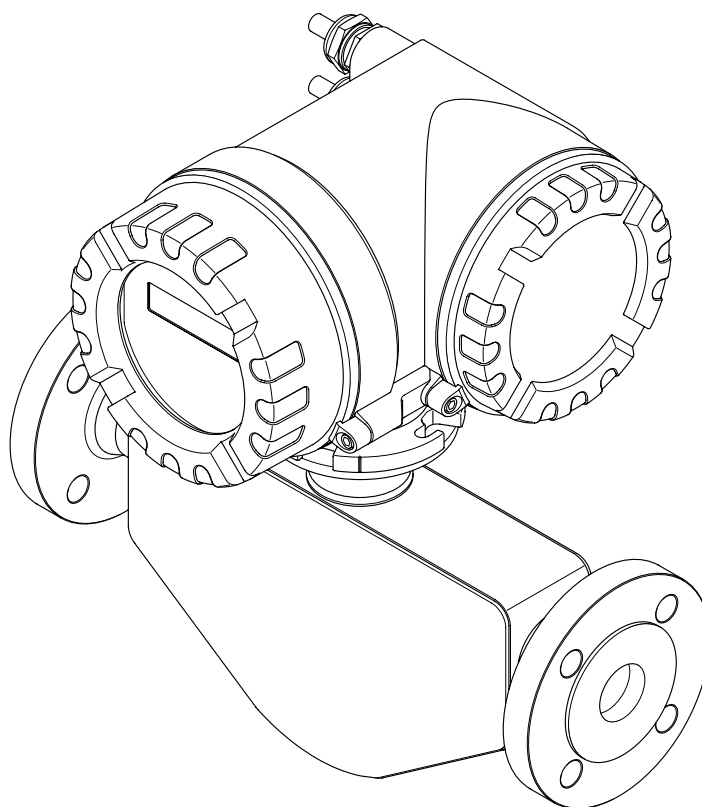


# ***promass 40*** **Coriolis Mass Flow Measuring System**

## Operating Instructions



## Promass 40 brief operating instructions

These brief operating instructions show you how to configure your measuring device quickly and easily:

|                                                                                                                                                                                                                                                                                              |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
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| <b>Switching on the measuring device</b>                                                                                                                                                                                                                                                     | Page 27     |
| ▼                                                                                                                                                                                                                                                                                            |             |
| <b>Display elements</b>                                                                                                                                                                                                                                                                      | Page 23     |
| ▼                                                                                                                                                                                                                                                                                            |             |
| <b>Customer specific configuration</b>                                                                                                                                                                                                                                                       | Page 25     |
| Complex measuring operations necessitate additional functions that you can configure as necessary with the aid of the function matrix, and customise to suit your process parameters.                                                                                                        |             |
|  <b>Note:</b><br>All functions are described in detail, as is the function matrix itself, in the <b>“Description of Device Functions”</b> manual, which is a separate part of this Operating Instruction. |             |
| ▼                                                                                                                                                                                                                                                                                            |             |
| <b>Trouble-shooting</b>                                                                                                                                                                                                                                                                      | Page 35 ff. |
| Always start trouble-shooting with the checklist on Page 35, if faults occur after start-up or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures.                                                                           |             |
| <b>Returning devices</b><br>If you return a measuring device to Endress+Hauser for repair or calibration, you must enclose the duly completed “Safety regulation” form with the device. You will find a preprinted blank of the “Safety regulation” form at the back of this manual.         |             |

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# 1 Safety instructions

## 1.1 Designated use

The measuring device described in these Operating Instructions is to be used only for measuring the mass flow rate or volume flow rate of liquids and gases. Fluids with widely differing properties can be measured, for example:

- additives
- oils, fats
- acids, alkalis
- lacquers, paints
- suspensions
- gases.

The manufacturer accepts no liability for damages resulting from incorrect use or use not as designated.

## 1.2 Installation, commissioning and operation

Note the following points:

- Installation, connection to the electricity supply, commissioning and maintenance of the device must be carried out by trained, qualified specialists authorised to perform such work by the facility's owner operator. The specialist must have read and understood this Operating Instruction and must follow the instructions it contains.
- The device must be operated by persons authorised and trained by the facility's owner operator. Strict compliance with the instructions in the Operating Instruction is mandatory.
- Endress+Hauser will be happy to assist in clarifying the chemical resistance properties of parts wetted by special fluids, including fluids used for cleaning. However the user is responsible for the choice of fluid wetted materials as regards their in-process resistance to corrosion. The manufacturer refuses to accept liability.
- The installer must ensure that the measuring system is correctly wired in accordance with the wiring diagrams. The transmitter must be grounded, unless the power supply is galvanically insulated.
- Invariably, local regulations governing the opening and repair of electrical devices apply.

## 1.3 Operational safety

Note the following points:

- Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an *integral part* of this Operating Instruction. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory. The symbol on the front of this supplementary Ex documentation indicates the approval and the test center (  Europe,  USA,  Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326, and NAMUR recommendation NE 21.
- The manufacturer reserves the right to modify technical data without prior notice. Your E+H distributor will supply you with current information and updates to this Operating Instruction.

## 1.4 Return

The following procedures must be carried out before a flowmeter requiring repair or calibration, for example, is returned to Endress+Hauser:

- Always enclose a duly completed "Safety regulation" form. Only then can Endress+Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.
- Remove all residues. Pay special attention to the grooves for seals and crevices which could contain residues. This is particularly important if the substance is hazardous to health, e.g. flammable, toxic, caustic, carcinogenic, etc.



Note:

You will find a preprinted blank of the "Safety regulation" form at the back of this manual.



Warning:

- Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.
- Costs incurred for waste disposal and injury (burns, etc.) due to inadequate cleaning will be charged to the owner operator.

## 1.5 Notes on safety conventions and icons

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 in accordance with EN 61010 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures". They can, however, be a source of danger if used incorrectly or for other than the designated use.

Consequently, always pay particular attention to the safety instructions indicated in this Operating Instruction by the following icons:



Warning:

"Warning" indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.



Caution:

"Caution" indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.



Note:

"Note" indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

## 2 Identification

### 2.1 Device designation

The “Promass 40” flow measuring system consists of the following components:

