

Pressure Transmitter *cerabar S PMP 71 K* for use in Nuclear Power Plants

**Cerabar S with a metal sensor
overload resistant with function monitoring**



Application

The Cerabar S transmitter accurately measures the pressure of gases, vapours and liquids and is used in all areas of chemical and process engineering.

- Cerabar S PMP 71 K:
 - piezoresistive pressure measurement with metal sensor up to 400 bar (6000 psi)
 - process connections thread with internal separating diaphragm

Features and Benefits

- High measurement accuracy
 - Linearity better than 0.1% of set span
 - Long-term drift better than 0.1% per year
- Universal modularity for differential pressure and process pressure (Cerabar S – Deltabar S), e.g.
 - Replaceable display
 - Sensor modules
 - Universal electronics for process pressure and differential pressure
- Zero and span freely adjustable with or without referential pressure
- Self-monitoring from sensor to electronics
- Wide variety of software functions such as characteristic curves, diagnostic codes etc.
- Type-tested for nuclear power plants as per KTA 3505 and IEEE standard 323/344

Endress + Hauser

The Power of Know How

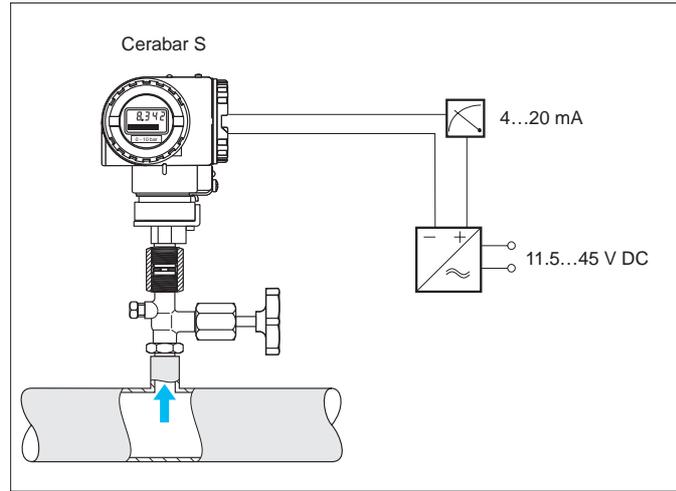


Measuring System

System Components

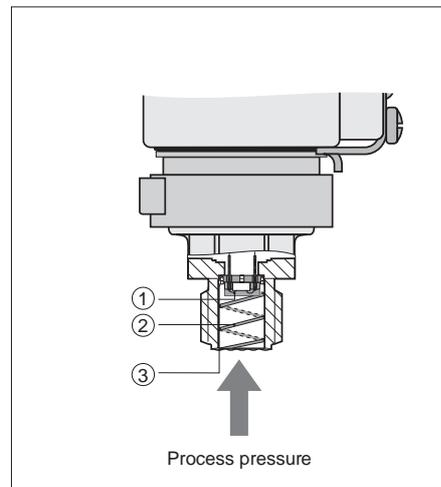
The complete measuring system consists of:

- Cerabar S pressure transmitter with
 - 4...20 mA signal output and
 - power supply: 11.5...45 V DC



Current output
4...20 mA

Operating Principle



- ① Polysilicon measuring element
- ② Channel with fill fluid
- ③ Welded metal flush-mounted separating diaphragm

Metal Sensor

The process pressure deflects the separating diaphragm with a fill fluid transmitting the pressure to a resistance bridge. The bridge output voltage, which is proportional to pressure, is then measured and processed.

Advantages:

- For process pressures up to 400 bar (6000 psi)
- Excellent long-term stability
- Guaranteed resistance to overload up to 4-times nominal pressure (max. 600 bar/9000 psi)

