Pressure Transmitter
cerabar S  PMC 731, PMP 731

Cerabar S with a ceramic or metal sensor overload resistant with function monitoring
Communication using HART, PROFIBUS-PA and Foundation Fieldbus

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.
The modular design of the Cerabar S enables it to be used in all industrial environments.
• Cerabar S PMC 731: Capacitive pressure measurement with dry ceramic sensor up to 40 bar (600 psi)
  – resistant to overload and water hammer, vacuum-tight
  – process connections: Threaded or flush-mounted ceramic sensor
• Cerabar S PMP 731: piezoresistive pressure measurement with metal sensor up to 400 bar (6000 psi)
  – process connections thread with flush-mounted metal diaphragm, e.g. for high-viscosity media or internal separating diaphragm

Features and Benefits
• High measurement accuracy
  – Non-linearity 0.1% of span
  – Long-term drift better than 0.1% per year
  – Temperature effects on zero and span smaller than ±0.1%
• Modular construction means less stock
  – Freely adjustable measuring range (max. TD 100:1) without process pressure
  – Simple replacement of process connection or sensor gasket
  – Electronics can be replaced without recalibrating the pressure transmitter
• Simple and easy operation via 4…20 mA, HART protocol or connection to PROFIBUS-PA or Foundation Fieldbus
• Self-monitoring from sensor to electronics

Endress+Hauser
The Power of Know How
Selecting the Instrument

The Cerabar S is designed as replaceable modules and is based on the same construction principle as its «twin brother» the Deltabar S. This has the following advantages:
- Better stock management and maintenance by stocking modules instead of instruments
- Simple handling using a universal operating principle.

The table below provides a complete summary of the Cerabar S/Deltabar S families. Further information on instruments:
- grey fields are found in this Technical Information
- white fields are found in Technical Information TI 217P and TI 256P.

<table>
<thead>
<tr>
<th>Cerabar S</th>
<th>Deltabar S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threaded and flush-mounted process connections</strong></td>
<td><strong>oval flange</strong></td>
</tr>
<tr>
<td><strong>Diaphragm seal TI 217P</strong></td>
<td><strong>Diaphragm seal with capillary extension TI 256P</strong></td>
</tr>
<tr>
<td><strong>Gauge and absolute pressure</strong></td>
<td><strong>Differential pressure</strong></td>
</tr>
<tr>
<td>PMC 731, PMP 731</td>
<td>- 25 mbar: PN 10</td>
</tr>
<tr>
<td>PMC 631, PMP 635</td>
<td>- to 3 bar: PN 100</td>
</tr>
<tr>
<td>PMC 631</td>
<td><strong>Metal sensor</strong></td>
</tr>
<tr>
<td><strong>Flow</strong></td>
<td><strong>Gauge and absolute pressure</strong></td>
</tr>
<tr>
<td>PMC 731</td>
<td>- from 10 mbar: PN 140/PN 420</td>
</tr>
<tr>
<td><strong>Level</strong></td>
<td>- to 40 bar: PN 420</td>
</tr>
<tr>
<td>PMC 731</td>
<td><strong>Differential pressure</strong></td>
</tr>
<tr>
<td>PMC 731</td>
<td><strong>Metallic diaphragm with with optional tube</strong></td>
</tr>
<tr>
<td><strong>Diaphragm seal</strong></td>
<td><strong>Diaphragm seal with capillary extension TI 256P</strong></td>
</tr>
<tr>
<td><strong>PMC 631, PMP 635</strong></td>
<td><strong>PMC 633</strong></td>
</tr>
</tbody>
</table>

Additionally:
- **PMC 731, PMP 731** including flush-mounted process connections from page 18
- **PMC 631** from page 22
- **PMP 731** optional flush-mounted diaphragm or internal diaphragm with adapter
- **PMD 230, PMD 235** metal-free connection also available
- **FMD 230, FMD 630**...
- **FMD 633** including hygienic applications
Mechanical Construction

Modularity
The intelligent pressure transmitters from Endress+Hauser
- Cerabar S:
  gauge/absolute pressure measurement
- Deltabar S:
  differential pressure, level and flow measurement (see TI 256P)
offer optimum modularity for future product development.

Features include:
- Interchangeable sensor module and process connections
- Interchangeable housing versions
- Universal interchangeable electronics for gauge/absolute and differential pressure
- Simple and uniform operation

Interchangeable Sensor Modules
The sensor modules are fully calibrated for pressure and temperature in the factory. These data are stored in the sensor module. After replacing the sensor module, the data is automatically loaded into the electronics from the calibrated sensor module. The transmitter is then again ready to measure without having to be recalibrated.

Display Module
A display module with the following features can be used for showing measured values and for simplifying local operation:
- Large four-character pressure display with bar graph showing current. For 4…20 mA instruments, the bar graph shows the actual current value and for fieldbus instruments, it displays the relationship between the current measured pressure value and the set measuring range.
- The housing has both an isolated electronics compartment and an isolated connection compartment.

