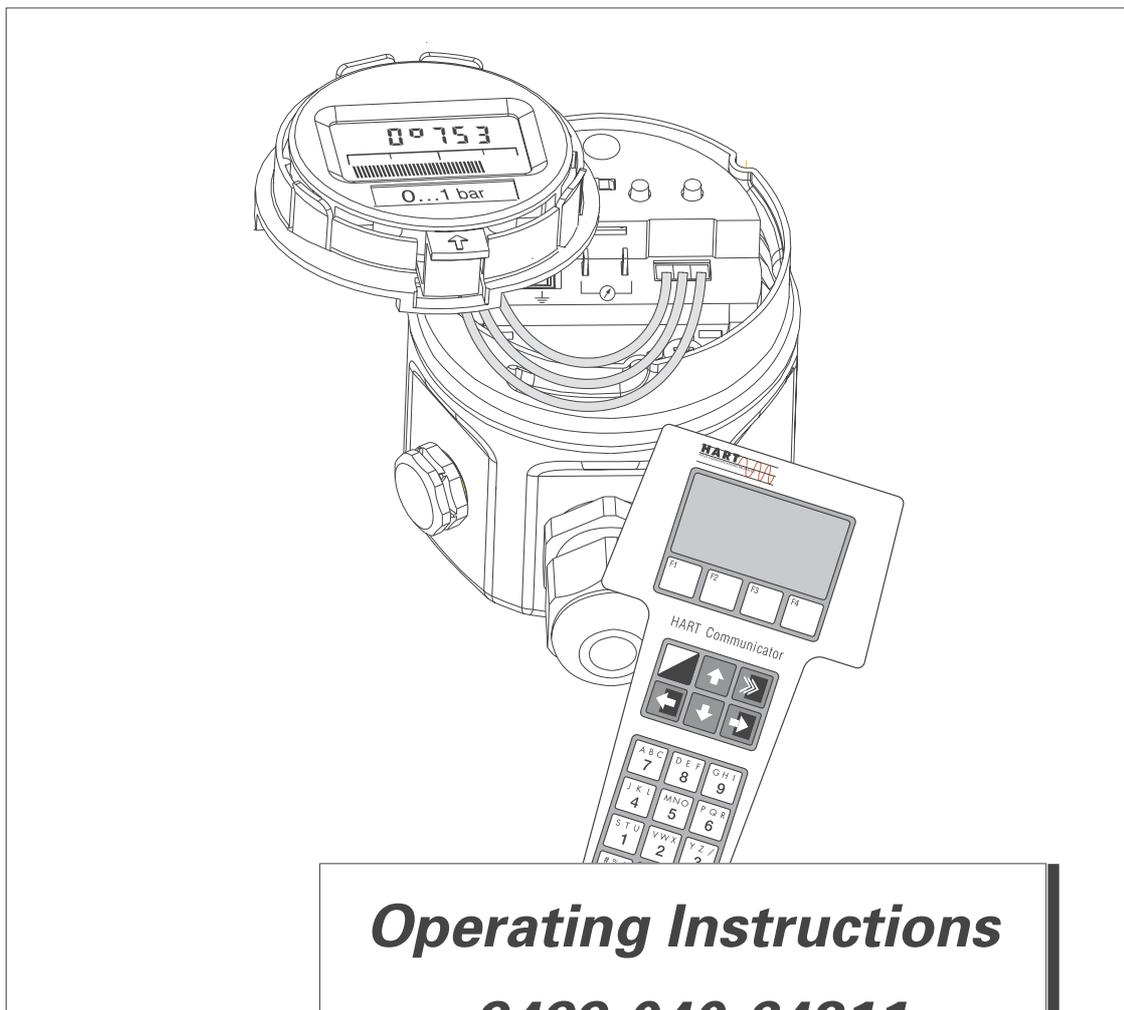


# ***PM 3X digital Pressure Transmitter***

**Operating instructions  
PM 3X digital with Smart electronics (HART)**

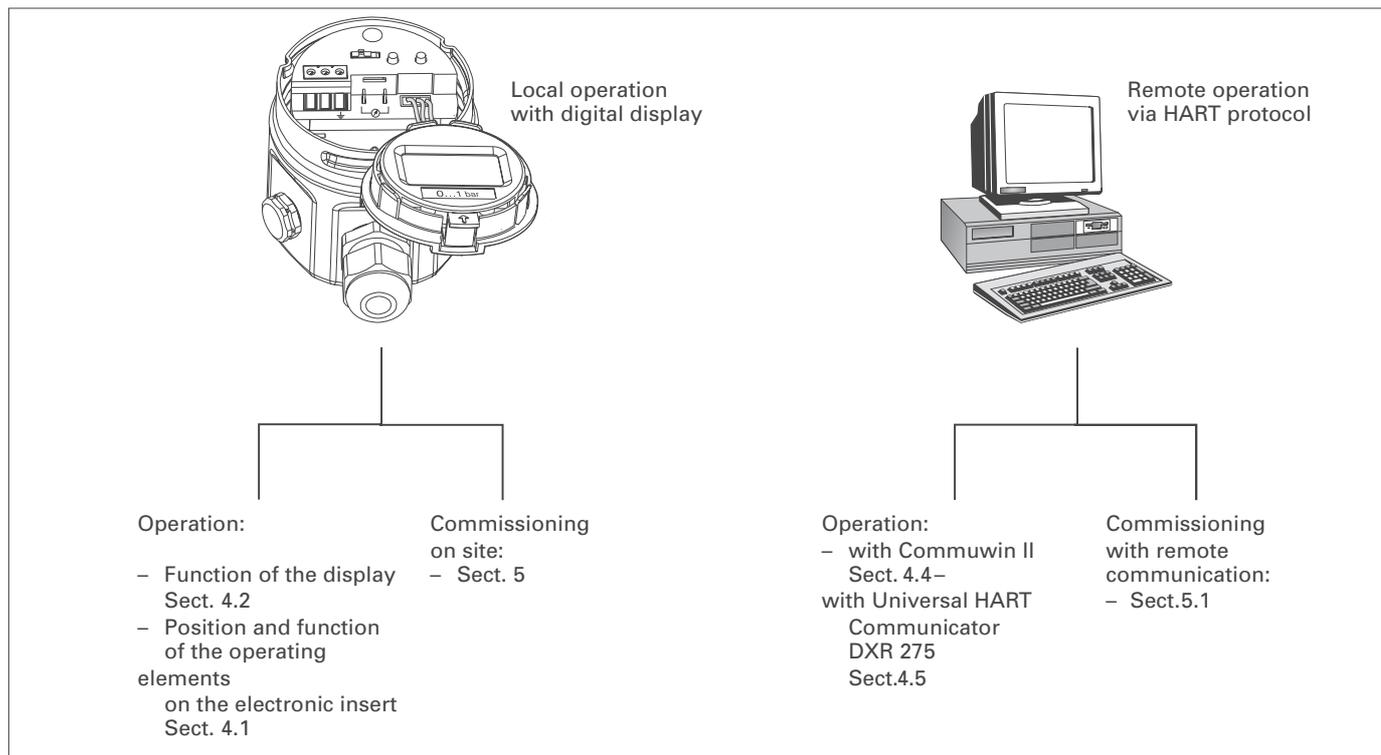


## ***Operating Instructions***

**9499-040-64311**

Valid from: 8385

## Short Operating Instructions



## Software History

| Software version | Valid operating instructions (BA) | Device and Software No. | Software revision | Changes in operating instructions |
|------------------|-----------------------------------|-------------------------|-------------------|-----------------------------------|
| 1.0              | 05.99                             | 8010                    | -                 | -                                 |

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# 1 Notes on Safety

## Approved usage

The PM 3X digital is a pressure transmitter for measuring gauge or absolute pressure depending on the version.

## Mounting, commissioning, operation

The PM 3X digital has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e.g. B. product overspill by incorrect installation or adjustment. For this reason, the instrument must be installed, connected, operated and maintained by personnel that are authorised by the user of the facility and who are suitably qualified. The manual must have been read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual.

## Explosion-hazardous area

The measuring system used in the explosion-hazardous area must comply with all existing national standards. The instrument can be supplied with the following certificates as listed in the table. The certificates are designated by the first letter of the order code on the nameplate (see table below).

Ensure that technical personnel are sufficiently trained.  
All measurement and safety regulations which apply to the measuring points are to be observed.

## PM3X

Order No. 

|   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| P | M | 3 | X | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

Certificate for applications in explosion hazardous areas

| Code       | Certificate | Protection                  |
|------------|-------------|-----------------------------|
| 0, 2, 4, 6 | Standard    | none                        |
| 1, 3, 5, 7 | ATEX 100    | ATEX II 1/2 G EEX ia IIC T6 |

## 1.1 Safety conventions

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

### Notes on safety

| Symbol  | Meaning  |
|---|--|
| <br>Note!    | <b>Note!</b><br>A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.   |
| <br>Caution! | <b>Caution!</b><br>Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument.   |
| <br>Warning! | <b>Warning!</b><br>A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument.   |
|              | <b>Device certified for use in explosion hazardous area</b><br>If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area.  |
|             | <b>Explosion hazardous area</b><br>Symbol used in drawings to indicate explosion hazardous areas.<br>Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.    |
|            | <b>Safe area (non-explosion hazardous area)</b><br>Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas.<br>Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas. |
| Electric symbols  |  |
|            | <b>Direct voltage</b><br>A terminal to which or from which a direct current or voltage may be applied or supplied.   |
|            | <b>Alternating voltage</b><br>A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied.  |
|            | <b>Grounded terminal</b><br>A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system.   |
|            | <b>Protective grounding (earth) terminal</b><br>A terminal which must be connected to earth ground prior to making any other connection to the equipment.  |
|            | <b>Equipotential connection (earth bonding)</b><br>A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice.   |

## 2 Introduction

### Application

The PM 3X digital pressure transmitter measures the pressure of gases, vapours and liquids and is used in all areas of chemical and process engineering.

### Operating principle

#### Ceramic sensor

The system pressure acts directly on the rugged ceramic diaphragm of the pressure sensor deflecting it by a maximum of 0.025 mm (0.0098 in). A pressure-proportional change in the capacitance is measured by the electrodes on the ceramic substrate and diaphragm. The measuring range is determined by the thickness of the ceramic diaphragm.

