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 sensor diaphragm;
Ceraphant T PTP31
– with metallic sensor 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.
• Functional safety SIL 2.
• Function check and information on site thanks to LEDs and digital display.
• Ceraphire® sensor 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.
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 material Ceraphire® as a ceramic.

**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.

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Measuring system Synopsis

<table>
<thead>
<tr>
<th>Ceraphant product family</th>
<th>PTC 31</th>
<th>PTP 31</th>
<th>PTP 35</th>
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<tbody>
<tr>
<td>Measuring cell</td>
<td>With capacitive measuring cell and ceramic measuring diaphragm (Ceraphire®)</td>
<td>With piezoresistive measuring cell and metallic measuring diaphragm</td>
<td>With piezoresistive measuring cell and metallic measuring diaphragm for hygienic applications</td>
</tr>
<tr>
<td>Field of application</td>
<td>Measurement and monitoring of absolute and gauge pressures</td>
<td>Measurement and monitoring of absolute and gauge pressures</td>
<td>Measurement and monitoring of absolute and gauge pressures in hygienic processes</td>
</tr>
<tr>
<td>Measuring range</td>
<td>0...100 mbar/1.5 psi to 0...40 bar/600 psi</td>
<td>0...1 bar/15 psi to 0...400 bar/6000 psi</td>
<td>0...1 bar/15 psi to 0...40 bar/600 psi</td>
</tr>
<tr>
<td>Process temperature</td>
<td>–40 °C...+100 °C</td>
<td>–40 °C...+100 °C</td>
<td>–40 °C...+100 °C (135 °C max. 1 hour)</td>
</tr>
</tbody>
</table>
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: 1x PNP switch output
B: 2x PNP switch output
C: PNP switch output with additional analog output 4...20 mA (active).

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

Functional safety (SIL)

The Ceraphant T pressure switches were developed according to the standards IEC 61508 and IEC 61511-1 (FDIS). The device version with PNP switch output and additional analog output is equipped with fault detection and fault prevention facilities within the electronics and software. This device version can therefore be used to monitor limit pressure up to SIL 2 (Safety Integrity Level).

The attainable SIL value is determined by the safety technical characteristics of probability of failure, hardware fault tolerance and the safe failure fraction. Details on this may be found in the Functional Safety Manual SD 176P (in development).

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

**Range of adjustment**
- Switch point: 0.5...100 % in increments of 0.1 % (min. 1 mbar) of the upper range limit (URL)
- Switch-back point: 0...99.5 % in increments of 0.1 % (min. 1 mbar) of the upper range limit (URL)
- Analog output: 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

**Switching capacity**
DC voltage version:
- Switch status ON: \( I_a \leq 250 \text{ mA} \)
- Switch status OFF: \( I_a \leq 1 \text{ mA} \)
- Switching cycles: > 10,000,000
- Voltage drop PNP: \( \leq 2 \text{ V} \)
- 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 (\( f = 2 \text{ Hz} \)) and indication of "Warning"

**Input PLC**
- Input impedance \( R_i \leq 2 \text{ k}\Omega \)
- Input current \( I_i \geq 10 \text{ mA} \)

**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).

**Power supply**

**Electrical connection**
**Connector and cable connection**

A: M 12x1.5 connector
B: M 16x1.5 or ½ NPT valve plug
C: cable, 5 m long, 5-core (➀ reference pressure supply)
Device connection

- DC voltage version with M 12x1.5 connector

A1: 1x PNP switch output
A2: 2x PNP switch output (in conformity with 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 ½ NPT valve plug

B: 1x PNP switch output

- DC voltage version with cable

C1: 1x PNP switch output
C2: 2x PNP switch output (in conformity with DESINA)
C3: PNP switch output with additional analog output
C3': PNP switch output with additional analog output (PIN assignment with "DESINA" setting)

Cable specification: all three versions 5-core (4 x 0.2 mm², PE 0.75 mm²)
- 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
  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.
- 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, relative humidity 45...75 %, ambient air pressure 860...1060 kPa

Switch output

- Accuracy: deviation < 0.5 %
- Non-repeatability: < 0.2 %
- Response time: ≤ 20 ms
- Settling time: 2...5 ms

