



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Ceraphant T PTC31, PTP31, PTP35

Process pressure

Dual output pressure transmitter with 4 to 20 mA and PNP switch output for safe measurement and monitoring of absolute and gage pressures



Application

Pressure transmitter for monitoring absolute and gage pressures in gases, vapors, liquids and dust.

Ceraphant T PTC31

– with ceramic sensor diaphragm;

Ceraphant T PTP31

– with metallic sensor diaphragm;

Ceraphant T PTP35

– for hygienic applications.

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

Your benefits

This compact pressure transmitter is designed with the latest technology being used:

- Integrated switching electronics for decentral and economic process monitoring and control.
- Quick and flexible process connection thanks to modular connections.
- High reproducibility and long-term stability.
- Function check and information on site thanks to LEDs and digital display.
- Ceraphire® 99.9% aluminum oxide ceramic sensor diaphragm: corrosion-proof, abrasion-proof and extremely overload-resistant.
- Excellent accuracy and response time right to the smallest measuring range.
- Operation and visualization with personal computer and ReadWin®2000.

Function and system design

Measuring principle

Ceraphant T PTC 31

The process pressure acts on the ceramic sensor 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.

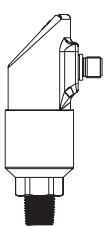
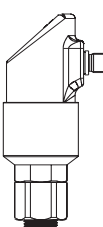
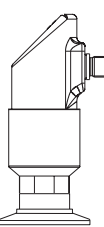
The ceramic sensor is a dry sensor i.e. no fill fluid is needed for pressure transmission. This means that the sensor can fully support a vacuum. Extremely high durability, on a par with the material Alloy, is achieved through the use of the highly pure ceramic material Ceraphire®.

Ceraphant T PTP 31 and PTP 35

The process pressure acting upon the metallic separating 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.

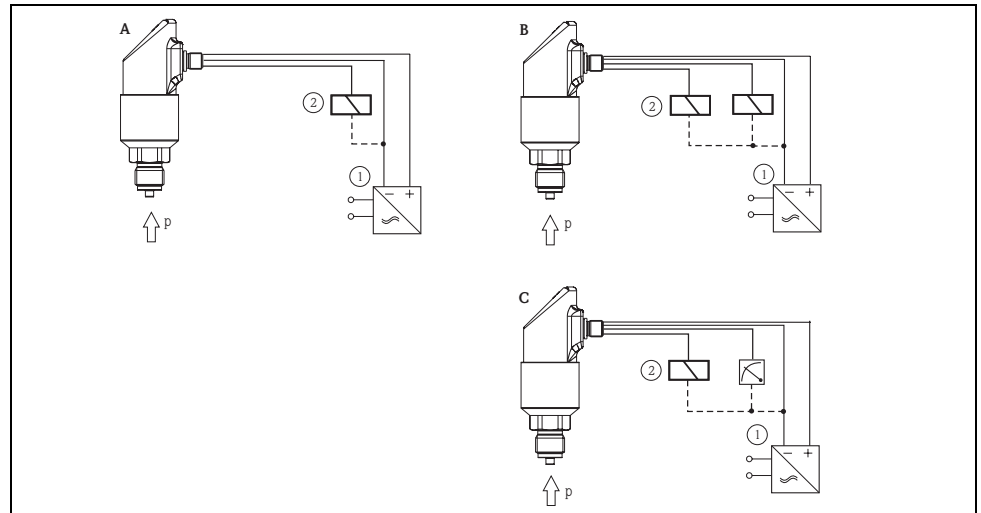
Measuring system

Synopsis

Ceraphant product family	PTC 31	PTP 31	PTP 35
	 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 measuring diaphragm (Ceraphire®)	With piezoresistive measuring cell and metallic measuring diaphragm	With piezoresistive measuring cell and metallic measuring diaphragm for hygienic applications
Field of application	Measurement and monitoring of absolute and gage pressures	Measurement and monitoring of absolute and gage pressures	Measurement and monitoring of absolute and gage pressures in hygienic processes
Process connection	Thread – ¼" FNPT and ½" MNPT – 7/16-20 UNF – G ¼ female – G ¼A and G ½A – G ½A, bore 11 mm – M 12x1.5	Thread – ¼" FNPT and ½" MNPT – 7/16-20 UNF – G ¼ female – G ¼A and G ½A – G ½A, bore 11 mm – M 12x1.5	Hygiene – Mini-clamp – Tri-clamp 1" – 2" – G 1A – Varivent F, N – DIN 11851 – APV inline
Measuring range	0 to 1.5 psi / 0 to 100 mbar to 0 to 600 psi / 0 to 40 bar	0 to 15 psi / 0 to 1 bar to 0 to 6000 psi / 0 to 400 bar	0 to 15 psi / 0 to 1 bar to 0 to 600 psi / 0 to 40 bar
Process temperature	– 40°F +212°F (–40°C to+100°C)	– 40°F +212°F (–40°C to+100°C)	– 40°F +212°F (–40°C to+100°C) (275°F / 135°C max. 1 hour)

DC voltage version

Positive signal at electronics switch output (PNP).
 Power supply, e.g. with a transmitter power supply unit.
 Preferred in conjunction with programmable logic controllers (PLC) or to control relays.



A: 1 x PNP switch output
 B: 2 x PNP switch output
 C: PNP switch output with additional analog output 4 to 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 gage pressure or absolute pressure.
Measuring range	Measuring ranges up to 6000 psi (400 bar), see "Ordering information" section.

Output

Output signal	<p>DC voltage version: Positive voltage signal (rate depends on power supply voltage) at electronics switch output (PNP). Short-circuit proof version.</p> <ul style="list-style-type: none"> ■ 1 x PNP switch output ■ 2x PNP switch output ■ PNP switch output with additional active analog output <p>The analog output 4 to 20 mA continuously represents the measuring range configured or specified by the sensor.</p>
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Range of adjustment	<ul style="list-style-type: none"> ■ Switch output: Switch point: 0.5 to 100 % in increments of 0.1 % (min. 0.01 psi / 1 mbar) of the upper range limit (URL) Reset point: 0 to 99.5 % in increments of 0.1 % (min. 0.01 psi / 1 mbar) of the upper range limit (URL) Minimum distance between SP and RSP: 0.5% URL ■ 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 to 40 s in increments of 0.1 s ■ Factory setting (if no customer-specific settings have been specified): Switch point SP 1: 45%; reset point RSP 1: 44.5% Switch point SP 2: 55%; reset point RSP 2: 54.5% Analog output: LRV 0%; URV 100%
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LRL = Lower Range Limit / URL = Upper Range Limit
LRV = Lower Range Value / URV = Upper Range Value

Switching capacity	<p>DC voltage version:</p> <ul style="list-style-type: none"> ■ Switch status ON: $I_a \leq 250$ mA, switch status OFF: $I_a \leq 1$ 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 "Warning" shown on display
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Input PLC	<p>Input impedance $R_i \leq 2$ kΩ Input current $I_i \geq 10$ mA</p>
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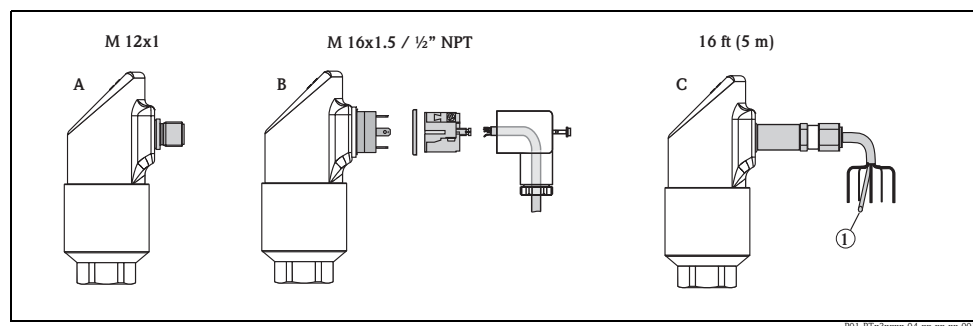
Inductive load	<p>To prevent electrical interference, only operate an inductive load (relays, contactors, solenoid valves) when directly connected to a protective circuit (free-wheeling diode or capacitor).</p>
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Signal on alarm	<ul style="list-style-type: none"> ■ 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)
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Load	<ul style="list-style-type: none"> ■ Max. $(V_{Supply} - 6.5$ V) / 0.22 A (analog output)
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Power supply