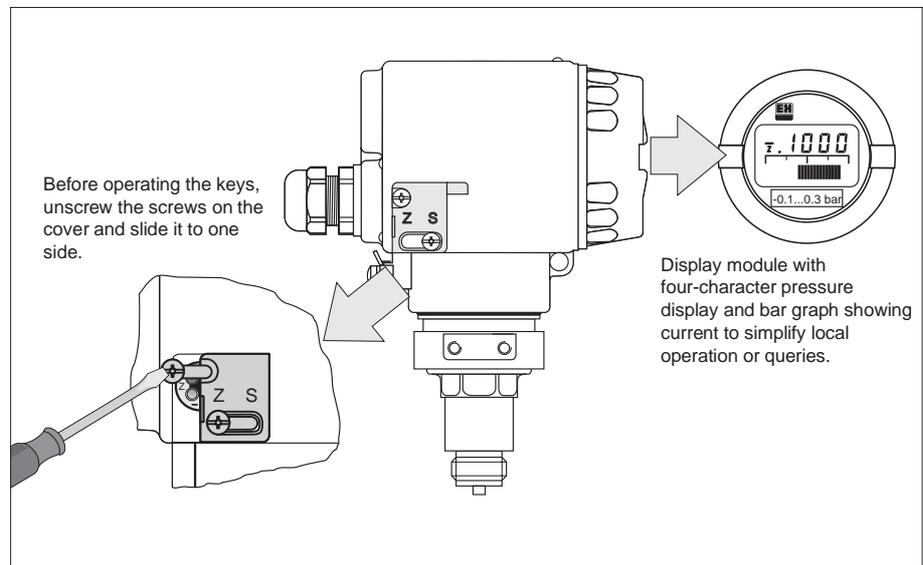
Operation

Operation Using Keys on the Instrument

The Cerabar S is calibrated via four keys on the instrument, directly at the place of installation. The pressure for 4 mA or 20 mA output can either be taken directly from the system pressure or else calibrated without reference pressure.

A zero point shift due to the orientation of the instrument can also be corrected using these keys as well as for locking and unlocking the measuring point.

- Lower range-value: +Z and -Z
- Upper range-value: +S and -S



Operating with keys

Screw the cover down securely with both screws after operation.

Installation

Mounting Instructions

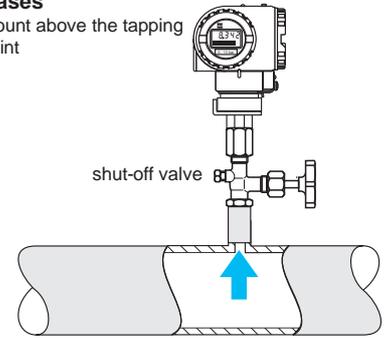
The Cerabar S is mounted in the same way as a manometer.

Its position depends upon the application:

- Gases: Mount above the tapping point
- Liquids: Mount below or at the same level as the tapping point
- Steam/vapour: Mount with a pigtail below the tapping point