- Promass 40 transmitter
- Promass E sensor

#### 2.1.1 Nameplate of the transmitter

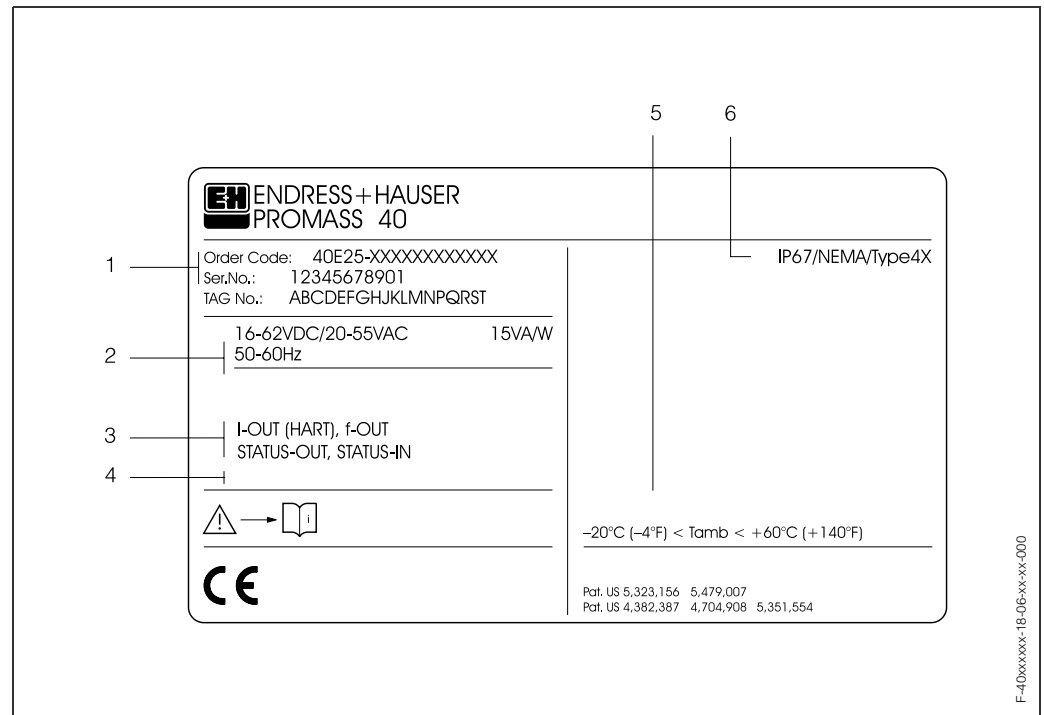


Fig. 1: Nameplate specifications for the “Promass 40” transmitter (example)

- 1 Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.
- 2 Power supply / frequency: 16...62 V DC / 20...55 V AC / 50...60 Hz  
Power consumption: 15 VA / W
- 3 Available inputs / outputs:  
I-OUT (HART): with current output (HART)  
f-OUT: with pulse/frequency output  
STATUS-IN: with status input (auxiliary input)  
STATUS-OUT: with status output (switching output)
- 4 Reserved for information on special products
- 5 Ambient temperature range
- 6 Degree of protection

### 2.1.2 Nameplate of the sensor

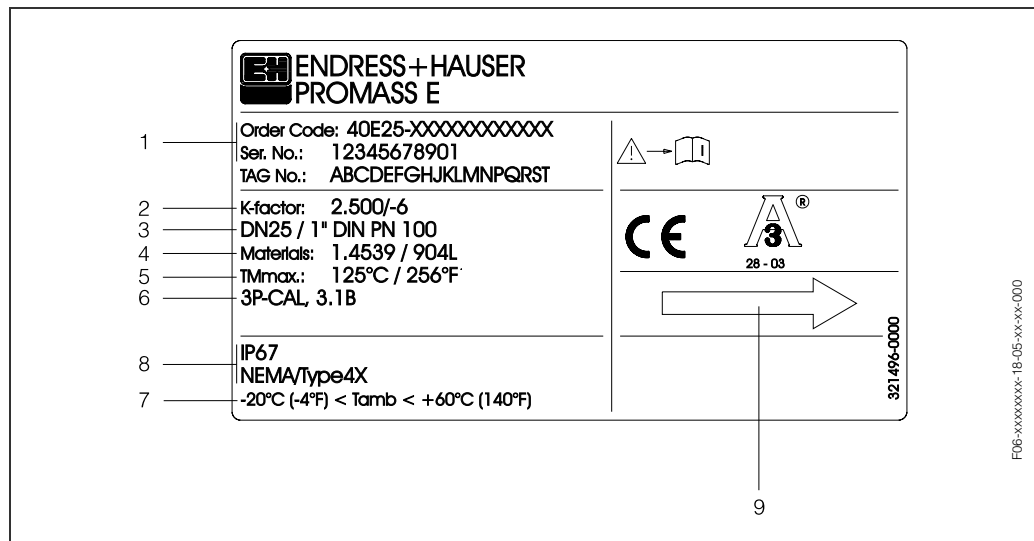


Fig. 2: Nameplate specifications for the "Promass E" sensor (example)

- 1 Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.
- 2 Calibration factor: 2.500; zero point: -6
- 3 Nominal diameter: DN 25 / 1"
- Pressure rating: DIN PN 100 bar
- 4 Material of measuring tubes: Stainless steel 1.4539/904L
- 5 TMax + 125 °C / +256 °F (max. fluid temperature)
- 6 Additional information (example):
  - With 3-point calibration
  - With 3.1 B certification for fluid wetted materials
- 7 Ambient temperature range
- 8 Degree of protection
- 9 Flow direction

## 2.2 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 in accordance with EN 61010 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures".

The measuring system described in this Operating Instruction thus complies with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

## 2.3 Registered trademarks

TRI-CLAMP<sup>®</sup>

is a registered trademark of Ladish & Co., Inc., Kenosha, USA

SWAGELOK<sup>®</sup>

is a registered trademark of Swagelok & Co., Solon, USA

HART<sup>®</sup>

is a registered trademark of HART Communication Foundation, Austin, USA

S-DAT<sup>™</sup>, FieldTool<sup>™</sup>, FieldCheck<sup>™</sup>, Applicator<sup>™</sup>

are registered trademarks of Endress+Hauser Flowtec AG, Reinach, CH

## 3 Installation

### 3.1 Incoming acceptance, transport and storage

#### 3.1.1 Incoming acceptance

On receipt of the goods, check the following points:

- 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 Transport

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- The covers or caps fitted to the process connections prevent mechanical damage to the sealing faces and the ingress of foreign matter to the measuring tube during transportation and storage. Consequently, do not remove these covers or caps until immediately before installation.
- Do not lift measuring devices of nominal diameters DN 40...50 by the transmitter housing or the connection housing in the case of the remote version (Fig. 3). Use webbing slings slung round the two process connections (Fig. 3). Do not use chains, as they could damage the housing.



Warning:

Risk of injury if the measuring device slips. The center of gravity of the assembled measuring device might be higher than the points around which the slings are slung.

At all times, therefore, make sure that the device does not unexpectedly turn around its axis or slip.

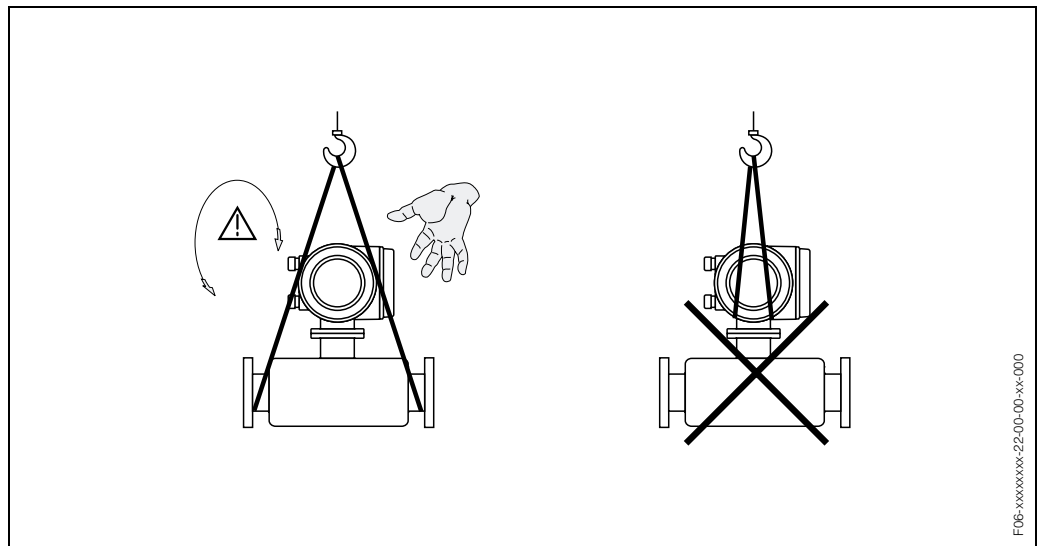


Fig. 3: Instructions for transporting sensors with DN 40...50

### 3.1.3 Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The permissible storage temperature is  $-40...+80\text{ }^{\circ}\text{C}$  (preferably  $+20\text{ }^{\circ}\text{C}$ ).
- Do not remove the protective covers or caps on the process connections until you are ready to install the device.