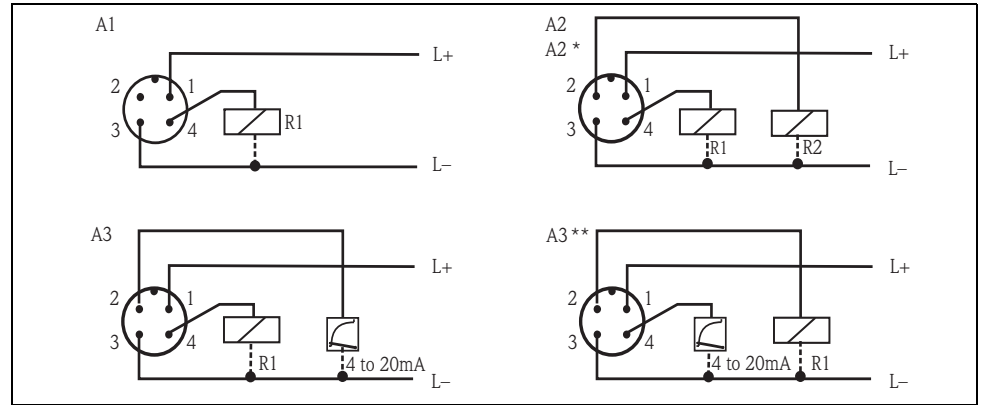
Electrical connection	Connector and cable connection
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A: M 12 x 1 connector
B: M 16 x 1.5 or 1/2" NPT valve plug
C: cable, 16 ft (5 m long), 5-core (1 = reference pressure supply)

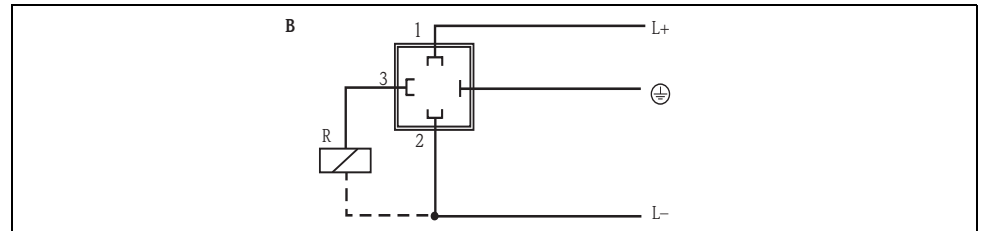
Device connection

- DC voltage version with M 12x1 connector



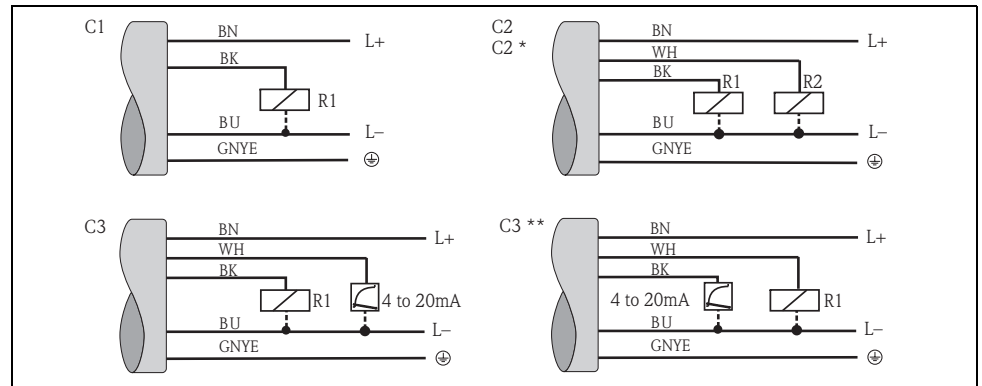
- A1: 1x PNP switch output
- A2: 2x PNP switch output R1 and R2
- A2 *: PNP switch outputs R1 and R2 (diagnosis/break contact with adjustment "DESINA")
- A3: PNP switch output with additional analog output
- A3 **: PNP switch output with additional analog output (PIN assignment with "DESINA" setting)

- DC voltage version with M 16x1.5 or 1/2" 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 R2 (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 versions 5-core (4 x 20 AWG, Ground 18 AWG)

– Wire colors: BN = brown, BK = black, WH = white, BU = blue, GNYE = green/yellow

Supply voltage	<ul style="list-style-type: none"> ■ DC voltage version 12 to 30 V DC
Current consumption	Without load < 60 mA, with reverse polarity protection
Power supply failure	<ul style="list-style-type: none"> ■ Behavior in case of overvoltage 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. ■ Behavior 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 = 76°F (25°C), relative humidity 45 to 75 %, ambient air pressure 12.4 to 15.4 psi (860 to 1060 kPa)
Switch output	<ul style="list-style-type: none"> ■ Accuracy: deviation < 0.5 % ■ Non-repeatability: < 0.2 % ■ Response time: ≤ 20 ms
Analog output	<ul style="list-style-type: none"> ■ 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
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	<ul style="list-style-type: none"> ≤ ± 1.5 %, -4 to +115°F (-20 to +45°C) ≤ ± 2.0 %, -40 to +185°F (-40 to +85°C) ≤ ± 2.5 %, -40 to +212°F (-40 to +100°C)

Operating conditions: Installation instructions

Installation instructions	<ul style="list-style-type: none"> ■ Any orientation. ■ Any position-dependent zero shift can be corrected. Offset: ±20% URL ■ Housing can be rotated up to 310°
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Operating conditions: Environment

Ambient temperature range	-40 to +185°F / -40 to +85°C (briefly up to +212°F / +100°C)
Storage temperature	-40 to +185°F (-40 to +85°C)

Degree of protection

	Sensor		
	Gage < 150 psi (10 bar)	Gage ≥ 150 psi (10 bar)	Absolute
Electrical connection			
M12 x 1	IP60	IP66	IP66
M16 x 1.5	IP60	IP65	IP65
1/2" NPT	IP60	IP65	IP65
16 ft (5 m) cable	IP66	IP66	IP66

- For applications where the device is installed outdoor or cleaned from outside and in which the ingress protection (IP 65/IP 66) could be overstepped, we recommend the use of a protective cover (cover in preparation)

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, Surge 0.5/1.0 kV) and NAMUR Recommendation NE 21

Operating conditions: Process

Medium temperature range

- PTC 31: -40 to +212°F (-40°C to +100°C)
- PTP 31: -40 to +212°F (-40°C to +100°C)
- PTP 35: -40 to +212°F (-40°C to +100°C) (+275°F / 135°C for max. 1 hour)

Please note the temperature limits of the seal used (see page 12)

Limiting medium pressure range

- For overload resistance see "Ordering information" section
- Vacuum resistance
 - For ceramic sensor with nominal value > 1.45 psi: 0 psia (100 mbar: 0 mbar_{abs})
 - For ceramic sensor 1.45 psi: 10 psia (100 mbar: 700 mbar_{abs})
 - For metal sensor: 0.15 psia (10 mbar_{abs})

Pressure specifications

The maximum pressure for the measuring device is dependent on the weakest element with regard to pressure, see the following sections for this:

- Ordering information: "Measuring range"
- Mechanical construction

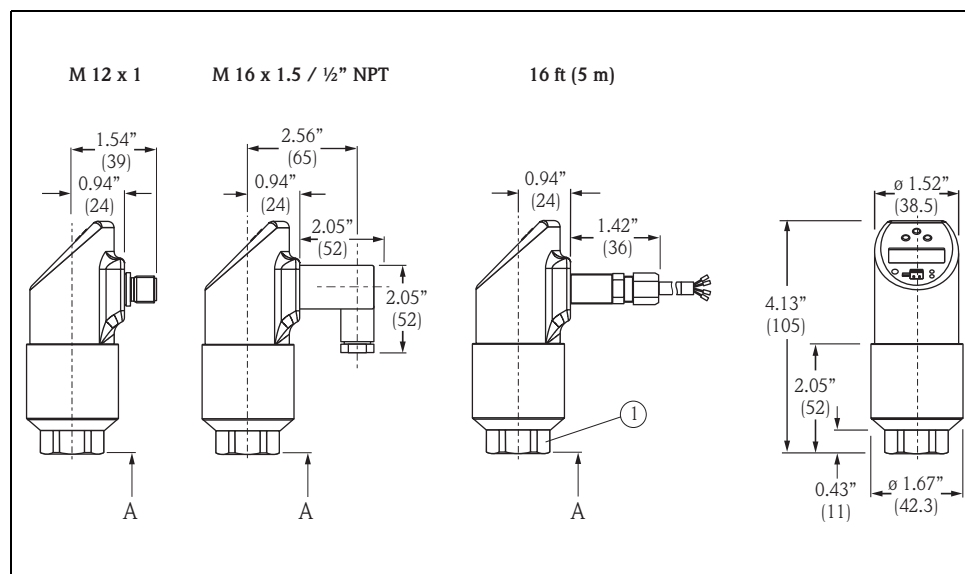
The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +68°F (+20°C) and may be applied to the device for an unlimited time.