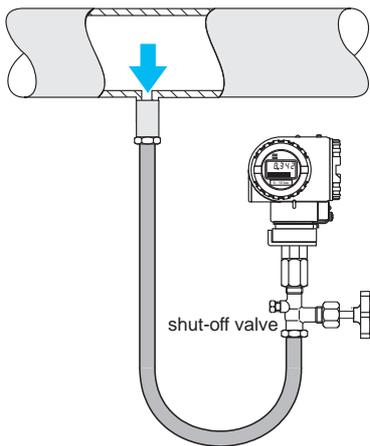
Gases

Mount above the tapping point



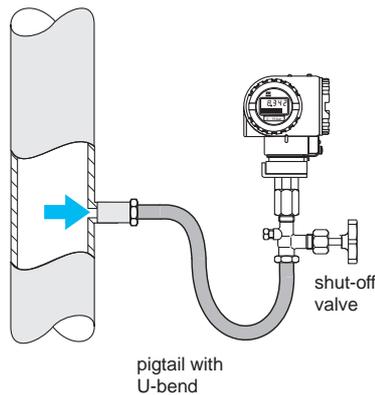
Liquids

Mount below the tapping point



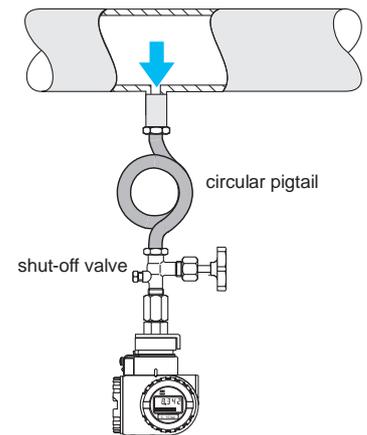
Steam/vapour

Mounted with pigtail with U-bend

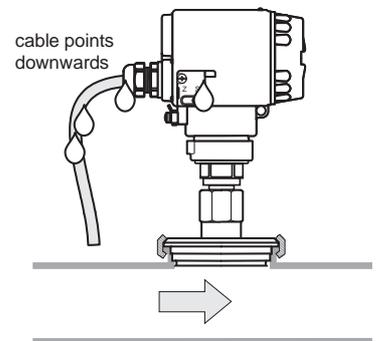


Steam/vapour

Mount with circular pigtail



Vertical mounting



Wall and Pipe Mounting

A mounting set is available for mounting on a wall or a horizontal or vertical pipe.

- Material: AISI 304 (1.4301)
- Order No: 919806-0000 (can also be selected in the Product Structure)

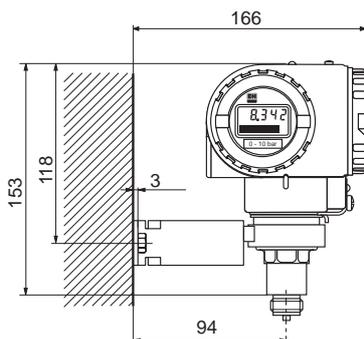
Conversion factors

1 mm = 0.039 in

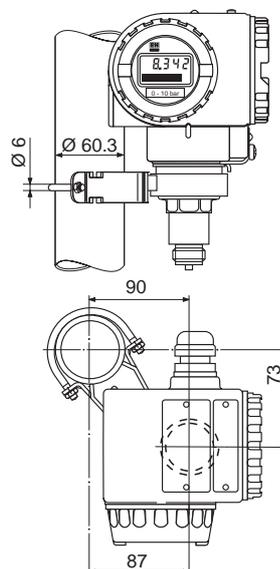
1 in = 25.4 mm

Dimensions are in mm.

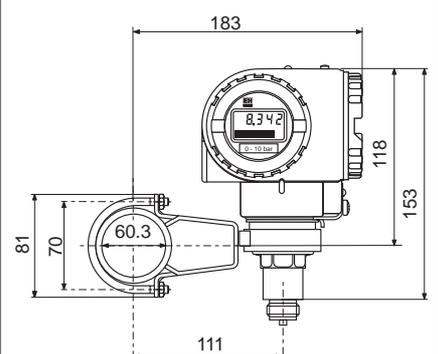
Mounting on a wall



Mounting on a vertical pipe



Mounting on a horizontal pipe



Mounting of the Cerabar S

- Cable points downwards.
- The cover for the Z/S keys is on the side of the housing.

Installation (Continuation)

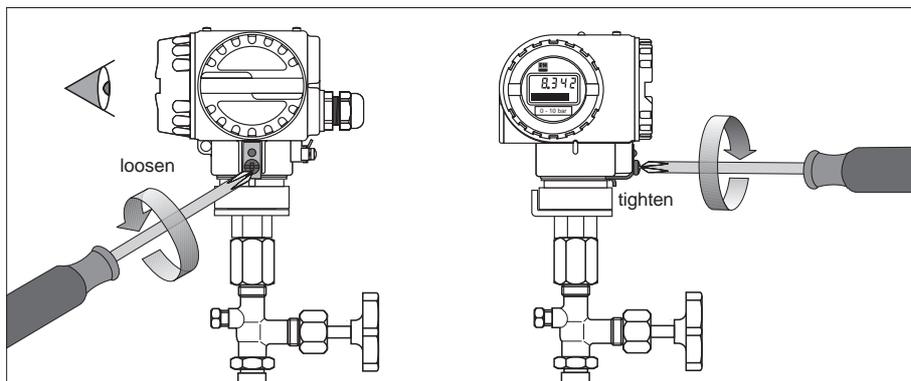
Rotating the Housing

By simply unscrewing the holding screw, the housing can be rotated max. 270° and still remain above the process connection, even when an instrument is plugged in.

Cleaning

The metal separating diaphragm of the Cerabar S PMP 71 K must not be pressed in or cleaned with pointed or hard objects.

Loosen the screw underneath the connection compartment to rotate the housing.

