Technical Information
TI 372P/00/en

Pressure Transducer
cerabar T PMP 135

Pressure transducer for hygienic processes
For absolute and gauge pressures up to 40 bar
Flush-mounted process connections with metal diaphragm

Application
The Cerabar T PMP 135 is a pressure transducer for hygienic applications, e.g. in the food processing and pharmaceutical industries. It is designed for measuring absolute and gauge pressures in gases, vapours, liquids and dust.

- Finely graduated measuring ranges up to 40 bar or 500 psi.
- Electronic versions:
  – Analogue output 4...20 mA
  – Switch output
  – Approved for use in hazardous areas

Your benefits
This compact pressure transducer impresses with its well-engineered construction:

- Flush-mounted process connections with metal diaphragm.
- Hygienic design as per 3A guidelines.
- Up to 4 times overload resistance and extremely longterm stable.
- Optional with 3.1.B inspection certificate.
- Materials in contact with the process only made of 316L stainless steel with a surface quality $R_a \leq 0.8$ µm.

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Function and system design

Measuring principle

PMP 135 with analogue output

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.

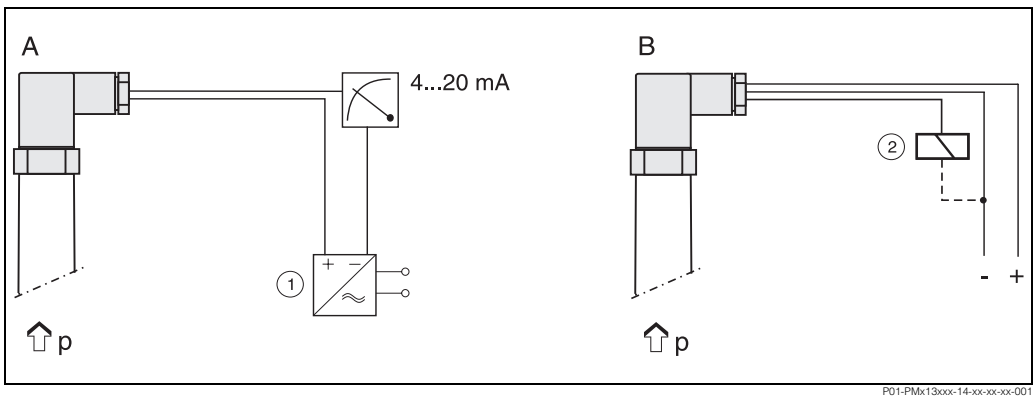
PMP 135 with switch output

The process pressure acting upon the metallic separating diaphragm of the sensor is transmitted to a resistance bridge via a fluid. A differential amplifier creates a standard signal from the pressure-proportional change in output voltage of the bridge. A comparator with an adjustable hysteresis compares this signal with the pre-set switch point and then activates the transistor output and the LED display.

Measuring system

Cerabar T PMP 135 pressure transducer with

- 4…20 mA analogue output.
  Power supply, e.g. with RN 221N transmitter power supply unit from Endress+Hauser
- Switch output.
  Preferably in connection with programmable logic controllers (PLC). Positive signal at electronics switch output (PNP).



A = analogue output with transmitter power supply unit ①
B = switch output with load ②, e.g. PLC, DCS, relay

Input

Measured variable

The measured variable for the Cerabar T PMP 135 pressure transducer can be selected as either gauge pressure or absolute pressure.

Measuring range

Measuring ranges up to 40 bar or 500 psi, see "Ordering information" section.

