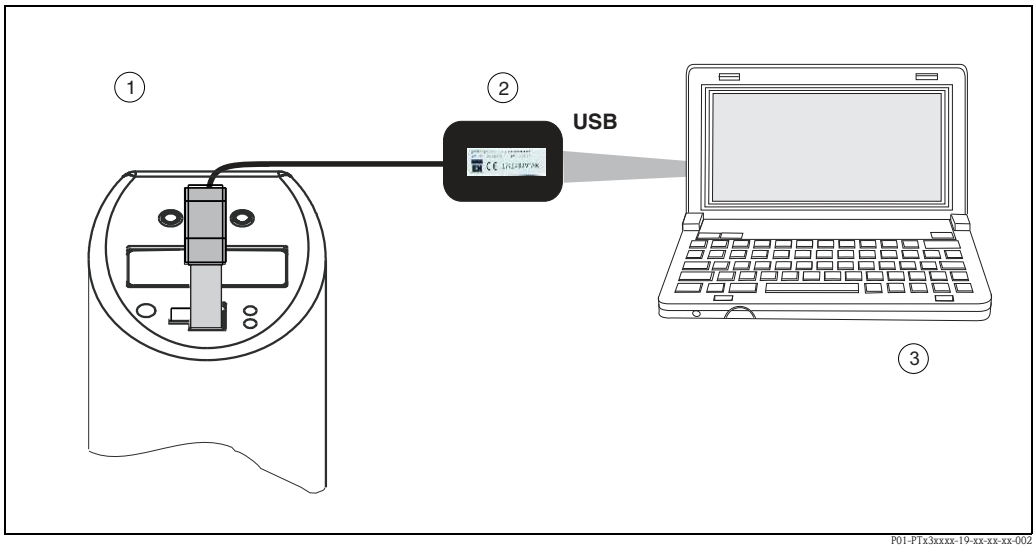


a Hysteresis function
b Window function
① Window NC contact switch status
② Hysteresis NC contact switch status
③ Window NO contact switch status
④ Hysteresis NO contact switch status

SP Switch point
RSP Switch-back point

Operation with PC

The device can be configured with the configuration software ReadWin® 2000 or FieldCare®. For the connection between the USB port of the computer and the device a configuration kit (e. g. TXU10 or FXA291) is necessary.



① *Ceraphant T with communication jack*
② *Configuration kit TXU10-AA or FXA291(USB interface)*
③ *Personal computer with ReadWin® 2000 or FieldCare® configuration software*

In addition to the operating options listed in the previous "On-site operation" section, the ReadWin® 2000 or FieldCare® configuration software provides further information on the Ceraphant T (reset only via on-side display):

Function group	**Description**
SERVICE	Number of switch changes
	Device status/error
INFO	Tag number
	Order code
	Device serial number
	Sensor serial number
	Electronics serial number
	Device release (change status)
	Hardware version
	Software version

Comprehensive information on the ReadWin® 2000 configuration software may be found in the Operating Instructions BA00137R/09/en.

The configuration kit TXU10-AA is available as an accessory (see chapter Assessories). For the order of the configuration kit FXA291 or software FieldCare please ask your E+H sales organisation.

Certificates and approvals

CE mark

The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

UL listing

The device was examined by Underwriters Laboratories Inc. USA (UL) in accordance with the standards UL 61010B-1 and CSA C22.2 No. 1010.1-92 and listed under the number E225237 UL for Canada and the USA.

Pressure Equipment Directive (PED)

This measuring device corresponds to Article 3 (3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.

Suitability for hygenic processes

All materials in contact with foodstuffs comply with framework Regulation (EC) 1935/2004. The device is available with hygienic process connections (overview: see order code).

Caution!
Risk of contamination if incorrect seals and parts are used!