## 3.2 Installation conditions

Note the following points:

- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations.
- No special precautions need to be taken for fittings which create turbulence (valves, elbows, T-pieces, etc.), as long as no cavitation occurs.

### 3.2.1 Dimensions

Dimensions and the fitting lengths of the transmitter and sensor are on see Page 59 ff.

### 3.2.2 Mounting location

Entrained air or gas bubbles in the measuring tube can result in an increase in measuring errors. Avoid the following locations:

- Highest point in a run. Risk of air accumulating.
- Directly upstream from an open pipe outlet in a down pipe.

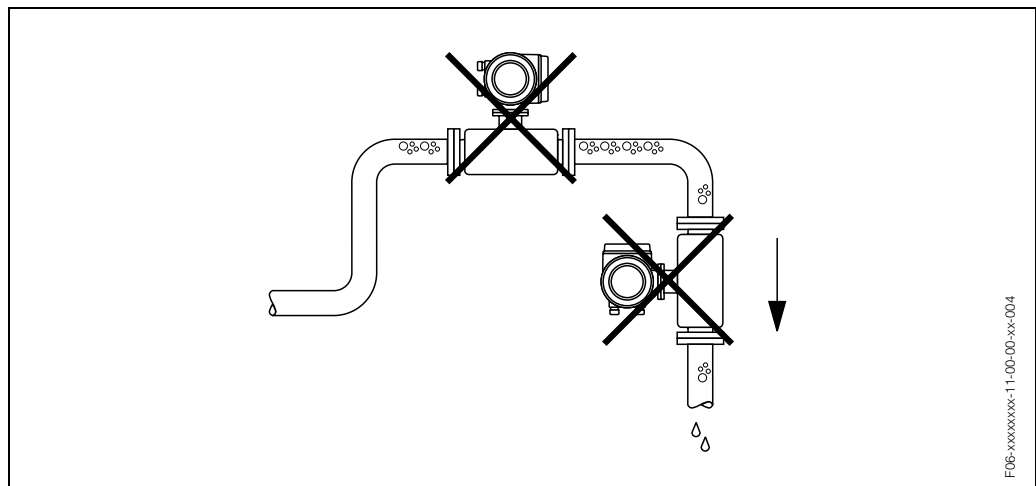


Fig. 4: Mounting location

The proposed configuration in Fig. 5, however, permits installation in an open down pipe. Pipe restrictors or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor from running empty while measurement is in progress.

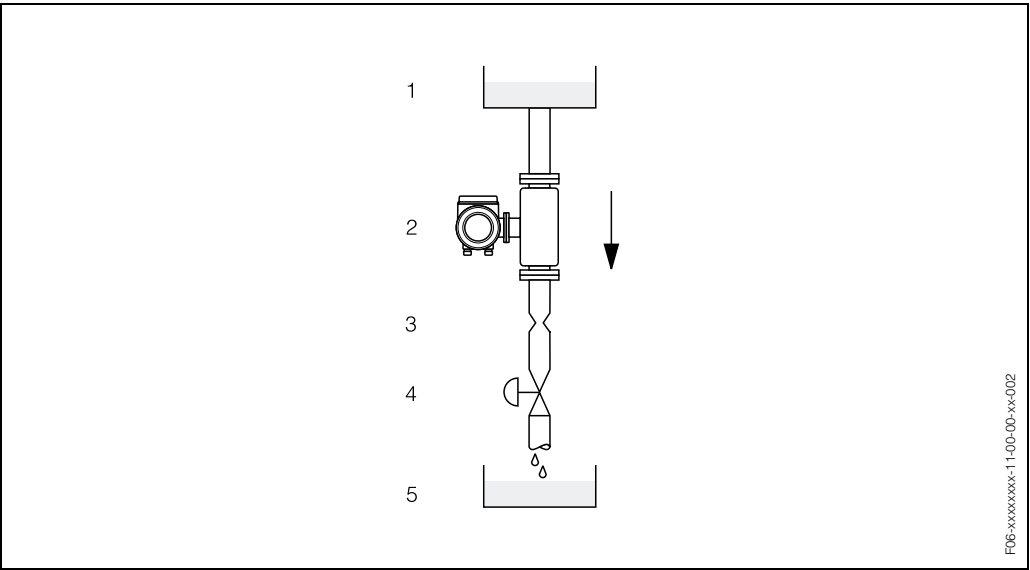


Fig. 5: Installation in a down pipe (e.g. for batching applications)

- 1 Supply tank
- 2 Sensor
- 3 Choke, restrictor
- 4 Valve
- 5 Batching tank

| Promass E / DN               | 8    | 15    | 25    | 40    | 50    |
|------------------------------|------|-------|-------|-------|-------|
| Ø orifice / pipe restriction | 6 mm | 10 mm | 14 mm | 22 mm | 28 mm |

**System pressure**

It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.  
In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapour pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.

- Consequently, it is generally best to install the sensor:
- downstream from pumps (no risk of partial vacuum)
  - at the lowest point in a vertical pipe

### 3.2.3 Orientation

#### Vertical:

Recommended orientation with upward direction of flow (View 1). When fluid is not flowing, entrained solids will sink down and gases will rise away from the measuring tube. The measuring tubes can be completely drained and protected against solids build-up.

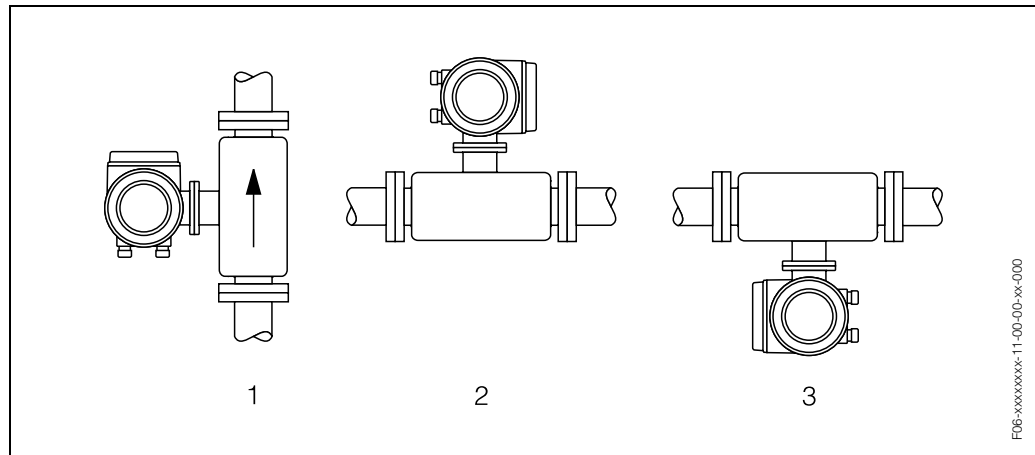


Fig. 6: Orientation Promass E

#### Horizontal:

The measuring tubes of Promass E must be horizontal and beside each other. When installation is correct the transmitter housing is above or below the pipe (Views 2, 3). Always avoid having the transmitter housing in the same horizontal plane as the pipe.



#### Caution:

The measuring tubes of Promass E are slightly curved. The position of the sensor, therefore, has to be matched to the fluid properties when the sensor is installed horizontally (Fig. 7).