Output

Analogue output

Output signal

4...20 mA

Load

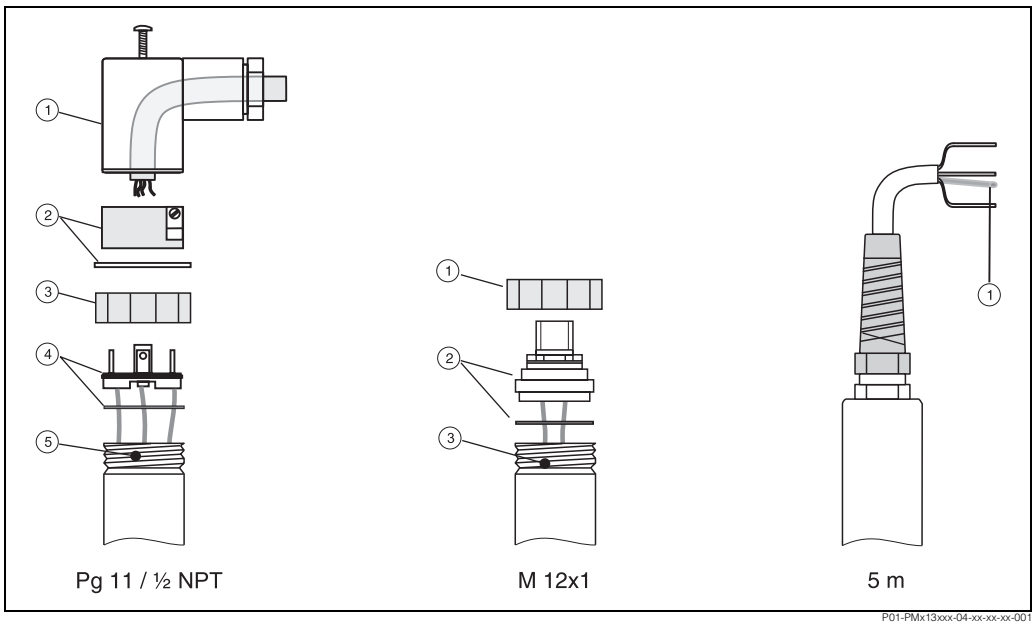
$R_B \leq (U_S - 12\ V) / 0.02\ A$ (U_S = power supply)

Switch output

Output signal	Positive voltage signal (rate depends on power supply voltage) at electronics switch output (PNP).
Output current	Switch status ON: $I_a \leq 500$ mA Switch status OFF: $I_a \leq 1$ mA
Power	max. 6 W
Switch frequency	max. 10 Hz
Input PLC	Input resistance $R_i \leq 2$ kΩ Input current $I_i \geq 10$ mA
Inductive loads	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