#### Metal sensor

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

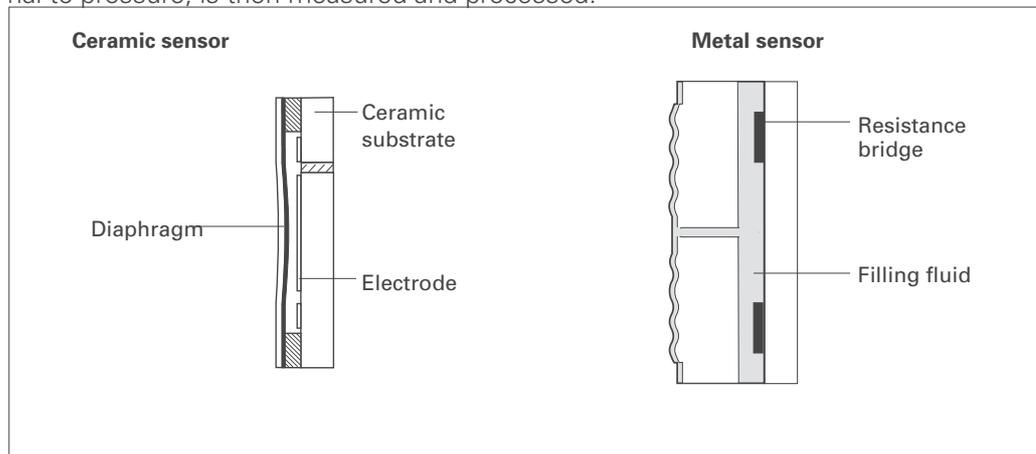


Figure 1.1  
Sensor construction

### Measuring system

The complete measuring system consists of

- PM 3X digital pressure transmitter with 4...20 mA signal output with superposed digital signal (HART communication) and
- power supply 11.5...45 VDC, in Ex area 11.5...30 VDC.

Operation can be carried out via:

- a digital display for operating and calling up measured values locally,
- the universal handheld HART Communicator DXR 275,
- the Commuwin II operating program.

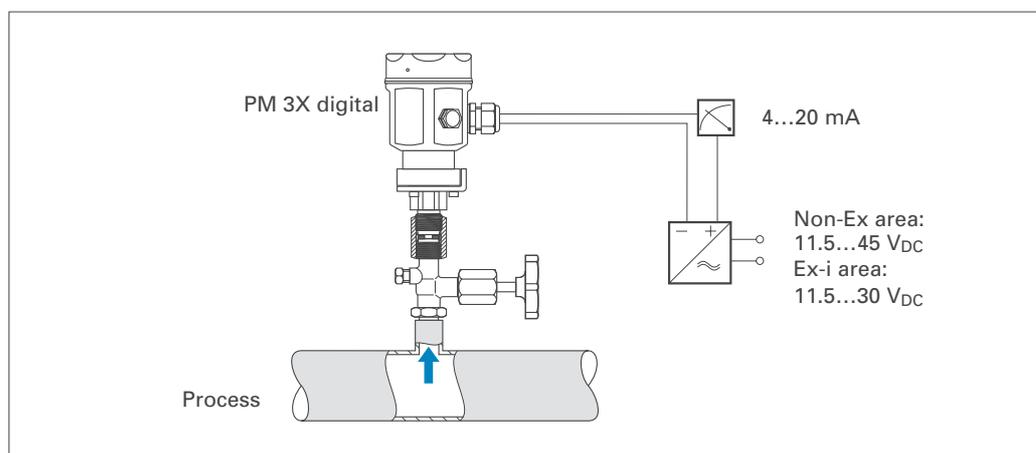


Figure 1.2  
The measurement system

### 3 Installation

This section describes:

- the mechanical installation of PM 3X digital with and without diaphragm seal,
- the electrical connection.

#### 3.1 Mounting instructions without diaphragm seal

The PM 3X digital without diaphragm seal is mounted in the same way as a manometer. The use of shut-off valves and pigtails is recommended. The position depends upon the application.

**PM 3X digital without diaphragm seal**  
 – PM 31, 32  
 – PM 33, 34

- Measurement in gases:  
 Mount the shut-off valve above the tapping point so that condensate can run back into the process.

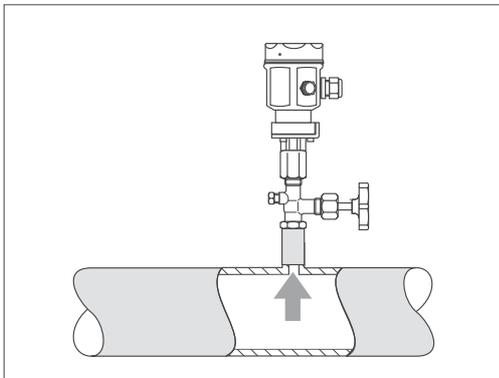


Figure 2.1  
 Mounting on a shut-off valve for measuring gases

- Measurement in steam:  
 Mount with a pigtail above the tapping point.  
 The pigtail reduces the temperature in front of the diaphragm to almost ambient temperature. Before start-up, the pigtail must be filled with water.

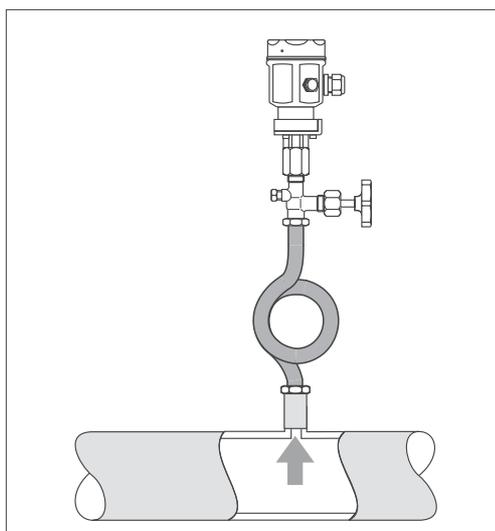
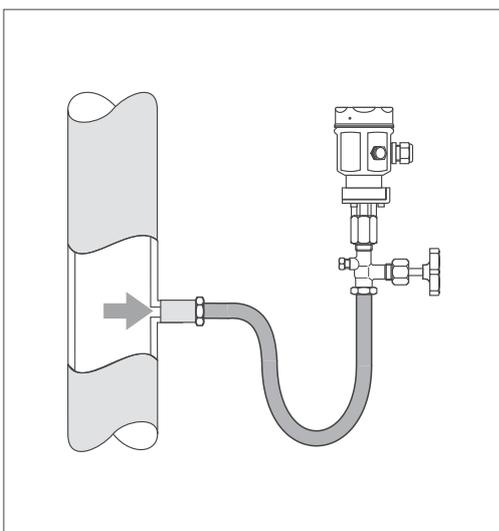


Figure 2.2  
 left:  
 Mounting with U-shaped pigtail for measuring steam  
 right:  
 Mounting with circular pigtail for measuring steam

- Measurement in liquids:  
Mount on the shut-off valve below the tapping point or at the same height

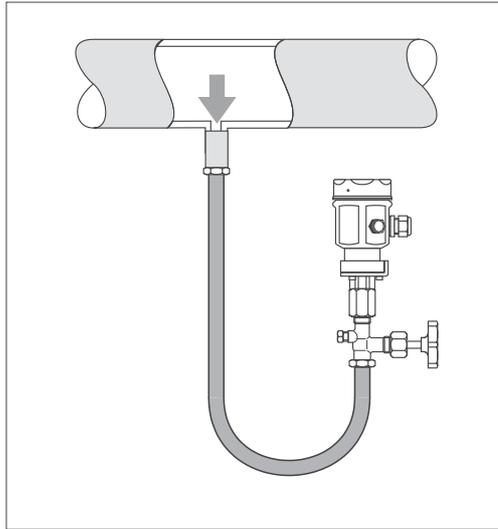


Figure 2.3  
Mounting on a shut-off valve  
for measuring liquids

The PM 33 with metal sensor is available in the following versions:

- with flush-mounted diaphragm or
  - with adapter and internal diaphragm.
- The adapter can be screwed on or welded in.

A gasket is enclosed according to the material used and version.

**Dimensions**  
1 in = 25.4 mm  
1 mm = 0.039 in

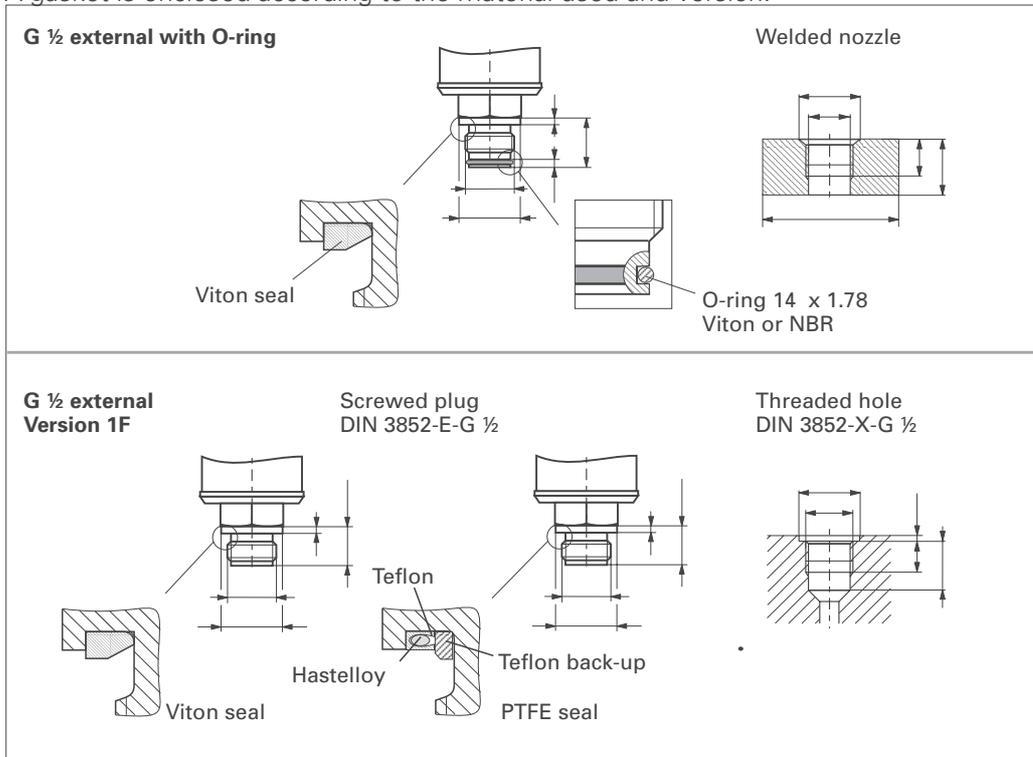


Figure 2.4  
PM 33 with flush-mounted  
diaphragm  
above:  
G 1/2 external with O-ring  
below:  
G 1/2 external