Analog output

- Non-linearity: ≤ 0.2 % (as per limit point method)
- Non-conformity:
  Non-linearity + hysteresis + non-repeatability: 0.5 % (as per limit point method)
- Rise time T_{90%} ≤ 200 ms
- Settling time T_{99%} ≤ 500 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

≤ ± 1.5 % (-20...+45 °C)
≤ ± 2.0 % (-40...+85 °C)
≤ ± 2.5 % (-40...+100 °C)

Operating conditions: Installation instructions

Installation instructions

- Any orientation.
- Any position-dependent zero shift can be corrected.
  Position adjustment (offset): ±20 % of the upper range limit

Operating conditions: Environment

Ambient temperature range

-40...+85 °C (briefly up to +100 °C)

Storage temperature

-40...+85 °C
**Climate class**

4K4H to DIN EN 60721-3-4

**Degree of protection**

- With M 16x1.5 or ½ NPT valve plug: IP 65
- With M 12x1.5 connector when using gauge pressure sensors: IP 66
  with M 12x1.5 connector when using absolute pressure sensors: IP 68 (1 mH₂O for max. 1 hour)
- With cable: IP 68 (1 mH₂O for max. 1 hour)

**Shock resistance**

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

**Vibration resistance**

- 20 g to DIN IEC 68-2-6 (10-2000Hz)
- 4 g to German Lloyd GL Guidelines

**Electromagnetic compatibility**

- Interference emission as per EN 61326, class B electrical equipment
- Interference immunity as per EN 61326, appendix A (industrial use) and NAMUR Recommendation NE 21
  
  EMC influence: ≤ 0.5 %

**Operating conditions: Process**

**Medium temperature range**

- PTC 31: −40 °C...+100 °C
- PTP 31: −40 °C...+100 °C
- PTP 35: −40 °C...+100 °C (+135 °C for max. 1 hour)

**Limiting medium pressure range**

- For overload resistance see "Ordering information" section
- Vacuum resistance
  For ceramic sensor with nominal value >100 mbar: 0 mbar abs
  For ceramic sensor 100 mbar: 700 mbar abs
  For metal sensor: 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 +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

<table>
<thead>
<tr>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 12x1.5</td>
</tr>
<tr>
<td>M 16x1.5 / ½ NPT</td>
</tr>
<tr>
<td>5 m</td>
</tr>
</tbody>
</table>

- M 12x1.5 connector to IEC 60947-5-2
- M 16x1.5 or ½ NPT valve plug as per DIN 43650A/ISO 4400
- Cable 5 m long, cable outer diameter 7.7 mm, cores 4 x 0.2 mm², PE 0.75 mm²
- Reference pressure hose with outer diameter 2.5 mm
- ① Across flats AF 27 (for 400 bar sensor AF 32)
- A = height dimension of process connections – see next diagrams (all dimensions in mm)

Process connection

- PTC 31: sensor module ① with process connection.
- PTP 31/35: sensor module ② with M24x1.5 adapter thread for adapters with process connection.
- Adapter (mounted onto sensor module at the factory, 400 bar thread adapter welded onto sensor module)
  - ③ Adapter with thread connection
  - ④ Adapter with clamp connection (except ½" clamp)
  - ⑤ Adapter with hygiene connection (except G 1A)
Process connections PTC 31
sensor module with ceramic sensor

PTC 31; sensor module with process connection
➀ with internal thread
➁ with external thread

"Seal" detail: ➂ Ceraphire ceramic sensor, ➃ moulded seal, in contact with process, ➄ sensor module

Dimension A: see the following dimension drawings (*)

Thread connections

Process connection versions (see also "Ordering information" section)
AC: thread ISO 288, G¼ (female)
AD: thread ISO 288, G½A
AE: thread ISO 288, G½A
AF: thread ISO 288, G½A, bore 11 mm
BA: Thread DIN 13, M 12x1.5
CA: thread 7/16-20 UNF (SAE)
DA: thread ANSI ¼ FNPT
DD: thread ANSI ½ MNPT
(all dimensions in mm)
Ceraphant T PTC31, PTP31, PTP35

Process connections PTP
Sensor module with metallic sensor 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: ➀ sensor module, ➁ Standard O-ring, in contact with process, ➂ adapter
Dimension A: see the following dimension drawing (*). For 400 bar sensor see also Page 12.