Housings
Housing T4 is used for vertical mounting of the Cerabar S:
- Protection IP 65
- Separate electronics and connection compartments
- Easily accessible operating elements on the outside of the instrument
- Optional M 20x1.5, ½ NPT or G ½ also PROFIBUS-PA M12 plug, Foundation Fieldbus 7/8" plug or Harting Han7D plug
- Housing can be rotated through 270°

Replaceable Process Connections
- The sensor gasket and process connection of the Cerabar S PMC 731 easily be replaced in just a few simple steps.
- Flush-mounted process connections for hygienic applications are also available for the PMC 731.
- Various thread versions are available for the Cerabar S PMP 731 with flush-mounted or internal separating diaphragm as required.
  Instruments with flush-mounted diaphragms are recommended for high viscous media.
Measuring System

System Components
The complete measuring system consists of:

- Cerabar S pressure transmitter with
  - 4…20 mA signal output and **HART** communication protocol and
  - power supply, e.g. with the RN 221N transmitter power supply unit from Endress+Hauser
    Non-Ex: 11.5…45 V DC,
    Ex d[ia]: 13…30 V DC,
    Ex ia: 11.5…30 V DC
  
or
- Cerabar S pressure transmitter with
  - **PROFIBUS-P A** digital communications signal and
  - connection via segment coupler to a PLC or PC using e.g. the Endress+Hauser Commuwin II operating program

or
- Cerabar S pressure transmitter with
  - **Foundation Fieldbus** digital communications signal and
  - Fieldbus interface card H1 or Link and Fieldbus interface card H1 for connecting to a PC with the operating program

Complete measuring system Cerabar S

- left above: PROFIBUS-P A
  see also Operation page 7
- right above: Current output 4…20 mA with HART communications signal
- below: Foundation Fieldbus
  see also Operation page 8
Operating Principle

Ceramic Sensor
The ceramic sensor is a dry sensor with the process pressure acting directly on the rugged ceramic diaphragm and deflecting it by a maximum of 0.025 mm. A pressure-proportional change in the capacitance is measured by the electrodes on the ceramic substrate and diaphragm. The measuring range is determined by the thickness of the ceramic diaphragm.

Advantages:
- Guaranteed resistance to overload up to 40-times nominal pressure
- Extremely high chemical resistance, comparable to Hastelloy
- For use with vacuums

Metal Sensor
The process pressure deflects the separating diaphragm with a filling liquid 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)

The pressure sensors:
➀ ceramic substrate
➁ ceramic diaphragm
➂ polysilicon measuring element
➃ channel with filling fluid
➄ welded metal flush-mounted separating diaphragm
The Cerabar S can be operated in the following ways:

- Using the four keys on the instrument directly at the mounting point for calibrating zero point and span at the touch of a button.

- Operating remotely using the digital HART data protocols
  - e.g. via Commubox FXA 191 and a PC with the Endress+Hauser Commuwim II operating program or
  - using the Universal HART communicator DXR 275 handheld terminal

- Using segment couplers to connect the intrinsically-safe PROFIBUS-PA and PROFIBUS-DP fieldbus and operating the instrument via PC and Commuwim II operating program

- Using interface card H1 or via Link and interface card H1 for connecting the intrinsically safe Foundation Fieldbus and for operating via PC and operating program.

Operation Using the Universal HART Communicator DXR 275

There are two possibilities for scaling the 4...20 mA output: either by directly applying the appropriate line pressures or by entering the desired range-end values via the display module.

- ZERO: +Z and –Z
- SPAN: +S and –S

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

Handheld Terminal

The Hart Communication DXR 275 can be connected at any point along the 4...20 mA line to check, configure and read additional information (operating matrix, see page 7).

The HART Communicator DXR 275 can be connected anywhere along the 4...20 mA line.

* Use an intrinsically safe power supply for Ex i (e.g. FXN 671, RN 221N).
**Operation Using the Matrix**

All operations and functions are identical whether the Cerabar S is calibrated using a process bus and PC or a handheld terminal.

All information can easily be accessed using the operating matrix. Calibration is just as easy.

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**Connecting to PROFIBUS-PA**

PROFIBUS-PA is an open fieldbus standard to enable several sensors and actuators, including those in explosion-hazardous areas, to be connected to a bus line. With PROFIBUS-PA, two-wire looped instruments can be supplied by the sensor with power and digital process information.

The number of instruments operated by one bus segment is:
- up to 10 for EEx ia applications
- up to 32 for non-Ex applications
Connecting to Foundation Fieldbus

Foundation Fieldbus is an open fieldbus standard to enable several sensors and actuators, including those in explosion-hazardous areas, to be connected to a bus line. With Foundation Fieldbus, two-wire looped instruments can be supplied by the sensor with power and digital process information.

The following instruments can be operated via an interface card or via Link and an interface card:
- up to 10 instruments for Ex ia applications
- up to 32 instruments for Non-Ex applications

Cerabar S with Foundation Fieldbus
CO: Controller
H1: H1 interface
CN: ControlNet
AI: Analogue Input
AO: Analogue Output
DI: Digital Input
I/O: Input/Output
FC: Frequency converter
LD: Link
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

To protect against moisture:
- The cable entry should preferably be pointing downwards.
- The cover of the Z/S keys is on the side of the housing.
Installation (Continuation)

Wall and Pipe Mounting
A mounting set is available for mounting on a wall or a horizontal or vertical pipe.
- Material: 1.4301 (AISI 304)
- Order No: 919806-0000
(can also be selected in the Product Structure)

<table>
<thead>
<tr>
<th>Mounting on a horizontal pipe</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMC 731</td>
<td>19 mm</td>
</tr>
<tr>
<td>PMP 731 flush-mounted diaphragm</td>
<td>14 mm</td>
</tr>
<tr>
<td>PMP 731 internal diaphragm</td>
<td>39 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting on a wall</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMC 731</td>
<td>19 mm</td>
</tr>
<tr>
<td>PMP 731 flush-mounted diaphragm</td>
<td>14 mm</td>
</tr>
<tr>
<td>PMP 731 internal diaphragm</td>
<td>39 mm</td>
</tr>
</tbody>
</table>

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 731 must not be pressed in or cleaned with pointed or hard objects.