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.

Mechanical construction

Design, dimensions

Dimensions



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

M 12 x 1 connector to IEC 60947-5-2

M 16 x 1.5 or 1/2" NPT valve plug as per DIN 43650A/ISO 4400

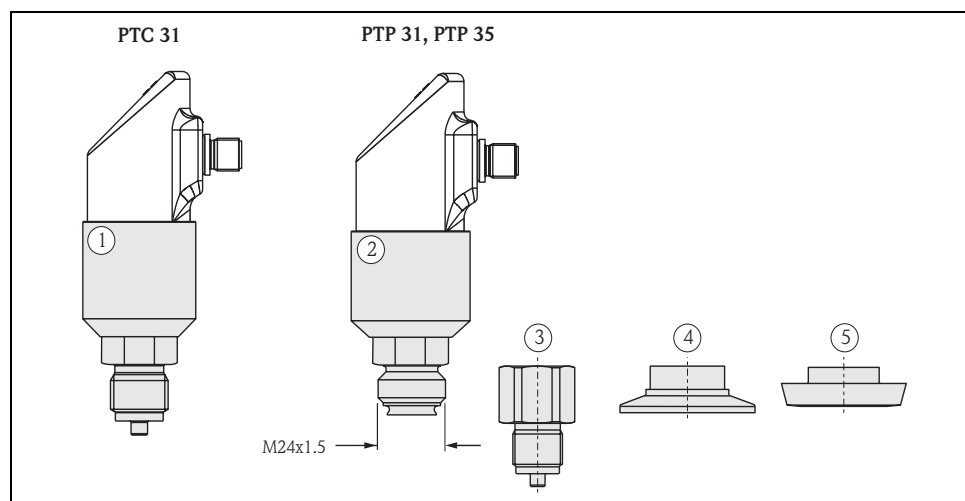
Cable 16 ft (5 m) long, cable outer diameter 0.3" (7.7 mm); wires 4 x 20 AWG (0.2 mm²), GND 18 AWG (PE 0.75 mm²)
reference pressure hose with outer diameter 0.1" (2.5 mm)

1 = Across flats AF 27 (for 6000 psi / 400 bar sensor AF 32)

A = height dimension of process connections – see next diagram

all dimensions in inches (mm)

Process connection



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

PTC 31: sensor module "1" with process connection.

PTP 31/35: sensor module "2" with M24 x 1.5 adapter thread for adapters with process connection.

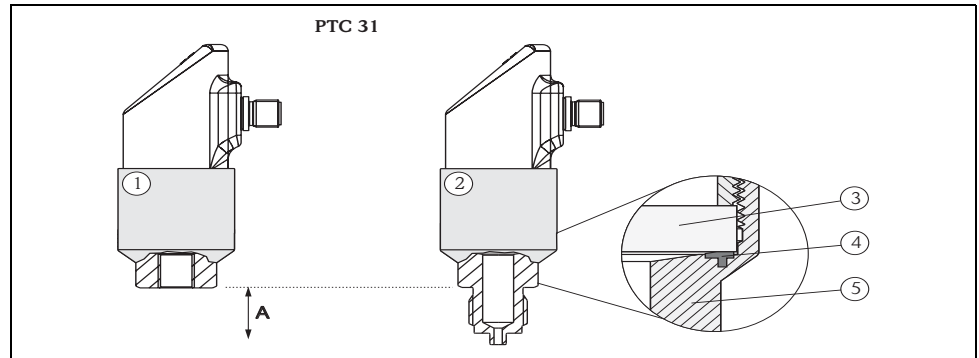
Adapter (mounted onto sensor module at the factory, 6000 psi / 400 bar thread adapter welded onto sensor module)

3 = Adapter with thread connection

4 = Adapter with clamp connection (except 1/2" mini-clamp)

5 = Adapter with hygienic connection (except G 1A)

**Process connections PTC 31
sensor module with ceramic
sensor**



P01-PTx3xxxx-14-xx-xx-xx-003

PTC 31; sensor module with process connection

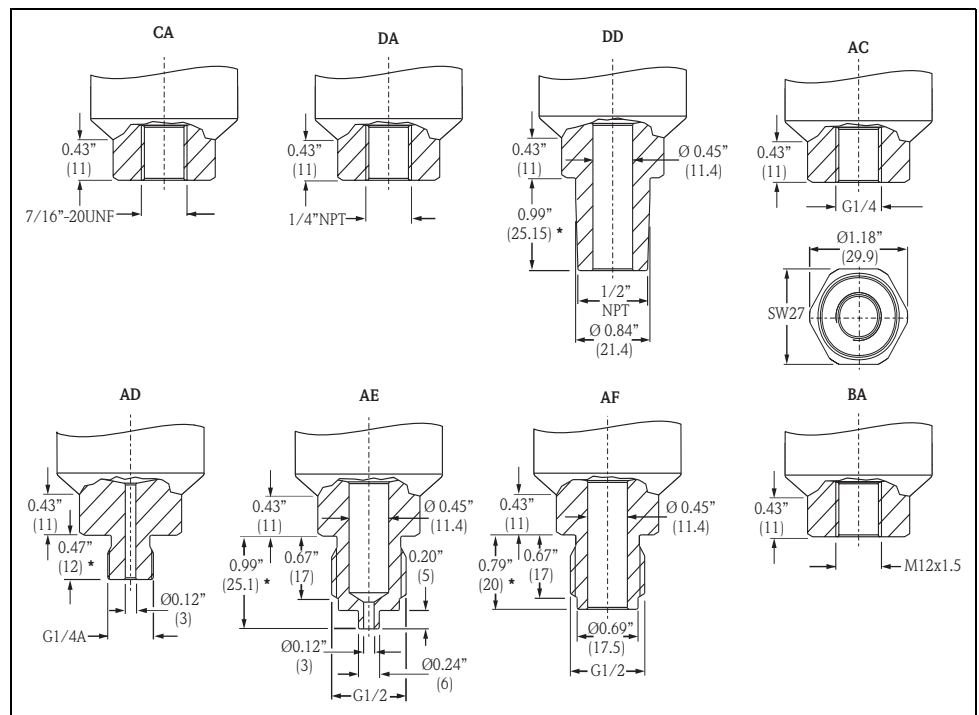
1 = with internal thread

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 (*)

Thread connections



P01-PTx3xxxx-06-xx-xx-xx-002

Process connection versions (see also "Ordering information" section)

CA: thread 7/16-20 UNF (SAE)

DA: thread ANSI 1/4" FNPT

DD: thread ANSI 1/2" MNPT

AC: thread ISO 288, G1/4 (female)

AD: thread ISO 288, G1/4A

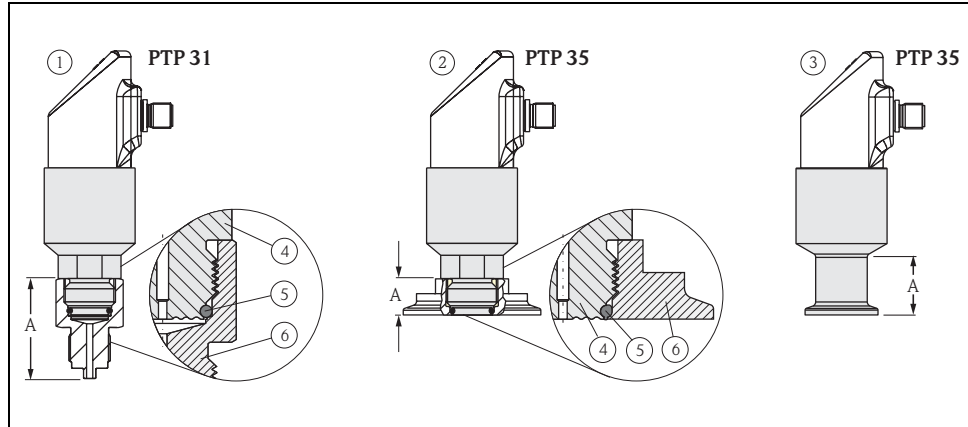
AE: thread ISO 288, G1/2A

AF: thread ISO 288, G1/2A, bore 11 mm

BA: Thread DIN 13, M 12x1.5

all dimensions inches (mm)

