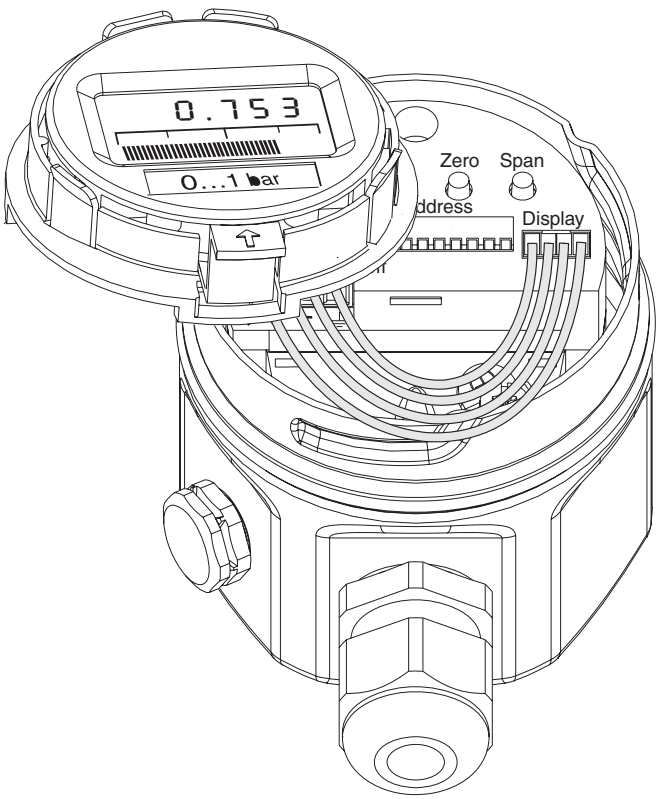
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Operating Instructions

Cerabar M PMC41/45, PMP41/45/46/48

Process pressure measurement



BA222P/00/en/06.08
71064505

Valid from software version:
1.1/1.2

Endress+Hauser

People for Process Automation

Overview of documentation

Device	Documentation	Contents
Cerabar M PROFIBUS PA	Technical Information TI399P	Technical data
	Operating Instructions BA222P	– Identification – Installation – Wiring – Operation – Commissioning – Maintenance – Troubleshooting and spare parts – Appendix: illustration of menus

Table of contents

1 Safety instructions

1.1 Designated use

The Cerabar M is a pressure transmitter for measuring pressure and level.

The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated.

1.2 Installation, commissioning and operation

The device is designed to meet state-of-the-art safety requirements and complies with applicable standards and EC regulations. If used incorrectly or for anything other than the designated use, the device can, however, be a source of danger e.g. product overflow due to incorrect installation or configuration. Consequently, installation, connection to the electricity supply, commissioning, operation and maintenance of the measuring system must be carried out by trained, qualified specialists authorized to perform such work by the facility's owner-operator. The specialists must have read and understood these Operating Instructions and must follow the instructions they contain. Modifications and repairs to the device are permissible only if they are expressly approved in the manual. Pay particular attention to the information and instructions on the nameplate.

1.3 Operational safety

1.3.1 Hazardous areas (optional)

Devices for use in hazardous areas are fitted with an additional nameplate (→ see from Page 7, Section 2.1.1 "Nameplates"). If the measuring system is to be used in hazardous areas, applicable national standards and regulations must be observed. The device is accompanied by separate "Ex documentation", which is an integral part of this documentation. The installation regulations, connection values and safety instructions listed in this Ex document must be observed. The documentation number of the related safety instructions is also indicated on the additional nameplate.

- Ensure that all personnel are suitably qualified.

1.4 Notes on safety conventions and icons

In order to highlight safety-specific or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Symbol	Meaning
	**Warning!** A warning highlights actions or procedures which, if not performed correctly, will lead to serious personal injury, a safety hazard or the destruction of the device.
	**Caution!** A caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or the incorrect operation of the device.
	**Note!** A note highlights actions or procedures which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

	**Explosion-protected, type-examined equipment** If the device has this symbol embossed on its nameplate, it can be used in a hazardous area or a non-hazardous area, depending on the approval.
	**Hazardous area** Symbol used in drawings to indicate hazardous areas. – Devices used in hazardous areas must possess an appropriate type of protection.
	**Safe area (non-hazardous area)** Symbol used in drawings to indicate non-hazardous areas. – Devices used in hazardous areas must possess an appropriate type of protection. Cables used in hazardous areas must meet the necessary safety-related characteristic quantities.

	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
	Alternating current A terminal to which alternating voltage (sine-wave) is applied or through which alternating current flows.
	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded by means of a grounding system.
	**Protective ground terminal** A terminal which must be connected to ground prior to establishing any other connections.
	**Equipotential connection** A connection that has to be connected to the plant grounding system: this may be a potential equalization line or a star grounding system depending on national or company codes of practice.

1.5 Measuring system

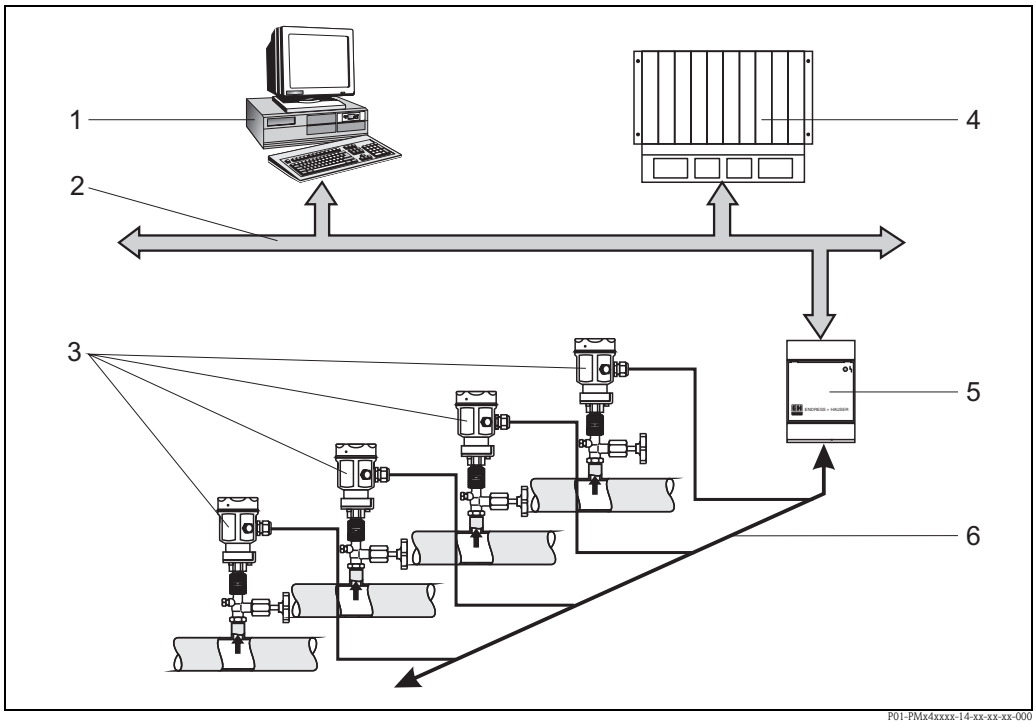


Fig. 1: Cerabar M measuring system with PROFIBUS-PA protocol

1 Personal computer with operating program, e.g. FieldCare or Commuwin II
2 PROFIBUS-DP
3 Cerabar M pressure transmitter
4 PLC
5 Segment coupler
6 Fieldbus with PROFIBUS-PA

The complete measuring point in a simple application consists of:

- Cerabar M transmitter with PROFIBUS-PA protocol
- PLC or personal computer with an operating program, e.g. FieldCare or Commuwin II
- Segment coupler
- PROFIBUS-PA terminating resistor

1.5.1 Number of devices

The maximum number of transmitters on one bus segment is determined by their current consumption, the power of the bus coupler and the required bus length, see Operating Instructions BA198F/00/en. In general, however, the maximum number of transmitters that can be operated on one bus segment is as follows:

- Max. 9 Cerabar M for hazardous area applications
- Max. 32 Cerabar M for non-hazardous area applications

Cerabar M has a max. current consumption of 11 mA ± 1 mA per device.

Refer also to:
PROFIBUS-PA Specification EN 50170 (DIN 19245), for Ex areas: EN 50 020, FISCO model or visit http://www.PROFIBUS.com.

2 Identification

2.1 Device designation

2.1.1 Nameplates

Note!
- The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 20°C (68°F), or a temperature of 100°F for ANSI flanges.
- The pressure values permitted at higher temperatures can be found in the following standards:
  – EN 1092-1: 2001 Tab. 18[1)]
  – ASME B 16.5a – 1998 Tab. 2-2.2 F316
  – ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  – JIS B2230
- The test pressure corresponds to the overpressure limit (OPL) of the device = MWP x 1.5[2)].
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.

Nameplate of the aluminum housing

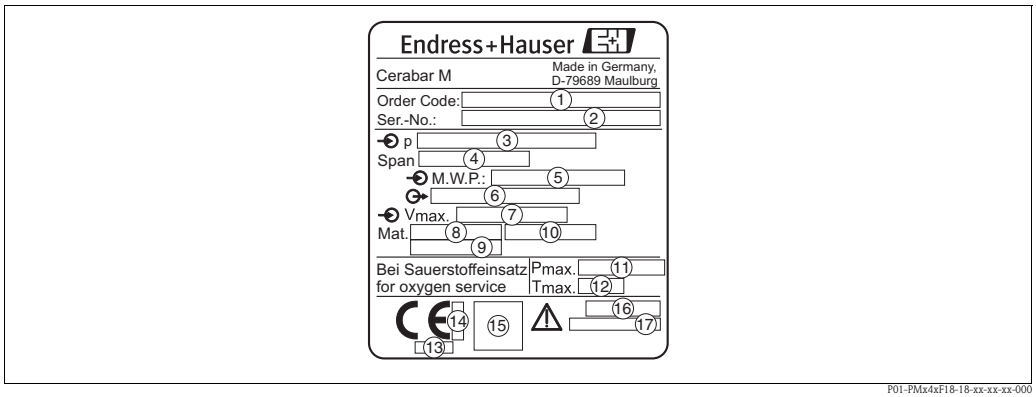


Fig. 2: Nameplate for Cerabar M with aluminium housing

① *Order code*
See the specifications on the order confirmation for the meanings of the individual letters and digits.
② *Serial number*
③ *Nominal measuring range*
④ *Minimum/maximum span*
⑤ *MWP (Maximum working pressure)*
⑥ *Electronic version (output signal)*
⑦ *Supply voltage*
⑧ *Wetted materials*
⑨ *Wetted materials*
⑩ *Wetted materials*
⑪ *Maximum pressure for oxygen applications (optional for devices, suitable for oxygen applications)*
⑫ *Maximum temperature for oxygen applications (optional for devices, suitable for oxygen applications)*
⑬ *ID number of notified body with regard to Pressure Equipment Directive (optional)*
⑭ *ID number of notified body with regard to ATEX (optional)*
⑮ *SIL-symbol for devices with SIL2/IEC 61508 Declaration of conformity (optional)*
⑯ *Degree of protection*
⑰ *CRN number (optional)*

1) With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
2) The equation does not apply for PMP41, PMP45 and PMP48 with a 100 bar measuring cell.

Nameplate of the stainless steel housing

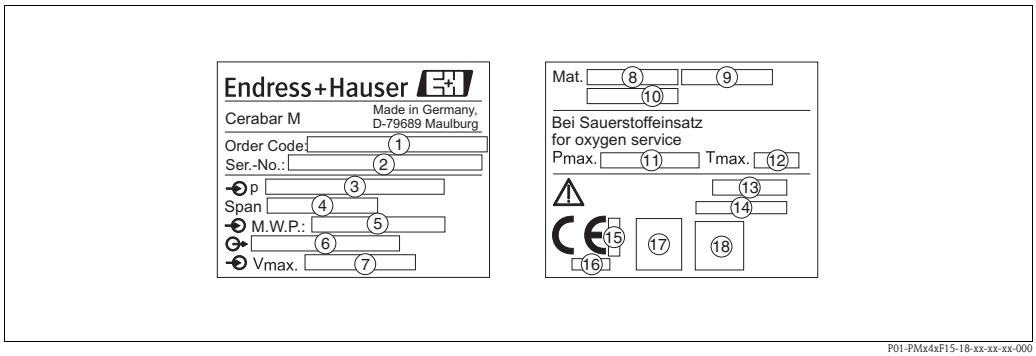


Fig. 3: Nameplate for Cerabar M with stainless steel housing

① *Order code*
See the specifications on the order confirmation for the meanings of the individual letters and digits.
② *Serial number*
③ *Nominal measuring range*
④ *Minimum/maximum span*
⑤ *MWP (maximum working pressure)*
⑥ *Electronic version (output signal)*
⑦ *Supply voltage*
⑧ *Wetted materials*
⑨ *Wetted materials*
⑩ *Wetted materials*
⑪ *Maximum pressure for oxygen applications (optional for devices, suitable for oxygen applications)*
⑫ *Maximum temperature for oxygen applications (optional for devices, suitable for oxygen applications)*
⑬ *Degree of protection*
⑭ *CRN number (optional)*
⑮ *ID number of notified body with regard to ATEX (optional)*
⑯ *ID number of notified body with regard to Pressure Equipment Directive (optional)*
⑰ *A3 symbol for devices with A3 (optional)*
⑱ *SIL-symbol for devices with SIL2/IEC 61508 Declaration of conformity (optional)*

Additional nameplate

Devices for use in hazardous areas are fitted with an additional nameplate.

2.2 Scope of delivery

The scope of delivery comprises:
- Cerabar M pressure transmitter
- Optional accessories

Documentation supplied:
- Operating Instructions BA222P (this document)
- Final inspection report
- Optional: factory calibration certificate
- Devices that are suitable for use in hazardous areas:
  additional documentation such as Safety Instructions, Control or Installation Drawings

2.3 CE mark, Declaration of Conformity

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations as listed in the EC Declaration of Conformity and thus comply with the statutory requirements of the EC Directives. Endress+Hauser confirms the successful testing of the device by affixing to it the CE mark.

2.4 Registered trademarks

KALREZ, VITON, TEFLON
Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

PROFIBUS PA
Registered trademark of the PROFIBUS Trade Organisation, Karlsruhe, D

TRI-CLAMP
Registered trademark of Ladish & Co., Inc., Kenosha, USA

GORE-TEX®
Registered trademark of W.L. Gore & Associates, Inc., USA

3 Installation

3.1 Incoming acceptance and storage

3.1.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2 Storage

The device must be stored in a dry, clean place and protected against damage from impact (EN 837-2).

Storage temperature range:
- –40 to +100°C (–40 to +212°F)
- Onsite display: –40 to +80°C (–40 to +176°F)

3.2 Installation conditions

3.2.1 Dimensions

→ For dimensions, please refer to the Technical Information for Cerabar M TI399P, "Mechanical construction" section.

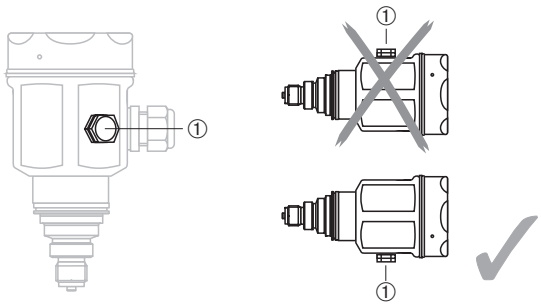
3.3 Installation instructions

Note!
- Due to the orientation of the Cerabar M, there may be a shift in the zero point, i.e. when the container is empty, the measured value does not indicate zero. The position-dependent zero point shift can be corrected directly at the device via 2 keys → see Page 44, Section 7.3.8 "Position adjustment - only display (bias pressure)" (onsite operation) or via communication → see Page 45, Section 7.3.9 "Zero point correction".
- For PMP46 and PMP48, please pay attention to Page 14, Section 3.3.2 "Installation instructions for devices with diaphragm seals – PMP46, PMP48".
- The onsite display can be rotated in 90° stages.
- Endress+Hauser offers a mounting bracket for installation on pipes or walls.
  → See Page 17, Section 3.3.4 "Wall and pipe-mounting (optional)".

3.3.1 Installation instructions for devices without a diaphragm seal – PMC41, PMC45, PMP41, PMP45

Note!

- If a heated Cerabar M is cooled during a cleaning process (e.g. by cold water), a vacuum develops for a short time, whereby moisture can penetrate the sensor through the pressure compensation ①. If this is the case, mount the Cerabar M with the pressure compensation ① pointing downwards.



- Keep the pressure compensation and GORE-TEX® filter ① free from dirt.
- Cerabar M devices without diaphragm seals are mounted as per the norms for a manometer (DIN EN 839-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.
- Do not clean or press the diaphragm with hard or pointed objects.

Pressure measurement in gases

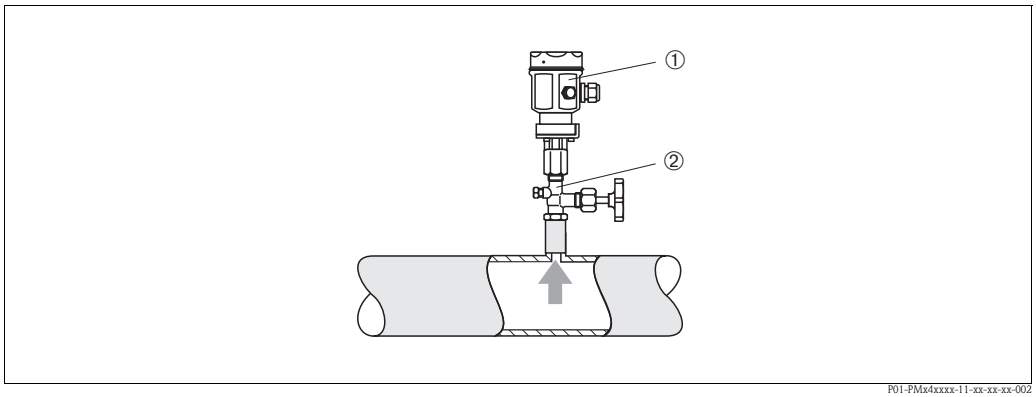


Fig. 4: Measuring arrangement for pressure measurement in gases

① *Cerabar M*
② *Shutoff device*

- Mount Cerabar M with shutoff device above the tapping point so that the condensate can flow into the process.