Conversion factors
1 in = 25.4 mm
1 mm = 0.039 in
Dimensions are in mm.

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.
- For the connecting line, we recommend you use a twisted, screened two-core cable.
- Supply voltage:
  - Non-Ex: 11.5…45 V DC
  - Ex d[ia]: 13…30 V DC
  - Ex ia: 11.5…30 V DC
- Internal protection circuits against reverse polarity, HF interference and overvoltage peaks (see Technical Information TI 241F “EMC Guidelines”).
- Test signal:
  The output current can be measured between terminal 1 and 3 without interrupting the process measurement.

**Wiring PROFIBUS-PA**
The digital communication signal is transmitted to the bus using a two-wire connecting cable. The bus cable also carries the power supply.
- Supply voltage:
  - Non-Ex: 9…32 V DC
  - Ex ia: 9…24 V DC
  - Bus cable:
    For the connecting line, we recommend you use a twisted, screened two-core cable. The following specifications must be observed when using the FISCO model (explosion protection):
    - Loop resistance (DC) 15…150 Ω/km
    - Inductance 0.4…1 mH/km
    - Capacitance 80…20 nF/km
- Instructions on connecting and grounding the network are given in BA 198F “Project Instructions for PROFIBUS-PA” as well as PROFIBUS-PA specifications.

**Wiring Foundation Fieldbus**
The digital communication signal is transmitted to the bus using a two-wire connecting cable. The bus cable also carries the power supply.
- Supply voltage:
  - Non-Ex: 9…32 V DC
  - Ex ia: 9…24 V DC
  - Ex d: 9…32 V DC
  - Bus cable:
    For the connecting line, we recommend you use a twisted, screened two-core cable. Further information on the type of cabling to be used can be found in the FF specification or in IEC 61158-2.
    Further information on connecting and grounding the network is given at the Internet address “http://www.fieldbus.org”.

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**Electrical connection:**
Cerabar S for all versions with 4…20 mA

**Electrical connection:**
Cerabar S for version with flameproof enclosure

**Electrical connection:**
Cerabar S for all versions with PROFIBUS-PA
(Reversed polarity has no effect on function.)

**Electrical connection:**
Cerabar S for all versions with Foundation Fieldbus
(Reversed polarity has no effect on function.)
Connection M12 Plug (PROFIBUS-PA)
Endress+Hauser also provides a Cerabar S with a M12 plug. This version can be easily connected to the PROFIBUS network using a preterminated cable.

Connections:
- PM 731 – M
- PM 731 – N
- PM 731 – U

Connection 7/8” Foundation Fieldbus Plug
Endress+Hauser also provides a Cerabar S with 7/8” Foundation Fieldbus plug. This version can be easily connected to the Foundation Fieldbus network using a preterminated cable.

Connections:
- PM 731 – P
- PM 731 – Q
- PM 731 – V

Connection Harting Plug
For applications in power stations, there is a Cerabar S with a Harting Han7D plug.

Connections:
- PM 731 – L
- PM 731 – K

View onto pins, plug on instrument

BU: blue
BN: brown
BK: black
GN-YE: green yellow
## Technical Data

### General Information

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Endress+Hauser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument</td>
<td>Pressure transmitter</td>
</tr>
<tr>
<td>Designation</td>
<td>Cerabar S PMC 731, PMP 731</td>
</tr>
<tr>
<td>Technical documentation Version</td>
<td>TI 216P/00/en 08.02 according to DIN 19259</td>
</tr>
</tbody>
</table>

### Application

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

### Operation and System Design

#### Measuring Principle

**PMC 731 with ceramic sensor**

The pressure causes a slight deflection of the ceramic diaphragm of the sensor. The change in capacitance is proportional to the pressure and is measured by the electrodes of the ceramic sensor.

Volume of chamber: approx. 2 mm³ (0.078 in³)

**PMP 731 with metal sensor**

The process pressure acting on the metallic separating diaphragm of the sensor is transmitted via a filling 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 mm³ (0.039 in³)

**with 4…20 mA current output**

Cerabar S and power supply, e.g. via the RN 221N transmitter power pack and operation via:

- four keys on the instrument and a plug-in display module
- Universal HART Communicator DXR 275 handheld terminal
- PC with Commuwin II operating program via Commubox FXA 191

**with PROFIBUS-PA**

Connection via segment coupler to PLC or PC, e.g. with Commuwin II operating program

**with Foundation Fieldbus**

Via interface card H1 direct connection to PC with operating program or via Link and interface card H1 connection to PC with operating program

### Construction

Threaded process connection according to European, American or Japanese standards or flush-mounted.