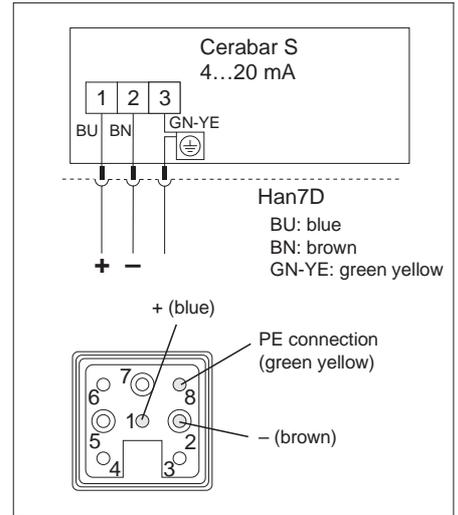
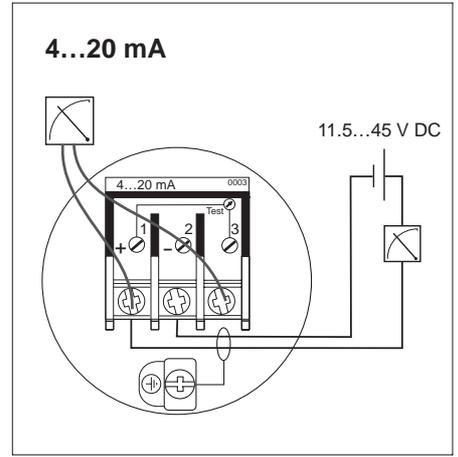


Electrical Connection

Wiring 4...20 mA

The two-wire cable is connected to screw terminals (wire cross section 0.5...2.5 mm²/ AWG 20...13) in the connecting compartment.

- We recommend using a twisted, screened two-wire cable for the connection line.
- Supply voltage: 11.5...45 V DC
- Internal protection circuits against reverse polarity, HF interference and overvoltage peaks
- Test signal:
The output current can be measured between terminal 1 and 3 without interrupting the process measurement.



Harting plug schematic diagram, view from the plug side

Technical Data

General Information

Manufacturer	Endress+Hauser
Designation	Cerabar S PMP 71 K

Application

Measurement of absolute and gauge pressure in gases, vapours and liquids
--

Operation and System Design

Measuring Principle

PMP 71 K with metal sensor	The process pressure acting on the metallic separating diaphragm of the sensor is transmitted via a fill fluid to a resistance bridge. The change in the output voltage of the bridge is proportional to the pressure and is then measured. Volume of chamber: approx. 1 mm ³ (0.039 in ³)
----------------------------	---

with 4...20 mA current output	Operation via keys on the instrument and a plug-in display module
-------------------------------	---

Construction	Threaded process connection according to European or American standards see "Product Structure" and "Mechanical Construction"
--------------	---

Input

Measured variables	Absolute or gauge pressure
--------------------	----------------------------

Measuring ranges

PMP 71 K				
Type of pressure	Measurement limits	Nominal value	min. span	Overload
	bar	bar	bar	bar
gauge	-1...1	1*	0.05	4
gauge	-1...2.5	2.5	0.125	10
gauge	-1...10	10	0.5	40
gauge	-1...40	40**	2	160
gauge	-1...100	100**	5	400
gauge	-1...400	400**	20	600
absolute	0...1	1*	0.05	4
absolute	0...2.5	2.5	0.125	10
absolute	0...10	10	0.5	40
absolute	0...40	40	2	160
absolute	0...100	100	5	400
absolute	0...400	400	20	600

* Technical data for linearity and temperature effect are doubled
 ** Absolute pressure sensors

Vacuum resistance	to 10 mbar _{absolute}
Adjusting the span (turndown)	20:1
Zero point increase and decrease	Within measurement limits

Output

4...20 mA

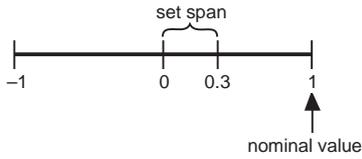
Output signal	4...20 mA with HART protocol, under-run 3.8 mA (4 mA adjustable), over-run 20.5 mA
Load diagram	
Signal on alarm	Standard: 22 mA Options: max.: settling in the range 21...22.5 mA continue: last measured value held min.: 3.6 mA
Resolution	1 μA
Damping (Integration time)	adjustable, 0...16 s via rotary switch
Adjusting range	freely adjustable within the limits of lower range-value and upper range-value