- To avoid the risk of contamination, when installing the device comply with the design principles of EHEDG, Guideline 37 "Hygienic Design and Application of Sensors" and Guideline 16 "Hygienic Pipe Couplings".
- Suitable assemblies and seals must be used to ensure hygienic design in accordance with 3-A SSI and EHEDG specifications.
- The leak-proof connections can be cleaned with the cleaning methods typical of this industry (CIP and SIP). Attention must be paid to the pressure and temperature specifications of the sensor and process connections for CIP and SIP processes (clean in place/sterilize in place).

Standards and guidelines

DIN EN 60770 (IEC 60770):
Transmitters for use in industrial-process control systems
Part 1: Methods for performance evaluation.

DIN EN 61003-1, publication date:1993-12
Industrial-process control systems - Instruments with analog inputs and two- or multi-state outputs - Part 1: Methods of evaluating the performance.

DIN 16086
Electrical pressure measuring instruments; pressure sensors, pressure transmitters, pressure measuring instruments;
concepts, specifications on data sheets

IEC 60529
Degrees of protection provided by enclosures (IP code).

EN 61326
Electrical equipment for measurement, control and laboratory use - EMC requirements.

IEC 61010
Safety requirements for electrical equipment for measurement, control and laboratory use.

EN 61000-4-5
Electromagnetic compatibility (EMC) -
Part 4: Testing and measurement techniques; Section 5: Surge immunity test

Ordering Information

Ceraphant T PTC31

This overview does not mark options which are mutually exclusive.

10	**Certificate**	
	A	For non-hazardous areas

20		**Electrical connection**	
	1	M 12x1 connector: IP 65; with sensors for gauge pressure and absolute pressure: IP 66	
	2	M16x1.5 valve plug, ISO 4400: IP 65	
	3	½NPT valve plug, ISO 4400: IP 65	
	4	5 m (16.4 ft) cable: IP 66	

30		**Electronics, output signal**	
	A	12...30V DC, PNP switch, 3-wire	
	B	12...30V DC, 2 PNP switch, 4-wire	
	C	12...30 V DC, PNP switch + 4...20mA, 4-wire	

40		**Display**	
	1	With digital display	

50		**Sensor**		
	Gauge pressure		Max. working pressure MWP	Overload OPL
	1C	0...0.1bar / 0...10 kPa	2.7 bar	4 bar
	1F	0...0.4 bar / 0...40 kPa	5.3 bar	8 bar
	1H	0...1 bar / 0...100 kPa	6.7 bar	10 bar
	1M	0...4 bar / 0...400 kPa	16.7 bar	25 bar
	1P	0...10 bar / 0...1000 kPa	26.7 bar	40 bar
	1S	0...40 bar / 0...4000 kPa	40 bar	60 bar
	Negative gauge pressure		Max. working pressure MWP	Overload OPL
	5C	-0.1...0.1 bar / -10...10 kPa	2.7 bar	4 bar
	5F	-0.4...0.4 bar / -40...40 kPa	5.3 bar	8 bar
	5H	-1...1 bar / -100...100 kPa	6.7 bar	10 bar
	5M	-1...4 bar / -100...400 kPa	16.7 bar	25 bar
	5P	-1...10 bar / -100...1000 kPa	26.7 bar	40 bar
	Absolute pressure		Max. working pressure MWP	Overload OPL
	2F	0...0.4 bar / 0...40 kPa	5.3 bar	8 bar
	2H	0...1 bar / 0...100 kPa	6.7 bar	10 bar
	2M	0...4 bar / 0...400 kPa	16.7 bar	25 bar
	2P	0...10 bar / 0...1000 kPa	26.7 bar	40 bar
	2S	0...40 bar / 0...4000 kPa	40 bar	60 bar

60		**Configuration and unit**	
	1	Sensor range: bar	Calibration in sensor range
	2	Sensor range: kPa/MPa	Calibration in sensor range
	3	Sensor range: psi	Calibration in sensor range
	S	Switch output 1, see additional specification	Calibration in sensor range
	T	Switch output 1 + 2, see additional specification	Calibration in sensor range
	U	Switch and analog output, see additional specification	Calibration in sensor range
	V	Switch output 1, switch output 2 DESINA, see add. spec.	Calibration in sensor range
	W	Analog output, switch output DESINA, see add. spec.	Calibration in sensor range