See »Product Structure« and »Mechanical Construction«

### Signal transmission

- HART, 4…20 mA analogue signal, 2-wire
- PROFIBUS-PA: digital communication signal, 2-wire
- Foundation Fieldbus: digital communication signal, 2-wire

### Input

**Measured variables**

Absolute and gauge pressure

### Measuring range

#### PMC 731

**Type of pressure**

<table>
<thead>
<tr>
<th>Measuring limits</th>
<th>Nominal value</th>
<th>Recommended min. span</th>
<th>Overload</th>
<th>Resistance to low pressure</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td></td>
</tr>
<tr>
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<td>0.005</td>
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<td>0.7</td>
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<td>-0.4…0.4</td>
<td>0.4</td>
<td>0.02</td>
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<tr>
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<td>-1.0…10</td>
<td>10</td>
<td>0.5</td>
<td>40*</td>
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<tr>
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<td>2</td>
<td>62</td>
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<td>0.4</td>
<td>0.02</td>
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<td>0.1</td>
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<td>0…10</td>
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<td>0.5</td>
<td>40*</td>
<td>0</td>
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<tr>
<td>absolute</td>
<td>0…40</td>
<td>40</td>
<td>2</td>
<td>62</td>
<td>0</td>
</tr>
</tbody>
</table>

* for PVDF-Connection max. 20 bar
**Adjusting the span (turndown) 100:1**

Zero point increase and decrease Within measurement limits

**Output signal 4...20 mA with HART protocol**

Load

Signal on alarm for electronic Order code “M”

Resolution 1 µA

Damping (integration time) 0 to 16 s in steps via rotary switch on the instrument, 0 to 40 s infinitely adjustable with handheld terminal or PC

Communication resistance min. 250 Ω

**PROFIBUS-PA**

Output signal Digital communication signal PROFIBUS-PA

PA function Slave

Transmission rate 31.25 kBit/s

Response time Slave: ca. 20 ms SPS: 300...600 ms (depending on system coupler) for approx. 30 transmitters

Signal on alarm Signal: Status bit set, last measured value will be held, Display module: Error code

Communication resistance PROFIBUS-PA termination resistor

Physical layer IEC 1158-2

**Foundation Fieldbus**

Output signal Digital communication signal, Foundation Fieldbus protocol

Foundation Fieldbus function Publisher–Subscriber

Transmission rate 31.25 kBit/s

Signal on alarm Signal: Status bit set, last measured value will be held, Display module: Error code

Communication resistance Foundation Fieldbus termination resistor

Physical layer IEC 1158-2

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### PMP 731

<table>
<thead>
<tr>
<th>Type of pressure</th>
<th>Measurement limits</th>
<th>Nominal value</th>
<th>Recommended min. span</th>
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<th>Resistance to low pressure</th>
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<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>mbar</td>
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<tr>
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<td>3H</td>
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<td>400</td>
<td>20</td>
<td>600</td>
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<td>4Z</td>
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</table>

* Technical data for linearity and temperature effect are doubled.

** Absolute pressure sensors

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<table>
<thead>
<tr>
<th>*U/V</th>
<th>R/Ω</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>1560</td>
</tr>
<tr>
<td>1</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>860</td>
</tr>
<tr>
<td>3</td>
<td>790</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
</tr>
<tr>
<td>5</td>
<td>11,5</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
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<td>40</td>
<td>45</td>
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<tr>
<td>50</td>
<td>11,5</td>
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<td>11,5</td>
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<td>30</td>
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<tr>
<td>800</td>
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<table>
<thead>
<tr>
<th>*</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>EEEx d IIC T4/T6</td>
<td>**</td>
</tr>
</tbody>
</table>

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Technical data for linearity and temperature effect are doubled.
### Accuracy

**Reference conditions**  
DIN IEC 770 T_u=25°C (77°F)  
Accuracy data adopted after entering »Low sensor calibration« and »High sensor calibration« for zero and nominal value

**Linearity including hysteresis and reproducibility based on the limit point method to IEC 770**  
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) of set span

**Linearity at low absolute pressure ranges (due to performance limits of currently available DKD calibration rigs)**  
Absolute: for > 30 mbar to < 100 mbar: ±0.3 %  
For ≤ 30 mbar: ±1 % of set span*

**Response time**  
PMC 731: 500 ms,  
PMP 731: 400 ms

**Warm-up time**  
2 s

**Rise time (T90-time)**  
150 ms

**Long-term drift**  
±0.1 % of nominal value per year  
±0.25 % of nominal value per 5 years

**Thermal effects (with reference to the set span*, max. TD 20:1)**  
For –10…+60°C (+14…+140°F): ± (0.1 % x TD + 0.1 %)  
For –40…–10°C (–40…+14°F) and +60…+85°C (+140…+185°F): ± (0.2 % x TD + 0.2 %)  
TD = nominal value/set span

**Temperature coefficient (maximum TK)**  
For zero signal and span:  
±0.02 % of nominal value/10K for –10…+60°C  
(+14…+140°F):  
±0.05 % of nominal value/10 K for –40…–10°C (–40…+14°F)  
and +60…+85°C (+140…+185°F)

**Temperature coefficient for Cerabar S with PTFE gasket (PMC 731 - # # # # # # # # D, max. TD 20:1)**  
For zero signal and span:  
±0.05 % of nominal value/10K for –20…+85°C (+4…+185°F)