Process connections PTP 31
Thread connections

AC: thread ISO 228, G½ (female)
AD: thread ISO 228, G½A
AE: thread ISO 228, G½A
AF: thread ISO 228, G½A, bore 11 mm
BA: Thread DIN 13, M 12x1.5
CA: thread 7/16-20 UNF (SAE)
DA: thread ANSI ¼ FNPT
DD: thread ANSI ½ MNPT

(all dimensions in mm)

A.P.O. - ELMOS v.o.s., Pražská 90, 509 01 Nová Paka, Tel.: +420 493 504 261, Fax: +420 493 504 257, E-mail: apo@apoelmos.cz, Internet: www.apoelmos.cz
Process connections PTP 35 clamp connections

**Process connection version**
DA: clamp ⅛"...¾" (ISO 2852) or DN 10...DN 20 (DIN 32676)

**Process connection versions (sensor module with adapter)**
DB: clamp 1"...1½" (ISO 2852) or DN 25...DN 40 (DIN 32676)
DL: clamp 2" (ISO 2852) or DN 50 (DIN 32676)

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

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Process connections PTP 35 hygiene connections

**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 × Ø8.6 + 2 × M8 thread)

See also "Ordering information" section
(all dimensions in mm)
PTP 31 with 400 bar sensor
- 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 5 mm longer
- For ½ NPT thread connections, G ½A:
  dimension A 1 mm longer

Weight
- PTC 31: approx. 0.32 kg
- PTP 31: approx. 0.37 kg
- PTP 35: approx. 0.58 kg (with clamp process connection 1…1½")

Material
- Process connection: AISI 316L
  Surfaces in contact with the process for PTP 35 with electronically polished surface $R_a \leq 0.8 \, \mu m$
  Coupling nut: AISI 304
- Sensor diaphragm for PTC 31: Ceraphire® (99.9 % Al₂O₃), FDA number: 21-CFR 186.1256
- Sensor diaphragm for PTP 31/35: AISI 316L
- Filling oil for PTP 31 and PTP 35: mineral oil, FDA number: 21-CFR 172.882
- Seals:
  FKM Viton
  EPDM, FDA number 21-CFR 177.2600
- Housing: AISI 316L, with electronically polished surface $R_a \leq 0.8 \, \mu m$
- Valve plug: polyamide (PA)
  M12 connector: exterior 316L, interior polyamide (PA)
  Cable outer covering: polyurethane (PUR/UL94, V0, UV-resistant)
- Display: polycarbonate PC-FR (Lexan®)
- Keys: polycarbonate PC-FR (Lexan®)
**Human interface**

### Operating elements

Position and meaning of display and operating elements.

**LED for status**
- Green = ok
- Red = error
- Red/green blinking = warning

**Operating keys**

**Digital display**
- Yellow LEDs for switching states
- LED on = switch closed
- LED off = switch open
- Communication jack for personal computer

*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.

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<tr>
<th>Function group</th>
<th>Operating options</th>
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<td><strong>BASE</strong> (basic functions)</td>
<td>Selection of unit: bar, psi, kPa/MPa</td>
</tr>
<tr>
<td></td>
<td>Position adjustment: ±20 % of the upper range limit</td>
</tr>
<tr>
<td></td>
<td>Damping display value, output signal: anywhere between 0...40 s (in increments of 0.1 s)</td>
</tr>
<tr>
<td></td>
<td>Display:</td>
</tr>
<tr>
<td></td>
<td>– Display of measured value or configured switch point</td>
</tr>
<tr>
<td></td>
<td>– Rotation of display by 180°</td>
</tr>
<tr>
<td></td>
<td>– Switching off display</td>
</tr>
<tr>
<td></td>
<td>Behaviour according to DESINA:</td>
</tr>
<tr>
<td></td>
<td>The PIN assignment of the M12 connector is in accordance with the guidelines of DESINA (distributed and standardised installation technology for machine tools and manufacturing systems)</td>
</tr>
<tr>
<td></td>
<td>Switch to SIL mode (functional safety)</td>
</tr>
<tr>
<td>Function group</td>
<td>Operating options</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------</td>
</tr>
</tbody>
</table>
| **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 % of the upper range limit (URL), (in increments of 0.1 %, min. 1 mbar) |
| | Switch-back point:  
- Input value  
- Acceptance of applied value  
Switch-back point anywhere between 0...99.5 % of the upper range limit (URL), (in increments of 0.1 %, min. 1 mbar) |
| | Switch output delay: anywhere between 0...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...20 mA |
| | Switch point 2:  
- Input value  
- Acceptance of applied value  
Switch point anywhere between 0.5...100 % of the upper range limit (URL), (in increments of 0.1 %, min. 1 mbar) |
| | Switch-back point 2:  
- Input value  
- Acceptance of applied value  
Switch-back value anywhere between 0...99.5 % of the upper range limit (URL), (in increments of 0.1 %, min. 1 mbar) |
| | 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 3.5 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 switch-back 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.