Accuracy

Explanation of terms:

Turn-down (TD)

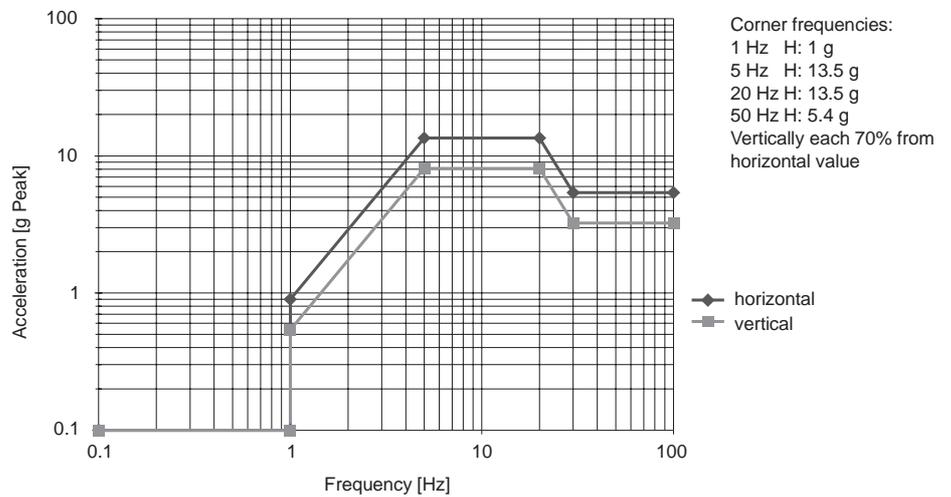
= nominal value / set span



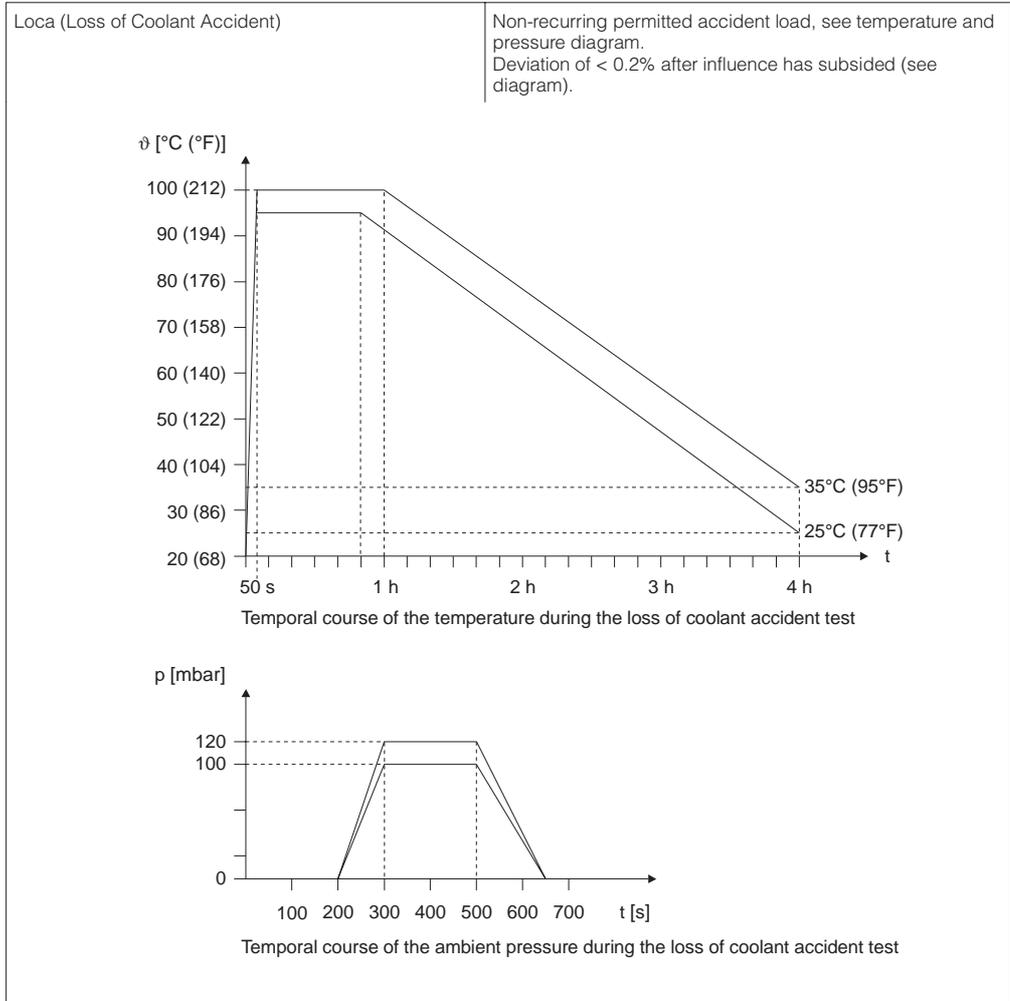
Example: nominal value = 1 bar
 set span = 0.3 bar
 TD = 1:0.3