**Vibration effects**  
None (4 mm in path peak-to-peak 5…15 Hz, 2 g: 15…150 Hz, 1 g: 150 Hz…2000 Hz)

### Application conditions

**Position for calibration**  
1. PMC 731, PMP 731  
2. PMP 731  
   (100 bar and 400 bar sensors only)  
3. PMC 731 (ceramic sensor flush-mounted)

**Installation conditions**  
Any position, zero point shift due to position can be corrected, no effect on span

**Ambient conditions**  
-40…+85°C (–40…+185°F)  
(For Ex see Safety Instructions XA…)

**Storage temperature**  
-40…+100°C (–40…+212°F)  
(For Ex see Safety Instructions XA…)

**Climatic class**  
4K4H to DIN EN 60721-3

**Protection**  
IP 65 (IP 68 on request)

**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 61 000-4-3: 30 V/m

**Process conditions**  
**Process temperature**  
(Please also note the temperature limits of the gasket used, see tables on next page)  
–40…+100°C (–40…+212°F)  
(For Ex see Safety Instructions XA…)

**Material temperature**  
Cleaning temperature for Cerabar S flush-mounted with ceramic sensor: +140°C (+284°F) up to 60 minutes

**Process pressure**  
Corresponds to permissible overload, see tables on pages 13…14

### Explanation of terms:

Turndown (TD) = nominal value/set span

Example: nominal value* = 2 bar  
set span = 0.9 bar  
TD = 2:0.9

* for fieldbus variants, the data relates to the "calibrated span"
Mechanical Construction

<table>
<thead>
<tr>
<th>Gaskets for PMC 731</th>
<th>Temperature limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FPM, Viton Compound 5008</td>
<td>-20...+100°C (-4...+212°F)</td>
</tr>
<tr>
<td>6 FPM, Viton cleaned for oxygen service Compound V70Q3</td>
<td>-10...+60°C (+14...+140°F)</td>
</tr>
<tr>
<td>A FPM, Viton oil-and grease-free Compound V70Q3</td>
<td>-10...+100°C (+14...+212°F)</td>
</tr>
<tr>
<td>2 NBR Compound 8307</td>
<td>-20...+100°C (-4...+212°F)</td>
</tr>
<tr>
<td>7 FFKM, Kaiz Compound 40379</td>
<td>+5...+100°C (+41...+212°F)</td>
</tr>
<tr>
<td>4 EPDM Compound EPDM 13-70</td>
<td>-30...+100°C (-40...+212°F)</td>
</tr>
<tr>
<td>D PTFE+ Hastelloy C4</td>
<td>-20...+85°C (-4...+185°F)</td>
</tr>
<tr>
<td>C Chemraz Compound Chemraz 505</td>
<td>-10...+100°C (+14...+212°F)</td>
</tr>
</tbody>
</table>

Design

<table>
<thead>
<tr>
<th>Housing</th>
<th>Housing can be rotated, Separated electronics and connection compartments, Optional electrical connection via M 20 x 1.5 with cable gland or G ½ ⅛ NPT thread, also via PROFIBUS-PA M12 plug or Fieldbus 7/8&quot; or Harting Han7D plug. Terminal connection for wire cross section 0.5...2.5 mm² (AWG 20...13)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th>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 – Stainless steel 1.4435 (AISI 316L)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nameplates</th>
<th>1.4301 (AISI 304)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Process connections</th>
<th>All common thread versions and flush-mounted connections</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Display and Operating Interface</th>
<th>Display and operating module</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Display</th>
<th>Pluggable digital display and extra bar graph (28 segments) (Pressure display as four-digit number and also in relating to set measuring range as bar graph).</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Display resolution</th>
<th>Digital display: 0.1% Bar graph: 1 segment equals 3.57 % of the set span</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
<th>Four keys on the instrument</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Communication interfaces</th>
<th>Handheld terminal – HART Universal HART Communicator DXR 275 – for connecting anywhere along the 4...20 mA line – minimum line resistance: 250 Ω</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PC</th>
<th>Communicator FXA 191 for connecting to serial interface of a PC – for connecting anywhere along the 4...20 mA line – minimum line resistance: 250 Ω</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PROFIBUS-PA</th>
<th>Segment coupler for connecting to PLC or PC, e.g. with the Communwin II operating program</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Foundation Fieldbus</th>
<th>Via interface card H1 direct connection to PC with operating program or via Link and interface card H1 connection to PC with operating program</th>
</tr>
</thead>
</table>

1) Gaskets for lower temperatures on request.
2) Note the Safety Instructions (XA) and electrostatic charging when using a PVDF process connection.
3) Observe operating limits for oxygen service for non-metallic materials.
### 4...20 mA with HART protocol

<table>
<thead>
<tr>
<th><strong>Power Supply</strong></th>
<th></th>
</tr>
</thead>
</table>
| **Power voltage** | - Non-Ex: 11.5...45 V DC  
- Ex d[ia]: 13...30 V DC  
- Ex ia: 11.5...30 V DC |
| **Overvoltage category** | III to DIN EN 61 010-1 |
| **Ripple** |  |
| **Ripple with Smart transmitters** | No effect for 4...20 mA signal up to ±5% residual ripple within permissible range HART:  
max. ripple (measured at 500 Ω) 47...125 Hz: $U_{ss}=200$ mV;  
max. noise (measured at 500 W) 500 Hz...10 kHz: $U_{eff}=2.2$ mV |