Pressure measurement in steam

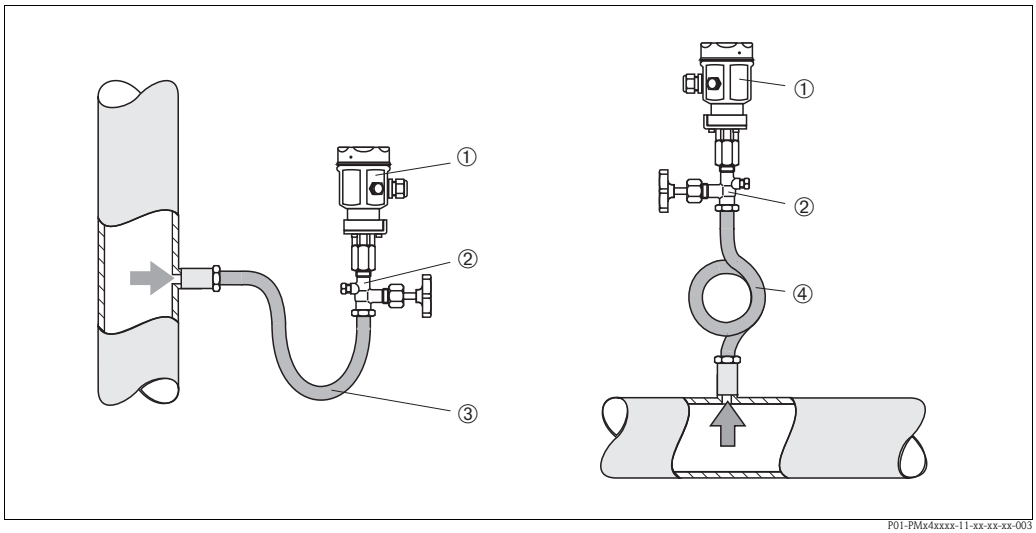


Fig. 5: Measuring arrangement for pressure measurement in steam

① *Cerabar M*
② *Shutoff device*
③ *U-shaped siphon*
④ *Circular siphon*

- Mount Cerabar M with siphon above the tapping point.
  The siphon reduces the temperature to almost ambient temperature.
- Fill the siphon with liquid before commissioning.

Pressure measurement in liquids

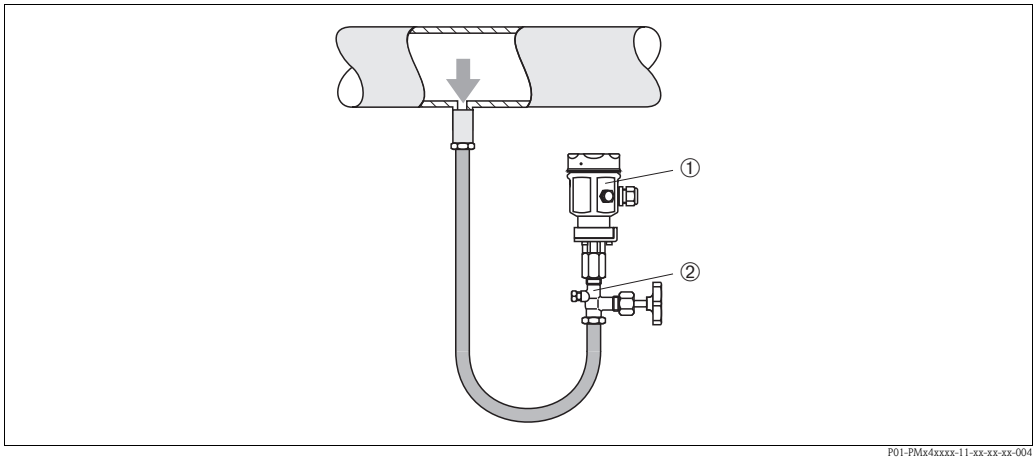


Fig. 6: Measuring arrangement for pressure measurement in liquids

① *Cerabar M*
② *Shutoff device*

- Mount Cerabar M with shutoff device below or at the same level as the tapping point.

Level measurement

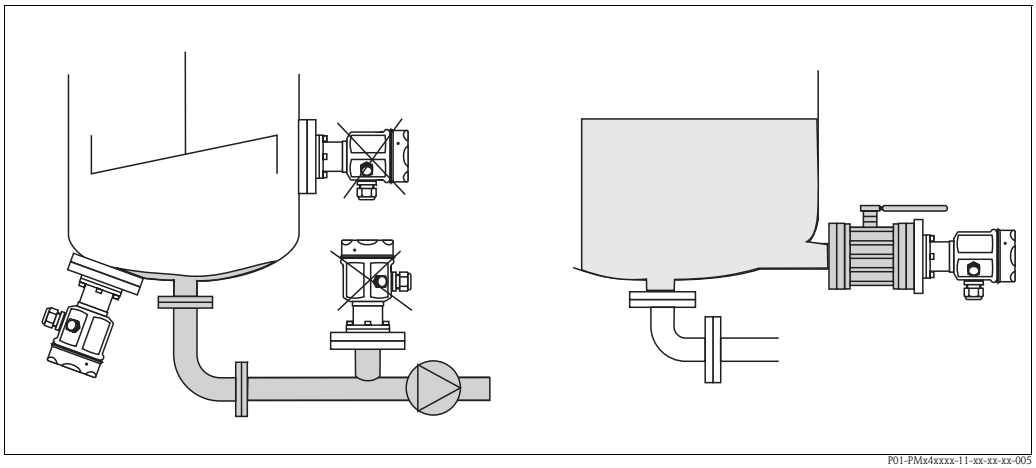


Fig. 7: Measuring arrangement for level

- Always mount Cerabar M below the lowest measuring point.
- Do not mount the device at the following positions:
  In the filling curtain, in the tank outlet or at a point in the tank which could be affected by pressure pulses from an agitator.
- Do not mount the device in the suction area of a pump.
- The calibration and functional test can be carried out more easily if you mount the device after a shutoff device.

PMP41 mounting

PMP41 is available with a flush-mounted diaphragm or an adapter and an internal diaphragm. The adapter can be screwed on or welded in. A seal is enclosed depending on the version and material used.

Threaded version:

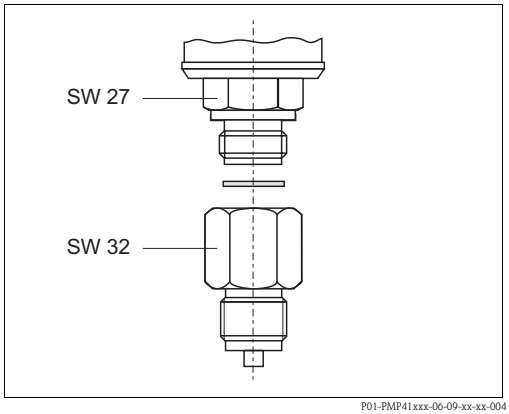


Fig. 8: The flush-mounted version is screwed together with the adapter using a torque of 50 Nm. Screw the complete device into the process thread with max. 80 Nm (at AF 32).

Welded version:

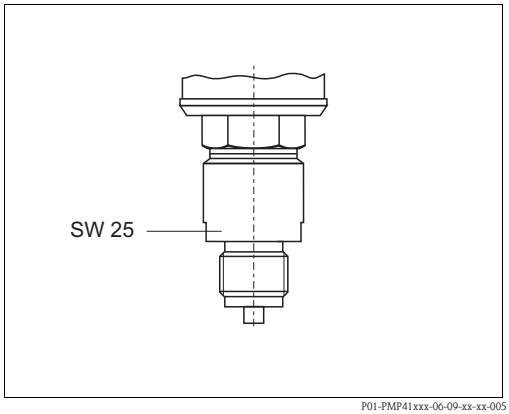


Fig. 9: Screw the complete device into the process thread with max. 80 Nm (at AF 25).

Threaded connection, flush-mounted diaphragm

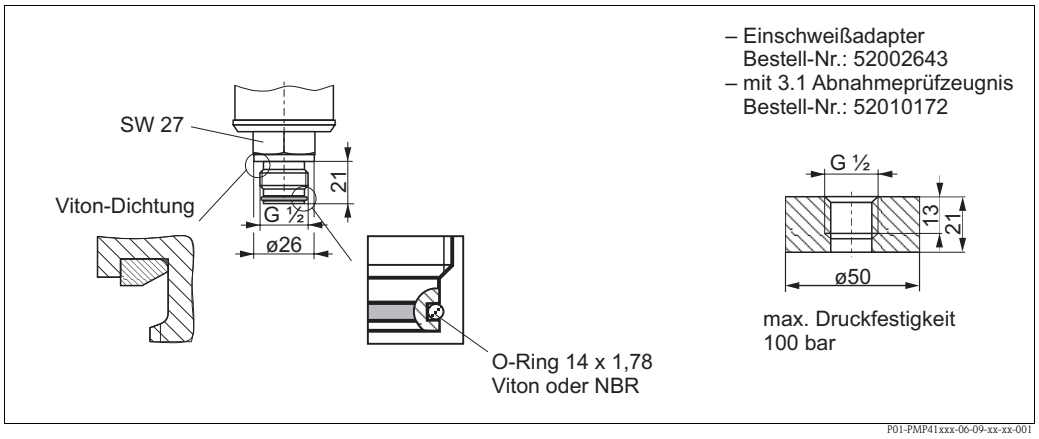


Fig. 10: The flush-mounted version is screwed into the process thread with max. 50 Nm ± 5 Nm (at AF 27).

3.3.2 Installation instructions for devices with diaphragm seals – PMP46, PMP48

Note!
- The Cerabar M with a diaphragm seal is screwed in, flanged or clamped, depending on the type of diaphragm seal.
- Together, a diaphragm seal and the pressure transmitter form a closed, calibrated system which is filled with oil. The filling hole is sealed and should not be opened.
- Do not clean or press the diaphragm of the diaphragm seals with hard or pointed objects.
- Do not remove diaphragm protection until shortly before installation.
- When using a mounting bracket, sufficient strain relief must be ensured for the capillaries in order to prevent the capillary from buckling (bending radius ≥ 100 mm).
- Please note that the hydrostatic pressure of the liquid columns in the capillaries can cause zero point shift. The position-dependent zero point shift can be corrected directly at the device via 2 keys → see Page 44, Section 7.3.8 "Position adjustment - only display (bias pressure)" (onsite operation) or via communication → see Page 45, Section 7.3.9 "Zero point correction".
- Please note the application limits of the diaphragm seal filling oil as detailed in the Technical Information for Cerabar M TI399P, "Planning instructions for diaphragm seal systems" section.

In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:
- Vibration-free (in order to avoid additional pressure fluctuations)
- Not in the vicinity of heating or cooling pipes
  Insulate if the ambient temperature is below or above the reference temperature
- With a bending radius of ≥ 100 mm.

Vacuum application

For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter below the diaphragm seal. This prevents a vacuum load of the diaphragm seal caused by the presence of filling oil in the capillaries.

When the pressure transmitter is mounted above the diaphragm seal, the maximum height difference H1 – as illustrated in the diagram below left – must not be exceeded. The maximum height difference depends on the density of the filling oil and the lowest pressure that is permitted to occur at the diaphragm seal (empty tank), see the following illustration.

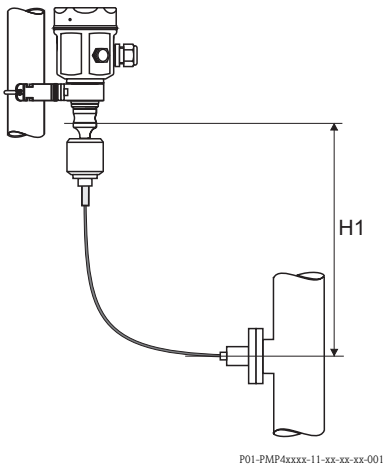


Fig. 11: Installation above the diaphragm seal

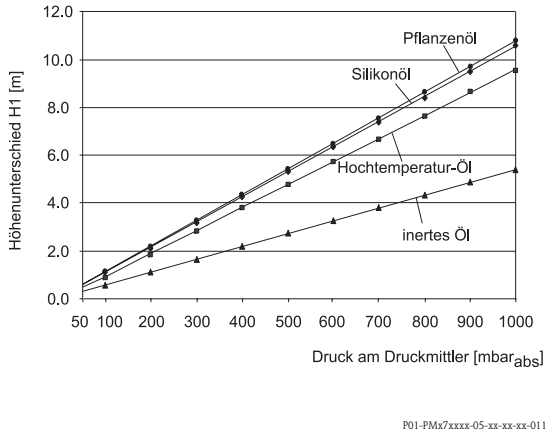
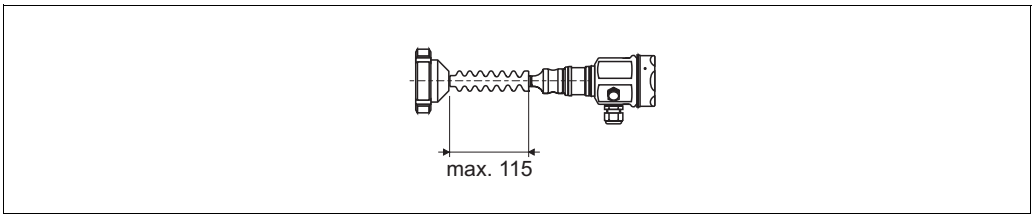


Fig. 12: Diagram of maximum installation height above the diaphragm seal for vacuum applications as a function of the pressure at the diaphragm seal

Mounting with temperature isolator



Endress+Hauser recommends the use of temperature isolators in the event of constant extreme fluid temperatures which lead to the maximum permissible electronics temperature of +85°C (+185°F) being exceeded. To minimize the influence of rising heat, Endress+Hauser recommends the device be mounted horizontally or with the housing pointing downwards.
The additional installation height also brings about a zero point shift of approx. 21 mbar due to the hydrostatic column in the temperature isolator. The position-dependent zero point shift can be corrected directly at the device using 2 keys → see Page 44, Section 7.3.8 "Position adjustment – only display (bias pressure)" (onsite operation) or via communication → see Page 45, Section 7.3.9 "Zero point correction".

Mounting with capillary tube

The housing of the Cerabar M can be mounted with a capillary tube to one side of the measuring point to protect from high temperatures, moisture or vibration, or in cases where the mounting point is not easily accessible.
A bracket for mounting on a wall or pipe is available for this purpose.

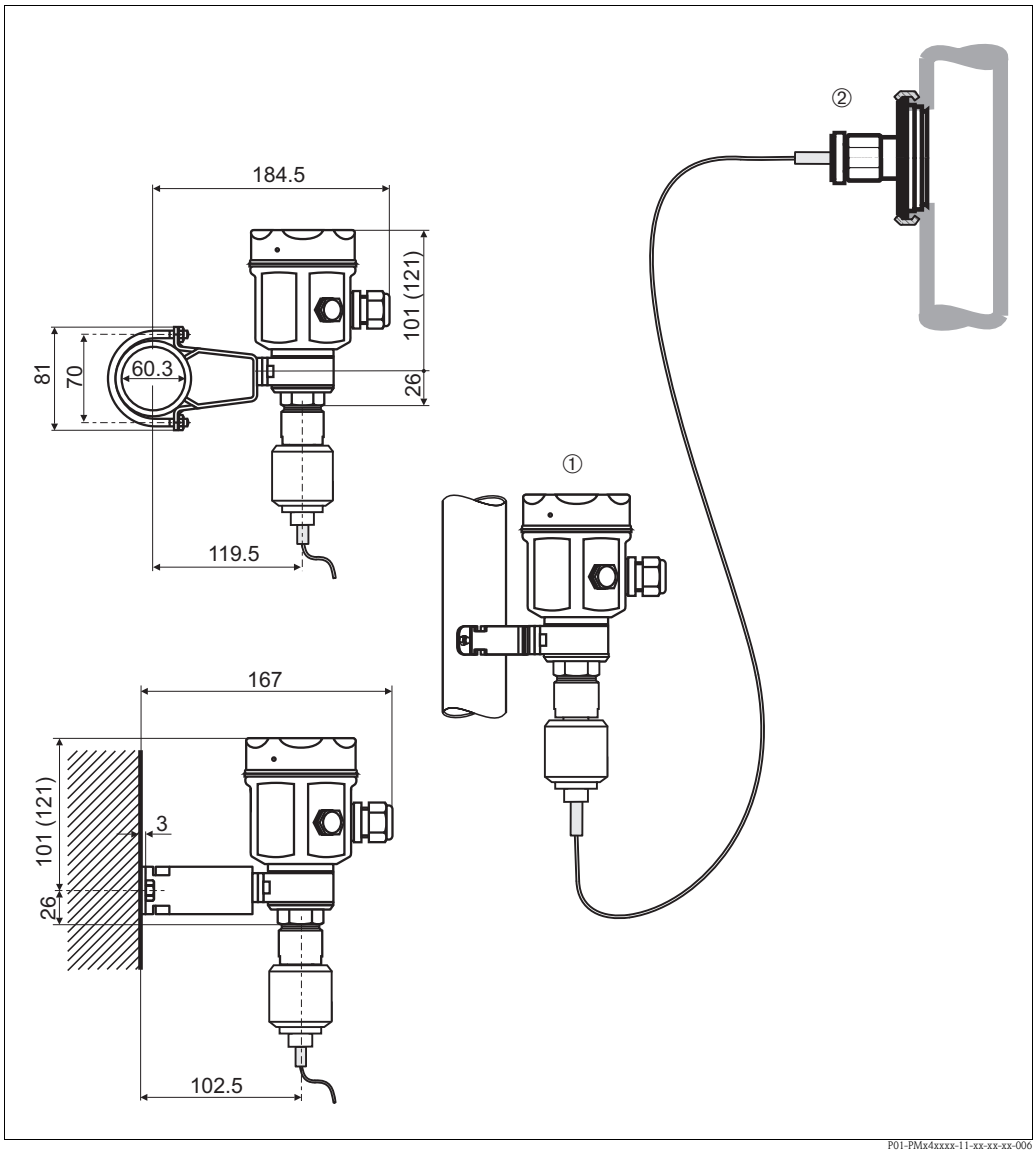


Fig. 13: Mounting with capillary tube and bracket away from the measuring point. Values in brackets apply to devices with a raised cover.
① Mounting location away from the measuring point.
② Measuring point: very humid, hot, with strong vibrations or difficult to access