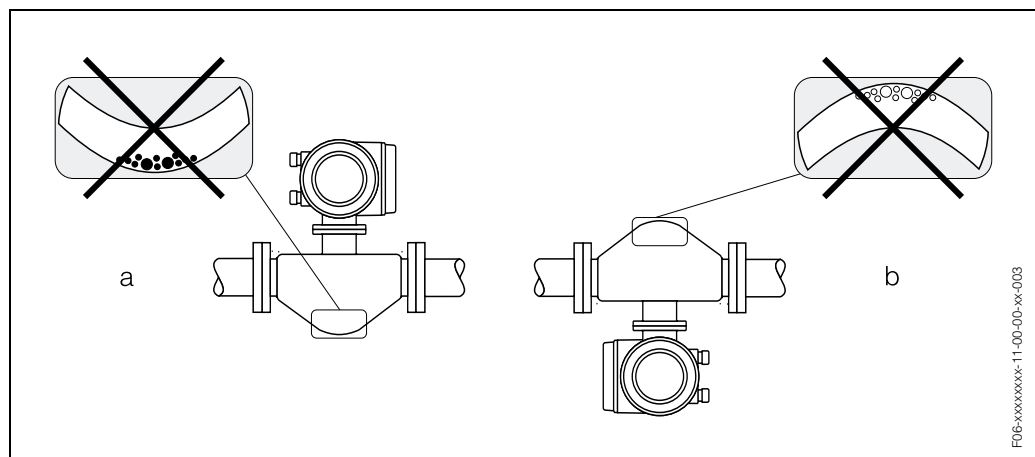


Fig. 7: Promass E installed horizontally

- a Not suitable for fluids with entrained solids. Risk of solids accumulating.
- b Not suitable for outgassing fluids. Risk of air accumulating.

**Fluid temperature**

In order to ensure that the maximum permissible ambient temperature for the transmitter (–20...+60 °C) is not exceeded, we recommend the following orientations:

*High fluid temperature*

- Vertical piping: installation in accordance with Fig. 6 / View 1
- Horizontal piping: installation in accordance with Fig. 6 / View 3

*Low fluid temperature*

- Vertical piping: installation in accordance with Fig. 6 / View 1
- Horizontal piping: installation in accordance with Fig. 6 / View 2

**3.2.4 Heating, thermal insulation**

Some fluids require suitable measures to avoid heat transfer at the sensor. A wide range of materials can be used to provide the required thermal insulation. Heating can be electric, e.g. with heated elements, or by means of hot water or steam pipes made of copper.



Caution:

Risk of electronics overheating!

- Make sure that the connector between sensor and transmitter always remains free of insulating material. Bear in mind that a certain orientation might be required, depending on the temperature of the fluid (see Section 3.2.3 "Fluid temperature").
- Information on permissible temperature ranges → Page 54.

**3.2.5 Inlet and outlet runs**

There are no installation requirements regarding inlet and outlet runs. If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc.

**3.2.6 Vibrations**

The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations. Consequently, the sensors require no special measures for attachment.

**3.2.7 Limiting flow**

See the information on Page 50 and 55.

### 3.3 Installation instructions

#### 3.3.1 Turning the transmitter housing



Warning:

The turning mechanism in devices with EEx d/de or FM/CSA Cl. I Div. 1 classification is not the same as that described here. The procedure for turning these housings is described in the Ex-specific documentation.

1. Loosen the two securing screws.
2. Turn the bayonet catch as far as it will go.
3. Carefully lift the transmitter housing as far as it will go.
4. Turn the transmitter housing to the desired position (max. 2 x 90° in either direction).
5. Lower the housing into position and re-engage the bayonet catch.
6. Retighten the two securing screws.

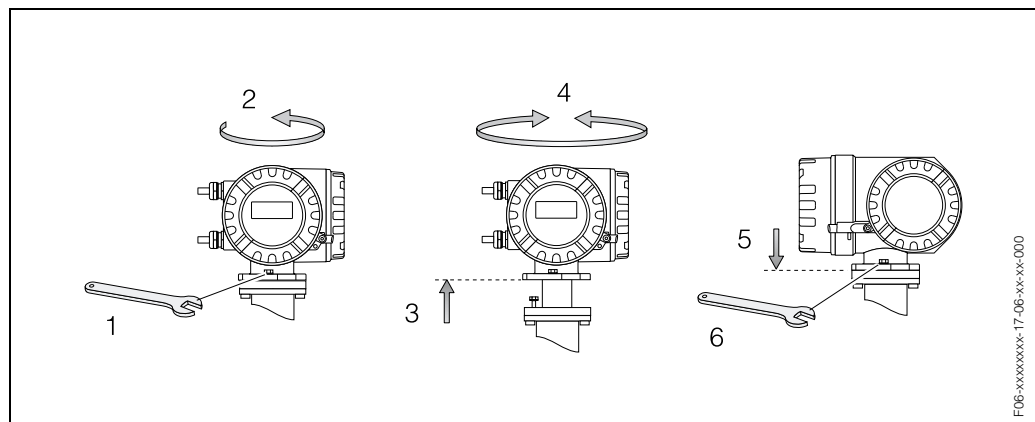


Fig. 8: Turning the transmitter housing (aluminum field housing)

3.3.2 Turning the local display

- 1. Remove the cover of the electronics compartment.
- 2. Press the side latches on the display module and remove it from the electronics compartment cover.
- 3. Rotate the display to the desired position (max. 4x45° in each direction), and reset it into the electronics compartment cover.
- 4. Screw the cover of the electronics compartment firmly onto the transmitter housing.

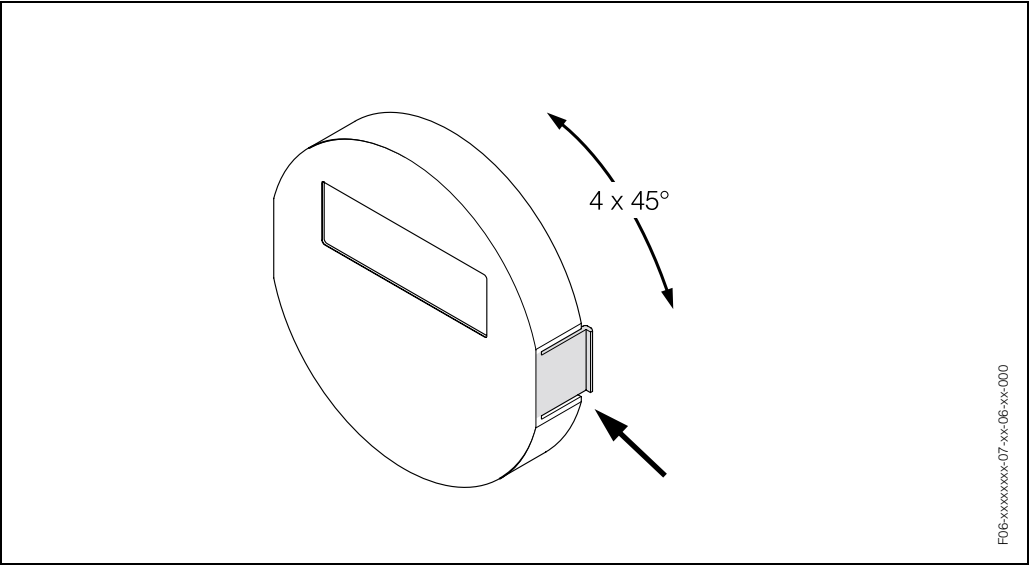


Fig. 9: Turning the local display (field housing)

3.4 Post installation check

Perform the following checks after installing the measuring device in the pipe:

| Device condition and specifications                                                                                                                                    | Notes           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Is the device damaged (visual inspection)?                                                                                                                             | –               |
| Does the device correspond to specifications at the measuring point, including process temperature and pressure, ambient temperature, measuring range, etc.?           | see Page 49 ff. |
| Installation                                                                                                                                                           | Notes           |
| Does the arrow on the sensor nameplate match the direction of flow through the pipe?                                                                                   | –               |
| Are the measuring point number and labeling correct (visual inspection)?                                                                                               | –               |
| Is the orientation chosen for the sensor correct, in other words suitable for sensor type, fluid properties (outgassing, with entrained solids) and fluid temperature? | see Page 10 ff. |
| Process environment / process conditions                                                                                                                               | Notes           |
| Is the measuring device protected against moisture and direct sunlight?                                                                                                | –               |



## 4 Wiring



Warning:

When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to this Operating Instruction. Please do not hesitate to contact your E+H representative if you have any questions.