\[ \text{Switch point } SP; \text{ Switch-back point } RSP \]
Operation, visualisation and maintenance with personal computer and 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:

<table>
<thead>
<tr>
<th>Function group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICE</td>
<td>Number of switch changes</td>
</tr>
<tr>
<td></td>
<td>Device status/error</td>
</tr>
<tr>
<td>INFO</td>
<td>Tag number</td>
</tr>
<tr>
<td></td>
<td>Order code</td>
</tr>
<tr>
<td></td>
<td>Device serial number</td>
</tr>
<tr>
<td></td>
<td>Sensor serial number</td>
</tr>
<tr>
<td></td>
<td>Electronics serial number</td>
</tr>
<tr>
<td></td>
<td>Device release (change status)</td>
</tr>
<tr>
<td></td>
<td>Hardware version</td>
</tr>
<tr>
<td></td>
<td>Software version</td>
</tr>
</tbody>
</table>

Comprehensive information on the ReadWin 2000 configuration software may be found in the Operating Instructions BA 137R/09/en.
### Certificates and approvals

<table>
<thead>
<tr>
<th>Certificates and approvals</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CE mark</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>UL listing</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Pressure Equipment Directive</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Hygiene standard</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Functional safety</strong></td>
<td>The pressure switches Ceraphant PTC 31 and PTP 31/35 with PNP switch output and additional analog output meet the requirements for functional safety as per IEC 61508 / IEC 61511-1 (FDIS). Thus, they can be used for limit pressure monitoring to SIL 2.</td>
</tr>
</tbody>
</table>
| **Standards and guidelines** | DIN EN 60770 (IEC 60770): Transmitters for use in industrial-process control systems  
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 60592 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  
NAMUR Association for Standards for Control and Regulation in the Chemical Industry. |
| **Registered trademarks**  | Ceraphire®  
Registered trademark of Endress+Hauser GmbH+Co.KG, Maulburg, Germany  
ReadWin®  
Registered trademark of Endress+Hauser Wetzer GmbH+Co.KG, Nesselwang, Germany  
LEXAN®  
Registered trademark of General Electric Plastics B.V., Bergen op Zoom, Netherlands |
# Ordering information

## Ceraphant T PTC31

### Certificate
- 10 Certificate
  - R For non-hazardous areas

### Electrical connection
- 20 Electrical connection
  - 1 M12x1.5 connector; IP66
  - 2 M16x1.5 valve plug, ISO4400; IP65
  - 3 ½NPT valve plug, ISO4400; IP65
  - 4 5 m cable; IP66/IP68

### Electronics, output signal
- 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, functional safety SIL 2

### Display
- 40 Display
  - 1 With digital display

### Sensor
- 50 Sensor
  - Gauge pressure
    - 1C 0...100 mbar / 0...10 kPa
    - 1F 0...400 mbar / 0...40 kPa
    - 1H 0...1 bar / 0...100 kPa
    - 1M 0...4 bar / 0...400 kPa
    - 1P 0...10 bar / 0...1000 kPa
    - 1S 0...40 bar / 0...4000 kPa
  - Negative gauge pressure
    - 5C -100...100 mbar / -10...10 kPa
    - 5F -400...400 mbar / -40...40 kPa
    - 5H -1...1 bar / -100...100 kPa
    - 5M -1...4 bar / -100...400 kPa
    - 5P -1...10 bar / -100...1000 kPa
  - Absolute pressure
    - 2F 0...400 mbar / 0...40 kPa
    - 2H 0...1 bar / 0...100 kPa
    - 2M 0...4 bar / 0...400 kPa
    - 2P 0...10 bar / 0...1000 kPa
    - 2S 0...40 bar / 0...4000 kPa