3.3.3 Seal for flange mounting

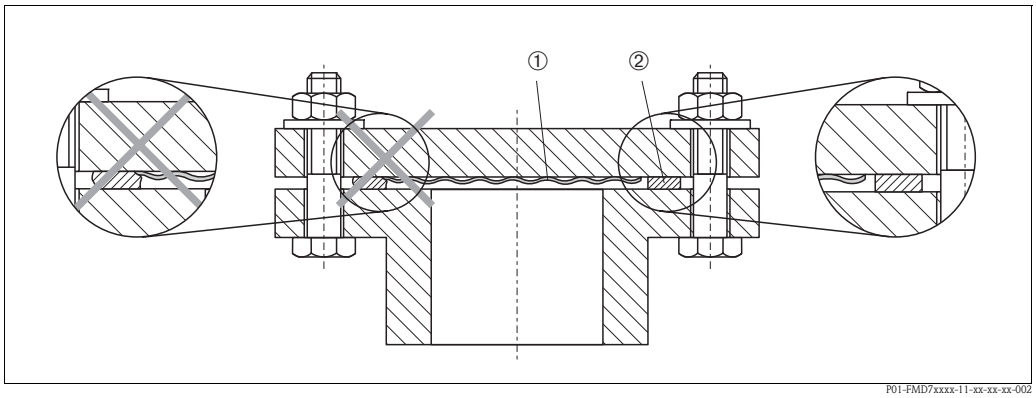


Fig. 14: Mounting the versions with flange or diaphragm seal

① *Diaphragm*
② *Seal*

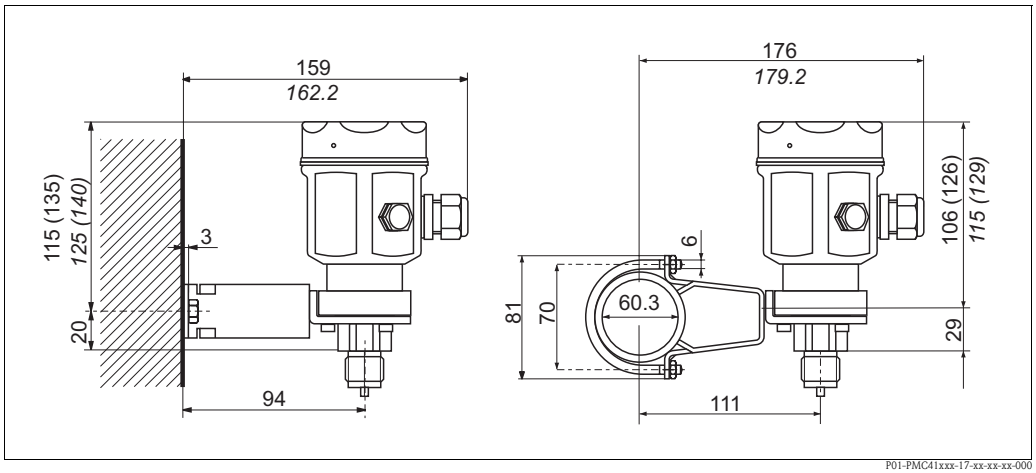
Warning!
The seal is not allowed to press down on the diaphragm as this could affect the measurement result.

3.3.4 Wall and pipe-mounting (optional)

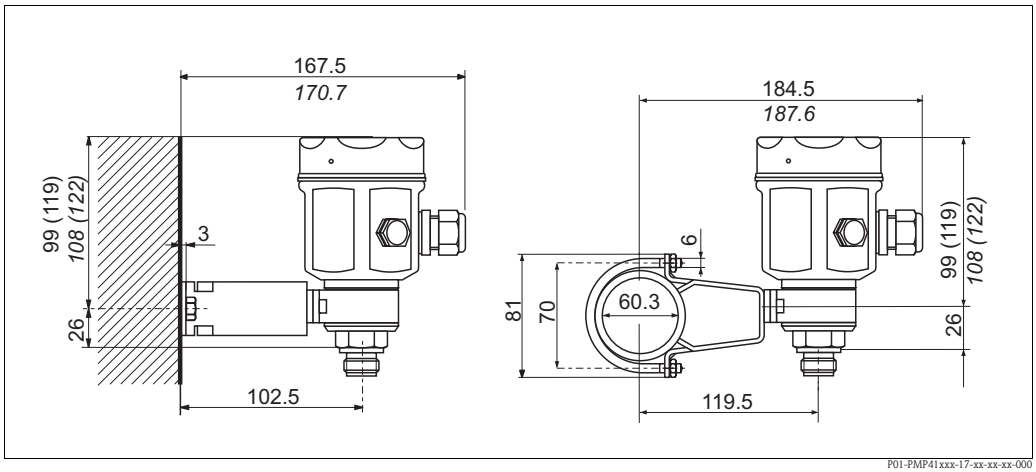
Endress+Hauser offers a mounting bracket for installing on pipes or walls for PMC41, PMP41, PMP46 and PMP48. You can order the mounting brackets either via the order code or separately as an accessory.

PMC41
- Order number: 919806-0000
- Material: AISI 304 (1.4301)

PMP41, PMP46 and PMP48
- Order number: 52001402
- Material: AISI 304 (1.4301)

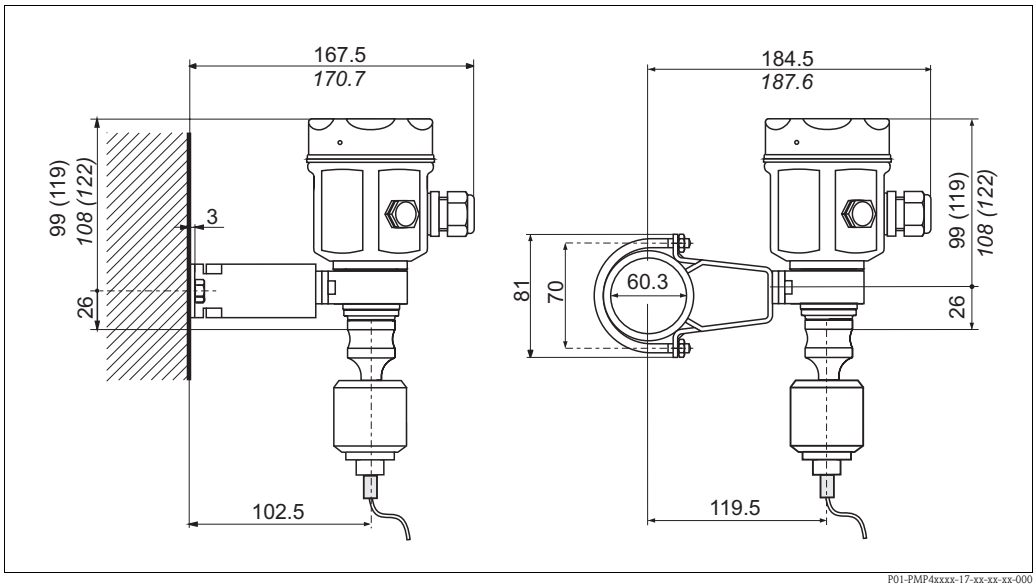


Wall and pipe-mounting PMC41



Wall and pipe-mounting PMP41

The dimensions in brackets apply to housings with a raised cover (for optional display). Dimensions written in italics apply to devices with an aluminum housing.



Wall and pipe-mounting PMP46/PMP48

The dimensions in brackets apply to housings with a raised cover (for optional display). Dimensions written in italics apply to devices with an aluminum housing.

3.4 Post-installation check

After installing the device, carry out the following checks:
- Are all the screws firmly tightened?
- Are the housing covers screwed down tight?

4 Wiring

4.1 Electrical connection

Note!
Cerabar M with a PROFIBUS-PA output is a two-wire transmitter. Note the following before connecting the device:
- Turn off the power supply.
- Ground the device using the external ground terminal.

4.1.1 Power supply

The Cerabar M has the following connection values:

I = 11 mA ± 1 mA
Non-hazardous area: U = 9 to 32 V DC
Hazardous area: U = 9 to 24 V DC

4.1.2 Bus cable

Endress+Hauser recommends you use a twisted, shielded twin-core cable. The following values must be observed for installation in Ex areas (EN 50020, FISCO model):

Loop-resistance (DC): 15 to 150 W/km
Inductance per unit length: 0.4 to 1 mH/km
Capacitance per unit length: 80 to 200 nF/km

The following are examples of suitable cable types:

Non-hazardous area:

- Siemens 6XV1 830-5BH10 (gray)
- Kerpen CEL-PE/OSCR/PVC/FRLA FB-02YS(ST)YFL (gray)
- Belden 3076F (orange)

Hazardous area:

- Siemens 6XV1 830-5AH10 (blue)
- Kerpen CEL-PE/OSCR/PVC/FRLA FB-02YS(ST)YFL (blue)

4.1.3 Shielding

For maximum EMC protection, e.g. near frequency convertors, it is advisable to connect the housing and cable shielding using a potential matching line (PML). (Max. wire cross-section: 2.5 mm², fixed conductor)

Please pay attention to the following points:

- Ground the device using the external ground terminal.
- The bus cable shield may not be interrupted.
- Ground the shield at each end of the cable, and always try to keep the connecting cable between the shielding and ground as short as possible.
- If there are large potential differences between the individual grounding points, you only need to connect one point to the reference ground. Connect all the other ends of the shield via a HF-enabled capacitor with reference potential (e.g. ceramic capacitor 10 nF/250 V~).

Caution!
Multiple protective shield grounding is only permitted under specific conditions in applications subject to explosion protection, see EN 60079-14.

Further information on the layout and grounding of the network is provided in Operating Instructions BA198F "PROFIBUS-PA: Guidelines for planning and commissioning" and in the PROFIBUS-PA Specification EN 50170 (DIN 19245).

4.2 Connecting the device

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- Protective circuits to prevent reverse polarity, HF influences and overvoltage peaks are installed.
- The shield or grounding (if present) must always be connected to the internal ground terminal ③ in the housing.
- The supply voltage must match the power supply on the nameplate (→ see Page 7ff., Section 2.1.1 "Nameplates").
- Switch off the supply voltage before connecting the device.
- Unscrew the housing cover.
- If present, remove the retaining ring with the onsite display.
  – Push up the latch with the arrow until the grip of the retaining ring is audibly released.
  – Release the retaining ring carefully to prevent damage to the display cables. The connector of the display can remain plugged in.
- Guide the cable through the gland. Preferably use twisted, shielded two-wire cable.
- Connect the device in accordance with the following diagram.
- Where applicable, refit the retaining ring with the onsite display. The grip of the retaining ring clips in with an audible click.
- Screw down housing cover.
- Switch on supply voltage.

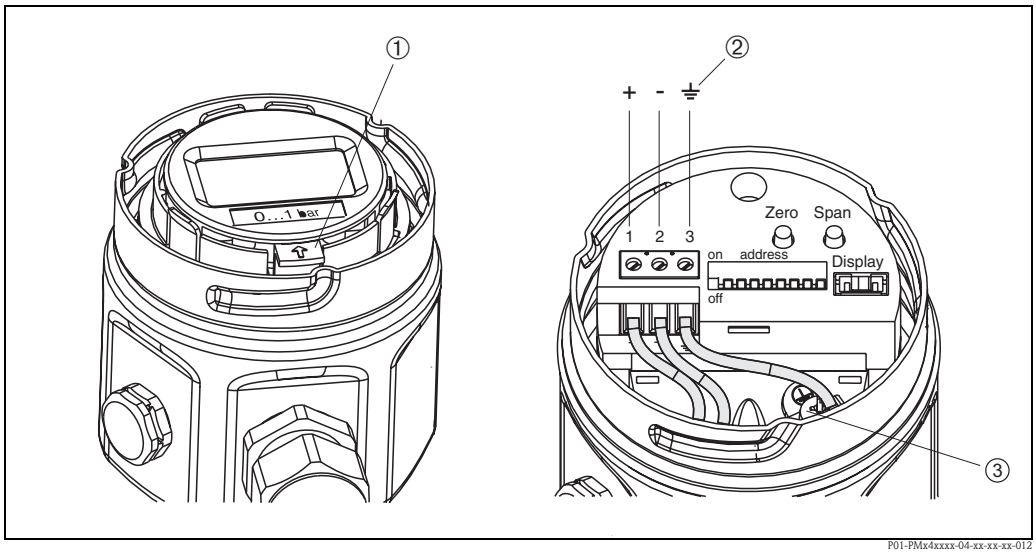


Fig. 15: PROFIBUS PA electrical connection

① *Disassembling the onsite display: To release the retaining ring from the electronic insert, push up the latch with the arrow.*

② *The terminal ② on the electronic insert is for grounding and is already wired internally. If the connecting cable also has a shielding or ground cable within it, then this may only be connected to the internal ground terminal ③ of the housing, not to terminal ②. The terminals are designed to take one wire each.*

4.2.1 Connecting devices with Harting connector Han7D

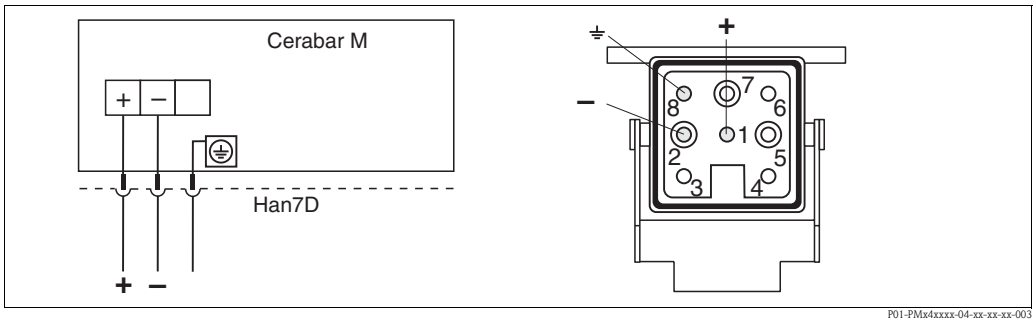


Fig. 16: Left: electrical connection for devices with Harting connector Han7D
Right: view of the connector at the device

4.2.2 Connecting devices with M12 connector

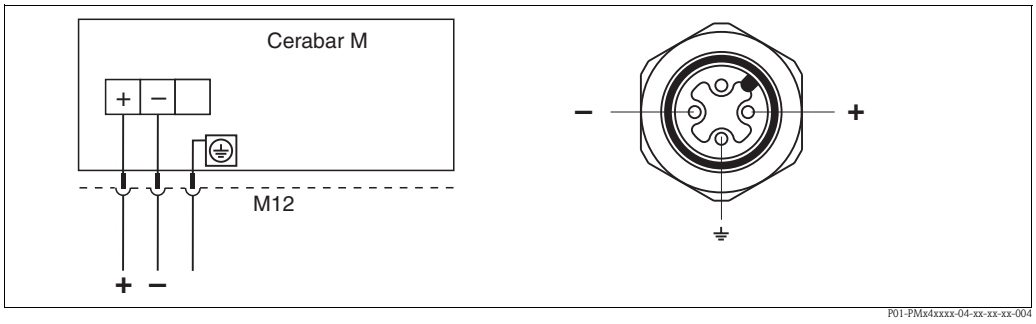


Fig. 17: Left: electrical connection for devices with M12 connector
Right: view of the connector at the device

4.2.3 Connecting the cable version

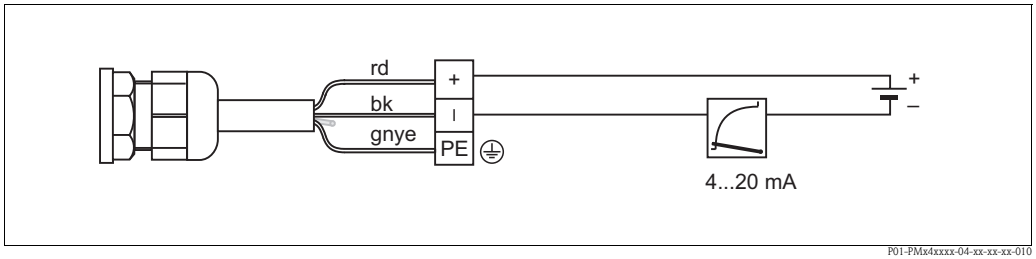


Fig. 18: rd = red, bk = black, gnye = green-yellow

4.2.4 Connecting the valve connector M16, ISO4400

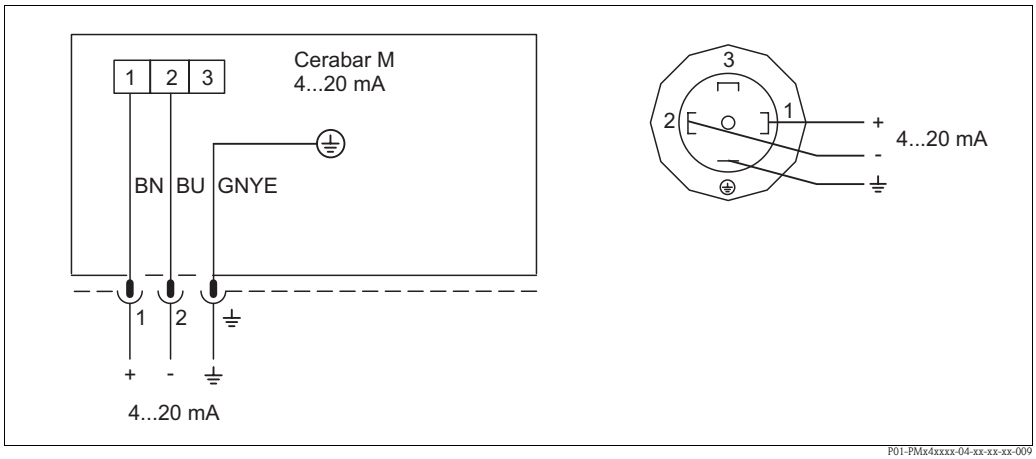


Fig. 19: BN = brown, BU = blue, GNYE = green/yellow

4.3 Connecting the measuring unit

4.3.1 Supply voltage

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in hazardous areas.