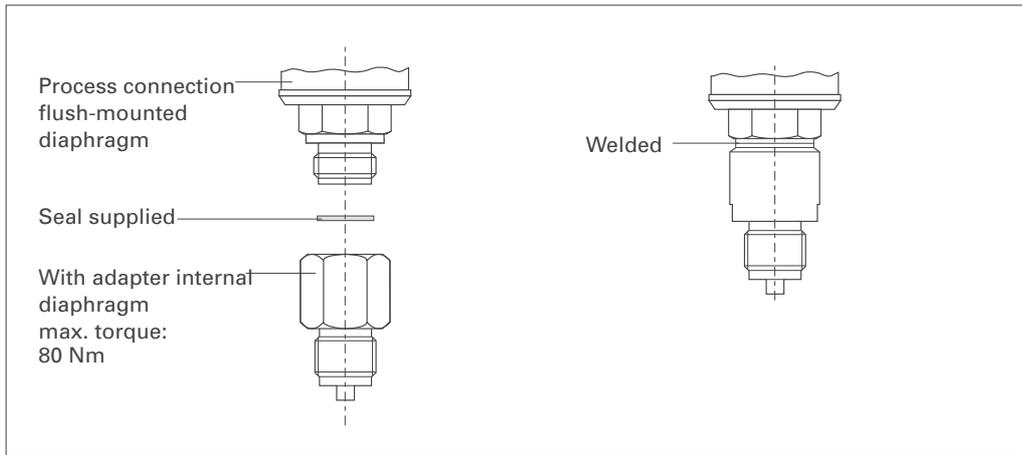
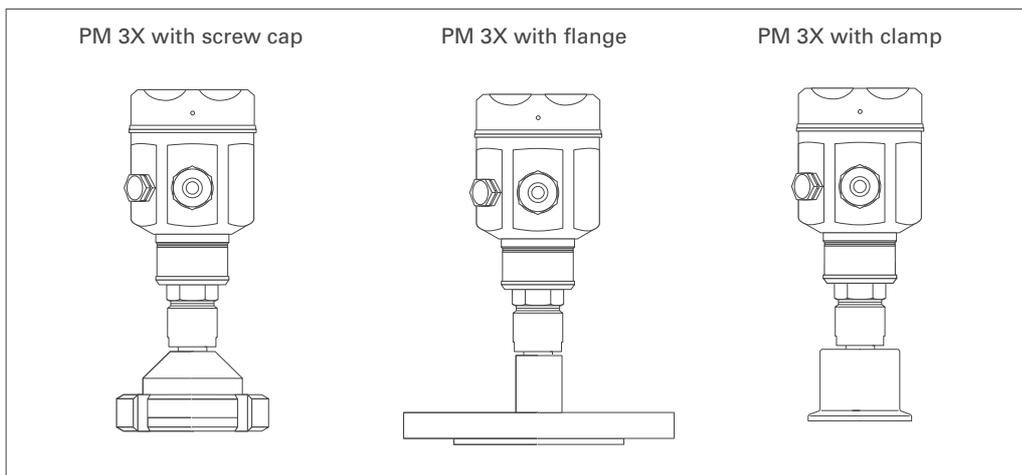


Figure 2.6  
PM 3X digital PM 33  
with screwed or welded adapter.  
With screw adapter max. torque 80 Nm.

### 3.2 Mounting instructions with diaphragm seal

The PM 3X digital with diaphragm seal is screwed in, flanged or clamped, depending on the type of diaphragm seal.



**PM 3X digital  
with diaphragm seal**  
– PM 35  
– PM 36

Figure 2.5  
Diaphragm seal versions

- The protective cap of the diaphragm seal should only be removed just before mounting in order to protect the diaphragm.
- The diaphragm of the diaphragm seal of the PM 3X digital must not be dented or cleaned with pointed or hard objects.
- The diaphragm seal and the pressure sensor together form a closed and calibrated system which is filled with filling fluid through a hole in the upper part of the sensor. The following rules should be observed:
  - This hole is sealed and is not to be opened.
  - The instrument should only be turned by the diaphragm seal at the point provided and not by the housing.

**Mounting with temperature spacers**

The use of temperature spacers is recommended for constant extreme product temperatures that can cause the maximum permissible ambient temperature of +85°C (+185°F) to be exceeded.

- Note when mounting that the temperature spacer increases the maximum height by 100 mm (3.94 in).
- Due to the water column in the temperature spacer, the increased height also causes a zero point shift of approx. 10 mbar (0.15 psi).

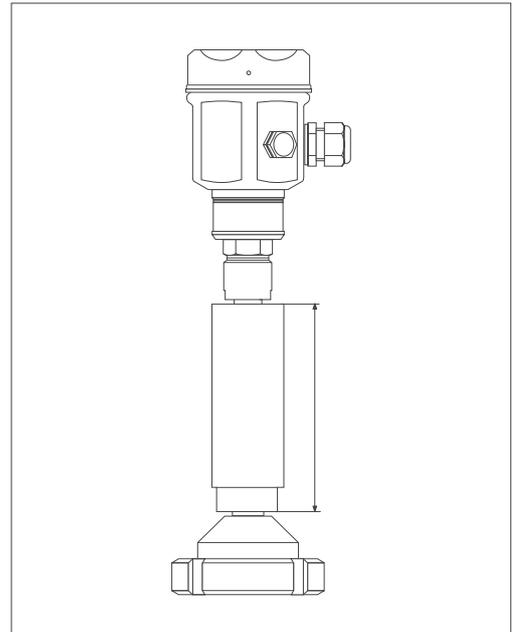


Figure 2.8  
Mounting with temperature spacers

**Mounting with capillary tubing**

To protect from high temperature, moisture or vibration, or where the mounting point is not easily accessible, the housing of the PM 3X digital can be mounted with a capillary tube to one side of the measuring point. A bracket for mounting on a wall or pipe is available for this.

**Dimensions**

1 in = 25.4 mm  
1 mm = 0.039 in

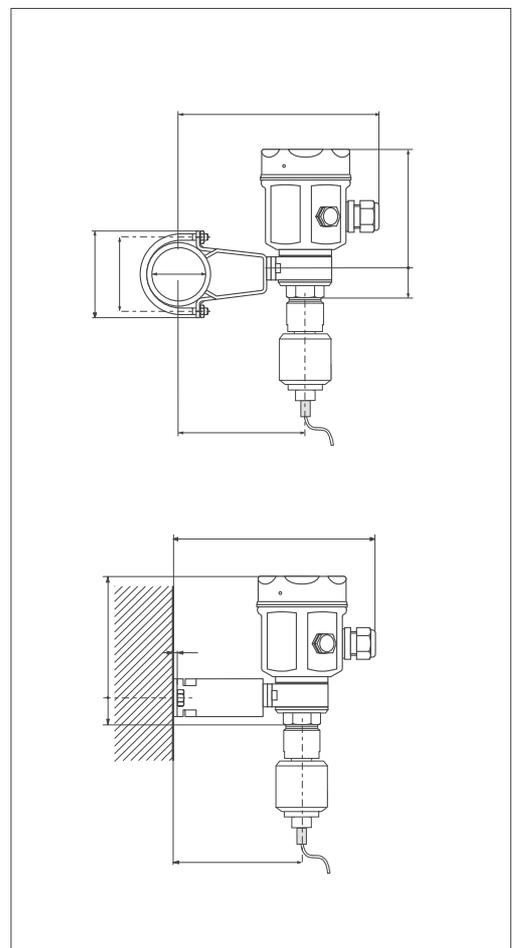
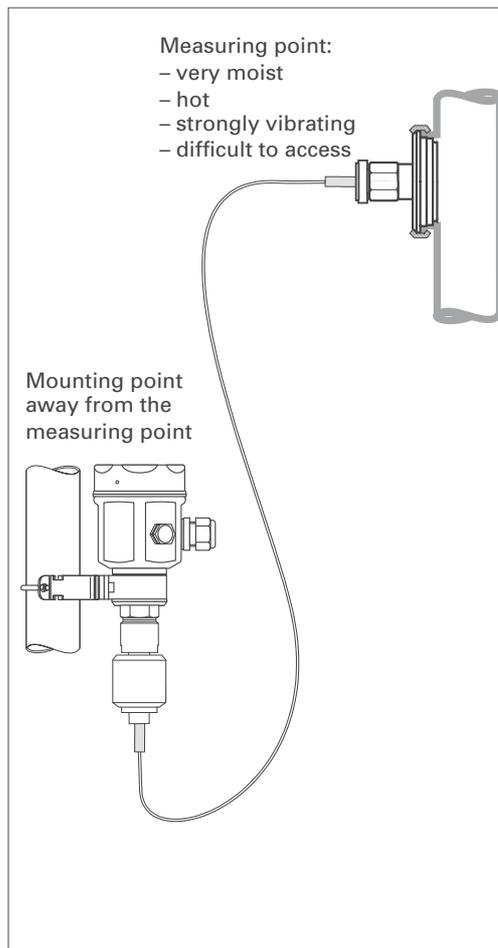
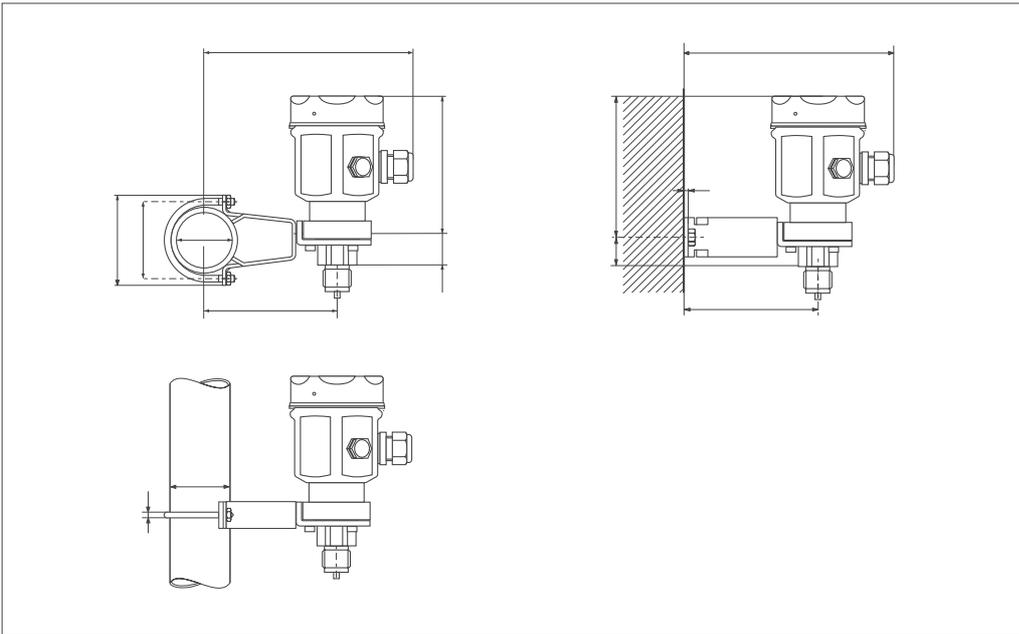