70		**Process connection, material**
	AC	Thread ISO 288, G¼ (female), 316L
	AD	Thread ISO 228, G¼A, 316L
	AE	Thread ISO 228, G½A, 316L
	AF	Thread ISO 228, G½A, bore 11.4 mm, 316L
	BA	Thread DIN 13, M 12x1.5, 316L
	CA	Thread 7/16-20 UNF (SAE), 316L
	DA	Thread ANSI ¼ FNPT, 316L
	DD	Thread ANSI ½ MNPT, 316L

80		**Sensor seal (in contact with process)**
	1	FKM sensor seal
	4	EPDM sensor seal
	6	FKM sensor seal, cleaned for O_2 service

90		**Additional equipment**
	A	Without additional equipment
	B	Final inspection report
	C	3.1 (process connection), inspection certificate to EN 10204

90									**Additional equipment**		
									D	Final inspection report + 3.1 (process connection), inspect. certificate to EN 10204	
995									**Marking:**		
									1	Tagging (TAG), see additional spec.	

PTC31											order code

Ceraphant T PTP31

This overview does not mark options which are mutually exclusive.

10 Certificate

A	For non-hazardous areas

20 Electrical connection

1	M 12x1 connector: IP 65; with sensors for gauge pressure and absolute pressure: IP 66
2	M16x1.5 valve plug, ISO 4400: IP 65
3	½NPT valve plug, ISO 4400: IP 65
4	5 m (16.4 ft) cable: IP 66

30 Electronics, output signal

A	12...30V DC, PNP switch, 3-wire
B	12...30V DC, 2 PNP switch, 4-wire
C	12...30 V DC, PNP switch + 4...20mA, 4-wire

40 Display

1	With digital display

50 Sensor

Gauge pressure		Max. working pressure MWP	Overload OPL
3H	0...1 bar / 0...100 kPa	2.7 bar	4 bar
3M	0...4 bar / 0...400 kPa	10.7 bar	16 bar
3P	0...10 bar / 0...1000 kPa	26.7 bar	40 bar
3S	0...40 bar / 0...4000 kPa	100 bar	160 bar
3U	0...100 bar / 0...10 MPa	100 bar	160 bar
3Z	0...400 bar / 0...40 MPa	400 bar	600 bar

Negative gauge pressure		Max. working pressure MWP	Overload OPL
7H	-1...1 bar / -100...100 kPa	2.7 bar	4 bar
7M	-1...4 bar / -100...400 kPa	10.7 bar	16 bar
7P	-1...10 bar / -100...1000 kPa	26.7 bar	40 bar

Absolute pressure		Max. working pressure MWP	Overload OPL
4H	0...1 bar / 0...100 kPa	2.7 bar	4 bar
4M	0...4 bar / 0...400 kPa	10.7 bar	16 bar
4P	0...10 bar / 0...1000 kPa	26.7 bar	40 bar
4S	0...40 bar / 0...4000 kPa	100 bar	160 bar
4U	0...100 bar / 0...10 MPa	100 bar	160 bar
4Z	0...400 bar / 0...40 MPa	400 bar	600 bar

60 Configuration and unit

1	Sensor range: bar	Calibration in sensor range
2	Sensor range: kPa/MPa	Calibration in sensor range
3	Sensor range: psi	Calibration in sensor range
S	Switch output 1, see additional specification	Calibration in sensor range
T	Switch output 1 + 2, see additional specification	Calibration in sensor range
U	Switch and analog output, see additional specification	Calibration in sensor range
V	Switch output 1, switch output 2 DESINA, see add. spec.	Calibration in sensor range
W	Analog output, switch output DESINA, see add. spec.	Calibration in sensor range