Supply voltage
- For non-hazardous areas: 9...32 V DC

4.3.2 Cable specification

- Endress+Hauser recommends using twisted, shielded two-wire cables.
- Terminals for wire cross-sections: 0.14 to 2.5 mm^2
- Cable outer diameter: 5 to 9 mm

4.3.3 Shielding/potential matching

- You achieve optimum shielding against interference influences if the shielding is connected on both sides (in the cabinet and at the device). If potential equalization currents are expected in the plant, only ground the shielding on one side, preferably at the transmitter.
- When using in hazardous areas, you must observe the applicable regulations.
  Separate Ex documentation with additional technical data and instructions is included with all Ex devices as standard.

4.4 Potential equalization

Ex applications: Connect all devices to the local potential equalization system.
Observe the applicable regulations.

4.5 Post-connection check

Perform the following checks after completing electrical installation of the device:
- Does the supply voltage match the specifications on the nameplate?
- Is the device connected as per → Section 4.2?
- Are all the screws firmly tightened?
- Are the housing covers screwed down tight?

The connected onsite display lights up as soon as voltage is applied to the device.

5 Operation

5.1 Onsite display (optional)

A plug-in onsite display is used as the display unit. The display can be rotated in 90° stages.

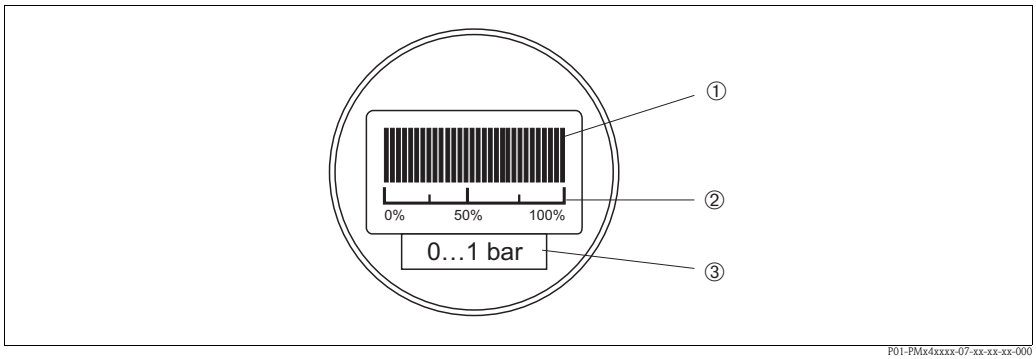


Fig. 20: Onsite display

① *4-digit display of measured values and input parameters*
② *Bar graph, display of current measured value*
③ *Nominal measuring range*

5.1.1 Function of the onsite display

The onsite display has two display modes:

- Display in measurement mode: This is shown as standard.
- Display in calibration mode: This is shown after pressing the Zero or Span key once. It returns automatically to measurement mode display after 2 seconds.

The bar graph displays the current value (4 to 20 mA) belonging to the pressure value.

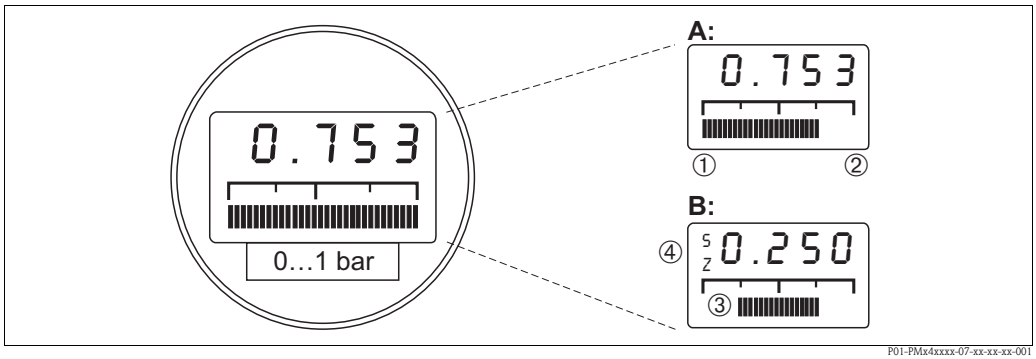


Fig. 21: Function of the onsite display

A Display in measuring mode
B Display in calibration mode

① *Lower-range value*
② *Upper-range value*
③ *Set measuring range in measuring limits*
④ *Display of calibration point (Z (Zero) = lower-range value (LRV) or S (Span) = upper-range value (URV))*

5.2 Operating elements

5.2.1 Position of the operating elements on the electronic insert

The onsite display is supplied ready-mounted if it is ordered with the device. In such instances, the onsite display with the retaining ring must be released from the electronic insert before operating.

Removing the display:
- Push up the latch with the arrow until the grip of the retaining ring on the electronic insert is audibly released.
- Release the retaining ring and lift off carefully to prevent damage to the display cables.
- During operation, you can fit the display onto the edge of the housing.

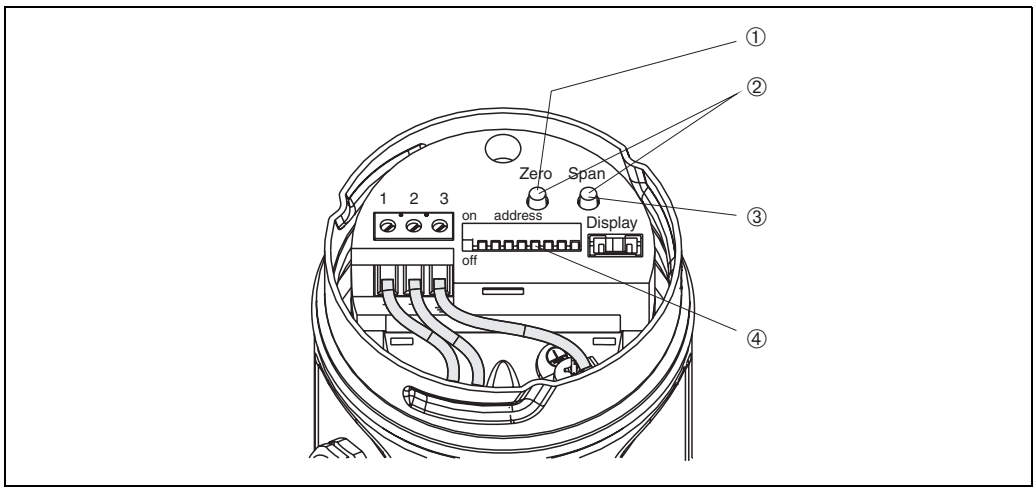


Fig. 22: Position of operating elements

① *Key for setting the lower-range value*
② *Position adjustment*
③ *Key for setting the upper-range value*
④ *Address switch*

5.2.2 Function of the operating elements

Use the "Zero" and "Span" keys to set the lower-range value and upper-range value of the bar graph in the display module. These settings do not have any effect on the digital output value (OUT value) and the "measured value" in the matrix field V0H0.

No.	Operating element	Function
①	Key for lower-range value	The value currently saved for the lower-range value (zero point) is displayed and the pressure present is accepted as the lower-range value.
②	Key for upper-range value	The value currently saved for the upper-range value is displayed and the pressure present is accepted as the upper-range value.
③	Bias key combination: Key for lower-range value and key for upper-range value	The value currently saved for the bias pressure is displayed and the pressure present is accepted as the bias pressure.
④	Address switch	Set device address in the bus (→ see Page 27, Section 6.2 "Device address configuration")

If the display does not show zero after calibrating the lower-range value at zero operating pressure (position-dependent), it can be corrected to zero by adopting a bias pressure.

5.3 Operation via Endress+Hauser operating program

5.3.1 FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard.

FieldCare supports the following functions:
- Configuration of transmitters in online operation
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Connection options:
- PROFIBUS PA via segment coupler and PROFIBUS interface card

Note!
For more information, see → www.endress.com.

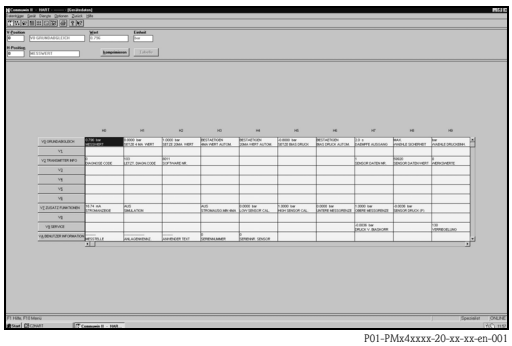
5.3.2 Commuwin II

With the Commuwin II display and operating program, Cerabar M can be configured and operated as follows:
- Via matrix operation or
- Via graphic operation

For this, the corresponding server (e.g. HART or ZA672) must be activated. For a description of the Commuwin II operating program, see Operating Instructions BA124F.

Matrix operation (Device parameter menu)

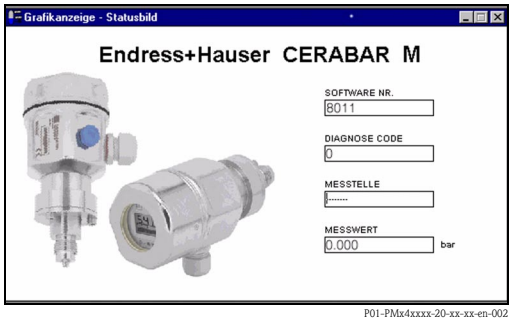
You can access the extended functions of the Cerabar M using the "Device parameter/matrix operation" menu.
- Each row is assigned to a function group.
- Every field represents a parameter.
- The setting parameters are entered in the appropriate fields and confirmed with ↵ .



P01-PMx4xxxx-20-xx-xx-en-001

Graphic operation

Commuwin II offers graphic templates for certain configuration procedures which you can access via the "Device parameter/graphic operation" menu. The parameter changes are entered directly here and confirmed with ↵.



P01-PMx4xxxx-20-xx-xx-en-002

6 PROFIBUS-PA interface

6.1 Overview

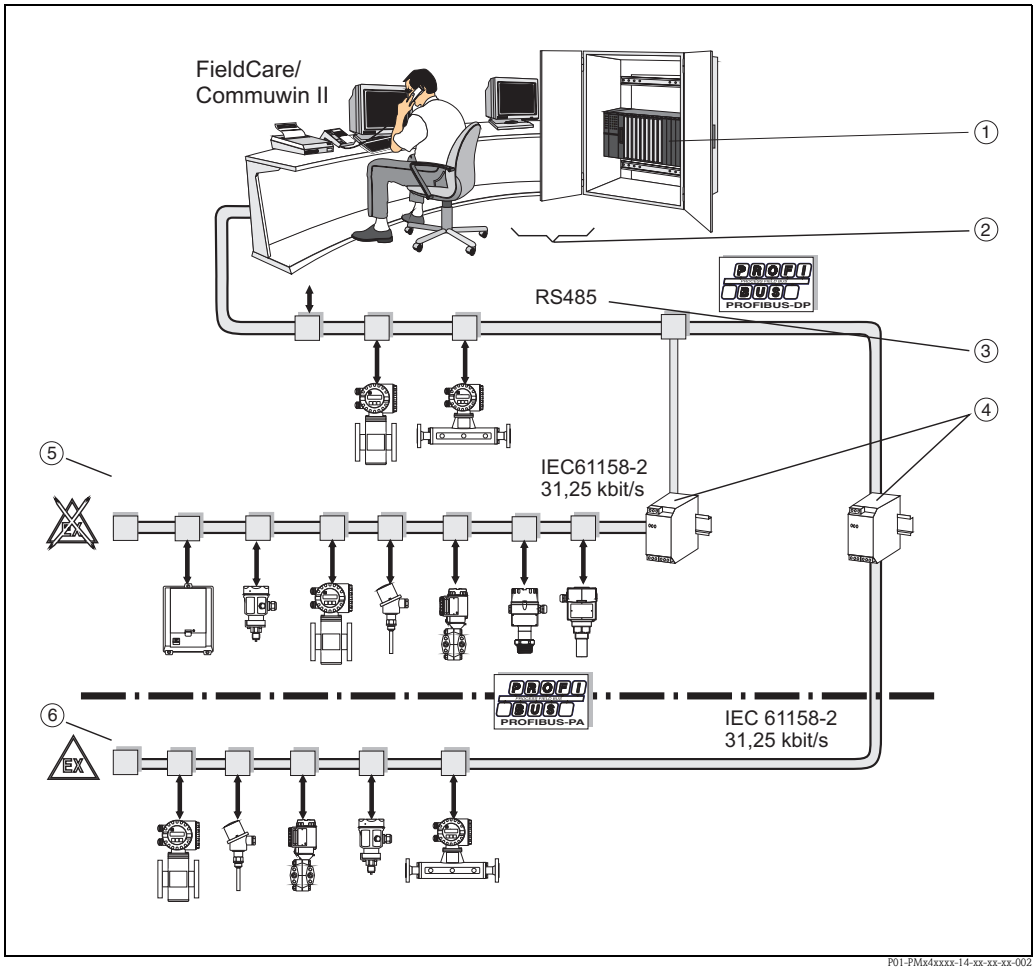


Fig. 23: PROFIBUS-PA schematic diagram

① *PLC*
② *Process control system*
③ *RS485 up to 12 Mbit/s*
④ *Segment coupler*
⑤ *Non-Ex area*
⑥ *Ex area*

Note!
Additional planning information for PROFIBUS-PA can be found in the Operating Instructions BA198F/00/en.

6.2 Device address configuration

An address must be assigned to every PROFIBUS-PA device. If the address is not set correctly, the device will not be recognized by the process control system.

- Valid device addresses are in the range from 0 to 126. All devices are delivered with the software address 126 on leaving the factory.
- A device address may appear only once within a particular PROFIBUS-PA network. Please refer also to the Operating Instructions BA198F for further information.

The address 126 set at the factory can be used to check the function of the device and to connect to a PROFIBUS-PA network already in operation. Afterwards the address should be changed to allow other devices to be connected to the network.

There are two ways of assigning an address to a Cerabar M:

- With software using an operating program, (DP Class 2 master e.g. Communwin II or
- Locally via DIP switches. The DIP switches are located on the electronic insert.

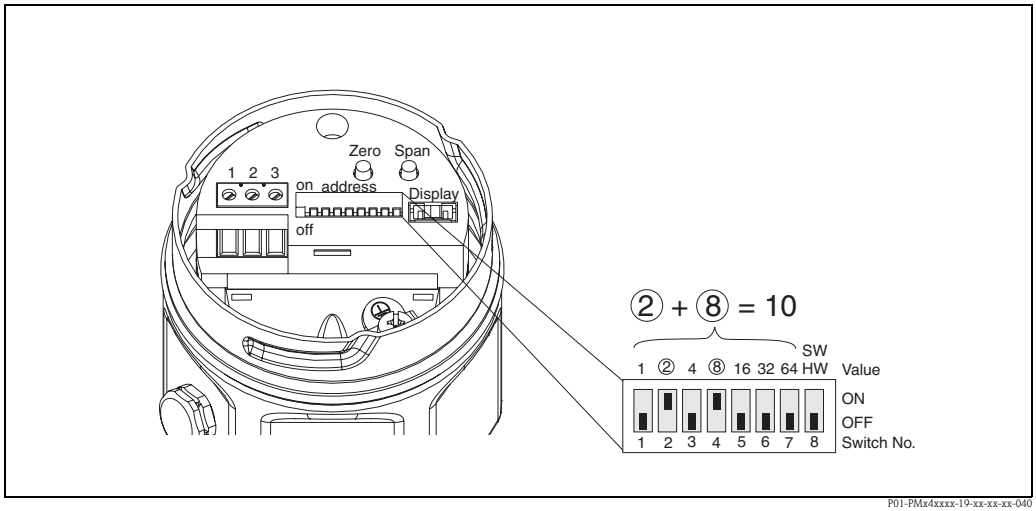


Fig. 24: Example for setting the device address via the address switches: set to address 10

6.2.1 Setting the address mode

Set the address mode via switch 8:

- ON = Software addressing via the bus system (default setting, SW)
- OFF = Hardware addressing, the device address must then be set via DIP switches 1-7.

6.2.2 Hardware addressing

Proceed as follows to set a hardware address:

1. Set DIP switch 8 to OFF.
2. Set address using DIP switches 1-7 in accordance with the table below.
3. You have to wait 10 seconds for a change in address to take effect.

Switch no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Weighting in "ON" position	1	2	4	8	16	32	64
Weighting in "OFF" position	0	0	0	0	0	0	0

6.2.3 Software addressing

Please refer to Operating Instructions BA198F for the procedure for addressing devices via software.

6.3 Device master and type files (GSD)

A device master file (GSD) contains a description of the properties of a PROFIBUS-PA device, e.g. what data transmission rate the device supports or what digital information the PLC gets from the device and in what format. Bitmap files also belong to the GSD files. These allow the measuring points to be represented as a graphic. The device master file and corresponding bitmaps are required to plan the PROFIBUS-DP network.

Every device is allocated an ID number by the PROFIBUS User Organization (PNO). The name of the device master file (GSD) is derived from this. For Endress+Hauser, this ID number always starts with "15XX", where "XX" stands for the device name.