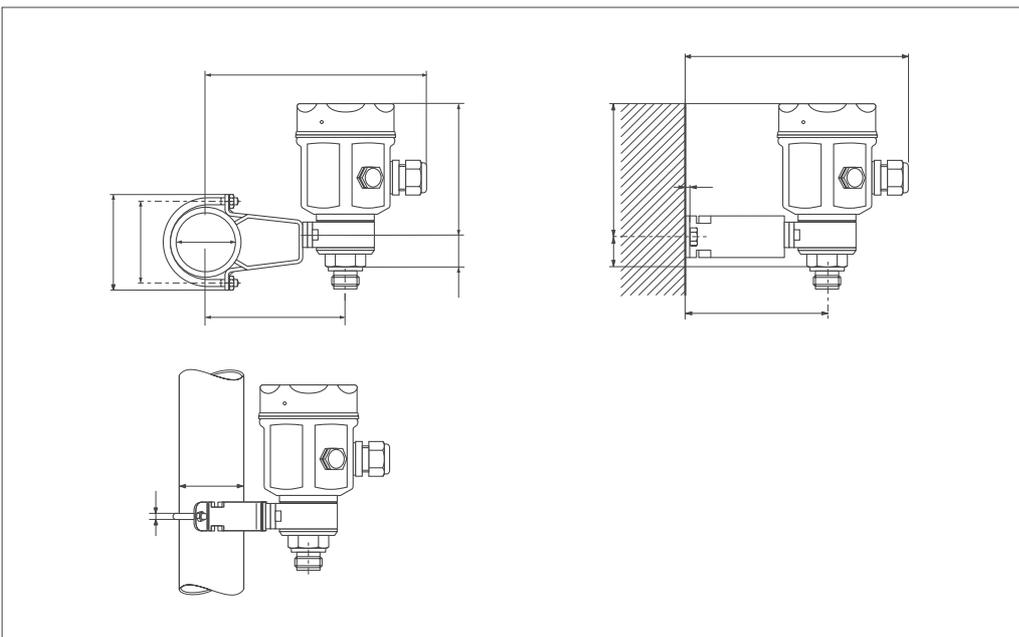
Figure 2.7  
Mounting with capillary tubing and bracket away from the measuring point. Values in brackets apply to instruments with a raised cover.

### 3.3 Mounting accessories



**PM 31**  
wall and pipe mounting  
with bracket

*Figure 2.9*  
Mounting with bracket  
*left:* on a vertical pipe  
*right:* on a wall.  
Values in brackets apply to in-  
struments with a raised cover.



**PM 33**  
wall and pipe mounting  
with bracket

**Dimensions**  
1 in = 25.4 mm  
1 mm = 0.039 in

*Figure 2.10*  
Mounting with bracket  
*left:* on a vertical pipe  
*right:* on a wall.  
Values in brackets apply to in-  
struments with a raised cover.

### 3.4 Electrical connection

Transposed, screened two-wire cabling is recommended for the connecting cable.

Max. wire diameter: 2.5 mm<sup>2</sup> permanently attached cable

The power supply voltage is:

- Non-Ex: 11.5...45 VDC
- Ex i area: 11.5...30 VDC

Internal protection circuits against reverse polarity, HF interference and overvoltage peaks (see TI 241F "EMC Guidelines").

A test signal can be measured using the terminal plugs for this purpose without interrupting measurement.

#### Cable connection

- Unscrew the cover
- If present, remove the retainer ring with analogue display.
  - In addition:
    - Push up the latch with the arrow until the grip of the retaining ring is audibly released.
    - Loosen the retainer ring carefully to prevent the display cable from breaking. The plug of the display can remain plugged in.
- Insert the cable through the cable entry
- Connect the cable wires as shown in the connection diagram.
- Where appropriate, replace the retainer ring with analogue display. The grip of the retainer ring clips in with an audible click.
- Screw down the cover

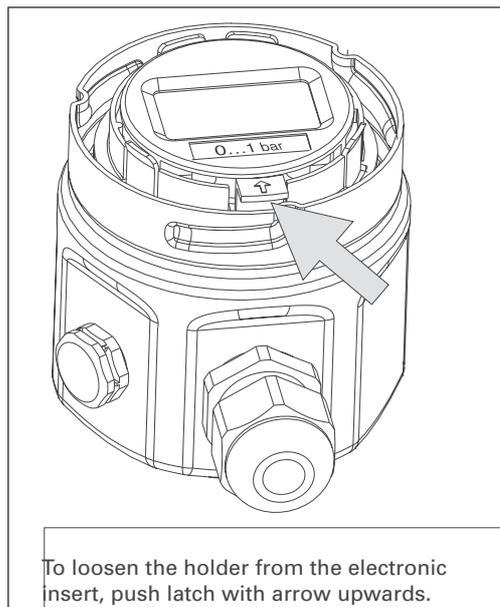


Figure 2.11  
Lifting off the display and  
removing the retaining ring

Observe all local regulations for  
applications in the Ex i area!

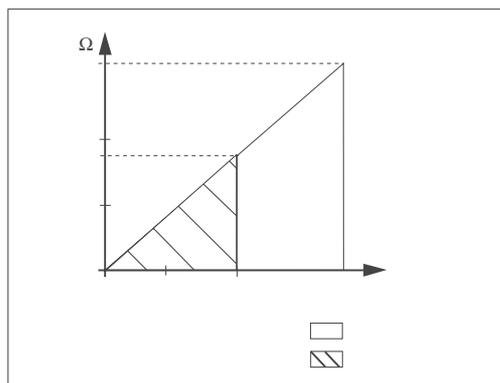


Figure 2.12  
Graph showing load

Note!

Terminal 3 on the electronic insert is for grounding and is already wired internally. If the connection cable has a screening or ground cable within it, then this may only be connected to the grounding terminal of the housing and not to Terminal 3 (see connecting diagrams).



Note!

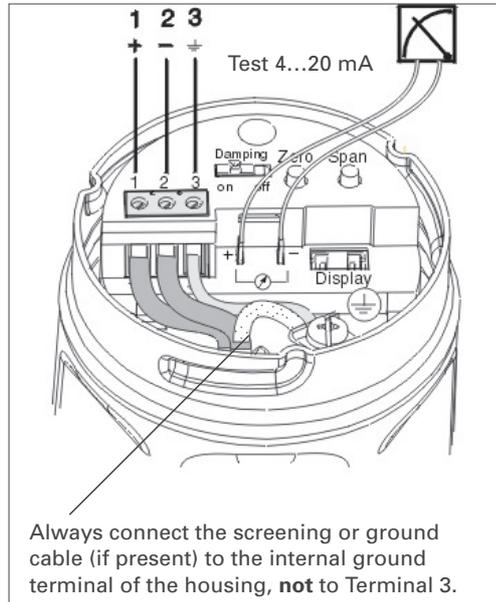


Figure 2.13  
Connection

| Plug         | Plug assignment |          |                     |  |
|--------------|-----------------|----------|---------------------|--|
|              | Terminal        | Function | Wire colour code    |  |
| Harting plug | 1               | +        | Blue (BL)           |  |
|              | 2               | -        | Brown (BN)          |  |
|              | 8               | PE       | Green-Yellow (GNYE) |  |
| Plug M 12x1  |                 | +        | Red (RD)            |  |
|              |                 | -        | Black (BK)          |  |
|              |                 | PE       | Green (GN)          |  |

### Connecting the handheld terminal

- Do not replace the battery of the handheld terminal in the explosion hazardous area.
- For a PM 3X digital with FM or CSA certificate: Electrical connection according to "Installation drawing" (enclosed in the packing of the PM 3X digital).
- For correct transmission of the communication signal, a minimum resistance of 250  $\Omega$  must be present between the connection points and the power supply.

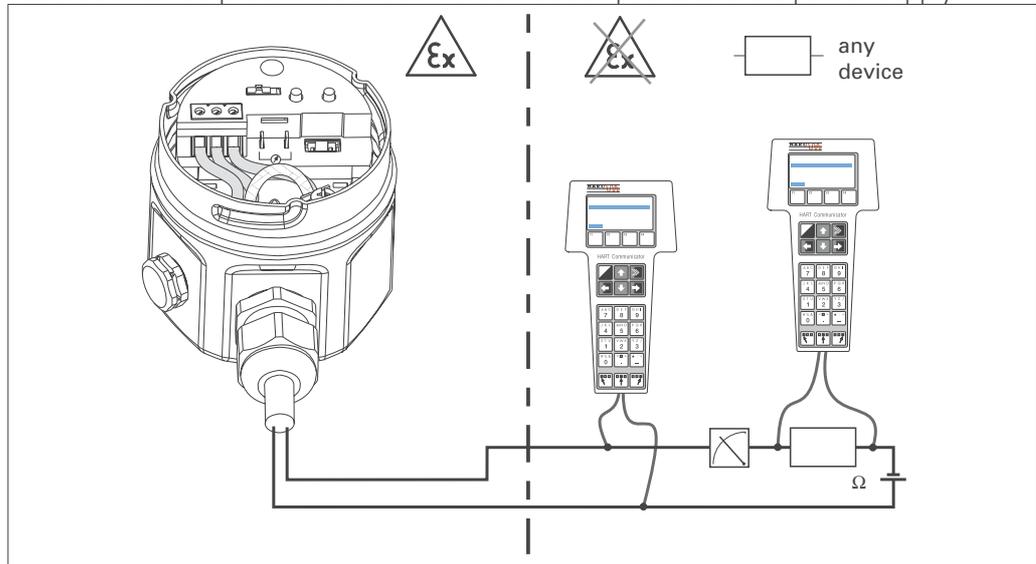
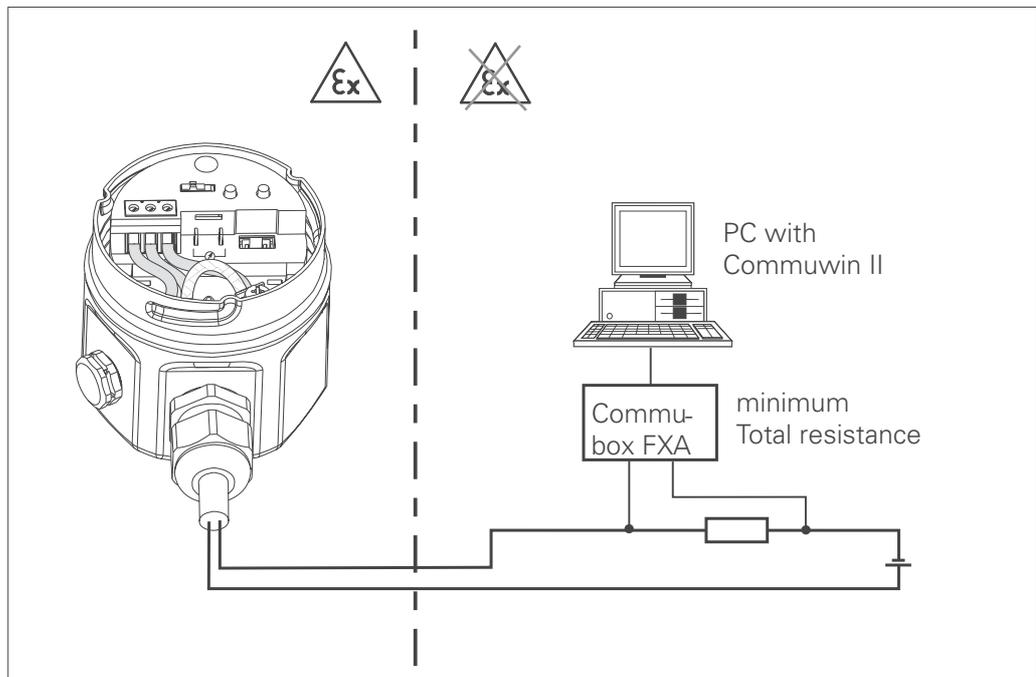


Figure 2.14  
The handheld terminal can be connected anywhere along the 4...20 mA line.