70 Process connection, material

AC	Thread ISO 288, G¼ (female), 316L
AD	Thread ISO 228, G¼A, 316L
AE	Thread ISO 228, G½A, 316L
AF	Thread ISO 228, G½A, bore 11.4 mm, 316L
AG	Thread ISO 228, G½A, seal DIN 3852, 316L, flush-mounted
BA	Thread DIN 13, M 12x1.5, 316L
CA	Thread 7/16-20 UNF (SAE), 316L
DA	Thread ANSI ¼FNPT, 316L
DD	Thread ANSI ½MNPT, 316L

80 Seal, filling fluid

1	O-ring FKM synthetic oil
4	O-ring EPDM, synthetic oil
7	Welded, synthetic oil (only for 400 bar sensor)

90 Additional equipment

A	Without additional equipment
B	Final inspection report
C	3.1 (process connection), inspection certificate to EN 10204
D	Final inspection report + 3.1 (process connection), inspect. certificate to EN 10204

995										**Marking:**
										1	Tagging (TAG), see additional spec.

PTP31											order code

Ceraphant T PTP35

This overview does not mark options which are mutually exclusive.

10	Certificate
A	For non-hazardous areas

20	Electrical connection
1	M 12x1 connector: IP 65; with sensors for gauge pressure and absolute pressure: IP 66
2	M16x1.5 valve plug, ISO 4400: IP 65
3	½NPT valve plug, ISO 4400: IP 65
4	5 m (16.4 ft) cable: IP 66

30	Electronics, output signal
A	12...30V DC, PNP switch, 3-wire
B	12...30V DC, 2 PNP switch, 4-wire
C	12...30 V DC, PNP switch + 4...20mA, 4-wire

40	Display
1	With digital display

50	Sensor		
	Gauge pressure	Max. working pressure MWP	Overload OPL
3H	0...1 bar / 0...100 kPa	2.7 bar	4 bar
3M	0...4 bar / 0...400 kPa	10.7 bar	16 bar
3P	0...10 bar / 0...1000 kPa	26.7 bar	40 bar
3S	0...40 bar / 0...4000 kPa	100 bar	160 bar
	Negative gauge pressure	Max. working pressure MWP	Overload OPL
7H	-1...1 bar / -100...100 kPa	2.7 bar	4 bar
7M	-1...4 bar / -100...400 kPa	10.7 bar	16 bar
7P	-1...10 bar / -100...1000 kPa	26.7 bar	40 bar
	Absolute pressure	Max. working pressure MWP	Overload OPL
4H	0...1 bar / 0...100 kPa	2.7 bar	4 bar
4M	0...4 bar / 0...400 kPa	10.7 bar	16 bar
4P	0...10 bar / 0...1000 kPa	26.7 bar	40 bar
4S	0...40 bar / 0...4000 kPa	100 bar	160 bar

60	Configuration and unit	
1	Sensor range: bar	Calibration in sensor range
2	Sensor range: kPa/MPa	Calibration in sensor range
3	Sensor range: psi	Calibration in sensor range
S	Switch output 1, see additional specification	Calibration in sensor range
T	Switch output 1 + 2, see additional specification	Calibration in sensor range
U	Switch and analog output, see additional specification	Calibration in sensor range
V	Switch output 1, switch output 2 DESINA, see add. spec.	Calibration in sensor range
W	Analog output, switch output DESINA, see add. spec.	Calibration in sensor range