### Configuration and unit
- 60 Configuration and unit
  - 1 Configured sensor range: mbar/bar
  - 2 Configured sensor range: kPa/MPa
  - 3 Configured sensor range: psi
  - 4 Configured switch output 1 to additional spec.
  - 5 Configured switch output 1 + 2 to additional spec.
  - 6 Configured switch and analog output to additional spec.

### Process connection, material
- 70 Process connection, material
  - AC Thread ISO288, G¼ (female), 316L
  - AD Thread ISO288, G¼A, 316L
  - AE Thread ISO288, G½A, 316L
  - AF Thread ISO288, G½A, bore 11 mm, 316L
  - BA Thread DIN13, M12x1.5, 316L
  - CA Thread 7/16-20 UNS (SAE), 316L
  - DA Thread ANSI ¼FNPT, 316L
  - DD Thread ANSI ½MNPT, 316L

### Sensor seal (in contact with process)
- 80 Sensor seal (in contact with process)
  - 1 FKM Viton sensor seal
  - 4 EPDM sensor seal
  - 6 FKM Viton sensor seal, cleaned for O₂ service

### Additional equipment
- 90 Additional equipment
  - A Without additional equipment
  - C 3.1.B process connection, inspection certificate to EN10204
# Ceraphant T PTP31, PTP35

## Ceraphant T PTP31

<table>
<thead>
<tr>
<th>10</th>
<th>Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>For non-hazardous areas</td>
</tr>
</tbody>
</table>

## Electrical connection

<table>
<thead>
<tr>
<th>20</th>
<th>Electrical connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M12x1.5 connector; IP66</td>
</tr>
<tr>
<td>2</td>
<td>M16x1.5 valve plug, ISO4400; IP65</td>
</tr>
<tr>
<td>3</td>
<td>½NPT valve plug, ISO4400; IP65</td>
</tr>
<tr>
<td>4</td>
<td>5 m cable; IP66/68</td>
</tr>
</tbody>
</table>

## Electronics, output signal

<table>
<thead>
<tr>
<th>30</th>
<th>Electronics, output signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12...30V DC, PNP switch, 3-wire</td>
</tr>
<tr>
<td>B</td>
<td>12...30V DC, 2 PNP switch, 4-wire</td>
</tr>
<tr>
<td>C</td>
<td>12...30 V DC, PNP switch + 4...20mA, 4-wire, functional safety SIL 2</td>
</tr>
</tbody>
</table>

## Display

<table>
<thead>
<tr>
<th>40</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>With digital display</td>
</tr>
</tbody>
</table>