### Connecting the Commubox FXA for operating with Commuwin II

The Commubox FXA connects the PM 3X digital with a HART protocol to the RS 232 C serial interface of a personal computer. This enables the PM 3X digital to be remotely operated with the operating program. The Commubox FXA is used for intrinsically safe signal circuits.

Figure 2.15



## 4 Operation

This section describes:

- Mounting the digital display
- Function of the digital display
- Position and function of the operating elements on the electronic insert
- Operating via Commuwin II
- Operating via the universal HART Communicator DXR 275

### Contents

### 4.1 Access to the operating elements

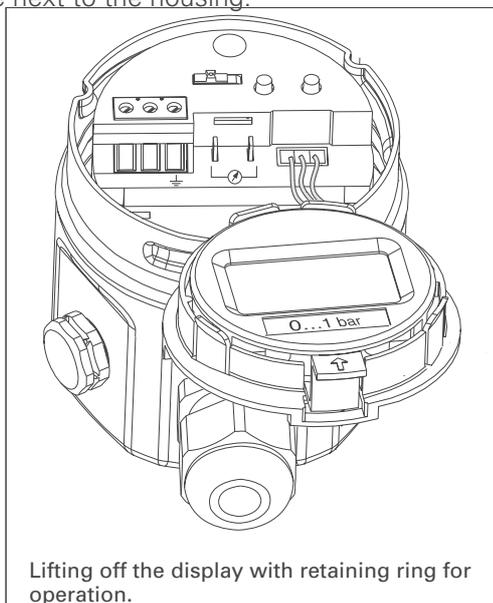
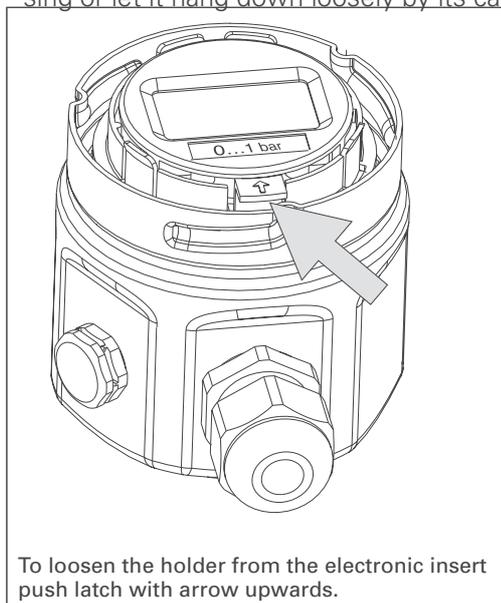
#### Lift display for operating

The digital display is delivered already mounted when it is ordered with the instrument. In this case the digital display with the retaining ring must be removed before operating.

If you want to order an digital display at a later date, then please observe the instructions in Section 6.3 "Mounting the digital display".

Removing the display:

- Push up the latch with the arrow until the grip of the retaining ring on the electronic insert is heard to click.
- Loosen the retainer ring and lift off carefully to prevent the display cable from breaking.
- For reading the display during operation, plug the display onto the edge of the housing or let it hang down loosely by its cable next to the housing.



*Figure 3.2*  
left:  
Loosing the holder  
right:  
Lifting off the display with  
retaining ring for operation

### 4.2 Function of the display

The digital display has two types of display:

- 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 after 2 seconds.

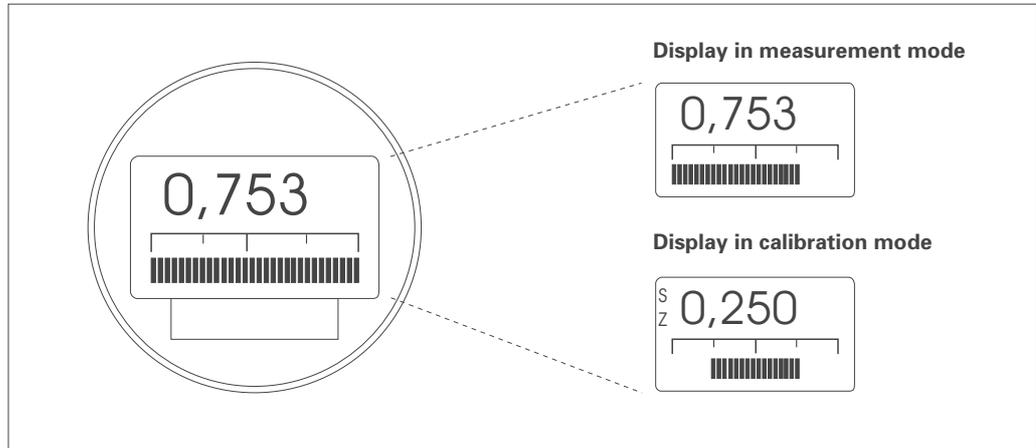


Figure 3.3  
Function of the display

### 4.3 Position and function of the operating elements on the electronic insert

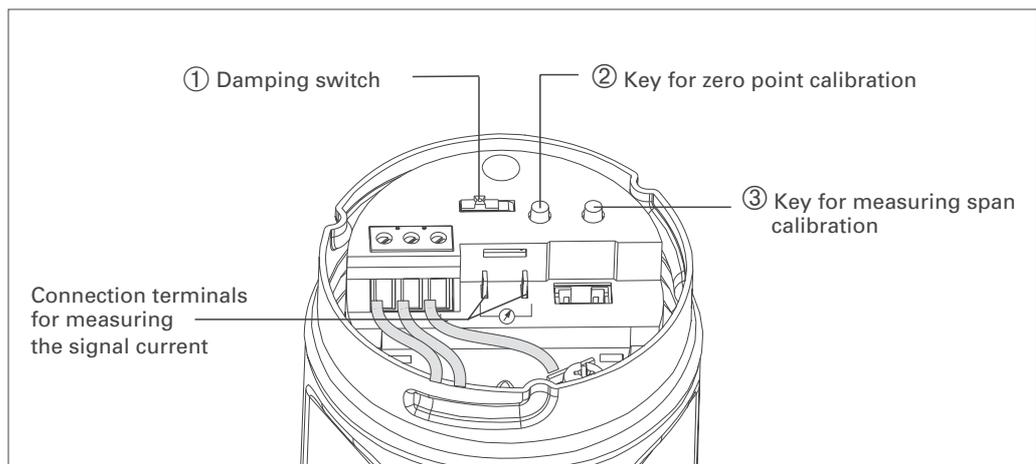


Figure 3.4  
Position of the operating elements

#### Position of the Operating Elements

| No. | Operating element  | Function  |
|-----|--|---|
| ①   | Damping switch   | Switch position "off": Damping 0 s<br>Switch position "on": Damping 2 s.<br>This switch position also enables any damping to be entered between 0...40 s by remote communication e.g. with the handheld terminal. |
| ②   | Key for calibrating the zero point   | <b>press once:</b> . . . The acting pressure for the zero point is . . . . . shown<br><b>press twice:</b> . . . The acting pressure for the zero point is . . . . . adopted                                       |
| ③   | Key for calibrating the measuring span   | <b>press once:</b> . . . The acting pressure for the measuring span . . . . . is shown<br><b>press twice:</b> . . . The acting pressure for the measuring span . . . . . is adopted                               |
| ②③  | Key for calibrating the zero point and key for calibrating the measuring point | <b>press once simultaneously:</b><br>The acting pressure is shown as the bias pressure<br><b>press twice simultaneously:</b><br>The acting pressure is adopted as the bias pressure                               |

### 4.4 Operation using Commuwin II

When operating using the Commuwin II display and operating program the PM 3X digital is calibrated and operated:

- via an operating matrix or
- via the graphics operating mode.

The appropriate server (e.g. HART ) must be activated. A description of the Commuwin II operating program is found in the operating manual of commuwin.

#### Operating matrix

The advanced functions of the PM 3X digital can be accessed in this operating mode in the menu.

- Each row is assigned to a function group.
- Every field displays a parameter.

The calibrating parameters are entered in the appropriate fields.

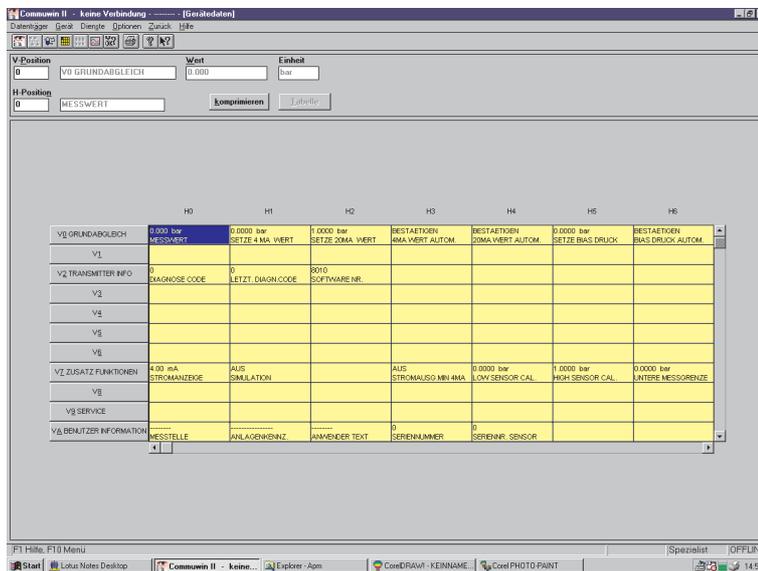


Figure 3.5 Menu of instrument data in Commuwin II

#### Graphics operation

In this operating mode the calibration parameters for specific configuration procedures are entered in the appropriate box.