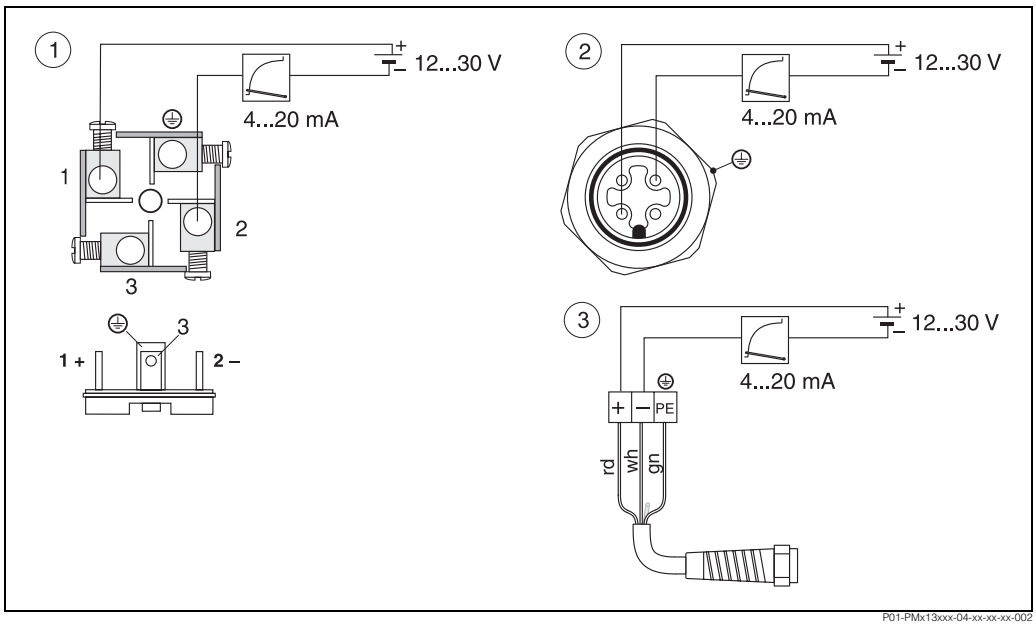
Cable entry



Plug with Pg 11 or ½ NPT gland	M 12x1 plug	5 m cable, only analogue output
① Plug-in housing	① Coupling nut	① Reference pressure line
② Plug-in jack with gasket	② Connector with gasket	
③ Coupling nut	③ Operating potentiometer (inner)	
④ Plug with O-ring		
⑤ Operating potentiometer (inner)		

Analogue output

Electrical connection



① *Plug with Pg 11 or ½ NPT gland*
② *M 12x1 plug*
③ *Cable (rd = red, wh = white, gn = green)*

Supply voltage

12...30 V DC
Ex i: no-load voltage ≤ 26 V DC, short-circuit current ≤ 100 mA, power consumption ≤ 0.8 W

Residual ripple

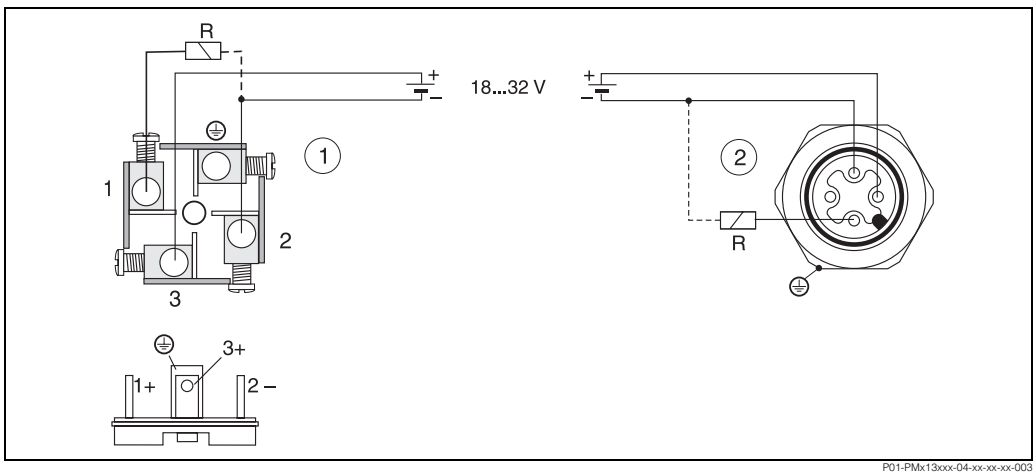
max. 5 %

Cable entry

Plug with Pg 11 or NPT ½ gland, M 12x1 plug or cable

Switch output

Electrical connection



① *Plug with Pg 11 or ½ NPT gland*
② *M 12x1 plug*
R: external load, e.g. relay, programmable logic controller, distributed control system

Supply voltage	18...32 V DC
Current consumption	without load < 20 mA, with reverse polarity protection
Residual ripple	max. 10 %
Cable entry	Plug with Pg 11 or ½ NPT gland or M 12x1 plug

Performance characteristics

The percentages in the "Performance characteristic" section refer to the measuring range.

Reference operating conditions	as per DIN IEC 60770, T = 25 °C
Analogue output non-linearity	≤ 0.5 % including hysteresis and non-reproducibility (limit point method as per DIN IEC 60770)
Switch point deviation	≤ 1 %
Switch point non-reproducibility	≤ 0.5 %
Settling time	2...5 ms
Long-term drift	≤ 0.15 % per year
Influence of temperature	• Zero: typical 0.2 %/10K, max. 0.5 %/10K. Values are 0.1 %/10 K higher for measuring spans ≤ 6 bar. • Span: typical 0.2 %/10 K, max. 0.5 %/10 K • Switch point: typical 0.2 %/10 K, max. 0.5 %/10K

Operating conditions: Installation instructions

Mounting location	anywhere
Location dependence	Location-dependent zero shift can be corrected using potentiometer adjustment.