Process connections PTP sensor module with metallic sensor diaphragm



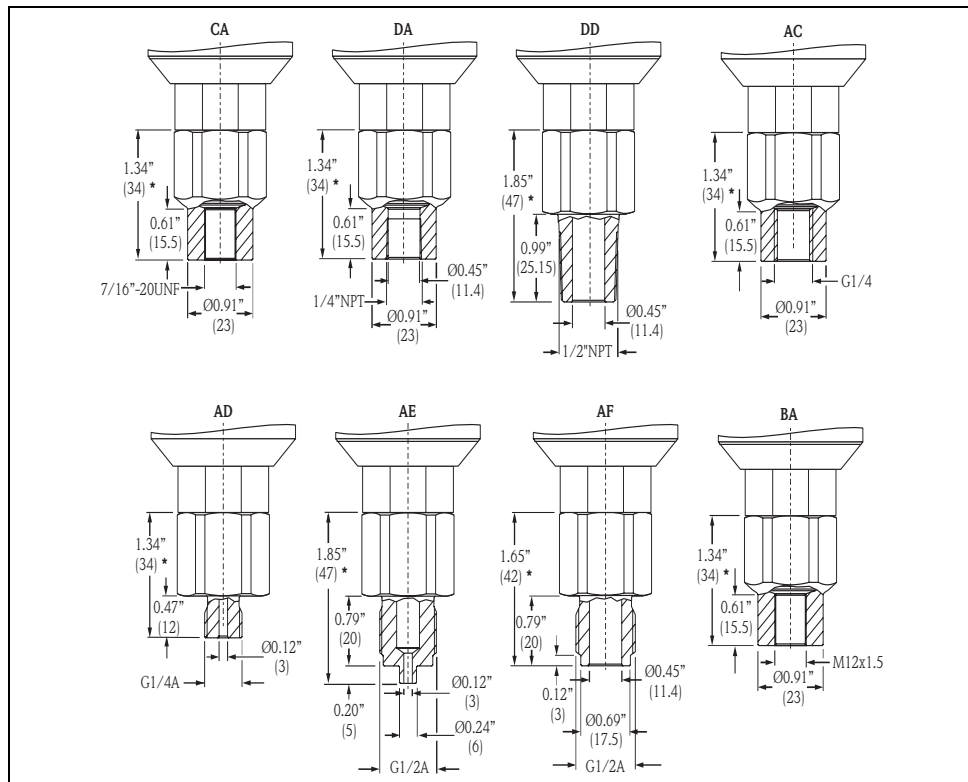
P01-PTx3xxxx-14-xx-xx-xx-002

- 1 = Sensor module with adapter thread for adapters with thread connection
- 2 = Sensor module with adapter thread for adapters with clamp or hygienic 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 (*). For 6000 psi / 400 bar sensor see also Page 11.

Process connections PTP 31 thread connections



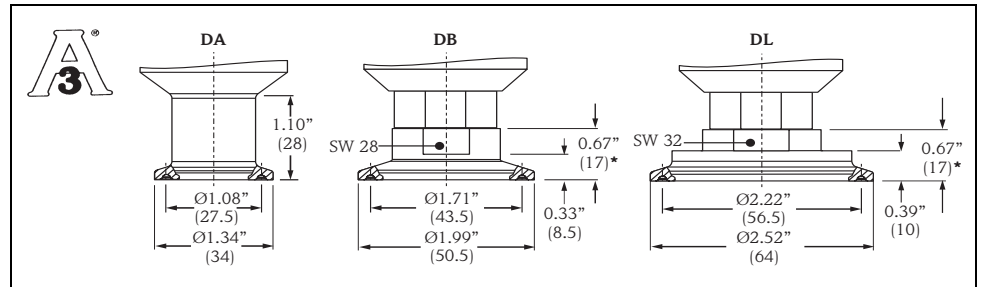
P01-PTx3xxxx-06-xx-xx-xx-003

Process connection versions: sensor module with adapter (see also "Ordering information" section)

- CA: thread 7/16-20 UNF (SAE)
- DA: thread ANSI 1/4" FNPT
- DD: thread ANSI 1/2" MNPT
- AC: thread ISO 228, G1/4 (female)
- AD: thread ISO 228, G1/4A
- AE: thread ISO 228, G1/2A
- AF: thread ISO 228, G3/2A, bore 11 mm
- BA: Thread DIN 13, M 12x1.5

all dimensions in inches (mm)

**Process connections PTP 35
Tri-clamp connections**



P01-PTx3xxxx-06-xx-xx-xx-005

Process connection version

DA: Mini-clamp 1/2" (DN 10 to DN 20), DIN 32676

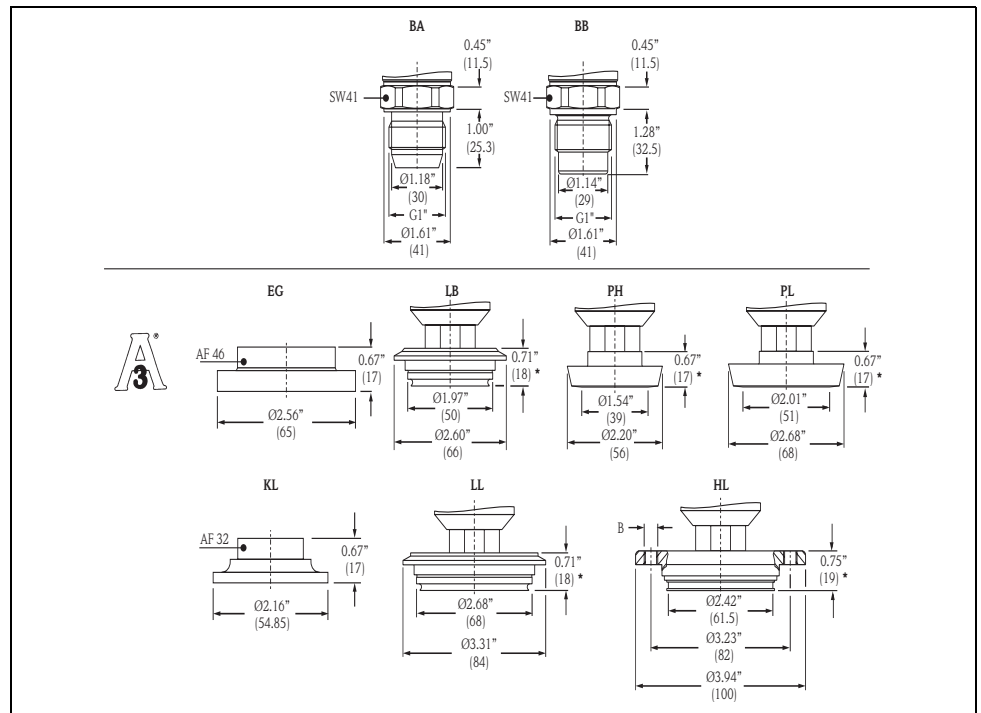
Process connection versions (sensor module with adapter)

DB: Tri-clamp 1" to 1½" (ISO 2852) or DN 25 to DN 40 (DIN 32676)

DL: Tri-clamp 2" (ISO 2852) or DN 50 (DIN 32676)

See also "Ordering information" section
all dimensions in inches (mm)

**Process connections PTP 35
hygienic connections**



P01-PTx3xxxx-06-xx-xx-xx-004

Process connection versions

BA: thread ISO228 G1A, metal taper seal

BB: thread ISO228 G1A, O-ring seat seal

Process connection versions (sensor module with adapter)

LB: Varivent F pipe DN 25-32, PN 40

LL: Varivent N pipe DN 40-162, PN 40

PH: DIN 11851, DN 40, PN 40 (including coupling nut)

PL: DIN 11851, DN 50, PN 40 (including coupling nut)

HL: APV inline, DN 50, PN 40, (B = bores 6 x Ø8.6 + 2 x M8 thread)