Name of device	ID No.	GSD	Type file	Bitmaps
Cerabar M	151C (hex)	EH3x151C.gsd	EH3151Cx.200	EH151C_d.bmp EH151C_n.bmp EH151C_s.bmp

The full set of GSD files for all Endress+Hauser devices can be obtained as follows:

- Internet:
  - Endress+Hauser → http://www.de.endress.com
    Products Product program → Process Solutions → PROFIBUS GSD files
  - PNO → http://www.de.PROFIBUS.com (GSD library)
- CD-ROM
  - Directly from Endress+Hauser: order no. 56003894

Note!
The PNO provides a universal database file called PA_x9700.gsd for devices with one Analog Output Block. This file supports the transmission of the primary measured value. This database file does not support the transmission of a second measured value (2nd cyclic value) or a display value (Display value). The universal profile must be selected via matrix field V6H0 in Commuwin II.

6.3.1 Working with GSD files

The GSD files must be loaded into a specific subdirectory in the PROFIBUS-DP network design software of your PLC.

- GSD files and bitmaps that are located in the "Extended" directory are used, for example, for the configuration software STEP7 of the Siemens S7-300/400 PLC family.
- x.200 files and bitmaps that are located in the "Typdat5x" directory are used for the configuration software COM ET200 with Siemens S5.
- GSD files that are located in the "Standard" directory
  are for PLCs that support the "identifier byte" (0x94) but not the "identifier format". They can be used with an Allen-Bradley PLC5, for example.

More details about the directories used for storing the GSD files can be found in the Operating Instructions BA198F.

6.4 Cyclic data exchange (Data_Exchange)

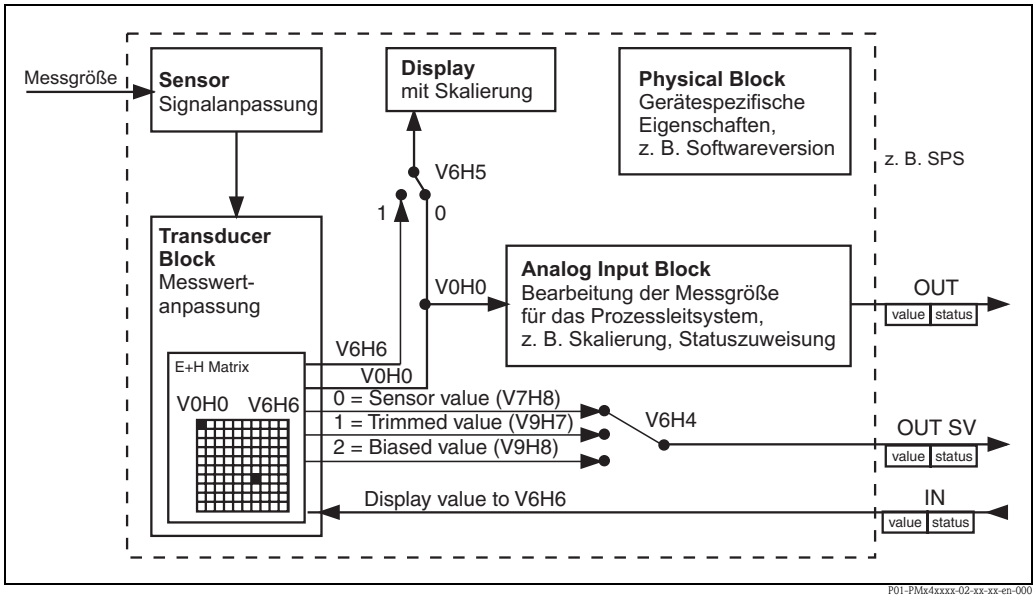


Fig. 25: Block model for Cerabar M with PROFIBUS-PA Profile 3.0
The values in brackets indicate the matrix position in the operating program.

6.4.1 Block model

The block model of a Cerabar M is shown in → Fig. 25. The primary measured value V0H0 is transferred from the Transducer Block to the Analog Input Block. Here, the measured value is scaled and limit values added before being output to the PLC as the variable OUT during cyclic data communication. A value and the related status is transmitted with the variable OUT.

The onsite display and the matrix field V0H0 normally show the same value. However, a cyclic output value (Display value) can also be made available to the onsite display via a PLC. For this, the matrix field V6H5 in Commuwin II must be set to "Display Value" or "1". Example: Two Cerabar M transmitters measure the pressure drop across a filter. The differential pressure is registered in the PLC and then allocated to the matrix field V6H6.

A Cerabar M can output a secondary value to the PLC. A value can be selected via the field V6H4 in Commuwin II.

6.4.2 Configuration

The data exchange must be configured via a network design tool and a operating program.

1. Use the network design tool for your PLC and add the Cerabar M to the network. Ensure that the address assigned corresponds to the set device address.
2. Select Cerabar M and start the configuration program. Four options appear: "Main process value", "2nd cyclic value", "Display value" and "FREE PLACE".
3. Select "Main process value". If no other values are required, close the configuration window, otherwise
4. Select "2nd cyclic value" or "FREE PLACE" (= function disabled) and select "Display value" or "FREE PLACE" (= function disabled). Then close the configuration window.
5. Start operating program and establish the connection to the bus using the server PA-DPV1 (Commuwin II) or PROFIdtmDPV1 (FieldCare). Then generate a live list, locate the device address and click Cerabar M.
6. Open the device menu. Select the operating matrix (Commuwin II only).
7. If required, select a secondary measured value via the matrix field V6H4:

0 = Sensor value, 1 = Trimmed value, 2 = Biased value.

8. To display a cyclic output value (Display value) on the onsite display, set V6H5 = "Display value" (or "1").
9. The data exchange is now configured for this Cerabar M.

6.4.3 Cerabar M → PLC (input data)

With the Data_Exchange service, a PLC can read the input data from a Cerabar M in the response telegram. The cyclic data telegram has the following structure.

Input data index	Data	Access	Data format/comments
0, 1, 2, 3	Pressure primary value	Read	32-bit floating point number (IEEE-754)
4	Status code for primary value	Read	See status codes
5, 6, 7, 8	Secondary value, Sensor value, Trimmed value or Biased value	Read	32-bit floating point number (IEEE-754)
9	Status code for secondary value	Read	See status codes

6.4.4 PLC→ Cerabar M (output data)

The output data from the PLC to the onsite display have the following structure:

Output data index	Data	Access	Data format/comments
0, 1, 2, 3	Display value	Write	32-bit floating point number (IEEE-754)
4	Status code	Write	See status codes for secondary value

6.4.5 Status codes

The following status codes are supported by the Cerabar M for the measured value and secondary measured value:

Status code	Device status	Meaning	Primary value	Secondary measured value
0F Hex	BAD	Non-specific	x	x
1F Hex	BAD	Out of service (target mode)	x	
47 Hex	UNCERTAIN	Last valid value (failsafe mode active)	x	
4B Hex	UNCERTAIN	Substitute quantity (failsafe mode active)	x	
4F Hex	UNCERTAIN	Initial value (failsafe mode active)	x	
5C Hex	UNCERTAIN	Configuration error (limits not set correctly)	x	
80 Hex	GOOD	OK	x	x
84 Hex	GOOD	Active block alarm (static revision has been increased)	x	
89 Hex	GOOD	LOW:LIM (alarm active)	x	
8A Hex	GOOD	HI_LIM (alarm active)	x	
8D Hex	GOOD	LOW_LOW_LIM (alarm active)	x	
8E Hex	GOOD	HI_HI_LIM (alarm active)	x	
0F Hex	BAD	Non-specific	x	x

6.5 Acyclic data exchange

The device parameters in the Physical Block, Transducer Block and Analog Input Block, see → Fig. 25, and in the device management PROFIBUS-DP Class 2 master can be accessed using the acyclic service. → Fig. 26 and → Fig. 27 show block models of the Transducer Block and Analog Input Block. A full description of the device management, standard parameters and the Physical Block can be found in the Operating Instructions BA198F.

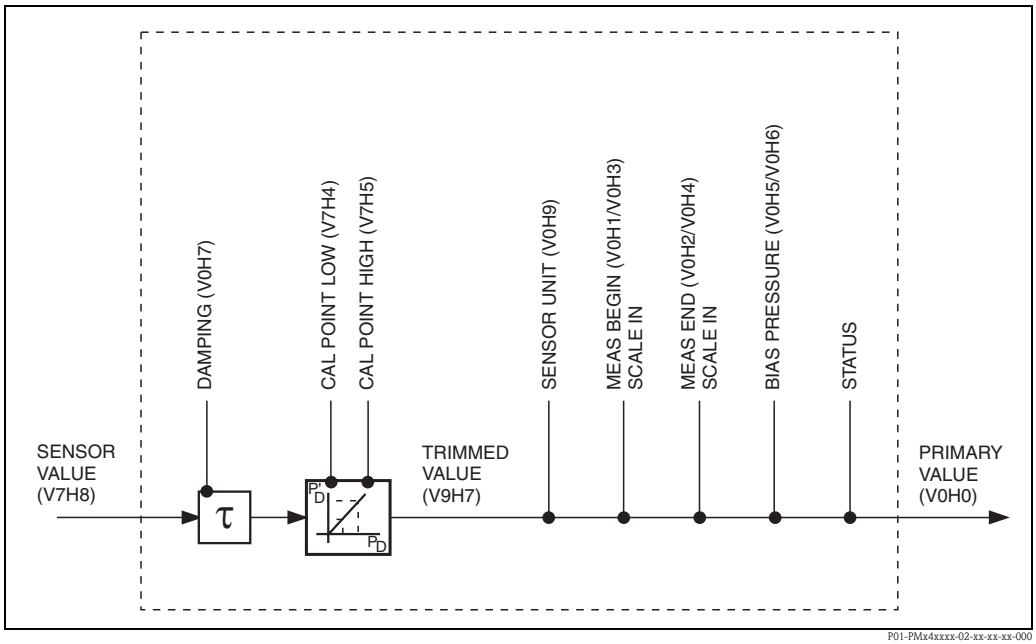


Fig. 26: Schematic diagram of the Cerabar M Transducer Block
Parameters with information on a matrix position (in brackets) can also be accessed using Commuwin II.

Note!
As standard, the OUT value is transmitted in the unit specified on the nameplate.

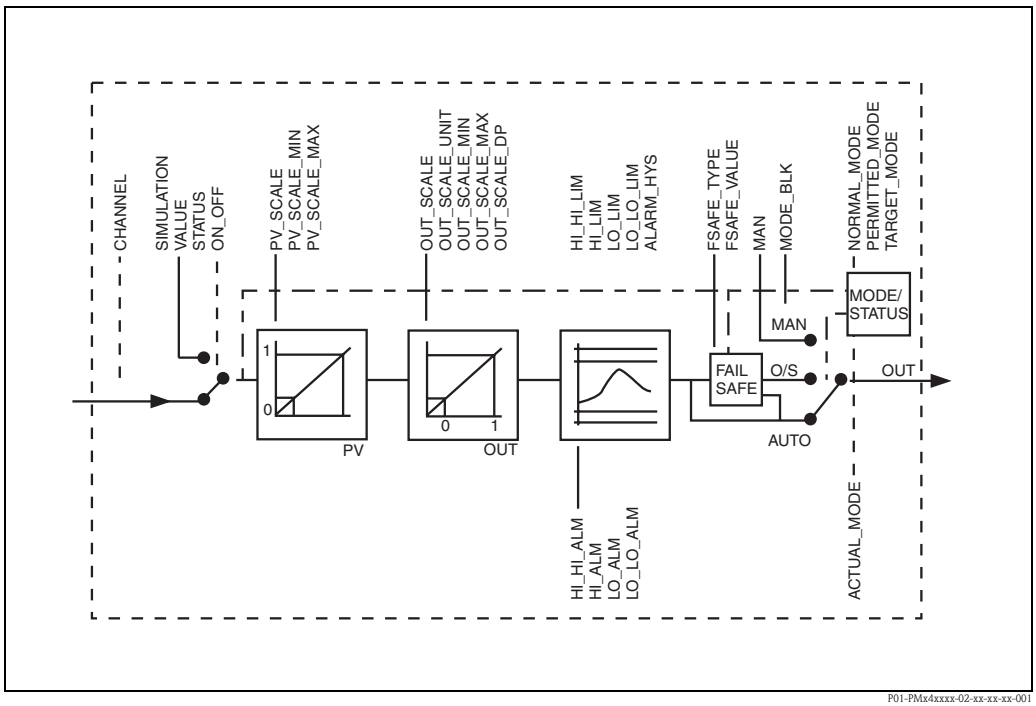


Fig. 27: Schematic diagram of the Cerabar M Analog Input Block

6.5.1 Slot/index table

The device parameters are listed in the following tables. The parameters are accessed via the slot and index number. The Analog Input Block, Transducer Block and Physical Block contain standard parameters, block parameters and manufacturer-specific parameters.

If Commuwin II is the operating program used, then the matrix field and the graphic operation are available as the user interface. As soon as the standard operating parameters are made available to a device block, every parameter change is automatically displayed in the block parameters. The dependencies are listed in the "E+H matrix" column. See also → Fig. 26 and → Fig. 27.

6.5.2 Device management

Parameter	E+H matrix/ parameter	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
Directory object header		1	0	12	Array of UNSIGNED16	X		C
Composite list directory entries		1	1	24	Array of UNSIGNED16	X		C
GAP directory continuous		1	2-8					
GAP reserved		1	9-15					

6.5.3 Analog Input Block

Parameter	E+H matrix/ parameter	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
AI Block data		1	16	20	DS-32[1)]	X		C
Static revision		1	17	2	UNSIGNED16	X		N
Device tag	VAH0	1	18	32	OSTRING	X	X	S
Strategy		1	19	2	UNSIGNED16	X	X	S
Alert key		1	20	1	UNSIGNED8	X	X	S
AI Target mode		1	21	1	UNSIGNED8	X	X	S
AI Mode block		1	22	3	DS-37[1)]	X		D/N/C
AI Alarm summary		1	23	8	DS-42[1)]	X		D
Batch		1	24	10	DS-67[1)]	X	X	S
Gap		1	25					
Block parameters								
OUT	V6H2/3	1	26	5	DS-33[1)]	X		D
PV scale		1	27	8	Array of FLOAT	X	X	S
OUT scale		1	28	11	DS-36[1)]	X	X	S
Linearization type		1	29	1	UNSIGNED8	X	X	S
Channel		1	30	2	UNSIGNED16	X	X	S
Gap		1	31					
PV FTIME		1	32	4	FLOAT	X	X	S
Fail safe type		1	33	1	UNSIGNED8	X	X	S
Fail safe value		1	34	4	FLOAT	X	X	S
Alarm Hysteresis		1	35	4	FLOAT	X	X	S
Gap		1	36					
HI HI Limit		1	37	4	FLOAT	X	X	S

Parameter	E+H matrix/ parameter	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
Gap		1	38					
HI Limit		1	39	4	FLOAT	X	X	S
Gap		1	40					
LO Limit		1	41	4	FLOAT	X	X	S
Gap		1	42					
LO LO Limit		1	43	4	FLOAT	X	X	S
Gap		1	44-45					
HI HI Alarm		1	46	16	DS-39[1)]	X		D
HI Alarm		1	47	16	DS-39[1)]	X		D
LO Alarm		1	48	16	DS-39[1)]	X		D
LO LO Alarm		1	49	16	DS-39[1)]	X		D
Simulate		1	50	6	DS-50[1)]	X	X	S
OUT unit text		1	51	16	OSTRING	X	X	S
Gap reserved		1	52-60					
Gap		1	61-65					

1) → See Page 37 ff., Section 6.6.2 "Data strings"
C = constant, N = nonvolatile (remains stored), S = static (revision counter incremented by 1), D = dynamic

6.5.4 Physical Block

Parameter	E+H matrix/ parameter	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
Standard parameters								
PB Block data		1	66	20	DS-36[1)]	X		C
Static revision		1	67	2	UNSIGNED16	X		N
Device tag	VAH0	1	68	32	OSTRING	X	X	S
Strategy		1	69	2	UNSIGNED16	X	X	S
Alert key		1	70	1	UNSIGNED8	X	X	S
PB Target mode		1	71	1	UNSIGNED8	X	X	S
PB Mode block		1	72	3	DS-37[1)]	X		D/N/C
PB Alarm summary		1	73	8	DS-42[1)]	X		D
Block parameters								
Software revision	V6H2/3	1	74	16	OSTRING	X		C
Hardware revision		1	75	16	OSTRING	X		C
Device manufacturer identity		1	76	2	UNSIGNED16	X		C
Device identity		1	77	16	OSTRING	X		C
Device serial number	VAH2	1	78	16	OSTRING	X		C
Diagnosis		1	79	4	OSTRING	X		D
Diagnosis extension		1	80	6	OSTRING	X		D
Diagnosis mask		1	81	4	OSTRING	X		C
Diagnosis mask extension		1	82	6	OSTRING	X		C
Device certification		1	83	32	OSTRING	X		N
Security locking	V9H9	1	84	2	UNSIGNED16	X	X	N

Parameter	E+H matrix/ parameter	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
Factory reset	V9H2	1	85	2	UNSIGNED16		X	S
Descriptor		1	86	32	OSTRING	X	X	S
Device message	VAH1	1	87	32	OSTRING	X	X	S
Device installation date		1	88	16	OSTRING	X	X	S
Gap reserved		1	89					
Identification number	V6H0	1	90	1	UNSIGNED8	X	X	S
HW write protection		1	91	1	UNSIGNED16	X		D
Gap reserved		1	92-98					
Gap		1	99-103					
Matrix error code	V2H0	1	104	2	UNSIGNED16	X		D
Matrix last error code	V2H1	1	105	2	UNSIGNED16	X	X	D
UpDown features supported		1	106	1	OSTRING	X		C
UpDown control		1	107	1	UNSIGNED8		X	D
UpDown data		1	108	20	OSTRING	X	X	D
Bus address	V9H4	1	109	1	UNSIGNED8	X		D
Matrix device software number	V2H2	1	110	2	UNSIGNED16	X		C
PA set unit to bus	V6H1	1	111	1	UNSIGNED8	X	X	S
PA input value	V6H6	1	112	6	FLOAT+U8+U8	X		D
PA select V0H0	V6H5	1	113	1	UNSIGNED8	X	X	S
PA profile revision	V6H7	1	114	16	OSTRING	X		C
Gap		1	115-119					
PA select second cyclic value	V6H4	1	120	1	UNSIGNED8	X	X	S
PA identity number		1	121	2	UNSIGNED16	X		D
PA identity string		1	122	32	OSTRING	X		C
PA DP status		1	123	1	UNSIGNED8	X		D
Gap		1	124-128			X		