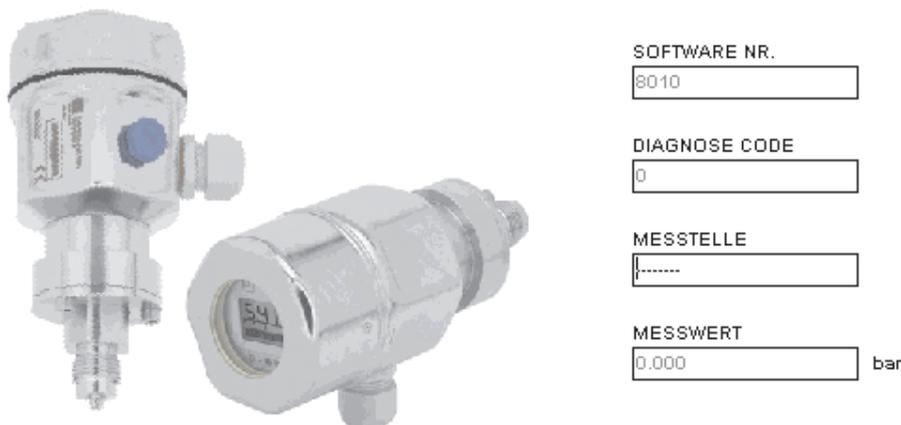


Figure 3.6 Menu of instrument data in Commuwin II

## 4.5 Operating with the HART protocol via Universal HART Communicator DXR 271

When operating with the HART protocol an interactive menu operation derived from the matrix is used (see also the appropriate operating manual for the handheld terminal).

- The menu "Group Select" calls up the matrix.
- The bar lines display the menu headings.
- Parameters are set using submenus.

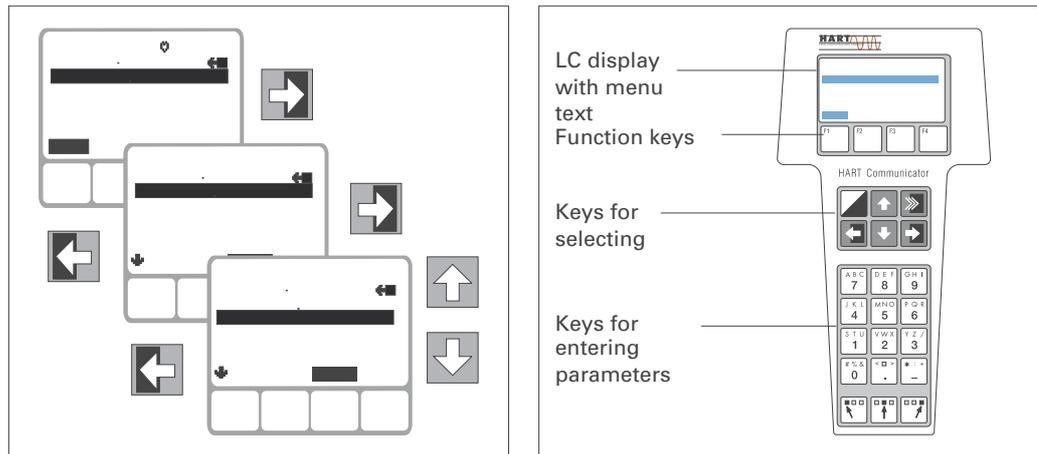


Figure 3.7  
left:  
Menu operation with the  
DXR 275  
right:  
Universal HART Communicator  
DXR 275 handheld terminal

Connecting the handheld terminal is described in Section 2, page 12. The procedure for commissioning the measuring point with the Universal HART Communicator DXR 275 handheld terminal is described in Section 4 "Pressure Measurement".

## 5 Commissioning

This section contains the following information:

- On-site commissioning using keys on the electronic insert
- Commissioning and operation using remote communication (Universal HART Communicator DXR 275 handheld terminal or Commuwin II)
- Locking and unlocking the measuring point
- Information on the measuring point

### 5.1 On-site commissioning

- Wire up the PM 3X digital (see Sect. 2.4 "Electrical connection")
- Connect a multimeter (4...20 mA) to the connection terminals provided.
- Ensure that a pressure can be generated within the required measuring range.

The damping  $t$  affects the speed with which the output signal and the digital display react to changes in pressure.

A switch on the electronic insert is used for setting the damping:

- Switch position off: Damping 0 s
- Switch position on: Damping 2 s

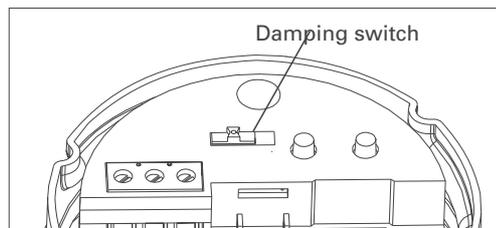


Figure 4.1  
Position of the damping switch

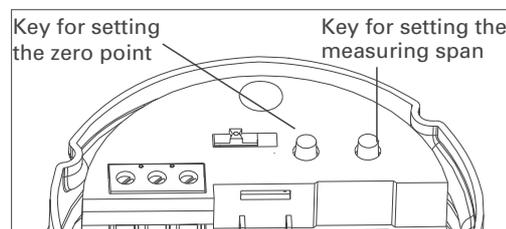


Figure 4.2  
Position of keys for adjust zero point and measuring span

Adjustment of Zero is carried out by means of the pushbutton identified with Zero.

Carry out the procedure as follows:

- Provide the exact pressure for span start (Zero) at the pressure port. .
- Push Zero button (Option "digital display", the presently stored Zero reference value is shown by the display).
- Release Zero button, press again within 2 seconds and hold on pushing for 4 seconds. (Option "digital display", the "Z"-symbol stops blinking). The pressure applied at the pressure port is taken as span start (Zero / 4 mA).

Adjustment of measuring span is carried out by means of the pushbutton identified with Span.

Carry out the procedure as follows:

- Provide the exact pressure for span end (20 mA) at the pressure port
- Push Span button, (Option "digital display", the presently stored Span end reference value is shown by the display) The acting pressure for the measuring span is adopted.
- Release Span button, press again within 2 seconds and hold on pushing for 4 seconds. (Option "digital display", the "S"-symbol stops blinking).

The pressure provided at the pressure port is taken as span end (Span / 20 mA)

By pressing Zero- or Span pushbutton once, the presently stored reference values will be read accordingly.

#### Contents

#### Preparatory work

#### Damping

#### Adjustment of Zero

#### Adjustment of Measuring Span

## 5.2 Commissioning and operation using communication

### Preparatory work

- Wire up the PM 3X digital (see Sect. 2.4 “Electrical Connection”).
- Decide which tool is to operate the PM 3X digital and wire it up accordingly. (Function Commuwin II see Sect. 3.4 , Function Universal HART Communicator DXR 275 see Sect. 3.5)

### Resetting to factory settings (Reset)

By entering a code, the entries in the matrix are reset partially or completely to factory settings. Further information on the various types of reset and their effects are given in Section 5.3 “Reset”.

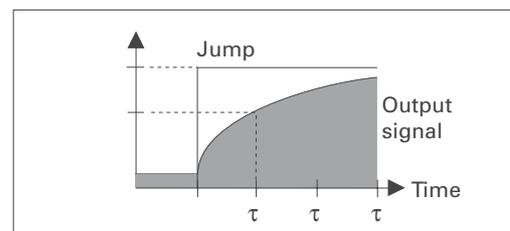
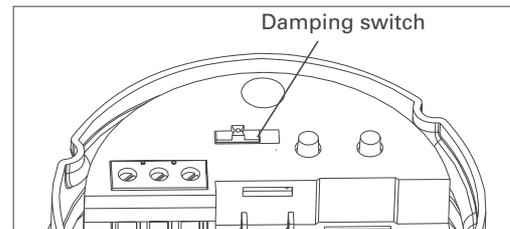
| #  | Matrix                                | Moving through the menus | Entry              |
|--|---------------------------------------|--------------------------|--------------------|
| <b>Main group: Transmitter information</b> |                                       |                          |                    |
| 1  | Resetting to factory settings (Reset) |                          |                    |
|  | V2H9                                  | ►Default values          | e.g. 2380<br>Enter |

### Damping

The damping  $t$  affects the speed with which the output signal and the digital display react to changes in pressure.

For setting the damping using the handheld terminal, the damping switch must be set to “on”. Values for damping between 0 and 40 s can be selected using the handheld terminal.

| #                                | Matrix                                       | Moving through the menus          | Entry              |
|----------------------------------|--|-----------------------------------|--------------------|
| 1                                | Set the damping switch to “on”               |                                   |                    |
| <b>Main group: Basic setting</b> |  |                                   |                    |
| 2                                | Suppressing variations in the measured value |                                   |                    |
|                                  | V0H7   | ►Damping output $\tau=0\dots40$ s | e.g. 20 s<br>Enter |



### Selecting the pressure units

Selecting the pressure units determines in which units the pressure-specific parameters are to be shown. The pressure units available are given in the table below.

After selecting new pressure units all information on the pressure are converted into the new units, e.g. 0...1 bar = 0...14.5 psi.

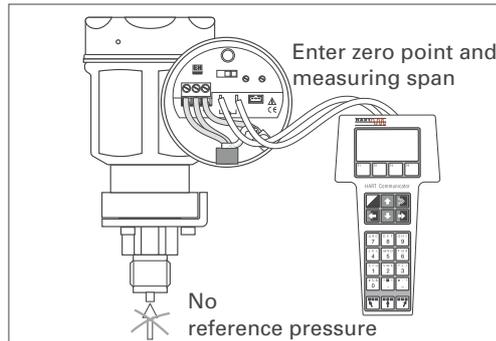
| #                                | Matrix                   | Moving through the menus  | Entry             |
|----------------------------------|--------------------------|---------------------------|-------------------|
| <b>Main group: Basic setting</b> |                          |                           |                   |
| 1                                | Selecting pressure units |                           |                   |
|                                  | V0H9                     | ►Selecting pressure units | e.g. psi<br>Enter |

| Units | Units               | Units               | Units                 | Units |
|-------|---------------------|---------------------|-----------------------|-------|
| mbar  | kPa                 | in H <sub>2</sub> O | kg / cm <sup>2</sup>  | Torr  |
| bar   | MPa                 | ft H <sub>2</sub> O | kgf / cm <sup>2</sup> | mm Hg |
| Pa    | mm H <sub>2</sub> O | psi                 | atm                   | in Hg |
| hPa   | m H <sub>2</sub> O  | g / cm <sup>2</sup> | lb / ft <sup>2</sup>  |       |

The pressure required for zero point and span is calibrated using the handheld terminal without entering a reference pressure.