Operating conditions: Environment

Ambient temperature range	–25...+70 °C Ex i: –25...+65 °C
Storage temperature	–40...+85 °C
Climate class	4 Z with Z = 70 °C as per VDI/VDE 3540

Degree of protection

- with plug with Pg 11 or ½ NPT gland: IP 65
- with M 12x1 plug when using gauge pressure sensors: IP 65
  with M 12x1 plug when using absolute pressure sensors: IP 68 (1 m water column)
- with cable: IP 68 (1 m water column)

Vibration resistance

4M5 as per DIN EN 60721-3

Electromagnetic compatibility

Interference emission as per EN 61326 electrical device B,
Interference immunity as per EN 61326 appendix A (industrial use) and NAMUR recommendation NE 21.

Operating conditions: Process

Medium temperature

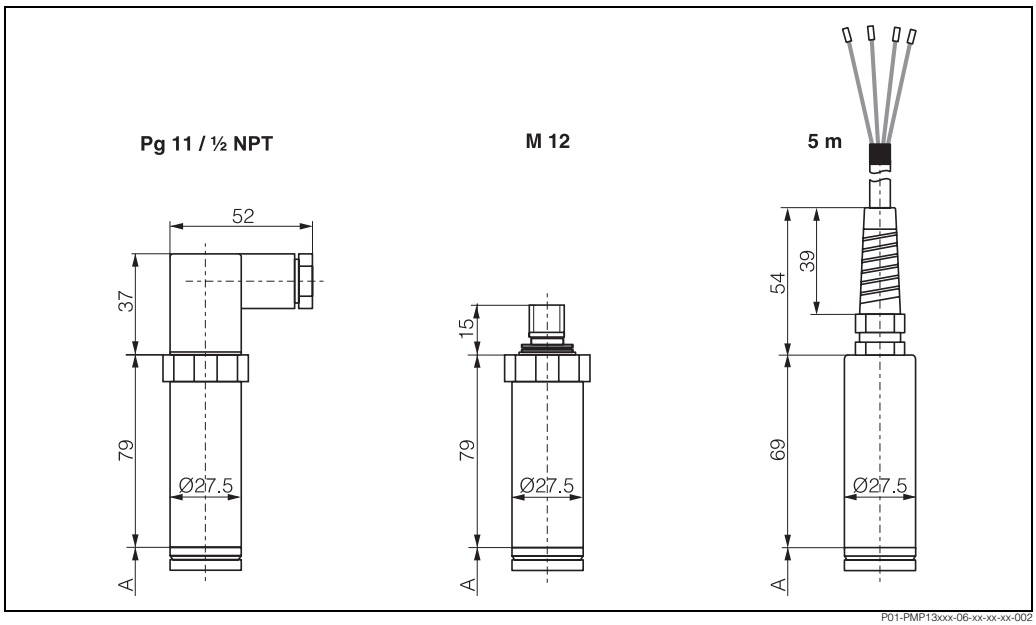
–25...+100 °C (+135 °C for max. 1 hour)

Limiting medium pressure range

– For overload resistance see "Ordering information" section
– Vacuum resistance up to 10 $mbar_{abs}$