### 4.1 Connecting the measuring unit

#### 4.1.1 Connecting the transmitter



Warning:

- Risk of electric shock. Switch off the power supply before opening the device. Do not install or wire the device while it is connected to the power supply. Failure to comply with this precaution can result in irreparable damage to the electronics.
- Risk of electric shock. Connect the protective conductor to the ground terminal on the housing before the power supply is applied (not necessary if the power supply is galvanically isolated).
- Compare the specifications on the nameplate with the local voltage supply and frequency. The national regulations governing the installation of electrical equipment also apply.

1. Remove the cover of the connection compartment (f) from the transmitter housing.
2. Feed the power supply cable (a) and signal cables (b) through the appropriate cable entries.
3. Connect the cables:
  - Wiring diagramm → Fig. 10
  - Terminal assignment → Page 18
4. Screw the cover of the connection compartment (g) firmly onto the transmitter housing.

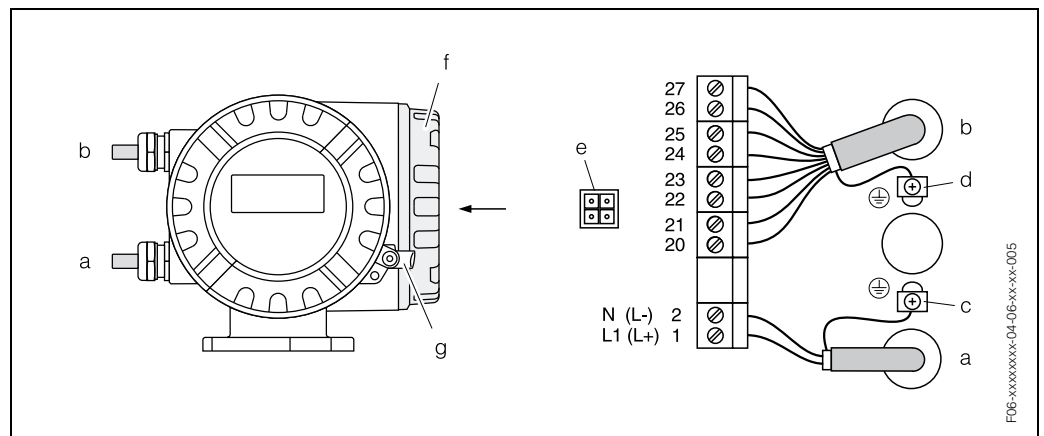


Fig. 10: Connecting the transmitter (aluminium field housing); Cable cross-section: max. 2.5 mm<sup>2</sup>

- a Cable for power supply: 85...260 V AC, 20...55 V AC, 16...62 V DC  
 Terminal No. 1: L1 for AC, L+ for DC  
 Terminal No. 2: N for AC, L- for DC
- b Signal cable: Terminals Nos. 20-27 → Page 17
- c Ground terminal for protective conductor
- d Ground terminal for signal cable shield
- e Service adapter for connecting service interface FXA 193 (FieldCheck™, FieldTool™)
- f Cover of the connection compartment
- g Locking clip

### 4.1.2 Terminal assignment

| Order variant        | Terminal Nos. (inputs/outputs) |               |                           |                                           |
|----------------------|--------------------------------|---------------|---------------------------|-------------------------------------------|
|                      | 20 – 21                        | 22 – 23       | 24 – 25                   | 26 – 27                                   |
| 40***_***** <b>A</b> | –                              | –             | Frequency output          | Current output<br>HART                    |
| 40***_***** <b>D</b> | Status input                   | Status output | Frequency output          | Current output<br>HART                    |
| 40***_***** <b>S</b> | –                              | –             | Frequency output<br>EEx i | Current output<br>EEx i, active, HART     |
| 40***_***** <b>T</b> | –                              | –             | Frequency output<br>EEx i | Current output<br>EEx i, passive,<br>HART |

*Status input (Auxiliary input)*

galvanically isolated, 3...30 V DC,  $R_i = 5 \text{ k}\Omega$ , configurable

*Status output*

Open collector, max. 30 V DC / 250 mA, galvanically isolated, configurable

*Frequency output (passive)*

Open collector, galvanically isolated, 30 V DC, 250 mA

- Frequency output: full scale frequency 2...1000 Hz ( $f_{\text{max}} = 1250 \text{ Hz}$ ), on/off ratio 1:1, pulse width max. 10 s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width adjustable (0.05...2 s), max. pulse frequency selectable

*Current output HART (active/passive)*

galvanically isolated, active: 0/4...20 mA,  $R_L < 700 \Omega$ , HART:  $R_L \geq 250 \Omega$ ,

passive: 4...20 mA, max. 30 V DC,  $R_i \leq 150 \Omega$

*Current output HART EEx i (active, passive)*

*Frequency output EEx i (passive)*

See the Ex documentation for details on the Ex-relevant data.

The Ex documentation is available for the following approvals:

CE = Europe,  = USA,  = Canada

### 4.1.3 HART connection

Users have the following connection options at their disposal:

- Direct connection to transmitter by means of terminals 26 / 27
- Connection by means of the 4...20 mA circuit.



Note:

- The measuring loop's minimum load must be at least 250  $\Omega$ .

#### Connection of the HART handheld communicator

See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

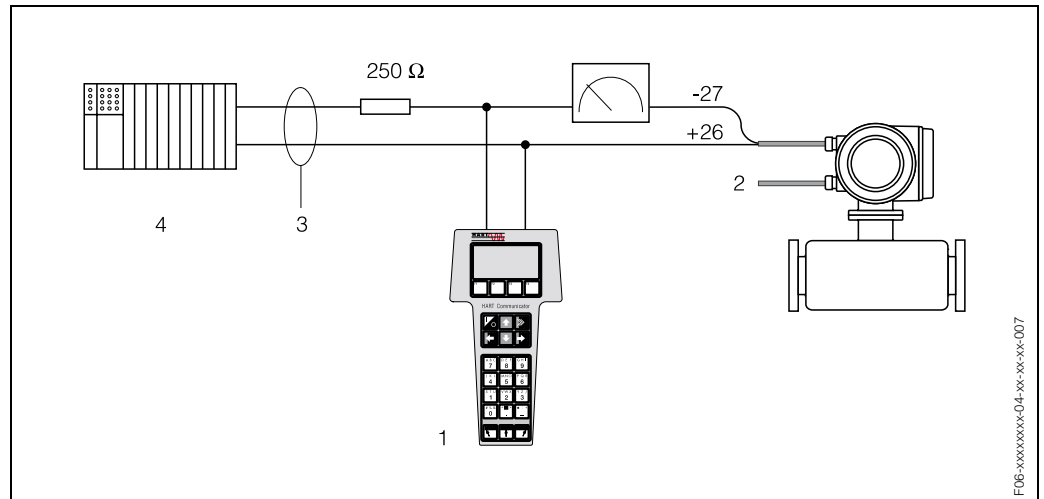


Fig. 11: Electrical connection of the HART handheld communicator:

1 = HART communicator, 2 = power supply, 3 = shield, 4 = other evaluation devices or PLC with passive input

#### Connecting a PC with operating software

In order to connect a personal computer with a operating software (e.g. "FieldTool™") a HART modem (e.g. Commubox FXA 191) is needed.