EG: DRD 65 mm PN25, 316L SS, 3-A

KL: SMS 1-1/2 PN 25, 316L SS, 3-A

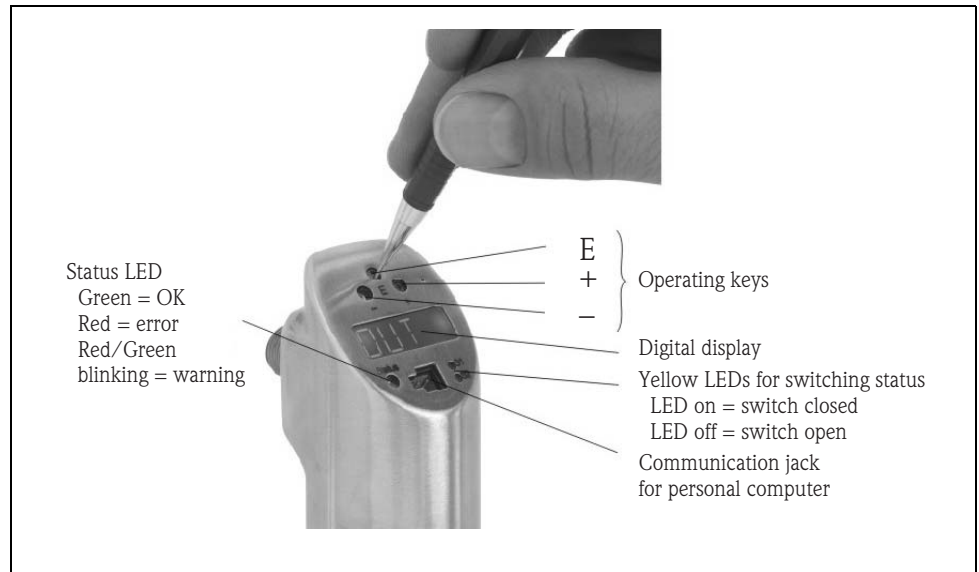
See also "Ordering information" section
all dimensions in inches (mm)

PTP 31 with 6000 psi (400 bar) sensor	<ul style="list-style-type: none"> ■ Across flats on sensor module AF 32 ■ Sensor module welded to thread adapter ■ For ¼ NPT thread connections, M12x1.5, 7/16-20UNF: dimension A 0.20" (5 mm) longer ■ For ½" NPT thread connections, G ½A: dimension A 0.04" (1 mm) longer
Weight	<ul style="list-style-type: none"> ■ PTC 31: approx. 0.7 lb (0.32 kg) ■ PTP 31: approx. 0.8 lb (0.37 kg) ■ PTP 35: approx. 1.3 lb (0.58 kg), with Tri-clamp process connection 1" to 1½"
Material	<ul style="list-style-type: none"> ■ Process connection: AISI 316L SS Surfaces in contact with the process for PTP 35 with electronically polished surface $R_a \leq 32 \mu\text{in}$ (0.8 μm) Coupling nut: AISI 304 SS ■ Sensor diaphragm for PTC 31: Ceraphire® (99.9 % Al_2O_3), FDA number: 21-CFR 186.1256 Sensor diaphragm for PTP 31/35: AISI 316L SS ■ Filling oil for PTP 31 and PTP 35: Berusynth FG-H mineral oil, NSF registered, FDA number: 21-CFR 172.882 ■ Seals: FKM: Viton® (temperature range -4 to +212°F / -20 to 100°C) EPDM, FDA number 21-CFR 177.2600, Class II 3-A Sanitary Standard 18 (temperature range -40 to +212°F / -40 to +100°C) FKM: Viton® for O_2 applications (70C3 CO2-70-0041V), temperature range 14 to 140°F (-10 to +60°C) ■ Housing: AISI 316L SS, with electronically polished surface $R_a \leq 32 \mu\text{in}$ (0.8 μm) O-ring between housing and sensor module, EPDM ■ Electrical connection: M12 connector: exterior AISI 316L SS, interior polyamide (PA) Valve plug: outer covering made of polyamide (PA) Cable: outer covering made of polyurethane (PUR/UL94, VO, UV-resistant) O-ring between electrical connection and housing: FKM ■ Display: polycarbonate PC-FR (Lexan®) Seal between display and housing: SEBS THERMOPLAST K® ■ Keys: polycarbonate PC-FR (Lexan®)

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

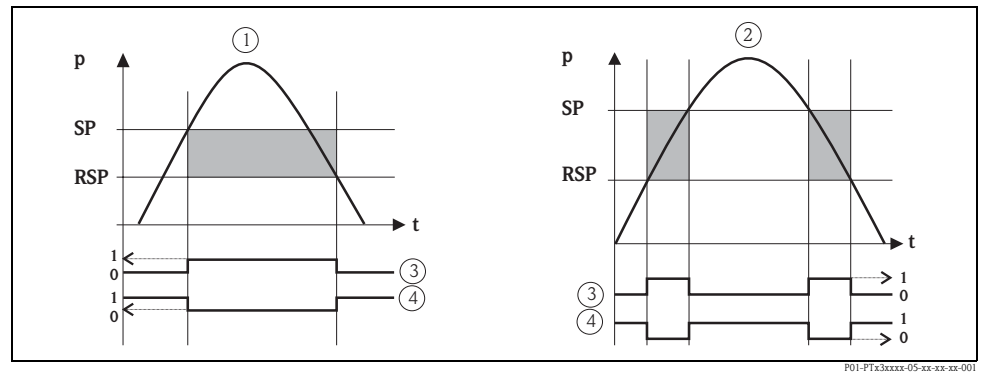
Menu-guided operation using operating keys.

Function group	Operating options
BASE (basic functions)	Selection of unit: bar, psi, kPa/MPa
	Position adjustment: ± 20 % of the upper range limit
	Damping display value, output signal: anywhere between 0 to 40 s (in increments of 0.1 s)
	Display: <ul style="list-style-type: none"> - Display of measured value or configured switch point - Rotation of display by 180° - Switching off display
	Behavior according to DESINA: The PIN assignment of the M12 connector is in accordance with the guidelines of DESINA (distributed and standardized installation technology for machine tools and manufacturing systems)

Function group	Operating options
OUT (Configuration of 1st output)	Output function: – Hysteresis function or window function – NC contact or NO contact (see next diagram) – Analog output 4 to 20 mA
	Switch point: – Input value – Acceptance of applied value Switch point anywhere between 0.5 to 100 % of the upper range limit (URL), (in increments of 0.1 %, min. 0.01 psi / 1 mbar)
	Reset point: – Input value – Acceptance of applied value Reset point anywhere between 0 to 99.5 % of the upper range limit (URL), (in increments of 0.1 %, min. 0.01 psi / 1 mbar)
	Switch output delay: anywhere between 0 to 99 s (in increments of 0.1 s)
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 to 20 mA
	Switch point 2: – Input value – Acceptance of applied value Switch point anywhere between 0.5 to 100 % of the upper range limit (URL), (in increments of 0.1 %, min. 0.01 psi / 1 mbar)
	Reset point 2: – Input value – Acceptance of applied value Reset value anywhere between 0 to 99.5 % of the upper range limit (URL), (in increments of 0.1 %, min. 0.01 psi / 1 mbar)
	Switch output delay: anywhere between 0 to 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 3.5 mA / 21.7 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

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 reset point RSP.
- Window function
The window function enables the monitoring of a process pressure range.
- NO contact or NC contact
This switch function is freely selectable.



1 = Hysteresis function, 2 = Window function, 3 = NO contact switch status, 4 = NC contact switch status
Switch point SP; Reset point RSP

Operation with ReadWin®2000

Operation, visualization and maintenance with personal computer and ReadWin 2000 configuration software



P01-PTx.3xxxx-19-xx-xx-en-002

- 1 = Ceraphant T with communication jack
- 2 = Configuration kit (USB interface)
- 3 = Personal computer with ReadWin 2000 configuration software

In addition to the operating options listed in the previous "On-site operation" section, the ReadWin 2000 configuration software provides further information on the Ceraphant T:

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:
BA 137R/09/en.