Mechanical construction

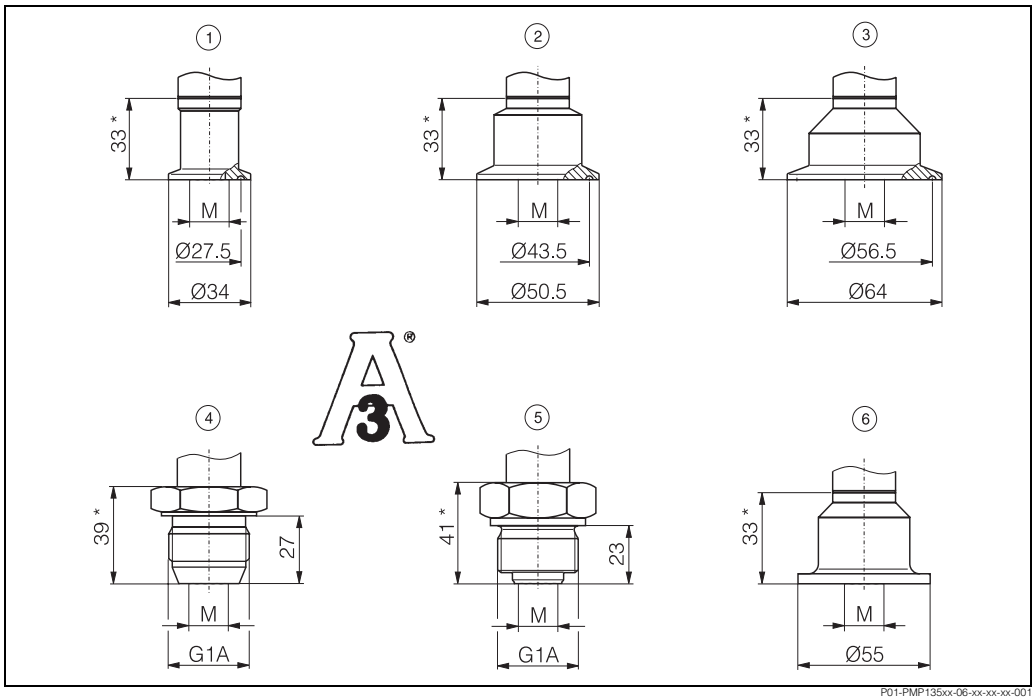
Design, dimensions



A = height dimension of process connections (see following section)
(all dimensions in mm / 25.4 mm = 1 in)

- Plug version with Pg 11 or ½ NPT gland as per DIN 43650A/ISO 4400
- M 12x1 plug version
- Cable version, cable length of 5 m with cable outer diameter of 5.8 mm; wires 4 x 0.22 mm^2; reference pressure hose with outer diameter of 2 mm

Process connections



① Clamp ½"...¾" (ISO 2852) or DN 10...DN 20 (DIN 32676)
② Clamp 1"...1½" (ISO 2852) or DN 25...DN 40 (DIN 32676)
③ Clamp 2" (ISO 2852) or DN 50 (DIN 32676)
④ G 1A (ISO 228), with metallic sealing taper
⑤ G 1A (ISO 228), with sealing surface for flush-mounted installation
⑥ SMS 1½"
M = diaphragm diameter of 17.2 mm
** Height dimension A (see previous section)*
(all dimensions in mm / 25.4 mm = 1 in)

Material

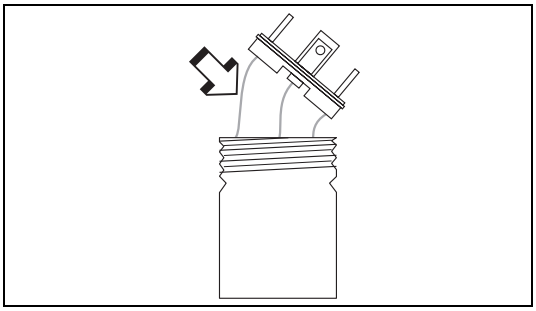
- Process connection and diaphragm: AISI 316L
  Surfaces in contact with the process with surface quality $R_a \leq 0.8$ µm
- Transducer housing: AISI 304
- Plug: polyamide (PA)
- Cable outer covering: polyurethane (PUR)
- Fill fluid: Neobee M20 (FDA-no. 21CFR172.856)

Human interface

Operating elements

Position of operating elements

The potentiometer for operating the Cerabar T with analogue or switch output is located below the base of the plug.