1) See Section 6.6, "Data strings" section or PROFIBUS-PA Specification Part 1
C = constant, N = nonvolatile (remains stored), S = static (revision counter incremented by), D = dynamic

6.5.5 View_1 parameters

Parameter	E+H matrix/ parameter	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
View 1 Physical block		1	205	17	OSTRING	X		D/N/C
Gap reserved		1	206-210					
View 1 Transducer block		1	211	22	OSTRING	X		D/N/C
Gap reserved		1	212-216					
View 1 Analog Input block		1	217	18	OSTRING	X		D/N/C
Gap reserved		1	218-222	18				

6.5.6 Transducer Block

Parameter	E+H matrix	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
Standard parameters								
TB Block data		1	129	20	DS-32[1)]	X		C
Static revision		1	130	2	UNSIGNED16	X		N
Device tag	VAH0	1	131	32	OSTRING	X	X	S
Strategy		1	132	2	UNSIGNED16	X	X	S
Alert key		1	133	1	UNSIGNED8	X	X	S
TB Target mode		1	134	1	UNSIGNED8	X	X	S
TB Mode		1	135	3	DS-37[1)]	X		D/N/C
TB Alarm summary		1	136	8	DS-42[1)]	X		D
Block parameters								
Sensor value	V7H8	1	137	4	FLOAT	X		D
Sensor high limit	V7H7	1	138	4	FLOAT	X		N
Sensor low limit	V7H6	1	139	4	FLOAT	X		N
Calibration point high	V7H5	1	140	4	FLOAT	X	X	S
Calibration point low	VAH4	1	141	4	FLOAT	X	X	S
Calibration minimum span		1	142	4	FLOAT	X		N
Sensor unit	V0H9	1	143	2	UNSIGNED16	X	X	N
Trimmed value	V9H7	1	144	5	DS-33[1)]	X		D
Sensor type		1	145	2	UNSIGNED16	X		N
Sensor serial number	VAH3	1	146	4	UNSIGNED32	X		N
Primary value	V0H0	1	147	5	DS-33[1)]	X		N
Primary value unit	V0H9	1	148	2	UNSIGNED16	X	X	S
Primary value type		1	149	2	UNSIGNED16	X	X	S
Gap		1	150-157					S
Secondary value 1		1	158	5	DS-33[1)]	X		S
Secondary value 1 unit	V0H9	1	159	2	UNSIGNED16	X	X	
Secondary value 2		1	160	5	DS-33[1)]	X		S
Secondary value 2 unit	V0H9	1	161	2	UNSIGNED16	X	X	D
Linearization		1	162	1	UNSIGNED8	X	X	
Scale in	V0H1/2	1	163	2*4	Array of FLOAT	X	X	
Gap		1	164-177					D
Gap reserved		1	178-187					D
Endress+Hauser parameters								
Measure begin	V0H1	1	188	4	FLOAT	X	X	S
Measure end	V0H2	1	189	4	FLOAT	X	X	S
Automatically measure begin	V0H3	1	190	1	UNSIGNED8	X	X	S
Automatically measure end	V0H4	1	191	1	UNSIGNED8	X	X	S
Bias pressure	V0H5	1	192	4	FLOAT	X	X	S
Automatically bias pressure	V0H6	1	193	1	UNSIGNED8	X	X	S
Damping	V0H7	1	194	4	FLOAT	X	X	S
Sensor tab index	V2H7	1	195	1	UNSIGNED8	X	X	S

Parameter	E+H matrix	Slot	Index	Size (bytes)	Type	Read	Write	Storage class
Sensor tab value	V2H8	1	196	4	FLOAT	X	X	S
Sensor trim off	V9H5	1	197	4	FLOAT	X		S
Sensor trim off value	V9H6	1	198	4	FLOAT	X		S
Biased pressure	V9H8	1	199	4	FLOAT	X		D
Gap	VAH6	1	200-204					

1) → See Page 37 ff., Section 6.6.2 "Data strings"
C = constant, N = nonvolatile (remains stored), S = static (revision counter incremented by 1), D = dynamic

6.6 Data format

6.6.1 IEEE 754 format

The measured value is transmitted as an IEEE -754 floating point number, whereby:

Measured value = $(-1)^{sign} \times 2^{(E-127)} \times (1+F)$

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Sign	Exponent (E)								Fraction (F)						
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}
Fraction (F)															
2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}

Example
40 F0 00 00 hex = 0**100 0000 1**111 0000 0000 0000 0000 0000 binary

Value = $(-1)^0 \times 2^{(129-127)} \times (1 + 2^{-1} \times 2^{-2} \times 2^{-3})$
= $1 \times 2^2 \times (1 + 0.5 \times 0.25 \times 0.125)$
= $1 \times 4 \times 1.875$
= 7.5

Note!
- Not all PLCs support the IEEE 754 format. If this is the case, a conversion module must be used or written.
- Depending on the type of data storage used in the PLC (master) - (most significant byte or low significant byte) - the byte sequence might have to be altered (byte swapping routine).

6.6.2 Data strings

Some data types, e.g. DS-36, are marked with an asterisk in the slot/index table (→ see Page 33, Section 6.5.1 "Slot/index table"). These data types are data strings that are structured according to the PROFIBUS-PA Specification Part 1, Version 3.0. They comprise several elements that are addressed via the slot, index and subindices, as shown in the following two examples:

Parameter type	Slot	Index	Element	Subindex	Type	Size
DS-33	1	26	OUT Value	1	FLOAT	4
			OUT Value	1	FLOAT	4

Parameter type	Slot	Index	Element	Subindex	Type	Size
DS-36		27	OUT Scale Max.	1	FLOAT	4
			OUT Scale Min.	5	FLOAT	4
			OUT Scale Unit.	9	UNSIGNED16	2
			OUT Scale DP (decimal point.)	11	INTEGER8	1

6.7 Configuration of parameter profiles

You can access the block parameters via a PROFIBUS-DP Class 2 master, such as Commuwin II/ FieldCare. Commuwin II/FieldCare runs on an IBM-compatible computer or laptop. The computer must be equipped with a PROFIBUS interface, i.e. PROFIBOARD for PCs and PROFICARD for laptops. During the system integration, the computer is registered as a Class 2 master.

6.7.1 Operation via FieldCare

The operating of FieldCare are described in the integrated FieldCare online help.
The PROFIdtmDPV1 server has to be installed for operation.

6.7.2 Operation via Commuwin II

The PA-DPV1 server has to be installed for operation. Then establish the connection to Commuwin II via this server.
- Generate a live list with "tags".
- Select the E+H device operation by clicking the device name, e.g. Cerabar M.
- Select profile operation by clicking the appropriate tag, e.g. AI: PIC 209 = Analog Input Block Cerabar M or by selecting the related device profile in graphic operation.
- The settings are then entered in the "Device parameter" menu.

Device parameter menu

The "Device parameter" menu in Commuwin II offers you two operating modes, namely "Matrix operation" and "Graphic operation".

- During matrix operation, the device or profile parameters are loaded to a matrix. A parameter can be changed when the corresponding matrix field is selected.
- In the case of graphic operation, the operating sequence is shown in a series of graphics with parameters. For profile operation, the Diagnosis, Scaling, Simulation and Block graphics are of interest.

Output scaling

The Cerabar M onsite display and the digital output operate completely independently of each other. As standard, the output value (OUT value) is transmitted in the unit specified on the nameplate.

Digital output value (Out value) = display value of the onsite display

The following operating options are available so that the display and the digital output produce the same value:

- Set the values for the lower and upper limit of PV scale and OUT scale in the Analog Input Block as equal; PV Scale min. = OUT Scale min. and PV Scale max. = OUT Scale max. See also (→ see Page 33, Section 6.5.1 "Slot/index table") and Section 11.1 "Matrix for Analog Input Block (AI Transmitter)",
- Scale the limits of PV scale and OUT scale in Commuwin II in the graphic mode, see illustration below or
- Confirm the "Set unit to bus" parameter in accordance with Section 7.3, "Selecting a pressure unit" section. Confirming this parameter automatically sets the PV scale and OUT scale limits to the same value.

Digital output value (Out value) ≠ display value of the onsite display

If you require an output value for your PLC that is scaled differently than the display value on the onsite display, the following operating options are available:

- Set the values for the lower and upper limit for PV scale and OUT scale in the Analog Input Block as per the requirements, (→ see Page 33, Section 6.5.1 "Slot/index table") and Section 11.1 "Matrix for Analog Input Block (AI Transmitter)" or
- Scale the limits of PV scale and OUT scale in Commuwin II in the graphic mode, see illustration below.

Note!
If you wish to perform position adjustment using bias pressure for the value indicated on the onsite display (see Section 7.3 "Position adjustment - only display (bias pressure)") this must be done before changing the values for OUT scale min. and OUT scale max.

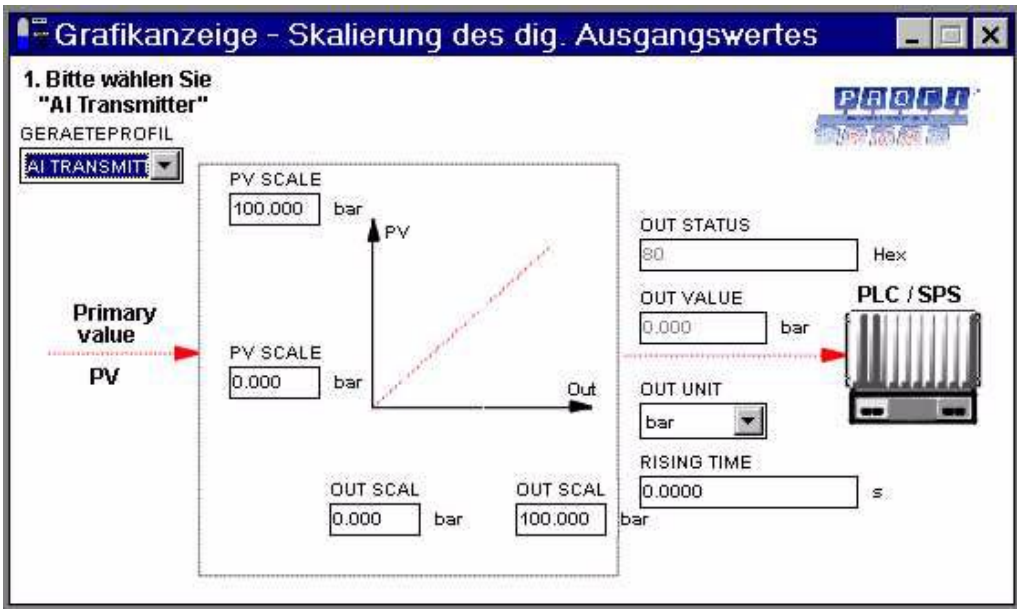


Fig. 28: Scaling the Out value via graphic operation in Commuwin II

7 Commissioning

The Cerabar M is ready for measurement immediately. The measuring range corresponds to the information on the nameplate. As standard, the pressure applied is transmitted via PROFIBUS-PA in the unit specified on the nameplate. The measured value is transmitted in the unit "bar" following a "5140" reset in the V2H9 matrix field (→ see Page 50, Section 9.5 "Reset").
There is no turndown in the conventional sense for PROFIBUS-PA digital signal transmission. The measured value is transmitted with a resolution corresponding to an accuracy of 0.2 %.

7.1 Function check

Carry out a post-installation and a post-connection check as per the checklist before commissioning the device.

- "Post-installation check" checklist (→ see Page 18, Section 3.4 "Post-installation check")
- "Post-connection check" checklist (→ see Page 23, Section 4.5 "Post-connection check")

7.2 Onsite commissioning

7.2.1 Preparatory work

- Connect the Cerabar M, → see Page 19, Section 4.1 "Electrical connection".
- Ensure that a pressure can be specified within the required measuring range.

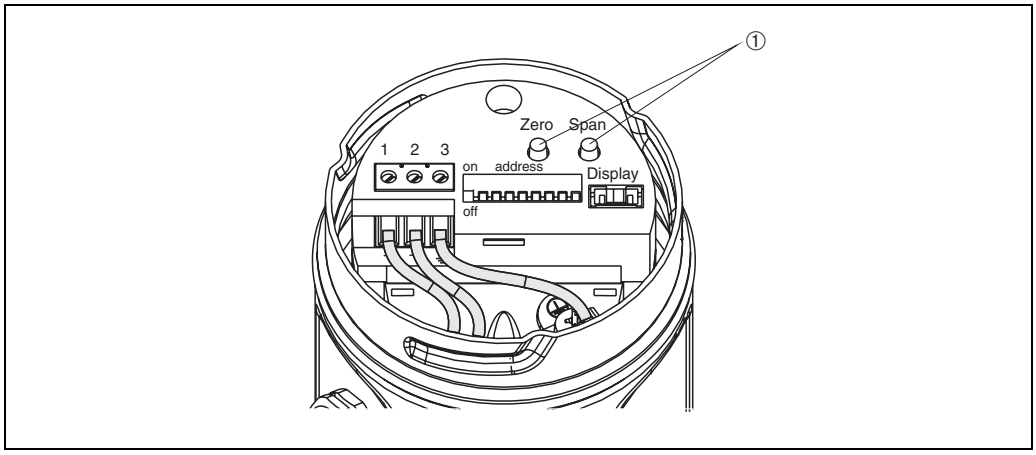


Fig. 29: ① *Position of keys for calibrating lower and upper-range value*

Example:
Zero key 1 x = display lower-range value, 2 x = accept lower-range value
Span key 1 x = display upper-range value, 2 x = accept upper-range value

Note!
Use the "Zero" and "Span" keys to set the lower-range value and upper-range value of the bar graph in the display module. These settings do not have any effect on the digital output value (OUT value) and the "measured value" in the matrix field V0H0.

7.2.2 Lower-range value calibration

Calibration of the lower-range value is carried out using the "Zero" key.
Proceed as follows when calibrating the lower-range value:
- Specify the exact pressure for the lower-range value.
- Press the Zero key twice.
  The acting pressure is adopted as the lower-range value.
  By pressing the Zero key once the value saved as the lower-range value can be output on the onsite display.

7.2.3 Upper-range value calibration

Calibration of the upper-range value is carried out using the "Span" key.
Proceed as follows when calibrating the upper-range value:
- Specify the exact pressure for the upper-range value.
- Press the Span key twice.
  The acting pressure is adopted as the upper-range value.
  By pressing the Span key once the value saved as the upper-range value can be output on the onsite display.

7.3 Commissioning and operation

7.3.1 Preparatory work

Connect the Cerabar M, see Section 4.1Electrical connection.

7.3.2 Endress+Hauser operating program

The calibration is performed via parameters with FieldCare or operating matrix with Commuwin II:

Matrix field/ parameter	**Meaning**
V0H1	Entry of pressure for lower-range value (only affects the bar graph in the display module)
V0H2	Entry of pressure for upper-range value (only affects the bar graph in the display module)
V0H3	Acting pressure is taken as lower-range value, (only affects the bar graph in the display module)
V0H4	Acting pressure is taken as upper-range value, (only affects the bar graph in the display module)
V0H5	Entry of bias pressure (only affects the display module and the matrix fields V0H0, V0H1 and V0H2)
V0H6	Acting pressure is taken as bias pressure (only affects the display module and the matrix fields V0H0, V0H1 and V0H2)
V0H7	Enter damping τ (0 to 40 s)
V0H9	Pressure unit can be selected: mbar, bar, Pa, hPa, kPa, MPa, mm H_2O, m H_2O, in H_2O, ft H_2O, psi, g/cm^2, kg/cm^2, kgf/cm^2, atm, lb/ft^2, torr, mm Hg, in Hg
V6H1	Various pressure units can be selected via V0H9. The pressure-specific parameters are converted and displayed with the selected unit in Commuwin II/FieldCare. V6H1 must be confirmed to transfer the converted values on the bus, see "Selecting pressure unit" section.
V9H5	Position adjustment, see "Zero point correction" section.

7.3.3 Reset to factory setting (reset)

By entering a certain code, the entries in the matrix are reset partially or completely to the factory settings. Further information on the various types of reset and their effects is given in Section 9.5 "Reset".

#	Matrix (VH position)/ parameter	Meaning	Entry
	V2H0	Reset to factory values	e.g. 2380

7.3.4 Damping τ (integration time)

The damping τ affects the speed at which the output signal and the onsite display react to changes in pressure.

#	Matrix (VH position)/ parameter	Meaning	Entry
	V0H7	Damping (s) (0 to 40 s)	e.g. 30

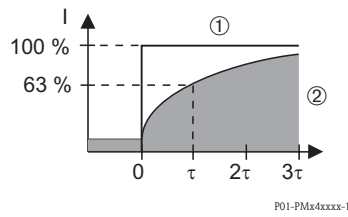


Fig. 30: ① *Jump in pressure.* ② *Output signal.*

7.3.5 Selecting a pressure unit

You can select a pressure unit using the "Select pressure unit" parameter (V0H9), (see table below). If you select a new pressure unit in V0H9, all pressure-specific parameters are converted and displayed in Commuwin II with the new pressure unit.

#	Matrix (VH position)/ parameter	Meaning	Entry
1	All pressure-specific parameters are given in pressure unit "bar", e.g. measured value V0H0 = 1 bar.		
2	V0H9	Select new pressure unit	e.g. psi
3	All pressure-specific parameters are given in pressure unit "psi", e.g. measured value V0H0 = 14.5 psi.		

Unit	Unit	Unit	Unit	Unit
mbar	kPa	in H_2O	kg / cm^2	Torr
bar	MPa	ft H_2O	kgf / cm^2	mm Hg
Pa	mm H_2O	psi	atm	in Hg
hPa	m H_2O	g / cm^2	lb / ft^2	

Note!
As standard, the measured value is transferred via the bus in the pressure unit given on the nameplate. For the digital output value and the measured value in the matrix field V0H0 to display the same value – even after selecting a new pressure unit – you must confirm the "Set unit to bus" parameter in V6H1 once. Note that a change of the digital output value can influence the controller.