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	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.
Hygiene standard	The Ceraphant T PTP 35 meets the requirements of the Sanitary Standard No. 74-2. Endress+Hauser confirms this by applying the 3-A symbol.
Standards and guidelines	<p>DIN EN 60770 (IEC 60770): Transmitters for use in industrial-process control systems Part 1: Methods for performance evaluation.</p> <p>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.</p> <p>DIN 16086: Electrical pressure measuring instruments; pressure sensors, pressure transmitters, pressure measuring instruments; concepts, specifications on data sheets</p> <p>IEC 60592 Degrees of protection provided by enclosures (IP code).</p> <p>EN 61326: Electrical equipment for measurement, control and laboratory use - EMC requirements.</p> <p>IEC 61010 Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques; Section 5: Surge immunity test</p> <p>NAMUR Association for Standards for Control and Regulation in the Chemical Industry.</p>
Registered trademarks	<p>Ceraphire® Registered trademark of Endress+Hauser GmbH+Co.KG, Maulburg, Germany</p> <p>ReadWin® Registered trademark of Endress+Hauser Wetzlar GmbH+Co.KG, Nesselwang, Germany</p> <p>LEXAN® Registered trademark of General Electric Plastics B.V., Bergen op Zoom, Netherlands</p> <p>THERMOPLAST® Registered trademark of Kraiburg TPE GmbH, Waldkraiburg, Germany</p>

Ordering information

Ceraphant T PTC31

10	Certificate								
	A	For non-hazardous areas							
20	Electrical connection								
	1	M12x1 connector: IP60; with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP66							
	2	M16x1.5 valve plug, ISO4400; IP60, with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP65							
	3	$\frac{1}{2}$ " NPT valve plug, ISO4400; IP60, with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP65							
	4	16 ft (5 m) cable; IP66							
30	Electronics, output signal								
	A	12 to 30V DC, PNP switch, 3-wire							
	B	12 to 30V DC, 2 PNP switch, 4-wire							
	C	12 to 30 V DC, PNP switch + 4 to 20mA, 4-wire							
40	Display								
	1	With digital display							
50	Sensor								
		Gage pressure			Max. working pressure MWP		Permitted overload		
	1C	0 to 1.5 psi / 0 to 100 mbar / 0 to 10 kPa			39 psi (2.7 bar)		60 psi (4 bar)		
	1F	0 to 6 psi / 0 to 400 mbar / 0 to 40 kPa			77 psi (5.3 bar)		116 psi (8 bar)		
	1H	0 to 15 psi / 0 to 1 bar / 0 to 100 kPa			97 psi (6.7 bar)		150 psi (10 bar)		
	1M	0 to 60 psi / 0 to 4 bar / 0 to 400 kPa			242 psi (16.7 bar)		362 psi (25 bar)		
	1P	0 to 150 psi / 0 to 10 bar / 0 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)		
	1S	0 to 600 psi / 0 to 40 bar / 0 to 4000 kPa			580 psi (40 bar)		870 psi (60 bar)		
		Negative gage pressure			Max. working pressure MWP		Permitted overload		
	5C	-1.5 to 1.5 psi / -100 to 100 mbar / -10 to 10 kPa			39 psi (2.7 bar)		60 psi (4 bar)		
	5F	-6 to 6 psi / -400 to 400 mbar / -40 to 40 kPa			77 psi (5.3 bar)		110 psi (8 bar)		
	5H	-15 to 15 psi / -1 to 1 bar / -100 to 100 kPa			97 psi (6.7 bar)		150 psi (10 bar)		
	5M	-15 to 60 psi / -1 to 4 bar / -100 to 400 kPa			242 psi (16.7 bar)		362 psi (25 bar)		
	5P	-15 to 145 psi / -1 to 10 bar / -100 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)		
		Absolute pressure			Max. working pressure MWP		Permitted overload		
	2F	0 to 6 psi / 0 to 400 mbar / 0 to 40 kPa			77 psi (5.3 bar)		116 psi (8 bar)		
	2H	0 to 15 psi / 0 to 1 bar / 0 to 100 kPa			97 psi (6.7 bar)		150 psi (10 bar)		
	2M	0 to 60 psi / 0 to 4 bar / 0 to 400 kPa			242 psi (16.7 bar)		362 psi (25 bar)		
	2P	0 to 150 psi / 0 to 10 bar / 0 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)		
	2S	0 to 600 psi / 0 to 40 bar / 0 to 4000 kPa			580 psi (40 bar)		870 psi (60 bar)		
60	Configuration and unit								
	1	Configured sensor range: mbar/bar						Calibration in sensor range	
	2	Configured sensor range: kPa/MPa						Calibration in sensor range	
	3	Configured sensor range: psi						Calibration in sensor range	
	S	Configured switch output 1 to additional spec.						Calibration in sensor range	
	T	Configured switch output 1 + 2 to additional spec.						Calibration in sensor range	
	U	Configured switch and analog output to additional spec.						Calibration in sensor range	
	V	Switch output 1, switch output 2 DESINA, see add. spec.						Calibration in sensor range	
	W	Analog output, switch output 2 DESINA, see add. spec.						Calibration in sensor range	
70	Process connection, material								
	AC	Thread ISO288, G $\frac{1}{4}$ (female), 316L SS							
	AD	Thread ISO228, G $\frac{1}{4}$ A, 316L SS							
	AE	Thread ISO228, G $\frac{1}{2}$ A, 316L SS							
	AF	Thread ISO228, G $\frac{1}{2}$ A, bore 11 mm, 316L SS							
	BA	Thread DIN13, M12x1, 316L SS							
	CA	Thread 7/16-20 UNF (SAE), 316L SS							
	DA	Thread ANSI $\frac{1}{4}$ " FNPT, 316L SS							
	DD	Thread ANSI $\frac{1}{2}$ " MNPT, 316L SS							
80	Sensor seal (in contact with process)								
	1	FKM Viton sensor seal							
	4	EPDM sensor seal							
	6	FKM Viton sensor seal, cleaned for O ₂ service							
90	Additional equipment								
	A	Without additional equipment							
	B	Calibration protocol							
	C	3.1.B process connection, inspection certificate to EN10204							

PTC 31 -

Ceraphant T PTP31

10	Certificate									
	A	For non-hazardous areas								
20	Electrical connection									
	1	M12x1 connector: IP60; with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP66								
	2	M16x1.5 valve plug, ISO4400; IP60, with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP65								
	3	1/2" NPT valve plug, ISO4400; IP60, with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP65								
	4	16 ft (5 m) cable; IP66								
30	Electronics, output signal									
	A	12 to 30V DC, PNP switch, 3-wire								
	B	12 to 30V DC, 2 PNP switch, 4-wire								
	C	12 to 30 V DC, PNP switch + 4 to 20mA, 4-wire								
40	Display									
	1	With digital display								
50	Sensor									
		Gage pressure			Max. working pressure MWP		Permitted overload			
	3H	0 to 15 psi / 0 to 1 bar / 0 to 100 kPa			39 psi (2.7 bar)		60 psi (4 bar)			
	3M	0 to 60 psi / 0 to 4 bar / 0 to 400 kPa			242 psi (16.7 bar)		232 psi (16 bar)			
	3P	0 to 150 psi / 0 to 10 bar / 0 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)			
	3S	0 to 600 psi / 0 to 40 bar / 0 to 4000 kPa			1548 psi (106.7 bar)		2320 psi (160 bar)			
	3U	0 to 1500 psi / 0 to 100 bar / 0 to 10 MPa			3868 psi (266.7 bar)		1600 psi (400 bar)			
	3Z	0 to 6000 psi / 0 to 400 bar / 0 to 40 MPa			6000 psi (400 bar)		8700 psi (600 bar)			
		Negative gage pressure			Max. working pressure MWP		Permitted overload			
	7H	-15 to 15 psi / -1 to 1 bar / -100 to 100 kPa			40 psi (2.7 bar)		60 psi (4 bar)			
	7M	-15 to 60 psi / -1 to 4 bar / -100 to 400 kPa			155 psi (10.7 bar)		232 psi (16 bar)			
	7P	-15 to 145 psi / -1 to 10 bar / -100 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)			
		Absolute pressure			Max. working pressure MWP		Permitted overload			
	4H	0 to 15 psi / 0 to 1 bar / 0 to 100 kPa			39 psi (2.7 bar)		60 psi (4 bar)			
	4M	0 to 60 psi / 0 to 4 bar / 0 to 400 kPa			242 psi (16.7 bar)		232 psi (16 bar)			
	4P	0 to 150 psi / 0 to 10 bar / 0 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)			
	4S	0 to 600 psi / 0 to 40 bar / 0 to 4000 kPa			1548 psi (106.7 bar)		2320 psi (160 bar)			
	4U	0 to 1500 psi / 0 to 100 bar / 0 to 10 MPa			3868 psi (266.7 bar)		1600 psi (400 bar)			
	4Z	0 to 6000 psi / 0 to 400 bar / 0 to 40 MPa			6000 psi (400 bar)		8700 psi (600 bar)			
60	Configuration and unit									
	1	Configured sensor range: mbar/bar					Calibration in sensor range			
	2	Configured sensor range: kPa/MPa					Calibration in sensor range			
	3	Configured sensor range: psi					Calibration in sensor range			
	S	Configured switch output 1 to additional spec.					Calibration in sensor range			
	T	Configured switch output 1 + 2 to additional spec.					Calibration in sensor range			
	U	Configured switch and analog output to additional spec.					Calibration in sensor range			
	V	Switch output 1, switch output 2 DESINA, see add. spec.					Calibration in sensor range			
	W	Analog output, switch output 2 DESINA, see add. spec.					Calibration in sensor range			
70	Process connection, material									
	AC	Thread ISO288, G $\frac{1}{4}$ (female), 316L								
	AD	Thread ISO228, G $\frac{1}{4}$ A, 316L								
	AE	Thread ISO228, G $\frac{1}{2}$ A, 316L								
	AF	Thread ISO228, G $\frac{1}{2}$ A, bore 11 mm, 316L								
	BA	Thread DIN13, M12x1.5, 316L								
	CA	Thread 7/16-20 UNF (SAE), 316L								
	DA	Thread ANSI 1/4" FNPT, 316L								
	DD	Thread ANSI 1/2" MNPT, 316L								
80	Seal, filling fluid									
	1	O-ring FKM Viton, mineral oil								
	7	Welded, mineral oil (only for 6000 psi / 400 bar sensor)								
90	Additional equipment									
	A	Without additional equipment								
	B	Calibration protocol								
	C	3.1.B process connection, inspection certificate to EN10204								