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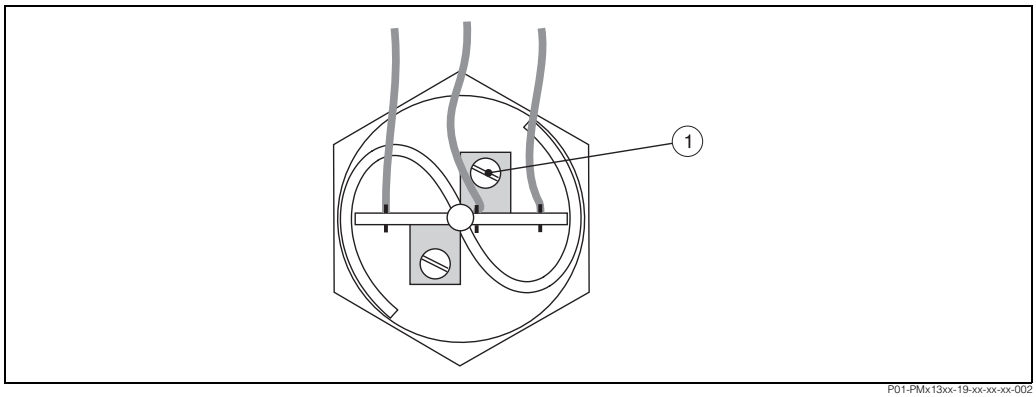
Analogue output: Zero point adjustment

The zero point can be corrected for the Cerabar T with analogue output and plug version.



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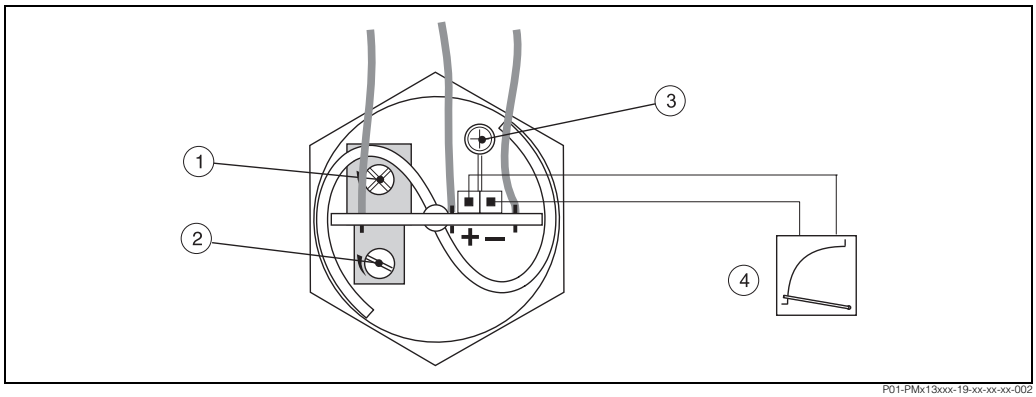
① *Potentiometer for zero point correction by ±5 % of the measuring range*

Switch output: Switch point and hysteresis adjustment

For the Cerabar T with switch output, both the switch point and hysteresis can be adjusted. This can also be carried out at atmospheric pressure using the enclosed test cable and a voltmeter.



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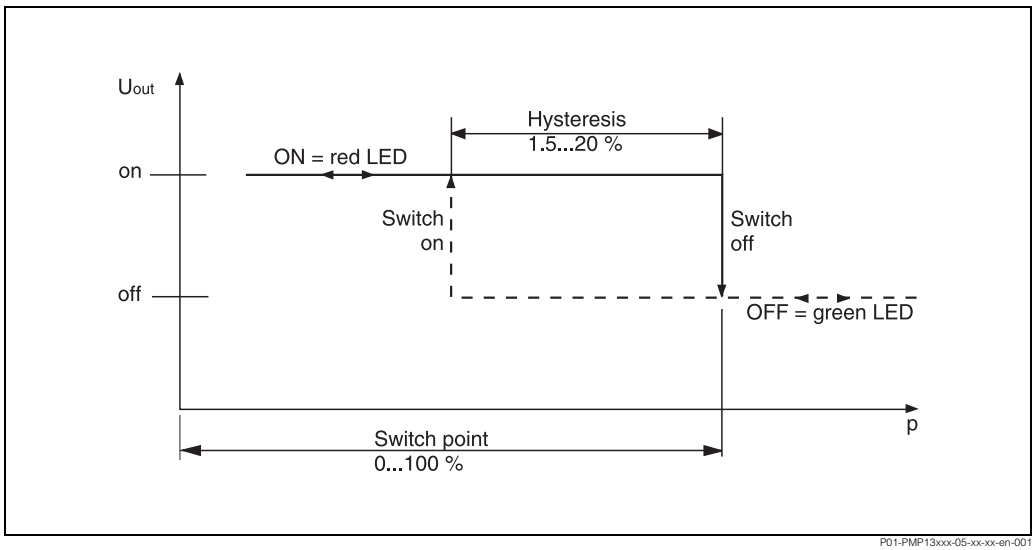
① *Hysteresis adjustment 1.5...20 %; Factory setting 10 %*
② *Switch point adjustment 0...100 %; Factory setting 50 %*
③ *LED colour code for checking the switch status: green = off; red = on*
④ *Connect voltmeter to test pins: 0...1 V corresponds to 0...100 %*
– *The percentages refer to the measuring range.*