Reference conditions	DIN IEC 60770 T _U =+25°C (+77°F) Accuracy data adopted after entering "Low sensor calibration" and "High sensor calibration" for lower range-value and upper range-value (span based on zero point)
Linearity including hysteresis and reproducibility based on the limit point method to IEC 60770 * lower range-value=0	to TD 10:1: ± 0.1% of set span* for TD 10:1 to 20:1: ±0.1% x [nominal value/(set span* x 10)] 1 bar sensors: to TD 10:1: ± 0.2% of set span* for TD 10:1 to 20:1: ±0.2% x [nominal value/(set span* x 10)]
Long-term drift	±0.1% of nominal value per year
T _{63%} (τ)	300 ms
Thermal effects (with reference to the set span)	for -10...+60°C: ± (0.1% x TD + 0.1%) for -20...-10°C, +60...+85°C: ± (0.2% x TD + 0.2%) 1 bar sensors: for -10...+60°C: 2 x ± (0.1% x TD + 0.1%) for -20...-10°C, +60...+85°C: 2 x ± (0.2% x TD + 0.2%)
Temperature hysteresis	< 0.1% (< 0.2% for 1 bar sensors) of nominal value
Response under irradiation	max. deviation 6% at a cumulative total dose of 10 Gy
Vibration load	type-tested as per KTA 3505 and IEEE standard 323/344
Seismic construction	no deviation of the output signal at maximum twice-repeated effect of a mechanical load as per diagram

Required response spectrum of safe shutdown earthquake (SSE)



**Accuracy
(Continuation)**



Application conditions

Installation conditions	Any position; zero point shift due to position up to 3 mbar; can be corrected
-------------------------	---

Ambient conditions

Ambient temperature	-20...+85°C (-4...+185°F)
Storage temperature	-40...+85°C (-40...+185°F)
Ingress protection	IP 65
Electromagnetic compatibility	Interference Emission to EN 61326, Electrical Equipment Class B; Interference Immunity to EN 61326, Annex A (Industrial) and NAMUR Recommendation EMC (NE 21); Interference Immunity to EN 61000-4-3: 30 V/m

Process conditions

Process temperature	-20...+85°C (-4...+185°F)
Process pressure	Corresponds to permissible overload

Mechanical Construction**Design**

Housing	Housing can be rotated, Optional electrical connection via M 20x1.5 with cable gland or G 1/2, 1/2 NPT cable entry or cable connection Harting Han7D plug Terminal connection for wire cross section: 0.5...2.5 mm ² (AWG 20...13)
Process connections	G 1/2 or 1/2 NPT thread

Materials

Housing	Cast aluminium housing with protective polyester-based powder coating RAL 5012 (blue), cover RAL 7035 (grey), saltwater spray test DIN 50021 (504 h) passed
Nameplates	AISI 304 (1.4301)
Process connections	AISI 316L (1.4435)
Process diaphragm	AISI 316L (1.4435)
O-ring for cover gasket	NBR
Mounting accessories	Bracket for pipe and wall mounting AISI 304 (1.4301) (Mounting within scope of seismic IEEE-344 tests not taken into account.)