See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

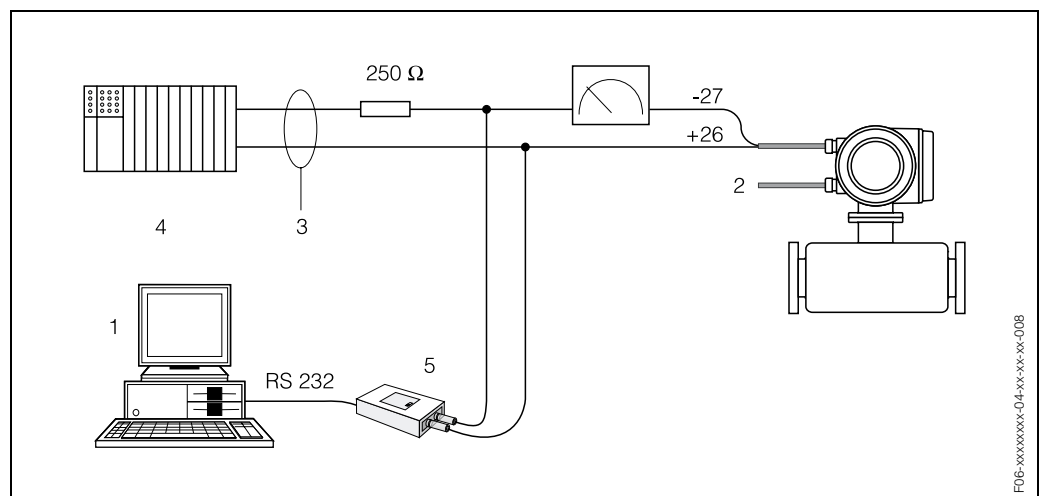


Fig. 12: Electrical connection of a PC with operating software:

1 = PC with operating software, 2 = power supply, 3 = shield, 4 = other evaluation devices or PLC with passive input, 5 = HART modem, e.g. Commubox FXA 191

## 4.2 Potential equalisation

No special measures for potential equalisation are required.



Note:

For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.

## 4.3 Degree of protection

The devices fulfill all the requirements for IP 67. Compliance with the following points is mandatory following installation in the field or servicing, in order to ensure that IP 67 protection is maintained:

- The housing seals must be clean and undamaged when inserted into their grooves. The seals must be dried, cleaned or replaced if necessary.
- All threaded fasteners and screw covers must be firmly tightened.
- The cables used for connection must be of the specified outside diameter (see Page 51).
- Firmly tighten the cable entries (Fig. 13).
- The cables must loop down before they enter the cable entries ("water trap", Fig. 13). This arrangement prevents moisture from penetrating the entry. Always install the measuring device in such a way that the cable entries do not point up.
- Remove all unused cable entries and insert plugs instead.
- Do not remove the grommet from the cable entry.

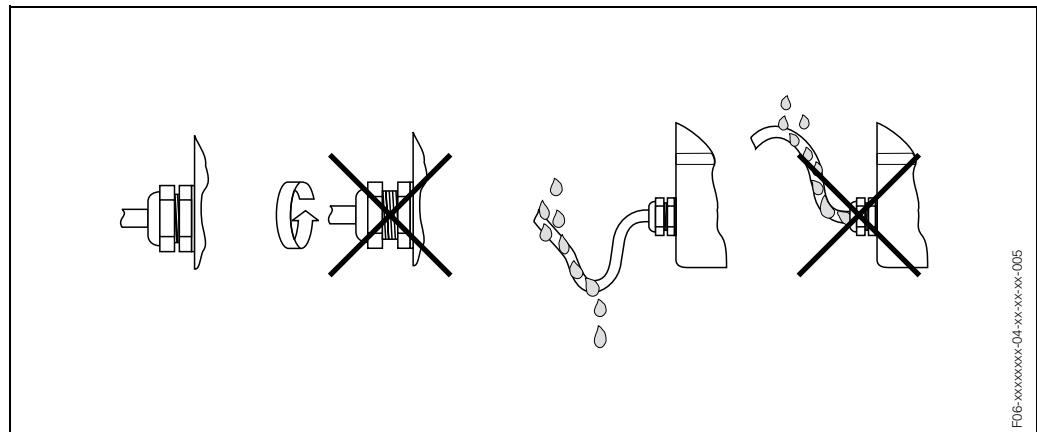


Fig. 13: Installation instructions, cable entries

## 4.4 Post connection check

Perform the following checks after completing electrical installation of the measuring device:

| Device condition and specifications                                                                        | Notes                                                                     |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Are cables or the device damaged (visual inspection)?                                                      | –                                                                         |
| Electrical connection                                                                                      | Notes                                                                     |
| Does the supply voltage match the specifications on the nameplate?                                         | 85...260 V AC (45...65 Hz)<br>20...55 V AC (45...65 Hz)<br>16...62 V DC   |
| Do the cables have adequate strain relief?                                                                 | –                                                                         |
| Cables correctly segregated by type?<br>Without loops and crossovers?                                      | –                                                                         |
| Are the power supply and signal cables correctly connected?                                                | See the wiring diagram<br>inside the cover of the<br>terminal compartment |
| Are all screw terminals firmly tightened?                                                                  | –                                                                         |
| Are all cable entries installed, firmly tightened and correctly sealed?<br>Cables looped as “water traps”? | see Page 20                                                               |
| Are all housing covers installed and firmly tightened?                                                     | –                                                                         |



## 5 Operation

### 5.1 Display element

The local display enables you to read all important parameters directly at the measuring point.

The display consists of two lines; this is where measured values and/or status variables (direction of flow, bar graph, etc.) are displayed. You can change the assignment of display lines to different variables to suit your needs and preferences by means of the HART interface or using the FieldTool™ program (→ see the "Description of Device Functions" manual).

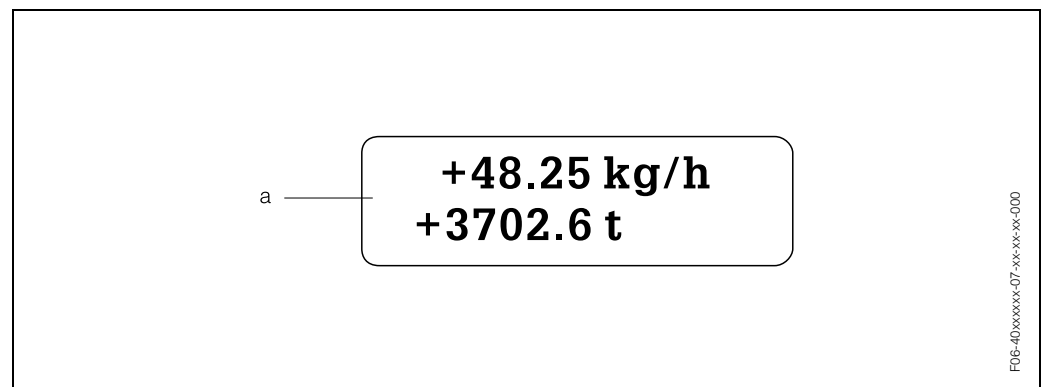


Fig. 14: a = Display elements

The backlit, two-line liquid crystal display shows measured values, dialog texts, fault messages and information messages. The display as it appears when normal measuring is in progress is known as the HOME position (operating mode).