**Lower and upper range value: calibration without reference pressure**

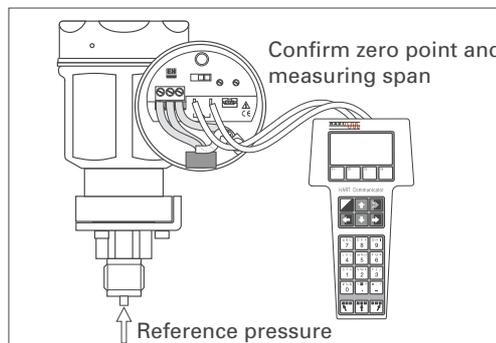
| #                                | Matri x                                | Moving through the menus | Entry                  |
|----------------------------------|--|--------------------------|------------------------|
| <b>Main group: Basic setting</b> |  |                          |                        |
| 1                                | Entering known pressure for zero point |                          |                        |
|                                  | V0H 1                                  | ►Setting 4 mA            | e.g. 0 psi<br>Enter    |
| 2                                | Entering known pressure for span       |                          |                        |
|                                  | V0H 2                                  | ►Setting 20 mA           | e.g. 14.5 psi<br>Enter |



A reference pressure is available that corresponds exactly to the zero point and span required.

**Lower and upper range value: calibration with reference pressure**

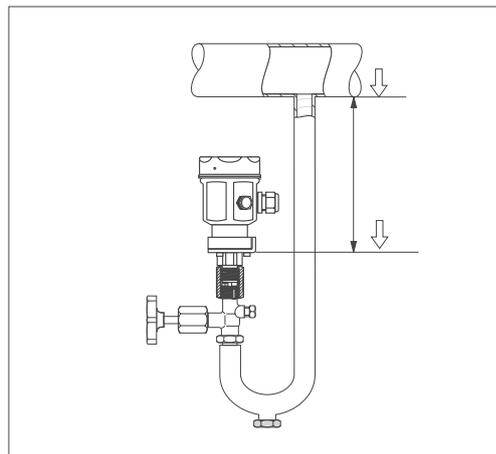
| #                                 | Matri x   | Moving through the menus        | Entry                  |
|-----------------------------------|---|---------------------------------|------------------------|
| <b>Main group: Basic settings</b> |   |                                 |                        |
| 1                                 | Adopting the acting pressure for the zero point |                                 |                        |
|                                   | V0H 3   | ►Confirming 4 mA automatically  | e.g. 0 psi<br>Enter    |
| 2                                 | Adopting the acting pressure for the span       |                                 |                        |
|                                   | V0H 4   | ►Confirming 20 mA automatically | e.g. 14.5 psi<br>Enter |



If the display does not show zero after zero point adjustment (due to position), then this can be corrected to zero by entering a bias pressure or by adopting the bias pressure acting (depending on position).

**Bias adjustment**

| #                                | Matri x   | Moving through the menus                | Entry               |
|----------------------------------|---|---|---------------------|
| <b>Main group: Basic setting</b> |   |   |                     |
| 1                                | Setting the display to zero by entering a known bias pressure (pressure dependent on position).                     |   |                     |
|                                  | V0H 5   | ►Setting bias pressure                  | e.g. 5 psi<br>Enter |
| <b>alternatively</b>             |   |   |                     |
| 2                                | Setting the display to zero<br>A bias pressure acting (pressure dependent on position) is adopted as zero pressure. |   |                     |
|                                  | V0H 6   | ►Confirming bias pressure automatically | Enter               |



The current signal is set to 3.8...20.5 mA as standard when operating correctly. Selecting the 4 mA level, ensures that a minimum current signal does not fall below 4 mA.

**4 mA level (current output min. 4 mA)**

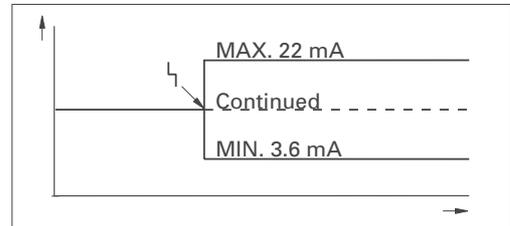
| #                              | Matri x | Moving through the menus         | Entry            |
|--------------------------------|---------|----------------------------------|------------------|
| <b>Main group: Sensor data</b> |         |                                  |                  |
| 1                              | V7H 3   | ►Off<br>Current output min. 4 mA | e.g. On<br>Enter |

## Output on error

To indicate an error, an error code is transmitted with the measured value. At the same time the bargraph in the digital display assumes the value selected by the operator. The following values can be selected:

- MIN: 3.6 mA
- MAX: 22 mA
- CONTINUE: measurement continued

| #                                 | Matrix                    | Moving through the menus | Entry              |
|-----------------------------------|---------------------------|--------------------------|--------------------|
| <b>Main group: Basic settings</b> |                           |                          |                    |
| 1                                 | Selecting output on error |                          |                    |
|                                   | V0H<br>8                  | ► Selecting fail-safe    | e.g. MAX.<br>Enter |



## 5.3 Locking/Unlocking operation

After calibrating or entering all parameters, the operation can be locked by entering a three-figure code other than 130. This blocks all fields and functions except V9H9 "Locking". Locking is released by entering 130.

| #                          | Matrix            | Moving through the menus | Entry             |
|----------------------------|-------------------|--------------------------|-------------------|
| <b>Main group: Service</b> |                   |                          |                   |
| 1                          | Locking operation |                          |                   |
|                            | V9H<br>9          | ► Locking                | e.g. 131<br>Enter |
| 2                          | Releasing locking |                          |                   |
|                            | V9H<br>9          | ► Locking                | 130<br>Enter      |

## 5.4 Information on the measuring point

The following information on the measuring point can be called up with the handheld terminal:

| Matrix field                      | Display or entry  |
|-----------------------------------|---|
| <b>Measured values</b>            |   |
| V0H0                              | Main measured value for pressure  |
| V7H0                              | Current display: Actual current in mA   |
| V7H8                              | Sensor pressure (units in V0H9) selectable  |
| V9H7                              | Actual dampened pressure without bias correction  |
| <b>Sensor data</b>                |   |
| V7H4                              | Lower calibration pressure  |
| V7H5                              | Upper calibration pressure  |
| V7H6                              | Lower measurement limit of sensor (units in V0H9 selectable)  |
| V7H7                              | Upper measurement limit of sensor (units in V0H9 selectable)  |
| <b>Information on transmitter</b> |   |
| V2H2                              | 8010 = Software number  |
| V2H7                              | Sensor data No.:<br>Number of entry in the sensor table (1...10).<br>Please remove from sensor pass               |
| V2H8                              | Sensor data value:<br>Entry in sensor table, contains all sensor-specific data.<br>Please remove from sensor pass |
| <b>Error response</b>             |   |
| V2H0                              | Actual diagnostic code  |
| V2H1                              | Last diagnostic code  |

### Communication level

| Matrix field | Display   |
|--------------|---|
| VAH0         | Measuring point tag.<br>The measuring point can be identified here with a max. of 8 characters. |
| VAH1         | Descriptor<br>A max. of 16 characters can be entered here for the Descriptor.                   |
| VAH2         | User text<br>A max. of 8 characters can be entered here.  |
| VAH3         | Serial number of the transmitter  |
| VAH3         | Serial number of the sensor   |

## 6 Diagnosis and Troubleshooting

### 6.1 Diagnosis of errors and warnings

#### Error

If the PM 3X digital identifies an error (E):

- an error code is given and flashes on the digital display,
- when a digital display is plugged in, the bargraph assumes the value selected for an error message (MIN, MAX, CONTINUE),
- if the value displayed and the bargraph are flashing,
- transmitter information can be read off in the main group or error codes read off in the matrix fields V2H0 and V2H1.

#### Warning

If the PM 3X digital identifies a warning (W):

- an error code is given: the PM 3X digital continues to measure,
- if the digital display is plugged in and the scale is flashing,
- transmitter information can be read off in the main group or error codes read off in the matrix fields V2H0 and V2H1.

#### Error codes in V2H0 and V2H1

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

| Code  | Type    | Source and remedy   |
|-------|---------|---|
| E 101 | Error   | Sensor Table check sum error<br>– is shown e.g. when sensor parameters are being entered.<br>· The error message disappears when the sensor parameters are entered correctly and in full. |
| E 103 | Error   | Initialisation is being carried out<br>– Wait until the procedure has been completed  |
| W 104 | Warning | Sensor calibration error (calibration points lie too near each other)<br>– Recalibrate sensor   |
| E 106 | Error   | Up/download active<br>– Wait until the procedure has been completed   |
| E 115 | Error   | Sensor overpressure<br>– Remains until the overpressure disappears  |
| E 116 | Error   | Download error<br>– Restart download  |
| E 120 | Error   | Sensor underpressure<br>– Remains until the underpressure disappears  |
| W 613 | Error   | Current simulation active<br>– Remains until the simulation is completed, see also page 26  |
| E 620 | Warning | Measured value outside initial value/final value  |

### 6.2 Current simulation

If the function or certain reactions to connected evaluation instruments are to be checked, then a signal current can be simulated independently of the system pressure.

| #                                       | Matrix | Moving through the menus | Entry      |
|---|--------|--------------------------|------------|
| <b>Main group: Additional functions</b> |        |                          |            |
| 1                                       | V7H 1  | ► Simulation             | ON         |
| 2                                       | V7H 2  | ► Simulates current      | e.g. 22 mA |

## 6.3 Reset

By entering a specific code, entries to the matrix can be reset either partially or fully.

| #                                   | Matrix | Moving through the menus | Entry     |
|-------------------------------------|--------|--------------------------|-----------|
| <b>Main group: Transmitter Info</b> |        |                          |           |
| 1                                   | V2H9   | ► Factory values         | e.g. 2380 |

The PM 3X digital differentiates between four types of reset with various responses. Which parameter is affected by which reset is given in the table below.

|                             | H0                       | H1                     | H2                       | H3                            | H4   | H5                        | H6                          | H7                    | H8                       | H9                   |
|-----------------------------|--------------------------|------------------------|--------------------------|-------------------------------|--|---------------------------|-----------------------------|-----------------------|--------------------------|----------------------|
| <b>V0</b>                   |                          | <b>Sets 4 mA</b>       | <b>Sets 20 mA</b>        | <b>4 mA automat.</b>          | <b>20 mA automat.</b>  | <b>Sets bias pressure</b> | <b>Bias pressure autom.</b> | <b>Dampens output</b> | <b>Selects fail-safe</b> | <b>Pressure unit</b> |
| 5140<br>2380<br>731<br>2509 |                          | 0.0<br>0.0<br>0.0      | V7H7<br>V7H7<br>V7H7     | deleted<br>deleted<br>deleted | deleted  | 0.0<br>0.0<br>0.0         | deleted                     | 0.0<br>0.0<br>0.0     | max.<br>max.<br>max.     | bar                  |
| <b>V2</b>                   |                          | <b>Diagnostic code</b> |                          |                               |  |                           |                             |                       |                          |                      |
| 5140<br>2380<br>2509<br>731 |                          | 0<br>0<br>0            |                          |                               |  |                           |                             |                       |                          |                      |
| <b>V3...V6</b>              |                          |                        |                          |                               |  |                           |                             |                       |                          |                      |
| <b>V7</b>                   |                          | <b>Simulation off</b>  | <b>Simulates current</b> | <b>Current min. 4 mA</b>      | <b>Low and high sensor calibration</b>                         |                           |                             |                       |                          |                      |
| 5140<br>2380<br>2509<br>731 |                          | off                    | deleted                  | off<br>off<br>off             | The pressure delivered by the equation system is not corrected |                           |                             |                       |                          |                      |
| <b>V8</b>                   |                          |                        |                          |                               |  |                           |                             |                       |                          |                      |
| <b>V9</b>                   |                          |                        |                          |                               |  |                           |                             |                       |                          | <b>Locking</b>       |
| 5140<br>2380<br>2509<br>731 |                          |                        |                          |                               |  |                           |                             |                       |                          | 130                  |
| <b>VA</b>                   | <b>Measurement point</b> | <b>Descriptor</b>      | <b>User text</b>         | <b>Serial number</b>          |  |                           |                             |                       |                          |                      |
| 5140<br>2380<br>2509<br>731 | deleted<br>deleted       | deleted<br>deleted     | deleted                  | deleted                       |  |                           |                             |                       |                          |                      |

## 7 Maintenance and Repair

### 7.1 Repair

If the PM 3X digital is to be sent to PMA GmbH Kassel for repair, then a note should be enclosed containing the following information.