70	Process connection, material
	Clamp connections
DA	ISO 2852 DN12-22 (¾") (EHEDG [2], 3A [1]), 316L, DIN32676, DN10-20
DB	ISO 2852 DN25-38 (1...1½") (EHEDG [2], 3A [1]), 316L, DIN32676, DN25-40
DL	ISO 2852 DN40-51 (2") (EHEDG [2], 3A [1]), 316L, DIN32676, DN50
	Hygienic connections
BA	Thread ISO 228 G1A, metallic taper seal, 316L, flush-mounted for sleeve 52005087
BB	Thread ISO 228 G1A (EHEDG [2], 3A [1]), O-ring seat seal, 316L, flush-mounted for sleeve 52001051
KL	SMS 1½" PN 25 (EHEDG [1], 3A [2]), 316L
LB	Varivent F pipe DN 25-32 (EHEDG [2], 3A [1]), PN 40, 316L, 3A
LL	Varivent N pipe DN 40-162 (EHEDG [2], 3A [1]), PN 40, 316L, 3A
PH	DIN 11851 DN 40 PN 40 (EHEDG [2], 3A [1]), slotted nut, 316L
PL	DIN 11851 DN 50 PN 25 (EHEDG [2], 3A [1]), slotted nut, 316L
HL	APV Inline DN 50 PN 40 (EHEDG [2], 3A [1]), 316L

1) Suitable fittings and seals must be used for hygienic design in accordance with EHEDG specifications.

2) Suitable fittings and seals must be used for hygienic design in accordance with 3A specifications.

80	Seal, filling fluid
4	O-ring EPDM, oil conform to FDA
8	Without O-ring, oil conform to FDA (only for process connections BA, BB, DA)

90	**Additional equipment**	
	A	Without additional equipment
	B	Final inspection report
	C	3.1.B process connection, inspection certificate to EN10204
	D	Final inspection report + 3.1 (process connection), inspect. certificate to EN10204
995	**Marking:**	
	1	Tagging (TAG), see additional spec.

PTP35	order code

Questionnaire on customer-specific configuration

The Ceraphant T pressure switch can also be ordered with customised settings. For this purpose, please use the questionnaire below. Information on the desired switch point (SP), switch-back point (RSP), lower range value and upper range value always refer to the pressure unit selected. The possible range of adjustment is indicated in the questionnaire in % of the upper range limit (URL). The bold-printed specifications are the factory settings.

Questionnaire for Ceraphant PTC31, PTP31, PTP35 for customer-specific setup

Pressure unit **( ) bar** ( ) kPa/MPa ( ) psi

Output 1 (Application 1)
Function: ( ) 1 = Window normally closed ( ) 3 = Window normally open
( ) 2 = Hysteresis normally closed **( ) 4 = Hysteresis normally open**

SP: [ ] Range of adjustment: 0,5...100 % URL (in increments of 0.1 %, min. 1 mbar *)

RSP: [ ] Range of adjustment: 0...99,5 % URL (in increments of 0.1 %, min. 1 mbar *)

Min. difference SP – RSP: 0,5% URL * increments of min. 10 mbar with neg. gauge pressure up to 4 bar

Output 2 (Application 2) (only if available)
Function:
( ) 1 = Window normally closed ( ) 3 = Window normally open ( ) 5 = 4...20 mA (only if available)
( ) 2 = Hysteresis normally closed **( ) 4 = Hysteresis normally open**

SP: [ ] Range of adjustment: 0,5...100 % URL (in increments of 0.1 %, min. 1 mbar *)

RSP: [ ] Range of adjustment: 0...99,5 % URL (in increments of 0.1 %, min. 1 mbar *)
* increments of min. 10 mbar with neg. gauge pressure up to 4 bar

Analogue output (only if output 2 = 4...20 mA output available)

Range low scale: [ ] Range of adjustment: 0....100 % URL

Range high scale: [ ] Range of adjustment: 0....100 % URL
Turn down up to 4 : 1

Failure mode: ( ) 1 = ≤ 3.6 mA **( ) 2 = ≥ 21.0 mA** ( ) 3 = last current value

Connection conform to DESINA (only for 2 outputs): **( ) no** ( ) yes
Hint: See section "Devices Connection"

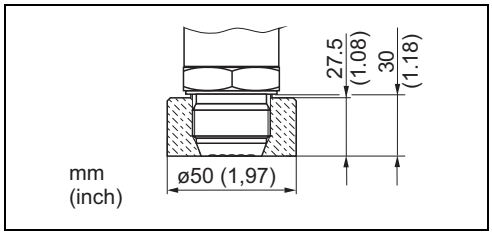
TAG (max. 2 x 18 characters) [ ]