- Upper display line: shows the primary measured value, mass flow or volume flow.
- Lower display line: shows additional measured variables and status variables, e.g. totalizer reading, bar graph, measuring point designation.

## 5.2 Operation with the HART protocol.

The measuring device can be configured and measured values obtained by means of the HART protocol. You have two options:

- Operation with the “HART Communicator DXR 275” universal handheld terminal.
- Operation by means of a personal computer using operating software (e.g. “Field-Tool™”) and a HART modem (e.g. “Commubox FXA 191”).

### 5.2.1 HART Communicator DXR 275

Selecting device functions with a HART Communicator is a process involving a number of menu levels and a special HART function matrix (see the “Description of Device Functions” manual).



Note:

The HART manual in the carrying case of the HART DXR 275 handheld communicator contains more detailed information on the device.

#### Procedure

1. Switching on the handheld communicator:
  - Measuring device not yet connected → HART main menu appears → select “Online” to continue
  - Measuring device connected → “Online” menu level is displayed
2. “Online” menu level
  - Display of current measured data such as flow, totalizer count, etc.
  - Use “GROUP SELECTION” in the HART function matrix to select the function group of your choice, for example “SYSTEM UNITS”, and then select the function, for example “MASS”.
3. Enter a numerical value or make your selection from the options and press F4 = Enter to confirm.
4. “SEND” appears above function key F2. All the values/settings entered with the handheld communicator are uploaded to the measuring device when you press F2.
5. Press the HOME function key F3 to return to the “Online” level. You can now read the current values that the measuring device measures with the new settings.

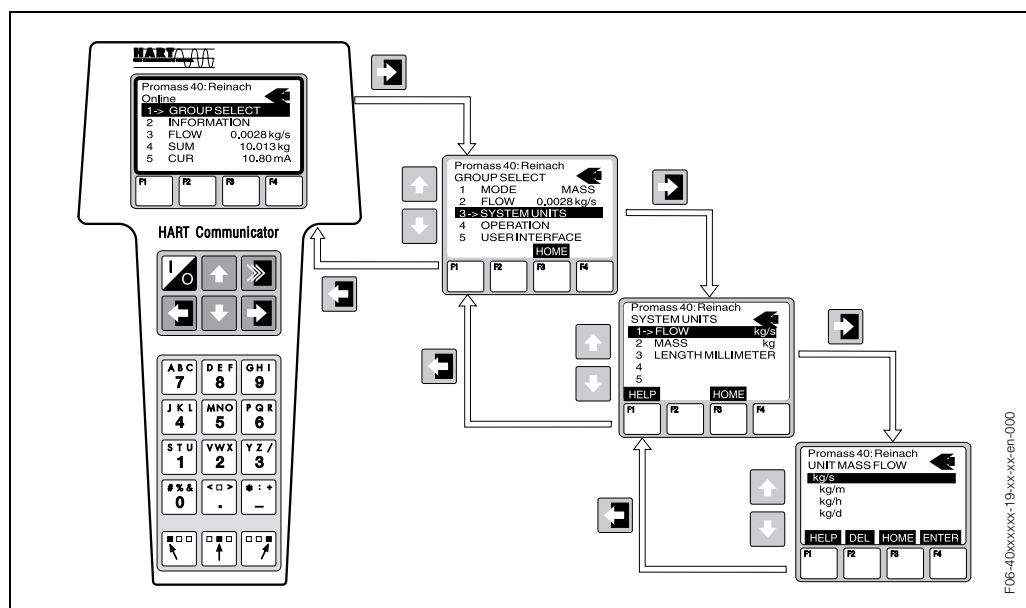


Fig. 15: Example of operation with the HART DXR 275 handheld terminal

### 5.2.2 FieldTool™ operating program

FieldTool™ is a universal service and configuration software package designed for the PROline measuring devices. Connection is by means of the PROline service interface (service adapter) with a Commubox FXA 193 or the HART interface with a Commubox FXA 191.

The functionality of FieldTool™ includes the following:

- Configuration of device functions
- Visualisation of measuring values (including data logging)
- Data backup of device parameters
- Measuring point documentation



Note:

You can find more information on FieldTool™ in the following E+H document:

- System Information: SI 031D/06/en “FieldTool™”

### 5.2.3 General notes

The function matrix comprises a multiplicity of functions which, for the sake of clarity, are arranged in a number of function groups.

Comply with the following instructions when configuring functions:

Certain functions prompt you to enter “yes” as confirmation after you complete your data entries. This saves your setting or starts a function, as applicable.



Note:

- The transmitter continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the power supply fails all preset and parameterised values remain safely stored in the EEPROM.



Caution:

- All functions are described in detail, as is the function matrix itself, in the “**Description of Device Functions**” manual, which is a separate part of this Operating Instruction.
- Changing certain parameters such as all sensor characteristics, for example, influences numerous functions of the entire measuring system, particularly measuring accuracy. There is no need to change these parameters under normal circumstances and consequently, they are protected by a special code known only to the E+H service organisation. Please contact Endress+Hauser if you have any questions.

## 5.3 Display of error messages

### Type of error

Errors that occur during commissioning or measuring are displayed immediately. If two or more system or process errors occur, the error with the highest priority is the one shown on the display. The measuring system distinguishes between two types of error:

- *System error*: this group includes all device errors, for example communication errors, hardware errors, etc. → see Page 36
- *Process error*: this group includes all application errors, for example empty pipe, etc. → see Page 39

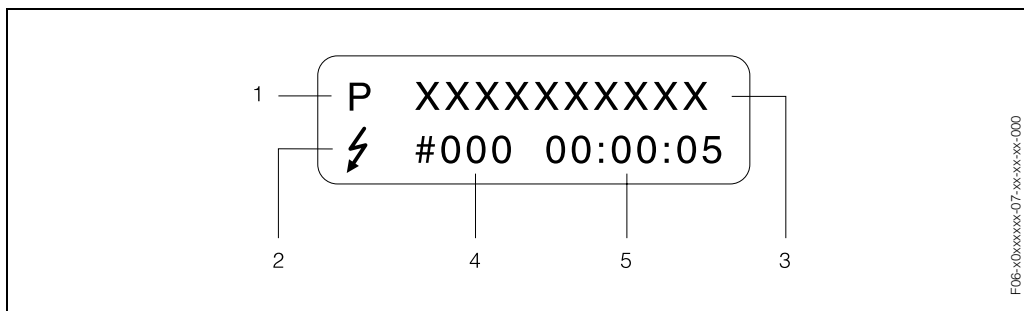


Fig. 16: Error messages on the display (example)

- 1 Error type: P = process error, S = system error
- 2 Error message type: ⚡ = fault message, ! = information message (definition: see below)
- 3 Error designation: e.g. FLUID INHOM. = fluid is not homogeneous
- 4 Error number: e.g. # 702
- 5 Duration of most recent error occurrence (in hours, minutes and seconds)

### Error message type

Users have the option of weighting system and process errors differently, by defining them as **“Fault messages”** or **“Notice messages”**. You can define messages in this way with the aid of the function matrix (see the “Description of Device Functions” manual).

Serious system errors, e.g. module defects, are always identified and classified as “fault messages” by the measuring device.

#### Notice message (!)

- Displayed as → Exclamation mark (!), error type (S: system error, P: process error).
- The error in question has no effect on the inputs or outputs of the measuring device.

#### Fault message (⚡)

- Displayed as → Lightning flash (⚡), error type (S: system error, P: process error).
- The error in question has a direct effect on the inputs or outputs.