Measuring cell

Oil filling	Silicone oil
-------------	--------------

Display and Operating Interface**Display and operating module**

Display	Plug-in display module with four-character pressure display and analogue display (bar graph) of current with 28 segments
Operation	via four keys on the instrument

Power Supply

Power voltage	11.5...45 V DC
Ripple	No effect for 4...20 mA signal up to ±5% residual ripple within permissible range

Certificates and Approvals

CE Mark	By attaching the CE Mark, Endress+Hauser confirms that the instrument fulfils all the requirements of the relevant EC directives.
---------	---

Order Code

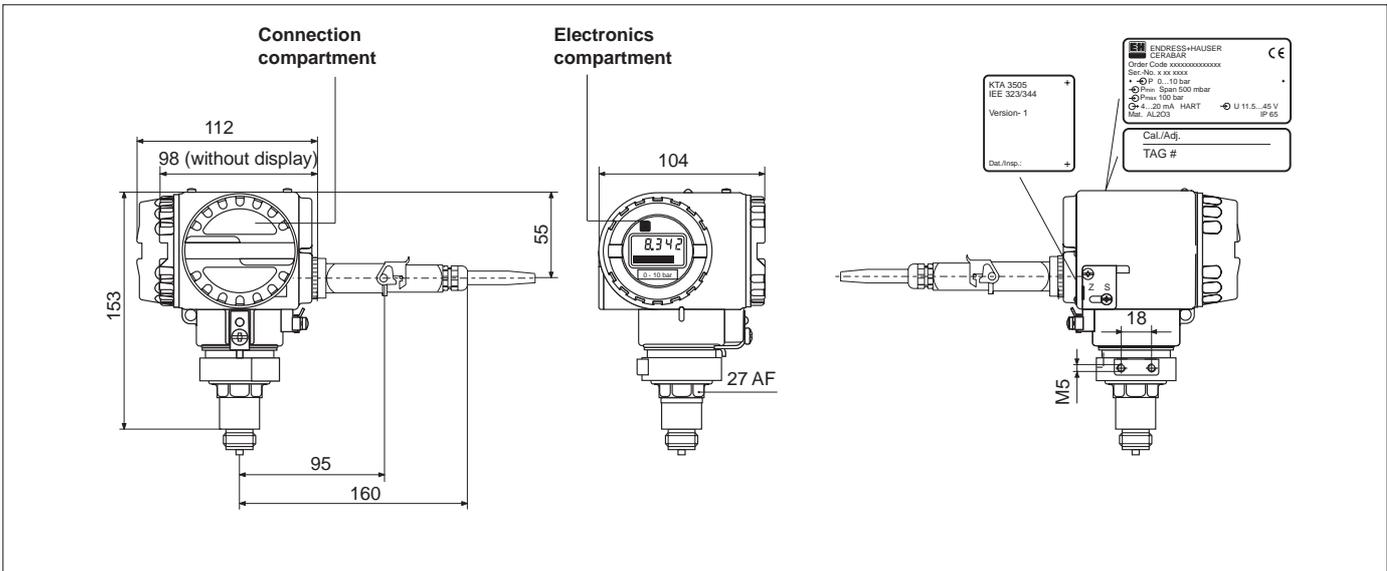
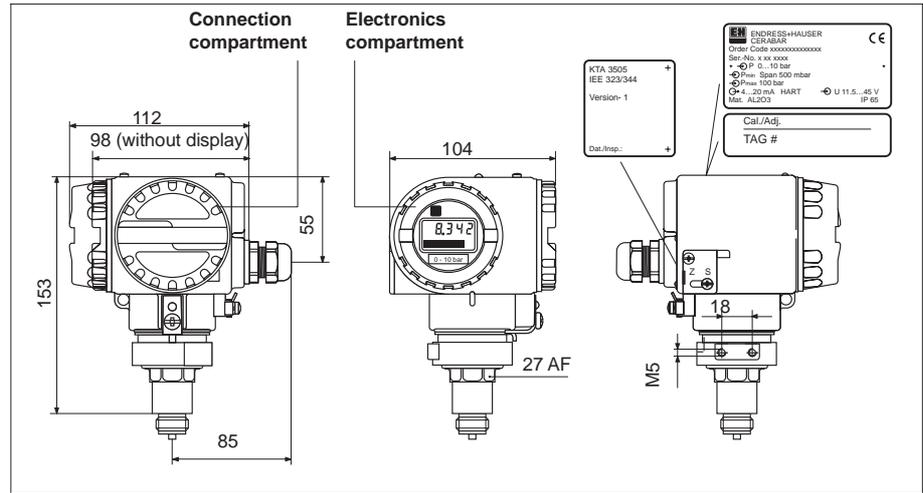
see "Product Structure"