### PROFIBUS-PA

<table>
<thead>
<tr>
<th><strong>Power Supply</strong></th>
<th></th>
</tr>
</thead>
</table>
| **Power voltage** | - Non-Ex: 9...32 V DC  
- Ex ia: 9...24 V DC |
| **Current consumption** | 10 mA ±1 mA (for Ex see Safety Instructions XA...) |
| **Power up current** | Corresponds to Table 4, IEC 1158-2 |

### Foundation Fieldbus

<table>
<thead>
<tr>
<th><strong>Power Supply</strong></th>
<th></th>
</tr>
</thead>
</table>
| **Power voltage** | - Non Ex: 9...32 V DC  
- Ex ia: 9...24 V DC |
| **Current consumption** | 11 mA ±1 mA |
| **Power up current** | Corresponds to Table 4, IEC 1158-2 |

### Certificates and Approvals

| **Protection** | see »Product Structure« |
| **CE Mark** | By attaching the CE Mark, Endress+Hauser confirms that the instrument fulfills all the requirements of the relevant EC directives. |

### Order Code

| see »Product Structure« |

### Supplementary Documentation

| Cerabar S/Deltabar S System Information: SI 020P/00/en |
| Cerabar S with diaphragm seal versions for all applications Technical Information: TI 217P/00/en |
| Cerabar S HART Operating Instructions: BA 187P/00/en |
| Cerabar S PROFIBUS-PA Operating Instructions: BA 168P/00/en |
| Cerabar S Foundation Fieldbus Operating Instructions: BA 211P/00/en |
| PROFIBUS-DP/PA Guidelines for planning and commissioning: BA 198F/00/en |
| CE Ex II 1/2 G, EEx ia IIC T4/T6 Safety Instructions: XA 001P/00 |
| CE Ex II 1/2 G or 2 G, EEx ia IIC T4/T6, PROFIBUS-PA Safety Instructions: XA 004P/00 |
| CE Ex II 2 G, EEx d IIC T5/T6 Safety Instructions: XA 022P/00 |
| CE Ex II 2 G, EEx d IIC T6 Safety Instructions: XA 053P/00 |
| CE Ex II 1/2 G, EEx ia IIC T4/T6, Foundation Fieldbus Safety Instructions: XA 088P/00 |
| CE Ex II 2 G, EEx d IIC T5/T6, Foundation Fieldbus Safety Instructions: XA 090P/00 |
| CE Ex II 3 G, EEx na II T6 Safety Instructions: XA 150P/00 |
| EMC Test procedures Technical Information: TI 241F/00/en |
Cerabar S PMC 731

Certificates, Approvals, Protection

R Standard
C ATEX II 3 G, Ex e n A II T6
G Cenelec Ex ia IIC T6/14 and ATEX II 1/2 G
I Cenelec Ex d [ia] IIC T61 and ATEX II 2 G (not with flush-mounted process connections, with cable entry M 20x1.5, G 1/2, 1/2 NPT)
O FM IS (non-incendive) CL. I, II, III; Div. 1, Groups A…G
S CSA IS (non-incendive) CL. I, II, III; Div. 1, Groups A…G

Certificate not with electronics version

Housing: Aluminium
with display module
without display module
3 Cable gland M 20x1.5
6 Cable entry 1/2 NPT
7 Cable entry G 1/2
K Harting Han7D plug
M PROFIBUS-PA plug M12
P Foundation Fieldbus plug 7/8"

Housing: Stainless steel (AISI 316L)
with display module
R Cable gland M 20x1.5
T Cable entry G 1/2
U PROFIBUS-PA plug M12
V Foundation Fieldbus plug 7/8"

Ceramic Sensor: Nominal Value (Maximum Overload)
Limits (see table measuring range PMC 731, page 13)

Sensors for gauge pressure
1C 100 mbar (4 bar) 10 kPa (0.4 MPa) 1.5 psig (60 psig) 150 psi (150 psig)
1F 400 mbar (10 bar) 40 kPa (2.0 MPa) 6 psig (30 psig)
1K 2 bar (20 bar) 200 kPa (2.0 MPa) 30 psig (150 psig)
1P 10 bar (40 bar) 1 MPa (4.0 MPa) 150 psig (600 psig)
1S 40 bar (60 bar) 4 MPa (6.0 MPa) 600 psig (900 psig)

Sensors for absolute pressure
2F 400 mbar (10 bar) 40 kPa (1.0 MPa) 6 psia (30 psia)
2K 2 bar (20 bar) 200 kPa (2.0 MPa) 30 psia (150 psia)
2P 10 bar (40 bar) 1 MPa (4.0 MPa) 150 psia (600 psia)
2S 40 bar (60 bar) 4 MPa (6.0 MPa) 600 psia (900 psia)

Calibration and Technical Units
1 Calibrated from 0 to nominal value in mbar/bar
2 Calibrated from 0 to nominal value in kPa/MPa
3 Calibrated from 0 to nominal value in mm H2O/m H2O
4 Calibrated from 0 to nominal value in inch H2O
5 Calibrated from 0 to nominal value in kgf/cm²
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 Version, Communication
M 4…20 mA passive, HART with linearisation and other functions
P PROFIBUS-PA
F Foundation Fieldbus