P01-PTx3xxxx-16-xx-xx-en-001

Accessories

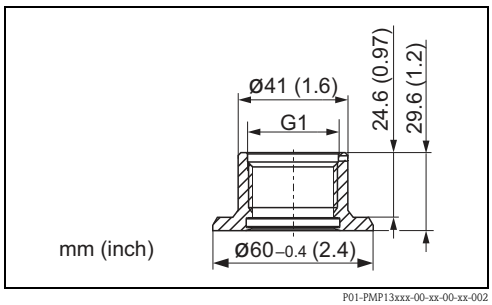
Welding boss
– with sealing taper

- Welding boss for flush mounting process connection G1 A with metallic sealing taper (version BA for PTP35)
  Material: AISI 316L
  Order number: 52005087
- Optional with inspection certificate 3.1
  Order number: 52010171
- Welding aid (Dummy) for welding the welding boss without any problems, order number 52005087 or 52010171
  Material: brass
  Order number: 52005272



Welding boss
– with sealing surface

- Welding boss for flush mounting process connection G1 A with sealing surface (version BB for PTP35)
  Material: AISI 316L
  Order number: 52001051
- Seal (enclosed): silicone O-ring
  FDA approved materials according to 21 CFR Part 177.1550/2600
- Optional with inspection certificate 3.1:
  Order number: 52011896



Thread adapter

- PTP31: order numbers for thread adapter versions

  Version AC: order no. 52023980
  Version AD: order no. 52023981
  Version AE: order no. 52023982
  Version AF: order no. 52023983
  Version BA: order no. 52023984
  Version CA: order no. 52023985
  Version DA: order no. 52023986
  Version DD: order no. 52023987

  See chapter "Process connection PTP31 Thread connections" → 13.

Clamp adapter

- PTP35: Order numbers for clamp adapter versions

  Version DB: order no. 52023994
  Version DL: order no. 52023995

  Optional with inspection certificate 3.1:
  Version DB: order no. 52024001
  Version DL: order no. 52024002

  See chapter "Process connection PTP35 Clamp connections" → 15.

Hygiene adapter

- PTP35: order numbers for hygiene adapter versions

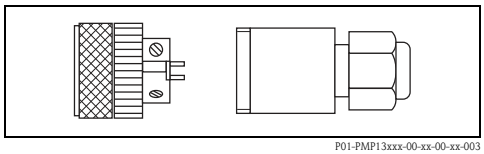
Version KL (EHEDG, 3A): order no. 52026997
Version LB (EHEDG, 3A): order no. 52023996
Version LL (EHEDG, 3A): order no. 52023997
Version PH (EHEDG, 3A): order no. 52023999
Version PL (EHEDG, 3A): order no. 52023998
Version HL (EHEDG, 3A): order no. 52024000

Optional with inspection certificate 3.1:
Version KL (EHEDG, 3A): order no. 52026999
Version LB (EHEDG, 3A): order no. 52023996
Version LL (EHEDG, 3A): order no. 52024004
Version PH (EHEDG, 3A): order no. 52024006
Version PL (EHEDG, 3A): order no. 52024005
Version HL (EHEDG, 3A): order no. 52024007

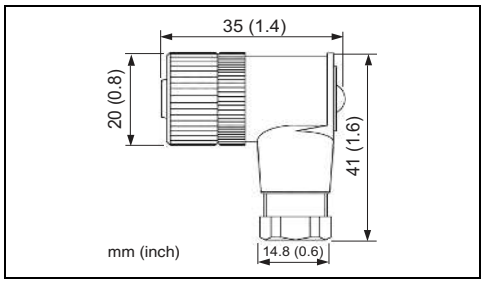
See chapter "Process connection PTP35 Hygiene connections" → 14.