PTP 31 -

Ceraphant T PTP35

10	Certificate									
	A	For non-hazardous areas								
20	Electrical connection									
	1	M12x1 connector: IP60; with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP66								
	2	M16x1.5 valve plug, ISO4400; IP60, with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP65								
	3	½" NPT valve plug, ISO4400; IP60, with sensors for gauge pressure ≥ 10 bar and absolute pressure: IP65								
	4	16 ft (5 m) cable; IP66								
30	Electronics, output signal									
	A	12 to 30V DC, PNP switch, 3-wire								
	B	12 to 30V DC, 2 PNP switch, 4-wire								
	C	12 to 30 V DC, PNP switch + 4 to 20mA, 4-wire								
40	Display									
	1	With digital display								
50	Sensor									
		Gage pressure			Max. working pressure MWP		Permitted overload			
	3H	0 to 15 psi / 0 to 1 bar / 0 to 100 kPa			40 psi (2.7 bar)		60 psi (4 bar)			
	3M	0 to 60 psi / 0 to 4 bar / 0 to 400 kPa			155 psi (10.7 bar)		232 psi (16 bar)			
	3P	0 to 150 psi / 0 to 10 bar / 0 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)			
	3S	0 to 600 psi / 0 to 40 bar / 0 to 4000 kPa			1548 psi (106.7 bar)		2320 psi (160 bar)			
		Negative gage pressure			Max. working pressure MWP		Permitted overload			
	7H	-15 to 15 psi / -1 to 1 bar / -100 to 100 kPa			40 psi (2.7 bar)		60 psi (4 bar)			
	7M	-15 to 60 psi / -1 to 4 bar / -100 to 400 kPa			155 psi (10.7 bar)		232 psi (16 bar)			
	7P	-15 to 150 psi / -1 to 10 bar / -100 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)			
		Absolute pressure			Max. working pressure MWP		Permitted overload			
	4H	0 to 15 psi / 0 to 1 bar / 0 to 100 kPa			40 psi (2.7 bar)		60 psi (4 bar)			
	4M	0 to 60 psi / 0 to 4 bar / 0 to 400 kPa			155 psi (10.7 bar)		232 psi (16 bar)			
	4P	0 to 150 psi / 0 to 10 bar / 0 to 1000 kPa			387 psi (26.7 bar)		600 psi (40 bar)			
	4S	0 to 600 psi / 0 to 40 bar / 0 to 4000 kPa			1548 psi (106.7 bar)		2320 psi (160 bar)			
60	Configuration and unit									
	1	Configured sensor range: mbar/bar						Calibration in sensor range		
	2	Configured sensor range: kPa/MPa						Calibration in sensor range		
	3	Configured sensor range: psi						Calibration in sensor range		
	S	Configured switch output 1 to additional spec.						Calibration in sensor range		
	T	Configured switch output 1 + 2 to additional spec.						Calibration in sensor range		
	U	Configured switch and analog output to additional spec.						Calibration in sensor range		
	V	Switch output 1, switch output 2 DESINA, see add. spec.						Calibration in sensor range		
	W	Analog output, switch output 2 DESINA, see add. spec.						Calibration in sensor range		
70	Process connection, material									
	Clamp connections									
	DA	ISO2852 DN12-22, 316L, 3A, DIN32676, DN10-20, mini-clamp								
	DB	ISO2852 DN25-38 (1 to 1½"), 316L, 3A, DIN32676, DN25-40, Tri-clamp								
	DL	ISO2852 DN40-51 (2"), 316L, 3A, DIN32676, DN50, Tri-clamp								
	Hygienic connections									
	BA	Thread ISO228 G1A, metal taper seal, 316L, 3A, flush-mounted for sleeve 52005087								
	BB	Thread ISO228 G1A, O-ring seat seal, 316L, 3A, flush-mounted for sleeve 52001051								
	KL	SMS 1-1/2 PN25, 316L, 3A								
	LB	Varivent F pipe DN25-32, PN40, 316L, 3A								
	LL	Varivent N pipe DN40-162, PN40, 316L, 3A								
	PH	DIN11851 DN40 PN40, 316L, 3A								
	PL	DIN11851 DN50 PN40, 316L, 3A								
	EG	DRD 65 mm PN25, 316L, 3A								
	HL	APV inline DN50 PN40, 316L, 3A								
80	Seal, filling fluid									
	4	O-ring EPDM, oil conform to FDA								
	8	Without O-ring, oil in conformity with FDA (only for process connections BA, BB, DA)								
90	Additional equipment									
	A	Without additional equipment								
	B	Calibration protocol								
	C	3.1.B process connection, inspection certificate to EN10204								

PTP 35 -

Questionnaire on customer-specific configuration

The Ceraphant T pressure switch can also be ordered with customized 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).

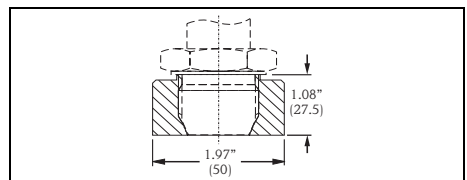
Questionnaire for Ceraphant PTC31, PTP31, PTP35 for customer specific setup																																									
Pressure units	<input type="checkbox"/> mbar/bar	<input type="checkbox"/> kPa/MPa <input type="checkbox"/> psi																																							
Output 1																																									
<input type="checkbox"/> 1=Hysteresis normally open <input type="checkbox"/> 2=Hysteresis normally closed <input type="checkbox"/> 3=Window normally open <input type="checkbox"/> 4=Window normally closed																																									
SP:	<input style="width:40px;" type="text"/>	Range of adjustment: 0.5 to 100% URL (in increments of 0.1%, min. 0.01 psi (1 mbar))																																							
RSP:	<input style="width:40px;" type="text"/>	Range of adjustment: 0 to 99.5% URL (in increments Of 0.1%, min. 0.01 psi (1 mbar))																																							
Output 2 (only if available / Code B)																																									
<input type="checkbox"/> 1=Hysteresis normally open <input type="checkbox"/> 2=Hysteresis normally closed <input type="checkbox"/> 3=Window normally open <input type="checkbox"/> 4=Window normally closed																																									
SP:	<input style="width:40px;" type="text"/>	Range of adjustment: 0.5 to 100% URL (in increments of 0.1%, min. 0.01 psi (1 mbar))																																							
RSP:	<input style="width:40px;" type="text"/>	Range of adjustment: 0 to 99.5% URL (in increments Of 0.1%, min. 0.01 psi (1 mbar))																																							
Analog output (only if output 2 = 4 to 20 mA / Code C)																																									
<input type="checkbox"/> 5 = 4 to 20 mA																																									
Range low scale:	<input style="width:40px;" type="text"/>	Range of adjustment: 0 to 100% URL																																							
Range high scale:	<input style="width:40px;" type="text"/>	Range of adjustment: 0 to 100% URL Turn down up to 4 : 1																																							
Failure mode:	<input type="checkbox"/> ≤ 3.6 mA	<input checked="" type="checkbox"/> 21.0 mA <input type="checkbox"/> last current value																																							
Connection conform to DESINA:	<input type="checkbox"/> no	<input type="checkbox"/> yes																																							
TAG (2 x 18 characters)	<table border="1" style="width:100%; border-collapse: collapse; height: 20px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; height: 20px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>																																								
Endress+Hauser <small>People for Process Automation</small>																																									