#	Matrix (VH position)/ parameter	Meaning	Entry
1	e.g. measured value V0H0 = 1 bar		
2	V0H9	Select new pressure unit	e.g. psi
3	Display measured value V0H0 = 14.5 psi Value 1 is still transmitted via the bus. V6H2 displays: 1.0 UNKNOWN		
4	V6H1	V6H2 displays: 14.5 psi	Press Enter to confirm "Set unit to bus"
5	Value 14.5 is now transmitted via the bus.		

Note!
The "Lower-range value" (V0H1/V0H3) and "Upper-range value" (V0H2/V0H4) parameters set the bar graph in the display module. These settings do not have any effect on the digital output value (OUT value) or the "measured value" in the matrix field V0H0.

7.3.6 Calibration without reference pressure

A pressure is entered for the lower-range value and upper-range value. No particular pressure must be acting.

#	Matrix (VH position)/ parameter	Meaning	Entry
1	V0H9	Select pressure unit	e.g. bar
2	V3H0	Select "Pressure" operating mode	"Pressure"
3	V0H1	Lower-range value	e.g. 0.0
4	V0H2	Upper-range value	e.g. 1.0
5	e.g. current measured value (V0H0) = 0.7 bar		

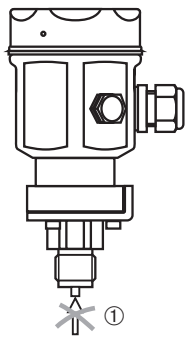


Fig. 31: ① No reference pressure

7.3.7 Calibration with reference pressure

A reference or process pressure present is accepted as the lower-range or upper-range value.

#	Matrix (VH position)/ parameter	Meaning	Entry
1	V0H9	Select pressure unit	e.g. bar
2	V3H0	Select "Pressure" operating mode	"Pressure"
3	Specify the exact pressure for the lower-range value.		
4	V0H3	Accept the pressure applied for the lower-range value	Confirm with "Enter".
5	Specify the exact pressure for the upper-range value.		
6	V0H4	Accept the pressure applied for the upper-range value	Confirm with "Enter".
7	e.g. current measured value (V0H0) = 0.7 bar		

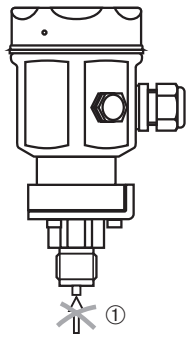
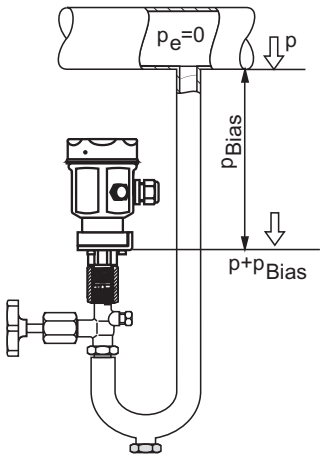


Fig. 32: ① No reference pressure

7.3.8 Position adjustment - only display (bias pressure)

If the display does not show zero after calibrating the zero point at zero operating pressure (position-dependent), the display value can be corrected to zero by entering or adopting a bias pressure (position adjustment).

#	Matrix (VH position)/ parameter	Meaning	Entry
1	V0H5	Enter bias pressure	e.g. 0.1
2	Where necessary, set the display value and output value (OUT value) as equal.		
	V6H1	Set the display value and output value as equal	Confirm with "Enter".
Accept a bias pressure present			
1	V0H6	Accept the pressure applied as the bias pressure	Confirm with "Enter".
2	Where necessary, set the display value and output value (OUT value) as equal.		
	V6H1	Set the display value and output value as equal	Confirm with "Enter".



7.3.9 Zero point correction

The "Zero offset" (V9H5) parameter offers a further possibility of carrying out position adjustment. In contrast to position adjustment using bias pressure (V0H5/V0H6), the digital output value (OUT value) is also corrected in addition to the display value on the onsite display (measured value (V0H0)). When carrying out a zero offset, an applied pressure is assigned a correction value via "Zero offset" (V9H5). This shifts the sensor characteristic curve according to the diagram and the "Low sensor cal" (V7H4) and "High sensor cal" (V7H5) values are recalculated. The "Zero offset value" (V9H6) matrix field indicates the value by which the sensor characteristic curve was shifted.

The value is calculated as follows for "Zero offset value" (V9H6):
- Zero offset value (V9H6) = Sensor pressure (V7H8) – Zero offset (V9H5)

The "Sensor pressure" (V7H8) displays the pressure currently applied.

Main group: Basic calibration

#	Matrix (VH position)/ parameter	Meaning	Entry
1	▪ Display measured value (V0H0) = 0.03 bar (position-dependent pressure) ▪ OUT value (V6H2) = 0.03 ▪ Lower-range value (V0H1) is set to 0.0 bar		
2	Pressure for zero point correction is applied: Sensor pressure (V7H8) = 0.03 bar (corresponds to the pressure-dependent pressure)		
3	V9H5	The value 0.0 is assigned to the pressure present.	0.0
4	After entering information for the "Zero offset" (V9H5) parameter, the parameters show the following values: ▪ Zero offset value (V9H6): V9H6 = V7H8 – V9H5 V9H6 = 0.03 bar – 0.0 bar V9H6 = 0.03 bar ▪ Measured value (V0H0) = 0.0 bar V6H2 = 0.0		

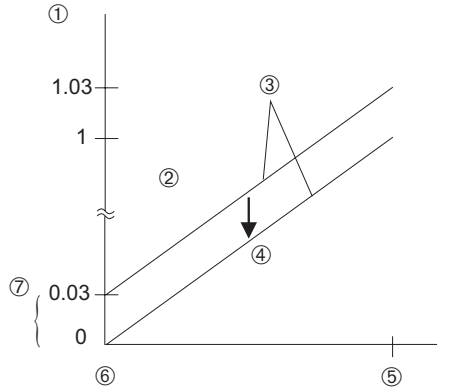


Fig. 33:
① *Pressure e.g. [bar]*
② *Before zero point correction*
③ *Sensor characteristic curve*
④ *After zero point correction*
⑤ *High sensor cal (V7H5)*
⑥ *Low sensor cal (V7H4)*
⑦ *Value for zero point correction (V9H6)*

7.4 Locking/unlocking operation

After calibrating or entering all the parameters, the operation can be locked by entering a code. As the code, enter any number from 1 to 9998, (except 130 and 2457).

#	Matrix (VH position)/ parameter	Meaning	Entry
1	V9H9	Lock operation	e.g. 131
2	V9H9	Unlock operation	130 or 2457

7.5 Information on the measuring point

The following information about the measuring point can be read via Commuwin II/FieldCare:

Matrix field/ parameter	Display or entry
Measured values	
V0H0	Primary value: pressure
V6H2/V6H3	OUT value, OUT status (Analog Input Block)
V7H8	Sensor pressure (unit in V0H9) can be selected
V9H7	Current damped pressure without bias correction
Sensor data	
V7H4	Low sensor calibration Lower calibration pressure (unit can be selected in V0H9)
V7H5	High sensor calibration Upper calibration pressure (unit can be selected in V0H9)
V7H6	Low sensor limit (unit can be selected in V0H9)
V7H7	High sensor limit (unit can be selected in V0H9)
Information on the transmitter	
V2H2	Software number
V2H7	Sensor data number: Number of the entry in the sensor table (1 to 11). Please take from sensor pass.
V2H8	Sensor data value: Entry in sensor table, contains all sensor-specific data. Please take from sensor pass.
Error response mode	
V2H0	Current diagnostic code
V2H1	Last diagnostic code

7.5.1 User information

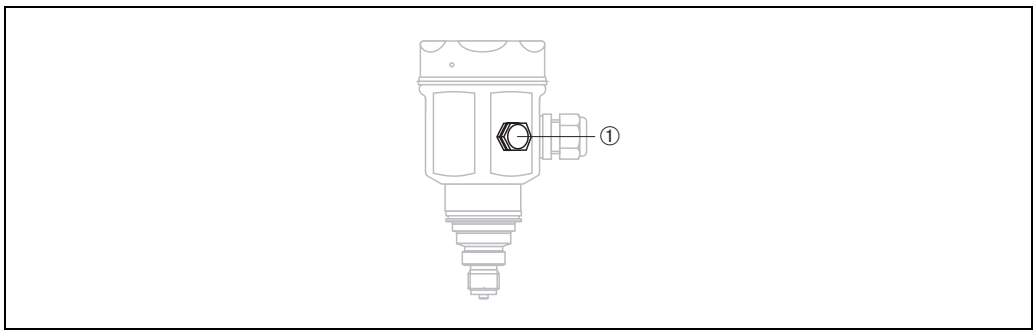
The VAH0 and VAH1 fields give you the option of saving additional information on the measuring point and measuring device. The serial number of the device and that of the sensor are saved in the VAH2 and VAH3 matrix fields/parameters.

Matrix field/parameter	Display
VAH0[1)]	Name of the measuring point.
VAH1 [1)]	User text (Physical Block)
VAH2 [1)]	Device serial number
VAH3 [1)]	Sensor serial number

1) Enter up to 32 characters (ASCII)

8 Maintenance

Keep the pressure compensation and GORE-TEX® filter ① free from dirt.



P01-PMx4xxxx-17-xx-xx-xx-001

8.1 Exterior cleaning

Please note the following points when cleaning the device:
- The cleaning agents used should not corrode the surface and the seals.
- Mechanical damage to the diaphragm, e.g. due to pointed objects, must be avoided.
- Observe the degree of protection. Where applicable, see → Page 7, Section 2.1.1, "Nameplates".

9 Troubleshooting

9.1 Fault

If the Cerabar M detects an error, the following occurs:
- An error code is generated and flashes on the onsite display
- When the onsite display is connected, the bar graph accepts the selected value for the error message (MIN, MAX, CONTINUE)
- The display value and the bar graph flash
- Error codes can be read in the "Transmitter information" main group or in matrix fields V2H0 and V2H1

9.2 Warning

If the Cerabar M detects a warning, the following occurs:
- An error code is generated: Cerabar M continues to measure
- The scale flashes when the onsite display is connected
- Error codes can be read in the transmitter information main group or in matrix fields V2H0 and V2H1.

9.3 Error codes in V2H0 and V2H1

If several errors occur simultaneously, the sequence in which they are displayed corresponds to their order of priority.

Code	Type	Cause and remedial action	Priority
E101	Fault	Sensor table checksum error ■ Appears when the sensor data are being entered. The error message disappears when the sensor data are entered completely and correctly. ■ The checksum is not correct. Check sensor data – see "Sensor data no." (V2H7) and "Sensor data value" (V2H8) parameters.	4
E102	Warning	■ Electronic device error for maximum indicator display Perform reset (5140 code), recalibrate sensor. ■ Electronic insert defective. Replace electronic insert.	12
E103	Warning	Initialization active ■ The electronics are initialized after connecting the device. Wait for the initialization process to complete.	10
E104	Warning	Sensor calibration ■ The values in V7H4 and V7H5 (Low sensor cal and High sensor cal) are too close to one another, e.g. following sensor recalibration. Perform a reset (code 2509) and recalibrate the sensor.	11
E106	Fault	■ Download active Wait for download to complete	7
E110	Fault	Checksum error ■ The power supply is disconnected when writing to the processor. Reestablish power supply. Perform a reset (code 5140) and recalibrate the sensor. ■ EMC effects are greater than specifications in → see Page 53, Section 10 "Technical data". Block off EMC effects ■ Electronic insert defective. Replace electronic insert, reenter sensor data.	9
E111	Fault	No connection to the sensor EEPROM ■ Cable connection between sensor electronics – main electronics – display (internal bus) disconnected or sensor electronics defective. Check connector for sensor. Check cable connection. Replace sensor.	1
E114	Fault	Electronics error ■ Electronic insert defective Replace electronic insert	2
E115	Fault	Sensor overpressure ■ Overpressure present. Reduce pressure until message disappears. ■ Cable connection sensor – electronic insert disconnected. Check cable connection. ■ Sensor defective Replace sensor.	2
E116	Fault	Download error (PC-transmitter) ■ During the download, the data are not correctly transmitted to the processor, e.g. because of open cable connections, spikes (ripple) on the supply voltage or EMC effects. Check cable connection PC – transmitter. Perform a reset (code 5140) and restart download.	2

Code	Type	Cause and remedial action	Priority
E120	Fault	Sensor low pressure ■ Pressure too low. Increase pressure until message disappears. ■ Cable connection sensor – electronic insert disconnected. Check cable connection. ■ Sensor defective. Replace sensor. ■ For small measuring ranges, screwing down the cover may cause the error "E120" to be shown for a short while. The error message disappears as soon as the overpressure in the housing is reduced.	2
E121	Fault	Checksum error ■ Main electronics defective Replace main electronics.	2

9.4 Simulation (Commuwin II only)

You have the option of simulating either the output value (OUT value) or the function of the Analog Input Block. In the following sections, the matrix fields in brackets indicate the matrix position in the Analog Input Block display in the operating program. See also Section 11.1 "Matrix for Analog Input Block (AI Transmitter)".

9.4.1 OUT value simulation

You can simulate the output value (OUT value) as follows:

1. Where necessary, unlock the matrix using code 130 or 2457 in matrix field VAH9.
2. Using matrix field V9H9, switch from the standard to the Analog Input Block display.
3. Set the mode of the "Target mode" parameter (V8H0) to "manual".
   – You can now enter a simulation value directly for the "OUT value" (V0H0).
   – Afterwards, check the change to the OUT value, e.g. at the PLC.
4. Set the "Target mode" parameter back to "automatic".

Note!
The operating program offers a further option of specifying an OUT value using the graphic operation in the "Simulation AI-Block" menu.

9.4.2 Analog Input Block simulation

You can simulate the function of the Analog Input Block as follows:

1. Where necessary, unlock the matrix using code 130 or 2457 in matrix field V9H9.
2. Using matrix field VAH9, switch from the standard to the Analog Input Block display.
3. Set the "Simulation" parameter in the Analog Input Block (V7H2) to "on".
   – You can now enter a simulation value directly for "Simulation value" (V7H0).
   – Afterwards, check the change to the OUT value (V0H0) and at the PLC.
4. Set the "Simulation" parameter back to "off".

9.5 Reset

By entering a certain code, the entries are reset partially or completely to the factory settings. Please note that in the event of a reset, customer-specific calibration carried out by the factory is also reset to the default values.

#	Matrix field/ parameter	Meaning	Entry
1	V2H9	Reset to factory setting	e.g.

The Cerabar M differentiates between different reset codes with different effects. See the following table to find out which parameters are reset by reset codes 5140 or 1, 2380 and 731.

Other reset codes have the following effects:

- 2506: Device warm start
- 2509: This reset sets the lower and upper sensor calibration limits and the zero offset value to the factory setting, i.e.:
  Low sensor cal = low sensor limit (V7H4 = V7H6),
  High sensor cal = high sensor limit (V7H5 = V7H7),
  Zero offset value (V9H6) = 0.0
- 2712: The device address set via the bus is reset to the default value 126.

Reset codes		**H0**	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**
	V0	**Measured value**	**Lower-range value**	**Upper-range value**	**Set lower value**	**Set upper value**	**Set bias pressure**	**Bias pressure autom.**	**Set output damping**		**Select pressure unit**
1/5140 2380 731			**0.0** **0.0** **0.0**	= V7H7 = V7H7 = V7H7			0.0 0.0 0.0		0.0 0.0 0.0		bar
	V1										
	V2	**Diag-nostic code**	**Last diagnostic code**	**Software number**					**Sensor data no.**	**Sensor data value**	**Default values**
1/5140 2380 731			0 0 0	= V7H7 = V7H7 = V7H7							
	V3 to V5										
	V6	**Manufact-urer ident. number**	**Set unit to bus**	**OUT value**	**OUT status**	**2nd cyclic value**	**Select V0H0**	**OUT value PLC**	**Profile version**		
1/5140 2380 731				[1] [1]			Prim. val. Prim. val.		0.0 0.0 0.0		
	V7					**Low sensor calibration**	**High sensor calibration**	**Lower range limit**	**Upper range limit**	**Sensor pressure**	
1/5140 2380 731						= V7H6 = V7H6	= V7H7 = V7H7				
	V8										
	V9						**Zero offset**	**Zero offset value**	**Unbiased pressure**	**Bias pressure**	**Security locking**

Reset codes		**H0**	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**
1/5140 2380 731								0.0 0.0	= V7H8[2)] = V7H8[2)]	= V7H8[2)] = V7H8[2)]	
	VA	**Set tag number**	**Set user text**								
1/5140 2380 731		deleted deleted	deleted deleted								

1) Following a "5140" or "2380" reset, the V6H2 field displays the current digital output value. UNKNOWN is displayed here since the unit is not known.

2) After a reset, the matrix fields V9H7 and V9H8 show the pressure currently applied.

9.6 Repair

The Endress+Hauser repair concept provides for measuring devices to have a modular design and that the customer may also carry out repairs.

The "Spare parts" section contains all the spare parts, and their order numbers, which you can order from Endress+Hauser to repair the Cerabar M. Where necessary, the spare parts also include replacement instructions.

Note!
- For certified devices, please refer to the "Repair of Ex-certified devices" section.
- For more information on service and spare parts contact Endress+Hauser Service. → See www.endress.com/worldwide.
- Only the process connection on the PMC41 can be exchanged by the customer. For all other models, a device without a display and housing can be ordered. → See Technical Information TI399P, "Ordering information" section.