Accessories
1 None
2 Bracket for pipe and wall mounting
3 3.1.B Inspection certificate for all parts in contact with the medium made of 1.4435 (AISI 316L)
4 3.1.B Inspection certificate for all parts in contact with the medium made of 1.4435 (AISI 316L) and bracket

Process Connection
Thread, Material
1M G 1/2 (external) DIN 16 288; 1.4435 (AISI 316L)
2M G 1/2 (external) DIN 16 288; Hastelloy C276
5M G 1/2 (external) DIN 16 288; PVDF (max. 20 bar/300 psi, max. –10…+60°C/+14…+140°F)
1P G 1/2 (external), G 3/4 (internal); 1.4435 (AISI 316L)
1R G 1/2 (external), Ø 11.4 mm (internal); 1.4435 (AISI 316L)
1N 1/2 NPT (external), 1/2 NPT (internal); 1.4435 (AISI 316L)
2N 1/2 NPT (external), 1/2 NPT (internal); Hastelloy C276
1A 1/2 NPT (external), Ø 11.4 mm (internal); 1.4435 (AISI 316L)
1S PF 1/2 (external) JIS B0202; 1.4435 (AISI 316L)
1K PT 1/2 (external), Ø 11.4 mm (internal) JIS B0203; 1.4435 (AISI 316L)
1T M 20x1.5 (external) DIN 16288, 1.4435 (AISI 316L)

Ceramic sensor flush-mounted (not with FPM Viton gasket, cleaned for oxygen service, gasket version 6)

Hygienic Connections
Flanges
AH DN 40, DIN 11851, PN 40
AL DN 50, DIN 11851, PN 40
KL DRD-Flange, D=65 mm
LL Varivent D=68 mm
(for pipes DN 40 … DN 125)

Threaded boss
AG G 1/2
BF 1/2 NPT
XK M 44x1.25

Replaceable Gasket, Wetted Parts, Lower Temperature Limit

1 FPM Viton, –20°C (–4°F)
2 FPM Viton, cleaned for oxygen service
A FPM Viton, oil and grease-free, –10°C (+14°F)
C Chemraz, –10°C (+14°F)
7 Kalrez, –5°C (+41°F)
4 EPDM, –40°C (–40°F)
2 NBR, –30°C (–2°F)
D PTFE+Hastelloy C4, for constructive reasons can only be exchanged for the same gasket
9 Others

PMC 731

Product designation
Dimensions PMC 731

Housing:
- Electronics and connection compartment separated
- can be rotated through 270°
- Material: cast aluminium with powdered polyester coating or stainless steel 1.4435 (AISI 316L)
- Cable gland or optional cable entry, see product structure page 18

Process connections
- below: thread
- Page 20: flush-mounted

Process Connection Threads

Conversion factors
1 mm = 0.039 in
1 in = 25.4 mm

Dimensions are in mm.

Process connections
Thread:
- Material: 1.4435 (AISI 316L) or Hastelloy 2.4819 (C276) or PVDF
- Process gasket: FPM Viton, FPM Viton cleaned for oxygen service, FPM Viton oil and grease-free, Chemraz, NBR, Kalrez, EPDM

Note on selection
Large internal diameters are recommended for highly-viscous media.
Flush-Mounted Process Connections

Hygienic Connections

Housing:
- Electronics and connection compartment separated
- can be rotated through 270°
- Material: cast aluminium with powdered polyester coating or stainless steel 1.4435 (AISI 316L)
- Cable gland or optional cable entry, see product structure page 18
- Surface height of parts in contact with medium Ra ≤ 0.8 µm

Material sanitary connections
- 1.4435 (AISI 316L)
- Dry measuring cell, without filling fluid

Threaded Bosses

Conversion factors
1 mm = 0.039 in
1 in = 25.4 mm
Dimensions are in mm.

Material of threaded boss
1.4435 (AISI 316L)
Flanges

Conversion factors
1 mm = 0.039 in
1 in = 25.4 mm

Dimensions are in mm.

Flange material
1.4435 (AISI 316L)

DIN 2527, Form B, DN 50 PN 40
Version EK

DIN 2527, Form B, DN 80 PN 40
Version EU

ANSI 16.5 2” 150 lbs (300 lbs), RF
Version KJ, KK

JIS 10 K, 50 A
Version RI

Values in brackets apply to version KK:
2” 300 lbs ANSI B16.5

Flange material
1.4435 (AISI 316L)

Conversion factors
1 mm = 0.039 in
1 in = 25.4 mm

Dimensions are in mm.

Flange material
1.4435 (AISI 316L)
Product Structure
PMP 731

Certificates, Approvals, Protection
R Standard
C ATEX II 3 G, EEx nA II T6
G Cenelec EEx ia IIC T4/T6 and ATEX II 1/2 G
I Cenelec EEx d IIC T5/T6 and ATEX II 1/2 G
O FM explosion proof CL. I, II, III Div. 1, Groups A...G
S CSA explosion proof CL. I, II, III, Div. 1 Groups B...G

Housing: Aluminium
1) Certificate not with electronics version

Metal Sensor: Nominal Value (Maximum Overload)