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

Accessories

**Welding boss
– with sealing taper**

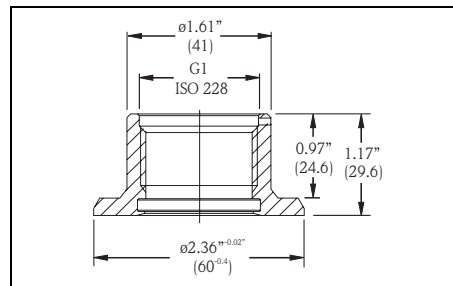
- Welding boss for flush mounting process connection G1 A with metallic sealing taper (version BA for PTP 35)
 Material: AISI 316L
 Order number: 52005087
- Optional with inspection certificate 3.1.B
 Order number: 52010171
- Welding aid (Dummy) for welding the welding boss without any problems, for use with order number 52005087 or 52010171
 Material: brass
 Order number: 52005272



P01-Pzxxxx-00-xx-00-xx-001

Welding boss
– with sealing surface

- Welding boss for flush mounting process connection G1 A with sealing surface (version BB for PTP 35)
Material: AISI 316L
Seal (enclosed): silicone O-ring
Order number: 52001051
- Optional with inspection certificate 3.1.B
Order number: 52011896

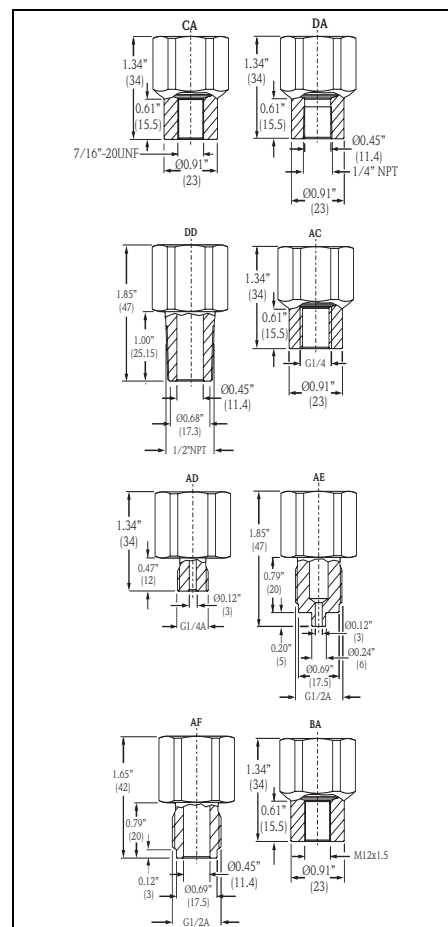


P01-FMP13xxxx-00-xx-00-xx-002

Thread adapter

- PTP 31: order numbers for thread adapter versions.

Version CA: order no. 52023985
Version DA: order no. 52023986
Version DD: order no. 52023987
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



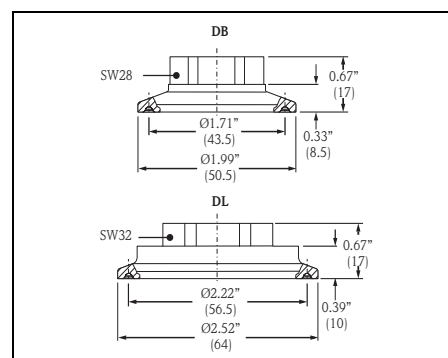
P01-PTx3xxxx-06-xx-xx-xx-007

Clamp adapter

- PTP 35: Order numbers for clamp adapter versions.

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

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



P01-PTx3xxxx-06-xx-xx-xx-009

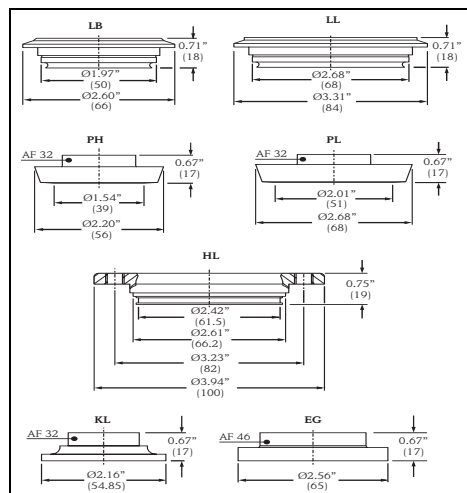
Hygienic adapter

- PTP 35: order numbers for hygienic adapter versions.

Version KL: order no. 52026997
 Version LB: order no. 52023996
 Version LL: order no. 52023997
 Version PH: order no. 52023999
 Version PL: order no. 52023998
 Version EG: order no. 52026996
 Version HL: order no. 52024000

Optional with inspection certificate 3.1.B:

Version KL: order no. 52026999
 Version LB: order no. 52024003
 Version LL: order no. 52024004
 Version PH: order no. 52024006
 Version PL: order no. 52024005
 Version EG: order no. 52026998
 Version HL: order no. 52024007

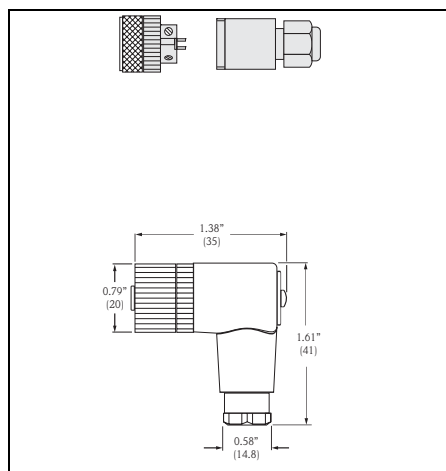


P01-PTx3xxx-06-xx-xx-xx-010

Plug-in jack

- M 12 x 1 plug-in jack
 Self-made connection to M 12 x 1 housing connector
 Materials: Body, PA
 Coupling nut: CuZn, brass, nickerled
 Protection: IP 67 (fully locked)
 Order number: 52006263

- M 12 x 1 plug-in jack, elbowed
 Self-made connection to M 12 x 1 plug
 Materials: Body, PBT/PA
 Coupling nut: CuZn, brass, nickerled
 Protection: IP 67 (fully locked)
 Order number: 51006327

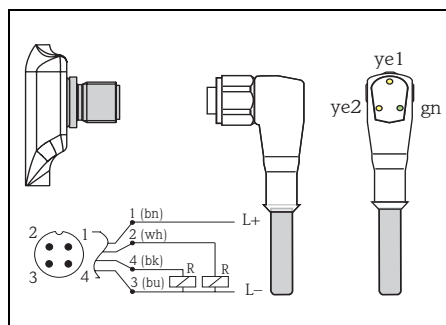


P01-PMP13xxx-00-xx-00-xx-003

Connecting cable

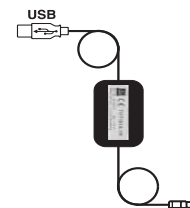
- Cable, 4 x 22 AWG (0.34 mm²) with M12 socket, elbowed, screw plug, length 16 ft (5 m), sprayed PVC cable
 Materials: Body, PUR
 Coupling nut: Cu Zn/Ni, brass, nickerled
 Cable: PVC
 Protection: IP 67 (fully locked)
 order number: 52010285

- Cable, 4 x 22 AWG (0.34 mm²) with M12 socket, with LED, elbowed, 316L SS screw plug, length 16 ft (5 m), sprayed PVC cable, specially for hygienic applications (for devices with switch output only)
 Materials: Body, PVC
 Coupling nut: 316L SS
 Cable: PVC
 Protection: IP 67 (fully locked)
 order number: 52018763
 Display:
 - gn: device operational
 - ye1: switch status 1
 - ye 2: switch status 2



P01-PTx3xxx-07-xx-xx-xx-001

- 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



Documentation

Operating Instructions

Ceraphant T PTC 31, PTP 31, PTP35
KA 225P/00/a2, order no. 52023159

Operating software ReadWin 2000
BA 137R/09/en

Technical Information

Technical Information on the Thermophant T temperature switch:
Thermophant T TTR 31, TTR 35
TI 105R/24/ae

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