Instructions for switch point and hysteresis
U_{out} = output voltage
p = acting pressure
– The percentages refer to the measuring range.

Certificates and approvals

Ex approval

- ATEX II 1/2 G EEx ib IIC T6
- ATEX II 2 G EEx ib IIC T6
- ATEX II 3 G EEx nA II T6

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.

Pressure equipment directive

This device conforms to Article 3 (3) of EC Directive 97/23/EC (pressure equipment directive) and is developed and produced in sound engineering practice.

Ordering information

Cerabar T PMP 135

10	Electrical connection
A1	Plug with Pg 11 gland, IP 65
A2	Plug with ½ NPT gland, IP 65
A3	M12x1 plug, IP 65/IP 68
A4	Cable, 5 m, IP 68
99	Special version

20	Process connection
F	Clamp ½"...¾", DN 10...20, PN 40
G	Clamp 1"...1½", DN 25...40, PN 40
H	Clamp 2", DN 50, PN 40
M	G 1A, with metallic sealing taper, PN 40
N	G 1A, with sealing surface for flush-mounted installation, PN40
S	SMS 1½", PN 40
Y	Special version

30	Output signal, certificate
0	Analogue 4...20 mA, 2-wire
D	Analogue 4...20 mA, ATEX II 1/2 G EEx ib IIC T6
1	Analogue 4...20 mA, ATEX II 2 G EEx ib IIC T6
5	Analogue 4...20 mA, ATEX II 3 G EEx nA II T6
2	Switch output PNP, 3-wire
3	Switch output PNP, ATEX II 3 G EEx nA II T6
9	Special version

40	Additional equipment
1	Without additional equipment
C	Inspection certificate 3.1.B as per EN 10204
2	Linearity protocol
Y	Special equipment

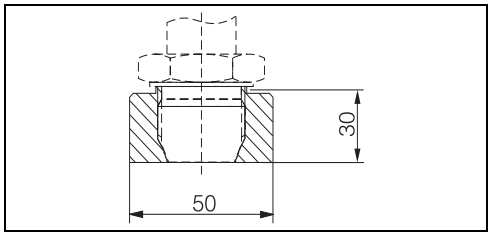
50	Measuring range, unit, pressure type	
	Gauge pressure	Permitted overload
A1G	0...1 bar / 0...100 kPa	4 bar
A1H	0...1.6 bar / 0...160 kPa	6.4 bar
A1N	0...2.5 bar / 0...25 kPa	10 bar
A1Q	0...4 bar / 0...400 kPa	16 bar
A1R	0...6 bar / 0...600 kPa	24 bar
A1S	0...10 bar / 0...1000 kPa	40 bar
A1T	0...16 bar / 0...1600 kPa	64 bar
A1W	0...25 bar / 0...2500 kPa	100 bar
A1X	0...40 bar * / 0...4000 kPa *	160 bar
Q4H	0...15 psi	60 psi
Q4K	0...30 psi	150 psi
Q4N	0...50 psi	240 psi
Q4R	0...150 psi	600 psi
Q4S	0...300 psi	1500 psi
Q4T	0...500 psi * (* absolute pressure sensor)	2400 psi
	Absolute pressure	Permitted overload
A2G	0...1 bar / 0...100 kPa	4 bar
A2H	0...1.6 bar / 0...160 kPa	6.4 bar
A2N	0...2.5 bar / 0...250 kPa	10 bar
A2Q	0...4 bar / 0...400 kPa	16 bar
A2R	0...6 bar / 0...600 kPa	24 bar
A2S	0...10 bar / 0...1000 kPa	40 bar
A2T	0...16 bar / 0...1600 kPa	64 bar
A2W	0...25 bar / 0...2500 kPa	100 bar
A2X	0...40 bar / 0...4000 kPa	160 bar
R4H	0...15 psi	60 psi
R4K	0...30 psi	150 psi
R4N	0...50 psi	240 psi
R4R	0...150 psi	600 psi
R4S	0...300 psi	1500 psi
R4T	0...500 psi	2400 psi