<table>
<thead>
<tr>
<th>Limit Type</th>
<th>Sensitivity</th>
<th>Units</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensors for gauge pressure</td>
<td>3H</td>
<td>1 bar (4 bar)</td>
<td>100 kPa (400 kPa)</td>
</tr>
<tr>
<td></td>
<td>3L</td>
<td>2.5 bar (10 bar)</td>
<td>250 kPa (1 MPA)</td>
</tr>
<tr>
<td></td>
<td>3P</td>
<td>10 bar (40 bar)</td>
<td>1 MPA (4 MPA)</td>
</tr>
<tr>
<td></td>
<td>3S</td>
<td>40 bar (160 bar)</td>
<td>4 MPA (16 MPA)</td>
</tr>
<tr>
<td></td>
<td>3Z</td>
<td>400 bar (600 bar)</td>
<td>40 MPA (60 MPA)</td>
</tr>
</tbody>
</table>

| Sensors for absolute pressure | 4H | 1 bar (4 bar) | 100 kPa (400 kPa) | 15 psia (60 psia) | 250 inch H2O (60 psig) |
| | 4L | 2.5 bar (10 bar) | 250 kPa (1 MPA) | 38 psia (150 psia) |
| | 4P | 10 bar (40 bar) | 1 MPA (4 MPA) | 150 psia (600 psia) |
| | 4S | 40 bar (160 bar) | 4 MPA (16 MPA) | 600 psia (2400 psia) |
| | 4U | 100 bar (400 bar) | 10 MPA (40 MPA) | 1500 psia (6000 psia) |
| | 4Z | 400 bar (600 bar) | 40 MPA (60 MPA) | 6000 psia (9000 psia) |

Calibration and Technical Units
1 Calibrated from 0 to nominal value in mbar/bar
2 Calibrated from 0 to nominal value in kPa/MPa
3 Calibrated from 0 to nominal value in mm H2O/m H2O
4 Calibrated from 0 to nominal value in inch H2O
5 Calibrated from 0 to nominal value in kgf/cm2
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 Version, Communication
M 4…20 mA passive, HART with linearisation and other functions
P PROFIBUS-PA
F Foundation Fieldbus

Accessories
1 None
2 Bracket for pipe and wall mounting
3 3.1.B Inspection certificate for all parts in contact with the medium made of 1.4435
4 3.1.B Inspection certificate for all parts in contact with the medium made of 1.4435 and bracket
5 NACE MR0175/3.1.B material, Inspection Certificate EN 10204
6 NACE MR0175/3.1.B material mounting bracket, Inspection Certificate EN 10204

Process Connection Thread, Material
Flush-mounted diaphragm
1F G ½ (external); Material Process Connection 1.4435 (AISI 316L) for diaphragm of 1.4435,
Material Process Connection Hastelloy for diaphragm of Hastelloy

Internal diaphragm, adapter 1.4435 (AISI 316L)

<table>
<thead>
<tr>
<th>Process Connection</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1M G ½ (external)</td>
<td>Material Process Connection 1.4435 (AISI 316L)</td>
</tr>
<tr>
<td>1G ½ NPT (external)</td>
<td>Material Process Connection Hastelloy for diaphragm of Hastelloy</td>
</tr>
<tr>
<td>1P ½ (external)</td>
<td>Material Process Connection 1.4435 (AISI 316L), welded, silicon oil</td>
</tr>
<tr>
<td>1K PT ½ (external)</td>
<td>Material Process Connection 1.4435 (AISI 316L), welded, silicon oil</td>
</tr>
<tr>
<td>1T M 20x1.5 (external)</td>
<td>Material Process Connection 1.4435 (AISI 316L), welded, silicon oil</td>
</tr>
<tr>
<td>1X ½ NPT (internal)</td>
<td>Material Process Connection 1.4435 (AISI 316L), welded, silicon oil</td>
</tr>
</tbody>
</table>

Material of Diaphragm, Gasket, Filling Fluid

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diaphragm 1.4435 (AISI 316L), weld, silicon oil</td>
</tr>
<tr>
<td>2</td>
<td>Diaphragm Hastelloy C276, weld, silicon oil</td>
</tr>
<tr>
<td>3</td>
<td>Diaphragm 1.4435 (AISI 316L), weld, silicon oil</td>
</tr>
<tr>
<td>4</td>
<td>Diaphragm 1.4435 (AISI 316L), weld, silicon oil</td>
</tr>
<tr>
<td>5</td>
<td>Diaphragm 1.4435 (AISI 316L), weld, silicon oil</td>
</tr>
<tr>
<td>6</td>
<td>Diaphragm 1.4435 (AISI 316L), weld, silicon oil</td>
</tr>
<tr>
<td>7</td>
<td>Diaphragm 1.4435 (AISI 316L), weld, silicon oil</td>
</tr>
</tbody>
</table>

22
Dimensions
PMP 731

Housing:
- Electronics and connection compartment separated
- can be rotated through 270°
- Material: cast aluminium with powdered polyester coating or stainless steel 1.4435 (AISI 316L)
- Cable gland or optional cable entry, see product structure page 22

Dimensions of Housing

Threaded Process Connections:
Internal diaphragm with adapter

Threaded Process Connections:
Flush-mounted diaphragm

Screw plug
DIN 3852-G ½
Material 1.4435 (AISI 316L) or Hastelloy
G ½ external
Version 1F

Screw plug
DIN 3852-G ½
Material: 1.4435 (AISI 316L)
G ½ external
Version 1F

Screw hole
DIN 3852-X-G ½