Dimensions

Dimensions of housing

Housing:

- Electronics and connection compartment separated
- can be rotated up to 270°
- Material: cast aluminium with powdered polyester coating
- Cable gland M 20x1.5, cable entry G ½, ½ NPT or optional cable connection Harting Han7D plug



Conversion factors

1 mm = 0.039 in

1 in = 25.4 mm

Dimensions are in mm.

Certificate (KTA 3505 / IEEE 323/344)

Housing Type T4, Display, Cable Entry

with display module

- 3 Cable gland M 20x1.5
- 5 Cable entry 1/2 NPT
- 7 Cable entry G 1/2
- C Cable connection Harting plug Han7D, straight

without display module

- 4 Cable gland M 20x1.5
- 6 Cable entry 1/2 NPT
- 8 Cable entry G 1/2
- D Cable connection Harting plug Han7D, straight

Metal Sensor: Nominal Value (Maximum Overload)

Gauge pressure: Limits -100% of nominal value, minimal -1 bar to +100% of nominal value

3H	1 bar (4 bar)	100 kPa (400 kPa)	15 psig (60 psig)
3L	2.5 bar (10 bar)	250 kPa (1 MPa)	38 psig (150 psig)
3P	10 bar (40 bar)	1 MPa (4 MPa)	150 psig (600 psig)
3S	40 bar* (160 bar)	4 MPa* (16 MPa)	600 psig* (2400 psig)
3U	100 bar* (400 bar)	10 MPa* (40 MPa)	1500 psig* (6000 psig)
3Z	400 bar* (600 bar)	40 MPa* (60 MPa)	6000 psig* (9000 psig)

* Absolute pressure sensors

Absolute pressure limits 0...100% of nominal value

4H	1 bar (4 bar)	100 kPa (400 kPa)	15 psia (60 psia)
4L	2.5 bar (10 bar)	250 kPa (1MPa)	38 psia (150 psig)
4P	10 bar (40 bar)	1 MPa (4 MPa)	150 psia (600 psig)
4S	40 bar (160 bar)	4 MPa (16 MPa)	600 psia (2400 psig)
4U	100 bar (400 bar)	10 MPa (40 MPa)	1500 psia (6000 psig)
4Z	400 bar (600 bar)	40 MPa (60 MPa)	6000 psia (9000 psig)

Calibration and Technical Units

- 1 Calibrated from 0 to nominal value in mbar/bar
- 2 Calibrated from 0 to nominal value in kPa/MPa
- 6 Calibrated from 0 to nominal value in psi
- 9 Adjusted from ... to ... technical unit
- B Calibrated from ... to ... technical unit, with calibration report

Electronics

- A 4...20 mA HART

Accessories

- 3 3.1B Inspection certificate acc. to EN 10204 for all wetted parts AISI 316L (1.4435)
- 4 3.1B Inspection certificate acc. to EN 10204 for all wetted parts AISI 316L (1.4435) and mounting bracket

Process Connection Thread, Material*

Internal diaphragm

- 1M G 1/2 (external) DIN 16288; internal diaphragm, adapter AISI 316L (1.4435)
- 1G 1/2 NPT (external), internal diaphragm, adapter AISI 316L (1.4435)

Material of Diaphragm*, Gasket*, Fill Fluid

- A Diaphragm AISI 316L (1.4435), welded, silicone oil

* wetted parts and pressurised

PMP 71 K -	R								
------------	---	--	--	--	--	--	--	--	--

Product designation

Endress+Hauser
GmbH+Co. KG
Instruments International
P.O. Box 2222
D-79574 Weil am Rhein
Germany

Tel. (07621) 975-02
Fax (07621) 975-345
<http://www.endress.com>
info@ii.endress.com

Endress + Hauser
The Power of Know How