Plug-in jack

- M12x1 plug-in jack
  Self-made connection to M12x1 plug
  Materials: Body PA
  Coupling nut: Cu Zn, brass, nickeled
  Protection: IP 67 (fully locked)
  Order number: 52006263


P01-PMP13xxx-00-xx-00-xx-003

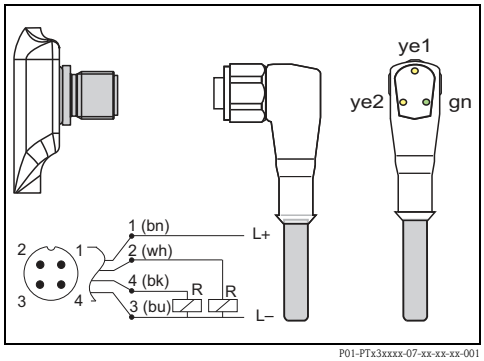
- M12x1 plug-in jack, elbowed
  Self-made connection to M12x1 plug
  Materials: Body PA
  Coupling nut: GD-Zn, brass, nickeled
  Protection: IP 67 (fully locked)
  Order number: 71114212



P01-Pxxxxxxx-00-xx-00-xx-002

Connecting cable

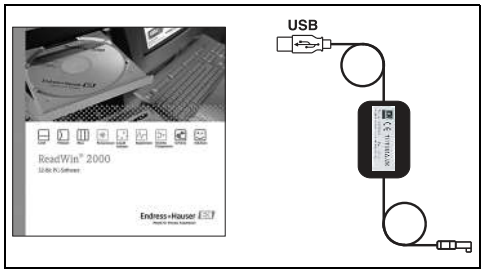
- Cable, 4 x 0.34 mm² (AWG 21) with M12 socket, elbowed, screw plug, length 5 m (16 ft), sprayed cable
  Materials: Body PUR
  Coupling nut: Cu Zn/Ni, brass, nickeled
  Cable: PVC
  Protection: IP 67 (fully locked)
  order number: 52010285
- Cable, 4 x 0.34 mm² (AWG 21) with M12 socket, with LED, elbowed, sprayed cable, length 5 m (16 ft), specially for hygiene applications
  (For devices with switch output only)
  Materials: Body: PVC
  Coupling nut: 316L
  Cable: PVC
  Protection: IP 69K (fully locked)
  Order number: 52018763
  Display: gn: device operational;
  ye1: switch status; ye 2: switch status 2



P01-PTx3xxxx-07-xx-xx-xx-001

Configuration kit

- Configuration kit for PC-programmable transmitters. Setup program and interface cable for PCs with USB port. Adapter for transmitters with 4-pin post connector.
  Order code: TXU10-AA
- ReadWin® 2000 is supplied with the configuration kit or it can be downloaded free of charge directly from the internet at the following address: www.readwin2000.com



P01-PTxx3xxx-00-xx-00-xx-001

Power supply RNB130

- Primary switched-mode power supply for sensors
- Space saving DIN rail mounting as per IEC 60715.
- Nominal input voltage: 100-240 V AC (wide-range voltage input)
- Output voltage: 24 V DC, max. 30 V in the event of a fault
- Nominal ouput current: 1.5 A
- Connection to monophased a.c. networks or to two phase conductors of three-phase supply networks

Documentation

This supplementary documentation can be found on our product pages on www.endress.com

Field of Activities

Pressure measurement, Powerful instruments for process pressure, differential pressure, level and flow: FA00004P/00/EN

Technical Information

Technical Information on the Thermophant T temperature switch:
- Thermophant T TTR31, TTR35: TI00105R/09/EN
- Flowphant T DTT31, DTT35: TI00125R/09/EN

Operating instructions

- Ceraphant T PTC31, PTP31, PTP35: KA00225P/00/EN
- Operating software ReadWin 2000: BA00137R/09/EN
- Operating software FieldCare: BA00027S/04/C4

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