## Sensor

<table>
<thead>
<tr>
<th>50</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gauge pressure</td>
</tr>
<tr>
<td>3H</td>
<td>0...1 bar / 0...100 kPa</td>
</tr>
<tr>
<td>3M</td>
<td>0...4 bar / 0...400 kPa</td>
</tr>
<tr>
<td>3P</td>
<td>0...10 bar / 0...1000 kPa</td>
</tr>
<tr>
<td>3S</td>
<td>0...40 bar / 0...4000 kPa</td>
</tr>
<tr>
<td>3U</td>
<td>0...100 bar / 0...10 MPa</td>
</tr>
<tr>
<td>3Z</td>
<td>0...400 bar / 0...40 MPa</td>
</tr>
<tr>
<td></td>
<td>Permitted overload</td>
</tr>
<tr>
<td></td>
<td>Negative gauge pressure</td>
</tr>
<tr>
<td>7H</td>
<td>-1...1 bar / -100...100 kPa</td>
</tr>
<tr>
<td>7M</td>
<td>-1...4 bar / -100...400 kPa</td>
</tr>
<tr>
<td>7P</td>
<td>-1...10 bar / -100...1000 kPa</td>
</tr>
<tr>
<td></td>
<td>Absolute pressure</td>
</tr>
<tr>
<td>4H</td>
<td>0...1 bar / 0...100 kPa</td>
</tr>
<tr>
<td>4M</td>
<td>0...4 bar / 0...400 kPa</td>
</tr>
<tr>
<td>4P</td>
<td>0...10 bar / 0...1000 kPa</td>
</tr>
<tr>
<td>4S</td>
<td>0...40 bar / 0...4000 kPa</td>
</tr>
<tr>
<td>4U</td>
<td>0...100 bar / 0...10 MPa</td>
</tr>
<tr>
<td>4Z</td>
<td>0...400 bar / 0...40 MPa</td>
</tr>
<tr>
<td></td>
<td>Permitted overload</td>
</tr>
<tr>
<td></td>
<td>Configuration and unit</td>
</tr>
<tr>
<td>1</td>
<td>Configured sensor range: mbar/bar</td>
</tr>
<tr>
<td>2</td>
<td>Configured sensor range: kPa/MPa</td>
</tr>
<tr>
<td>3</td>
<td>Configured sensor range: psi</td>
</tr>
<tr>
<td>4</td>
<td>Configured switch output 1 to additional spec.</td>
</tr>
<tr>
<td>5</td>
<td>Configured switch output 1 + 2 to additional spec.</td>
</tr>
<tr>
<td>6</td>
<td>Configured switch and analog output to additional spec.</td>
</tr>
</tbody>
</table>

## Process connection, material

<table>
<thead>
<tr>
<th>70</th>
<th>Process connection, material</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Thread ISO288, G½ (female), 316L</td>
</tr>
<tr>
<td>AD</td>
<td>Thread ISO288, G½A, 316L</td>
</tr>
<tr>
<td>AE</td>
<td>Thread ISO288, G¼A, 316L</td>
</tr>
<tr>
<td>AF</td>
<td>Thread ISO288, G¼A, bore 11 mm, 316L</td>
</tr>
<tr>
<td>BA</td>
<td>Thread DIN13, M12x1.5, 316L</td>
</tr>
<tr>
<td>CA</td>
<td>Thread 7/16-20 UNF (SAE), 316L</td>
</tr>
<tr>
<td>DA</td>
<td>Thread ANSI ½NPT, 316L</td>
</tr>
<tr>
<td>DD</td>
<td>Thread ANSI ½MNPT, 316L</td>
</tr>
</tbody>
</table>

## Seal, filling fluid

<table>
<thead>
<tr>
<th>80</th>
<th>Seal, filling fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O-ring FKM Viton, mineral oil</td>
</tr>
<tr>
<td>7</td>
<td>Welded, mineral oil (only for 400 bar sensor)</td>
</tr>
</tbody>
</table>

## Additional equipment

<table>
<thead>
<tr>
<th>90</th>
<th>Additional equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Without additional equipment</td>
</tr>
<tr>
<td>C</td>
<td>3.1.B process connection, inspection certificate to EN10204</td>
</tr>
</tbody>
</table>

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**A.P.O. - ELMOS v.o.s., Pražská 90, 509 01 Nová Paka, Tel.: +420 493 504 261, Fax: +420 493 504 257, E-mail: apo@apoelmos.cz, Internet: www.apoelmos.cz**
## Ceraphant T PTP35

### Certificate
- R For non-hazardous areas

### Electrical connection
1. M12x1.5 connector; IP66
2. M16x1.5 valve plug, ISO4400; IP65
3. NPT valve plug, ISO4400; IP65
4. 5 m cable; IP66/68

### 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, functional safety SIL 2

### Display
- 1 With digital display

### Sensor
- **Gauge pressure**
  - 3H 0...1 bar / 0...100 kPa 4 bar
  - 3M 0...4 bar / 0...400 kPa 16 bar
  - 3P 0...10 bar / 0...1000 kPa 40 bar
  - 3S 0...40 bar / 0...4000 kPa 160 bar
- **Negative gauge pressure**
  - 7H -1...1 bar / -100...100 kPa 4 bar
  - 7M -1...4 bar / -100...400 kPa 16 bar
  - 7P -1...10 bar / -100...1000 kPa 40 bar
- **Absolute pressure**
  - 4H 0...1 bar / 0...100 kPa 4 bar
  - 4M 0...4 bar / 0...400 kPa 16 bar
  - 4P 0...10 bar / 0...1000 kPa 40 bar
  - 4S 0...40 bar / 0...4000 kPa 160 bar