- An exact description of the application
- The chemical and physical characteristics of the product.
- A brief description of the error.

Before sending in the PM 3X digital to PMA GmbH Kassel for repair, please take the following protective measures:

- Remove all traces of the product.  
This is particularly important if the product is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- We do request that no instrument should be returned to us without all dangerous material being completely removed first as it can, e.g. penetrate into fissures or diffuse through plastic.



**Caution!**

Caution!

Instruments with certificates of conformity or design approval must be sent in for repair as complete units only.



**Note!**

Note!

In case of malfunction do not hesitate to contact our PMA-service.

## 7.2 Mounting the digital display

The digital display is delivered already mounted when it is ordered with the instrument. In cases of damage, accessories can be ordered.

- Push up the latch with the arrow until the grip of the retaining ring on the electronic insert is heard to click.
- Loosen the retainer ring and lift off carefully to prevent the display cable from breaking.
- Remove the plug of the display from the electronic insert.

### Removing the display

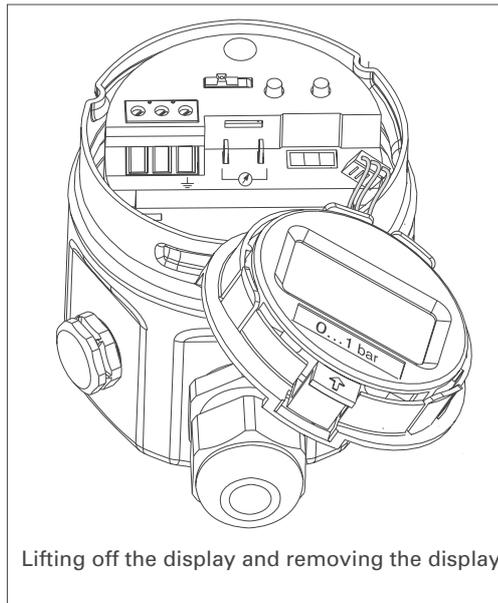
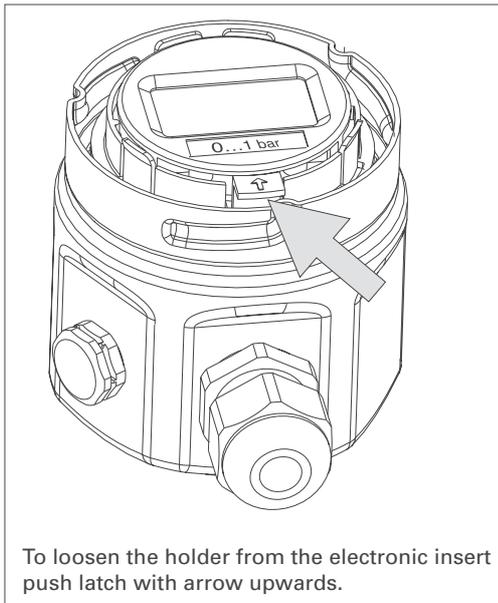


Figure 6.1  
left:  
Loosening the retaining ring  
right:  
Removing the display

- Insert the plug of the display in the jack in the electronic insert provided for this purpose and clip in ①.
- Insert the pin on the retaining ring into the hole in the electronic insert provided for this purpose ②.
- Firmly press down the retaining ring with the display onto the electronic insert. The stop makes an audible click.

### Mounting the display

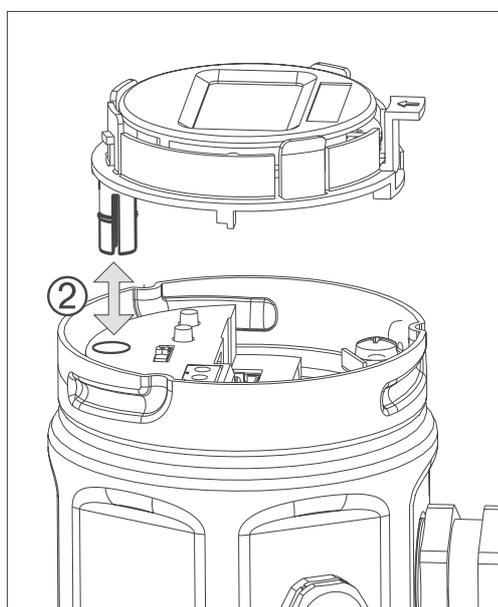
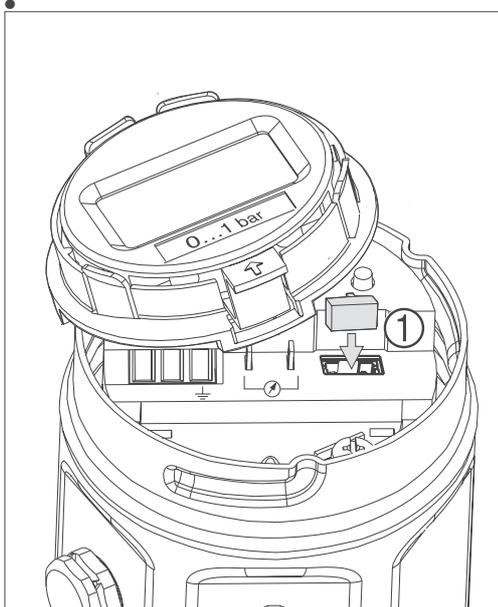


Figure 6.2  
Mounting the display

### 7.3 Changing the gasket

The gasket in contact with the medium and inside the process connection of the PM 3X digital can be replaced. Except for the PTFE gasket (Structure D), all gaskets can thus be interchanged as required. The different temperature limits should therefore be observed for individual materials.

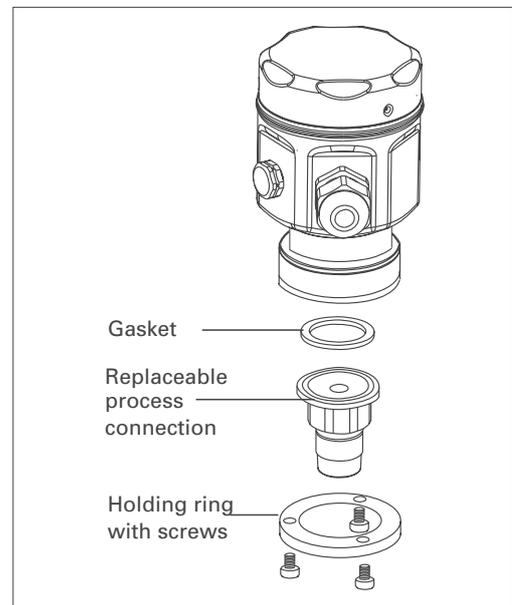
| Gasket |   | Temperature limits             |
|--------|---|--------------------------------|
| 1      | FPM, Viton                                | -20°C* (-4°F)                  |
| 6      | FPM, Viton grease-free                    | -10°C* (+14°F)                 |
| A      | FPM, Viton oil and grease-free for oxygen | -10°C...+60°C (+14°F...+140°F) |
| 2      | NBR                                       | -20°C* (-4°F)                  |
| 7      | FFKM, Kalrez compound 4079                | +5°C* (+41°F)                  |
| 4      | EPDM                                      | -40°C* (-40°F)                 |

\* Upper temperature limit according to specifications of

Changing the gasket

- Loosen the screws on the retaining ring of the process connection.
- Remove the retaining ring and process connection.
- Replace gasket. The surfaces each side of the gasket and the gasket itself must be free from fibres and dirt.
- Secure the process connection with the retaining ring and screws.

Figure 6.3  
Changing the gasket



## 8 Technical Data

### General information

|                         |  |
|-------------------------|--|
| Manufacturer            | PMA  |
| Instrument              | Pressure transmitter   |
| Designation             | PM 31, PM 32, PM 33, PM 34, PM 35, PM 36   |
| Technical documentation | 9499-040-64311   |
| Technical data          | PM 31 : 9498-737-38813<br>PM 32 : 9498-737-38913<br>PM 33 : 9498-737-39013<br>PM 34 : 9498-737-39113<br>PM 35 : 9498-737-39213<br>PM 36 : 9498-737-39313 |

### Application

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

### Operation and system design

#### Measuring principle

|  |  |
|--|--|
| PM 31, PM 32 with ceramic sensor             | The pressure causes a slight deflection of the ceramic diaphragm of the sensor. The change in the capacitance is proportional to the pressure and is measured by the electrodes of the ceramic sensor.<br>Volume of chamber: approx. 2 mm <sup>3</sup> (0.078 in <sup>3</sup> )  |
| PM 33, PM 34, PM 35, PM 36 with metal sensor | The process pressure acting on the metallic separating diaphragm of the sensor is transmitted via a filling fluid to a resistance bridge. The change in the output voltage of the bridge is proportional to the pressure and is then measured.<br>Volume of chamber: smaller than 1 mm <sup>3</sup> (0.039 in <sup>3</sup> ) |
| Measuring system                             | PM 3X digital and power supply e.g. via transmitter power pack and operation via<br>–two keys on the instrument and a plug-in display module<br>–DXR 275 handheld terminal<br>–PC with the Commuwin II operating program via Commubox FXA  |
| Construction                                 | Aluminium- housing: PM31, PM33, PM36<br>Standard SS housing: PM32, PM34, PM35<br>for process connections see page 8  |
| Signal transmission                          | 4...20 mA signal with superposed HART communications signal, 2-wire  |

detailed technical data see datasheet over internet [http:// www.pma-online.de](http://www.pma-online.de) observably and/or to be downloaded can

Page for notes

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Subject to alterations without notice.

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