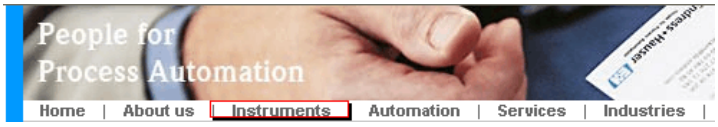
9.7 Repair of Ex-certified devices

Warning!
When repairing Ex-certified devices, please note the following:
- Only specialist personnel or Endress+Hauser may undertake repairs to certified devices.
- Relevant standards, national hazardous area regulations and safety instructions and certificates must be observed.
- Only use genuine spare parts from Endress+Hauser.
- When ordering spare parts, please check the device designation on the nameplate. Identical parts may only be used as replacements.
- Electronic inserts or sensors already in use in a standard device may not be used as spare parts for a certified device.
- Carry out repairs according to the instructions. After a repair, the device must fulfill the requirements of the specified individual tests.
- A certified device may only be converted to another certified version by Endress+Hauser.
- All repairs and modifications must be documented.

9.8 Spare Parts

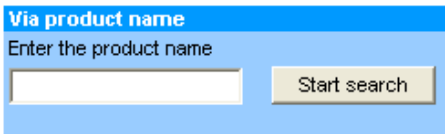
An overview of the spare parts for your device is available in the internet at www.endress.com. To obtain information on the spare parts, proceed as follows:

1. Go to "www.endress.com" and select your country.
2. Click "Instruments".

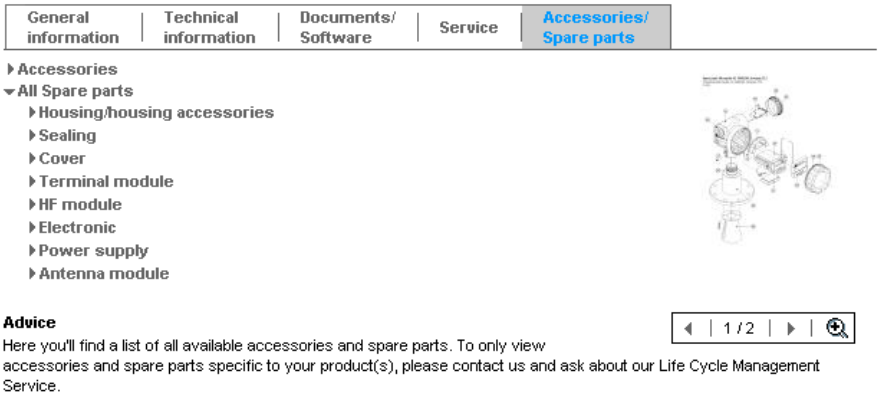


3. Enter the product name into the "product name" field.

Endress+Hauser product search



4. Select the device.
5. Click the "Accessories/Spare parts" tab.



6. Select the required spare parts (You may also use the overview drawing on the right side of the screen.)

When ordering spare parts, always quote the serial number indicated on the nameplate. As far as necessary, the spare parts also include replacement instructions.

9.9 Return

Before you send in a device for repair or inspection, perform the following:
- Remove all traces of the fluid. Pay special attention to the grooves for seals and crevices which could contain fluid residues. This is especially important if the fluid is hazardous to health. Please refer also to the "Declaration of Hazardous Material and Decontamination".

Please enclose the following when returning the device:
- The duly completed and signed "Declaration of Hazardous Material and Decontamination". Only then can Endress+Hauser inspect or repair the returned device.
- The chemical and physical properties of the fluid.
- A description of the application.
- A description of the error which occurred.
- Special instructions on handling, if necessary, e.g. safety data sheet as per EN 91/155/EEC.

9.10 Disposal

When disposing, separate and recycle the device components based on the materials.

9.11 Software history

Date	Software version	Changes to software	Operating Instructions
12.2000	1.0	Original software. Compatible with: – Commuwin II – FieldCare – PDM	BA222P/00/en/07.00 52006534
06.2001/ 05.2002	1.1/1.2	Transducer block adaption/Communication service adaption	BA222P/00/en/06.02 52014606
			BA222P/00/en/12.03 52022185
			BA222P/00/en/03.05 52027748
			BA222P/00/en/06.08 71064505

10 Technical data

For technical data, please refer to the Technical Information TI399P for Cerabar M.

11 Operating matrix

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 Basic calibration	Measured value	Lower range-value	Upper-range value	Set lower value	Set upper value	Set bias pressure	Bias pressure autom.	Set output damping		Select pressure unit
V1										
V2 Trans-mitter information	Diagnostic code	Last diagnostic code	Software No.					Sensor data No.	Sensor data value	Default values
V3…V5										
V6 PROFIBUS parameter	Manufacture r ident number	Set unit to bus	Out value	Out status	2nd cyclic value	Select V0H0		Profile version		
V7 Sensor data					Low sensor calibration	High sensor calibration	Lower range limit	Upper range limit	Sensor pressure (P)	
V8										
V9 Service					Instrument address	Zero offset	Zero offset value	Unbiased pressure	Bias pressure	Security locking [1]
VA Communi-cation	Set tag number	Set user text	Serial number	Serial number sensor						Device profile

= display field

1) Security locking ≠ 130/2457, unlocking = 130/2457
Security locking = 333, all parameters apart from "Sensor data No." (V2H7) and "Sensor data value" (V2H8) are locked.

The following matrix gives an overview of the factory settings.
You can also enter your values here.

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0	—	0.0	V7H7	—	—	0.0	—	0.0		bar
V1										
V2	0	0	xxxx					1	0	0
V3 to V5										
V6	xxxx	—	UNKNOWN	—	—			3.0		
V7					= V7H6	= V7H7	—	—	—	
V8										
V9					xxx	0.0	0.0	—	—	130/2457
VA	————	————	————	————						

11.1 Matrix for Analog Input Block (AI Transmitter)

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 OUT	OUT Value	OUT Status	OUT Status	OUT Sub Status	OUT Limit		Fail Safe Action	Fail Safe Value		
V1 Scaling	PV Scale Min	PV Scale Max	Type of Linearization	OUT Scale Min	OUT Scale Max	OUT Unit	User Unit	Decimal Point OUT	Rising Time	
V2 Alarm Limits	Alarm Hysteresis									
V3 HI HI Alarm	HI HI Limit	Value	Alarm State	Switch-on Point	Switch-off Point					
V4 HI Alarm	HI Limit	Value	Alarm State	Switch-on Point	Switch-off Point					
V5 LO Alarm	LO Limit	Value	Alarm State	Switch-on Point	Switch-off Point					
V6 LO LO Alarm	LO LO Limit	Value	Alarm State	Switch-on Point	Switch-off Point					
V7 Simulation	Simulation Value	Simulation Status	Simulation Mode							
V8 Block Mode	Target Mode	Actual	Permitted	Normal		Channel		Unit Mode		
V9 Alarm Config.	Current	Disable				Static Revision				
VA Block Parameter	Set Tag Number	Strategy	Alert Key	Profile Version	Batch ID	Batch Rup	Batch Phase	Batch Operation		Device Profile

11.2 Description of parameters

Matrix field/ parameter	Description
Measured value (V0H0)	This parameter indicates the value currently measured. V0H0 corresponds to the onsite display. Select a pressure unit via the "Select pressure unit" (V0H9). The measured value is converted and displayed in the pressure unit you selected. Note: As standard, the measured value is transmitted via the bus in the pressure unit indicated on the nameplate. To transmit the converted measured value via the bus, the "Set unit to bus" must be confirmed once in the V6H1 matrix field/parameter. See also Matrix/Parameter description for "Set unit to bus" (V6H1).
Lower-range value (V0H1)	Enter a pressure value for the lower-range value (calibration without reference pressure). Use this parameter to set the lower-range value for the bar graph on the onsite display. This parameter has no effect on the digital output value (OUT value). See Section 7.3, "Calibration without reference pressure". Factory setting: 0.0
Upper-range value (V0H2)	Enter a pressure value for the upper-range value (calibration without reference pressure). Use this parameter to set the upper-range value for the bar graph on the onsite display. This parameter has no effect on the digital output value (OUT value). See Section 7.3, "Calibration without reference pressure". Factory setting: "Upper range limit" (V7H7)

Matrix field/ parameter	Description
Set lower value (V0H3)	If you confirm this parameter, the current pressure value is set as the lower-range value (calibration with reference pressure). The lower-range value only refers to the bar graph on the onsite display. It has no effect on the digital output value (OUT value). The value is displayed in the "Lower-range value" parameter (V0H1). This is equivalent to pressing the Zero key twice during onsite operation.
Set upper value (V0H4)	If you confirm this parameter, the current pressure value is set as the upper-range value (calibration with reference pressure). The lower-range value only refers to the bar graph on the onsite display. It has no effect on the digital output value (OUT value). The value is displayed in the "Upper-range value" parameter (V0H2). This is equivalent to pressing the Span key twice during onsite operation.
Set bias pressure (V0H5)	If the onsite display does not show zero after calibrating the lower-range value at zero operating pressure (position-dependent), you can correct the display value of the onsite display to zero by entering a pressure value (bias pressure) (position adjustment). The "Measured value" (V0H0), "Lower-range value" (V0H1) and "Upper-range value" (V0H2) parameters are corrected by the bias pressure. Note: In the "Pressure" operating mode, position adjustment via a bias pressure has no effect on the digital output value ("OUT value" parameter) which is transmitted via the bus. For the onsite display and the "OUT value" (V6H2) to display the same value, the "Set unit to bus" must be confirmed in Matrix field/Parameter V6H1. See also Section 7.3, "Position adjustment - only display (bias pressure)". Factory setting: 0.0
Bias pressure autom. (V0H6)	If you confirm this parameter, the current pressure value is adopted as the bias pressure. The value is displayed in the "Set bias pressure" (V0H5). This is equivalent to pressing the Zero and Span key twice simultaneously during onsite operation. See also parameter description for "Set bias pressure" (V0H5).
Set output damping (V0H7)	The damping (integration time) affects the speed at which the output signal and the display value react to a change in the pressure. Damping is adjustable from 0 to 40 s. Factory setting: 0.0
Select pressure unit (V0H9)	Select a pressure unit. If a new pressure unit is selected, all the pressure-specific parameters are converted and displayed in the new pressure unit. Note: As standard, the measured value is transmitted via the bus in the pressure unit indicated on the nameplate. To transmit the converted measured value via the bus, the "Set unit to bus" must be confirmed once in the V6H1 Matrix field/Parameter. See also parameter description for "Set unit to bus" (V6H1). See Section 7.3, "Selecting a pressure unit". Factory setting: see information on the nameplate
Diagnostic code (V2H0)	The pressure transmitter outputs an error code if it detects a fault or a warning. This parameter indicates the current error code. For a description of the error codes, see Section 9.3.
Last diagnostic code (V2H1)	Indicates the last error code. For a description of the error codes, see Section 9.3. Factory setting: 0
Software number (V2H2)	Indicates the device and software number. The first two digits represent the device number and digits 3 and 4 the software version. Example: Cerabar M PROFIBUS-PA SW 1.2 = 8212
Sensor data no. (V2H7)	A sensor pass with 11 items of sensor data is provided with each device. If the electronics are replaced, these data must be reentered via the "Sensor data no." (V2H7) and "Sensor data value" (V2H8).
Sensor data value (V2H8)	See "Sensor data no." (V2H7).
Default values (V2H9)	Enter a reset code. Possible reset codes are: 5140 or 1, 2380, 731, 2506, 2509 and 2712. The parameters that are reset to the factory setting by the specific reset codes are indicated in Section 9.5.

Matrix field/ parameter	Description
Manufacturer ident. number (V6H0)	For selecting the ID number. Options: – Profile: General ID number of the PNO (PROFIBUS User Organization): "9700 (hex)". To configure the PLC, the device master file (GSD) of the PNO (Profibus User Organization) must be used. – Manufacturer: Device ID number for Cerabar M PROFIBUS-PA: "151C (hex)". To configure the PLC, the device-specific GSD must be used. See also Section 6.3 "Device master and type files (GSD)".
Set unit to bus (V6H1)	In the following instances, the digital output value (OUT value) and the onsite display or the "Measured value" parameter (V0H0) do not show the same value: – If you have selected a new pressure unit via the "Select pressure unit" (V0H9) and/or – If you have performed position adjustment in the "Pressure" operating mode by entering a bias pressure (V0H5/V0H6). To make the digital output value display the same value as the onsite display or V0H0 in such instances, the "Set unit to bus" in Matrix field/Parameter V6H1 must be confirmed after calibration. Note that a change of the digital output value can influence the controller. See also Section 7.3, "Selecting a pressure unit" and "Position adjustment - only display (bias pressure)".
V6H2 OUT value (V6H2)	This parameter shows the OUT value of the Analog Input Block (digital output value that is transmitted via the bus). As long as Matrix field/Parameter V6H2 continues to display UNKNOWN, "Set unit to bus" in Matrix field/Parameter V6H1 has not yet been confirmed.
OUT status (V6H3)	This parameter shows the status of the OUT value (digital output value). For the description of the status codes, see Section 6.4, "Status codes".
2nd cycl. value (V6H4)	This field can be used to select a second parameter that is output cyclically to the PLC. Options: Sensor value (V7H8), Trimmed value (V9H7) and Biased value (V9H8). See also Section 6.4, Fig. 25. Factory setting: measured value (V0H0)
Select V0H0 (V6H5)	The onsite display and Matrix field/Parameter V0H0 normally show the same value. However, a cyclic output value can also be made available to the onsite display via a PLC. For this purpose, this parameter has to be set to "display value" (or 1). See also Section 6.4.
OUT_value from PLC (V6H6)	Displays a cyclic OUT value of the PLC. See also Section 6.4, Fig. 25.
Profile version (V6H7)	Displays the PROFIBUS-PA profile version.
Low sensor calibration (V7H4)	For entering the lower point of the sensor characteristic curve during a sensor calibration. Use this parameter to assign a new value to a reference pressure applied to the device. The pressure value present and the value entered for "Low sensor cal" corresponds to the lower point of the sensor characteristic curve. Factory setting: "Lower range limit" (V7H6)
High sensor calibration (V7H5)	For entering the upper point of the sensor characteristic curve during a sensor calibration. Use this parameter to assign a new value to a reference pressure applied to the device. The pressure value present and the value entered for "High sensor cal" corresponds to the upper point of the sensor characteristic curve. Factory setting: "Upper range limit" (V7H7)
Lower range limit (V7H6)	Displays the lower measuring limit.
Upper range limit (V7H7)	Displays the upper measuring limit.
Sensor pressure (V7H8)	Displays the pressure currently present.
Instrument address (V9H4)	Displays the instrument address set in the bus. The address can either be set on site, via DIP switches or via software. See also Section 6.2. Factory setting: 126

Matrix field/ parameter	Description
Zero offset (V9H5)	You can use this parameter to perform a calibration (zero point correction) simultaneously for the display value of the onsite display ("Measured value" (V0H0)) and for the digital output value (OUT value). By entering a value for this parameter, you can assign a new value to a pressure applied at the device. The sensor characteristic curve is shifted by this value and the "Low sensor calibration" (V7H4) and "High sensor calibration" (V7H5) parameters are recalculated. See Section 7.3, "Zero point correction". Factory setting: 0.0
Zero offset value (V9H6)	Displays the value by which the sensor characteristic curve has been moved during zero point correction. See also parameter description for "Zero offset" (V9H5) and Section 7.3, "Zero point correction". Factory setting: 0.0
Unbiased pressure (V9H7)	This parameter indicates the pressure currently present and damped without bias correction. See also parameter description for "Set bias pressure" (V0H5).
Bias pressure (V9H8)	This parameter indicates the pressure currently present and damped after bias correction. See also parameter description for "Set bias pressure" (V0H5). Calculation: "Bias pressure" (V9H8) = "Unbiased pressure" (V9H7) – "Set bias pressure" (V0H5) In the "Pressure" operating mode, this parameter and the "Measured value" parameter (V0H0) display the same value.
Security locking (V9H9)	For entering a code to lock or unlock the operating matrix and local operation. Locking operation: – via the "Security locking" parameter (V9H9): enter a number from 1 to 9998, apart from 130 and 2457. Unlocking operation: – via the "Security locking" parameter (V9H9): enter 130 or 2457. See also Section 7.4.
Set tag number (VAH0)	Enter a text for the name of the measuring point (up to 32 ASCII characters).
Set user text (VAH1)	Enter a text for additional information (up to 32 ASCII characters).
Serial no. (VAH2)	Displays the serial number of the device.
Serial no. sensor (VAH3)	Displays the serial number of the sensor.

Index

Endress+Hauser

People for Process Automation

Declaration of Hazardous Material and De-Contamination

Erklärung zur Kontamination und Reinigung

RA No. ☐☐☐☐☐☐☐☐

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.

Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor
Geräte-/Sensortyp _____

Serial number
Seriennummer _____

☐ **Used as SIL device in a Safety Instrumented System /** *Einsatz als SIL Gerät in Schutzeinrichtungen*

Process data/ *Prozessdaten*

Temperature / *Temperatur* _____ [°F] _____ [°C]
Pressure / *Druck* _____ [psi] _____ [Pa]
Conductivity / *Leitfähigkeit* _____ [µS/cm]
Viscosity / *Viskosität* _____ [cp] _____ [mm²/s]

Medium and warnings
Warnhinweise zum Medium

	Medium /concentration *Medium /Konzentration*	Identification CAS No.	flammable *entzündlich*	toxic *giftig*	corrosive *ätzend*	harmful/ irritant *gesundheits-schädlich/ reizend*	other * *sonstiges**	harmless *unbedenklich*
Process medium / *Medium im Prozess*								
Medium for process cleaning / *Medium zur Prozessreinigung*								
Returned part cleaned with / *Medium zur Endreinigung*								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive
* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.
Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / *Fehlerbeschreibung* _____

_____

_____

Company data / *Angaben zum Absender*

Company / *Firma* _____

_____

Address / *Adresse*

_____

_____

Phone number of contact person / *Telefon-Nr. Ansprechpartner:*

_____

Fax / E-Mail _____

Your order No. / *Ihre Auftragsnr.* _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge.We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

_____ (place, date / *Ort, Datum*)

_____ Name, dept./*Abt.* (please print / *bitte Druckschrift*)

_____ Signature / *Unterschrift*

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