### 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
4. Configured switch output 1 to additional spec. Calibration in sensor range
5. Configured switch output 1 + 2 to additional spec. Calibration in sensor range
6. Configured switch and analog output to additional spec. Calibration in sensor range

### Process connection, material
**Clamp connections**
- DA ISO2852 DN12-22 (1/2...¾"), 316L, 3A, DIN32676, DIN10-20
- DB ISO2852 DN25-38 (1...1½"), 316L, 3A, DIN32676, DIN25-40
- DL ISO2852 DN40-51 (2"), 316L, 3A, DIN32676, DIN50

**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
- 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 DNS0 PN40, 316L, 3A
- HL APV inline DNS0 PN40, 316L, 3A

### 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)

### Additional equipment
- A Without additional equipment
- C 3.1.B process connection, inspection certificate to EN10204

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**PTP35**

**A.P.O. • ELMOS v.o.s., Pražská 90, 509 01 Nová Paka, Tel.: +420 493 504 261, Fax: +420 493 504 257, E-mail: apo@apoelmos.cz, Internet: www.apoelmos.cz**
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).

<table>
<thead>
<tr>
<th>Output 1</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Hysteresis normally open</td>
<td>2 = Hysteresis normally closed</td>
<td>3 = Window normally open</td>
<td>4 = Window normally closed</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Output 2 (only if available) /Code B</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Hysteresis normally open</td>
<td>2 = Hysteresis normally closed</td>
<td>3 = Window normally open</td>
<td>4 = Window normally closed</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Analogue output (only if output 2 = 4...20 mA /Code C)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5 = 4...20 mA only if available</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:
- ( ) ≤ 3.6 mA
- ( ) ≥ 21.0 mA
- ( ) last current value
Connection conform to DESINA:
- ( ) no
- ( ) yes

TAG
(2 x 18 characters)

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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, order number 52005087 or 52010171
  Material: brass
  Order number: 52005272

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Endress+Hauser
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: 52011196

Thread adapter

- PTP 31: 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

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
Hygiene adapter

- PTP 35: order numbers for hygiene adapter versions.
  
  Version LB: order no. 52023996
  Version LL: order no. 52023997
  Version PH: order no. 52023999
  Version PL: order no. 52023998
  Version HL: order no. 52024000

Optional with inspection certificate 3.1B:
  
  Version LB: order no. 52024003
  Version LL: order no. 52024004
  Version PH: order no. 52024006
  Version PL: order no. 52024005
  Version HL: order no. 52024007

Plug-in jack

- M 12x1.5 plug-in jack
  
  Self-made connection to M 12x1.5 plug
  Order number: 52006263

- M 12x1.5 plug-in jack, elbowed
  
  Self-made connection to M 12x1.5 plug
  Order number: 51006327

Connecting cable

- Cable, 4 x 0.34 mm² with M12 socket, elbowed, screw plug, length 5 m, sprayed PVC cable
  
  Order number: 52010285

- Cable, 4 x 0.34 mm² with M12 socket, with LED, elbowed, 316L screw plug, length 5 m, sprayed PVC cable, specially for hygiene applications
  
  Order number: 52018763
  Display: gn: device operational; ye1: switch status; ye2: switch status 2

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
## Documentation

### Technical Information
Technical Information on the Thermophant T temperature switch:
Thermophant T TTR 31, TTR 35
TI 105R/09/en

### Operating Instructions
Ceraphant T PTC 31, PTP 31, PTP35
KA 225P/00/a2, order no. 52023159
Operating software ReadWin 2000
BA 137R/09/en

### Safety instructions
- ATEX Safety instructions for electrical equipment for use in hazardous locations (in development).
- Functional Safety Manual (SIL)
  SD 176P/00/en (in development)