PMP 135 -						

Accessories

Welding bosses

- Welding boss for flush-mounted installation of G1 A process connection with metallic sealing taper (version M)
  Material: AISI 316L
  Order number: 52005087
- Optional with inspection certificate 3.1.B
  Order number: 52010171



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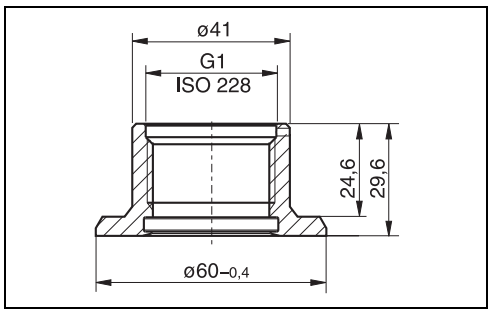
- Welding aid (dummy) for welding the welding boss with order number 52005087 or 52010171 without any problems
  Material: brass
  Order number: 52005272

- Welding boss for flush-mounted installation of G1 A process connection with sealing surface (version N)
  Material: AISI 316L
  Gasket (enclosed): silicone O-ring
  Order number: 52001051
- Optional with inspection certificate 3.1.B
  Order number: 52011196



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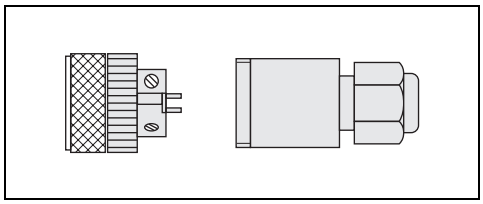
Plug-in jack

- M 12x1 plug-in jack
  Self-made connection to M 12x1 housing plug
  Order number: 52006263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Devices

- RN 221N transmitter power supply unit
  For safe galvanic isolation of the 4...20 mA analogue signal and for supplying the Cerabar T with power.


P01-RN221xx-10-06-00-xx-001

- RIA 251 process display unit
  Digital display unit for displaying the analogue signal by looping into the 4...20 mA current loop.

P01-RIA251xx-10-06-00-xx-001

Documentation

System information	Cerabar T, the compact pressure transducer. SI 035P/00/en
Technical Information	Further technical information about the Cerabar T: Cerabar T PMP 131, pressure transducer with polysilicon sensor TI 291P/00/en Cerabar T PMC 131, pressure transducer with capacitive ceramic sensor TI 279P/00/en
Operating Instructions	Cerabar T PMP 135, pressure transducer for hygienic processes KA 198P/00/a6
Safety Instructions	Safety Instructions for electrical devices for hazardous areas. Cerabar T PMP 135, ATEX II1/2 G EEx ib II C T6 certificate and Cerabar T PMP 135, ATEX II 2 G EEx ib II C T6 certificate XA 142P/00/a3 Cerabar T PMP 135, ATEX II 3 G EEx nA II T6 certificate XA 191P/00/a3

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