The response of the inputs or outputs (failsafe mode) can be defined by means of functions in the function matrix (see Page 42).



Note:

For security reasons, error messages should be output via the status output.

# 6 Commissioning

## 6.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:

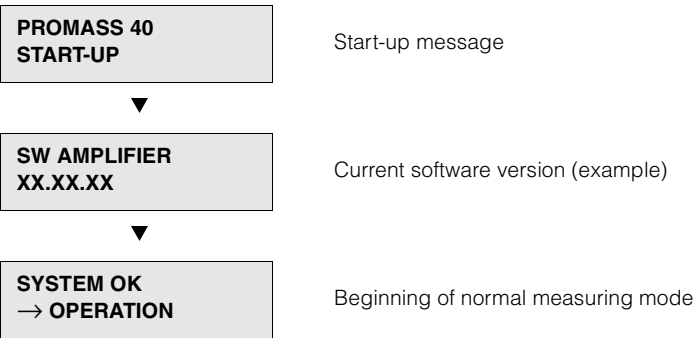
- Checklist for “Post installation check” → Page 15
- Checklist for “Post connection check” → Page 21

## 6.2 Commissioning

### 6.2.1 Switching on the measuring device

Once the function checks have been successfully completed, it is time to switch on the power supply. The device is now operational.

The measuring device performs a number of power on self-tests. As this procedure progresses the following sequence of messages appears on the local display:



Normal measuring mode commences as soon as start-up completes. Various measured value and/or status variables appear on the display (HOME position).



Note:  
If start-up fails, an error message indicating the cause is displayed.

### 6.2.2 Zero point adjustment

The Promass 40 E is calibrated with state-of-the-art technology. The zero point obtained in this way is printed on the nameplate. Calibration takes place under reference operating conditions (see Page 53). Consequently, zero point adjustment is generally **not** necessary.

Experience shows that the zero point adjustment is advisable only in special cases:

- with very small flow rates
- under extreme process or operating conditions (e.g. very high process pressures or very high viscosity fluids).

#### Preconditions for a zero point adjustment

Note the following before you perform a zero point adjustment:

- A zero point adjustment can be performed only with fluids that contain no gas or solid contents.
- A zero point adjustment is performed with the measuring tubes completely filled and at zero flow ( $v = 0$  m/s). This can be achieved, for example, with shut-off valves upstream and/or downstream of the sensor or by using existing valves and gates (Fig. 17):
  - Normal operation → valves 1 and 2 open
  - Zero point adjustment *with* pump pressure → valve 1 open / valve 2 closed
  - Zero point adjustment *without* pump pressure → valve 1 closed / valve 2 open



Caution:

- If the fluid is very difficult to measure (e.g. containing entrained solids or gas) it may prove impossible to obtain a stable zero point despite repeated zero point adjustments. In instances of this nature, please contact your E+H service center.
- You can view the currently valid zero point value using the "ZERO POINT" function (see the "Description of Device Functions" manual).

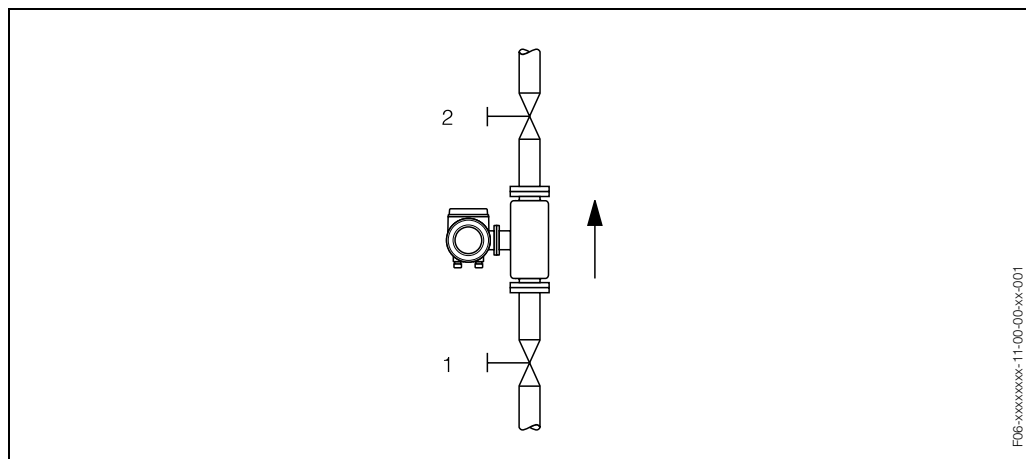


Fig. 17: Zero point adjustment and shut-off valves

**Performing a zero point adjustment**

- 1. Operate the system until operating conditions have settled.
- 2. Stop the flow ( $v = 0 \text{ m/s}$ ).
- 3. Check the shut-off valves for leaks.
- 4. Check that operating pressure is correct.
- 5. Perform a zero point adjustment as follows:

| Procedure                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HOME position → Enter the function matrix                                                                                                                                                                                                                              |
| Select the "PROCESS PARAMETER" function group                                                                                                                                                                                                                          |
| Select the "ZERO ADJUST." function                                                                                                                                                                                                                                     |
| Select "START"                                                                                                                                                                                                                                                         |
| Zero adjustment now starts. While zero adjustment is in progress, the "Zero adjustment running" message is visible for 30...60 seconds.<br>If the flow of fluid in the pipe exceeds 0.1 m/s, an error message appears on the display:<br>"A: ZERO ADJUST NOT POSSIBLE" |

### 6.2.3 Density adjustment

Accuracy in measuring fluid density (which is proportional to the resonance of the measuring tubes) has a direct effect on calculating volume flow. Density adjustment is not necessary unless the properties of the fluid are outside the reference operating conditions used at calibration.

#### Performing a density adjustment



Caution:

- On-site density adjustment can be performed only if the user has detailed knowledge of the fluid density, obtained for example from detailed laboratory analyses.
- The target density value specified in this way must not deviate from the fluid density measured in the device by more than  $\pm 10\%$ .
- An error in defining the target density affects all calculated volume functions.
- Density adjustment changes the factory density calibration values or the calibration values set by the service technician.

The functions outlined in the instructions below are described in detail in the “Description of Device Functions” manual.

1. Fill the sensor with fluid. Make sure that the measuring tubes are completely filled and that liquids are free of gas bubbles.
2. Wait until the temperature difference between fluid and measuring tube has equalised. The time you have to wait for equalisation depends on the fluid and the temperature level.
3. Select the density adjustment function:  
PROCESSPARAMETER → DENSITY SET VALUE  
Enter the fluid's target density and save this value.  
Input range = actual density value  $\pm 10\%$
4. Select the “MEASURE FLUID” function.  
Select the “START” setting. A “MEASURING DENSITY” message appears for approx. 10 seconds on the display. During this time the current density of the fluid (measured density value) is measured.
5. Select the “DENSITY ADJUST” function.  
Select the “DENSITY ADJUST” setting. Promass compares the measured density value with the target density value and calculates the new density coefficient.



Caution:

If density adjustment does not complete correctly, you can select the “RESTORE ORIGINAL” function to reactivate the default density coefficient.

### 6.2.4 Current output: active/passive

The current output is configured as “active” or “passive” by means of various jumpers on the I/O board.



**Warning:**

Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

1. Switch off power supply.
2. Remove the I/O board → see Page 45 ff.
3. Set the jumpers in accordance with Fig. 18.



**Caution:**

Risk of destroying the measuring device. Set the jumpers exactly as shown in Fig. 18. Incorrectly set jumpers can cause overcurrents that would destroy either the measuring device or external devices connected to it.

4. Installation of the I/O board is the reverse of the removal procedure.

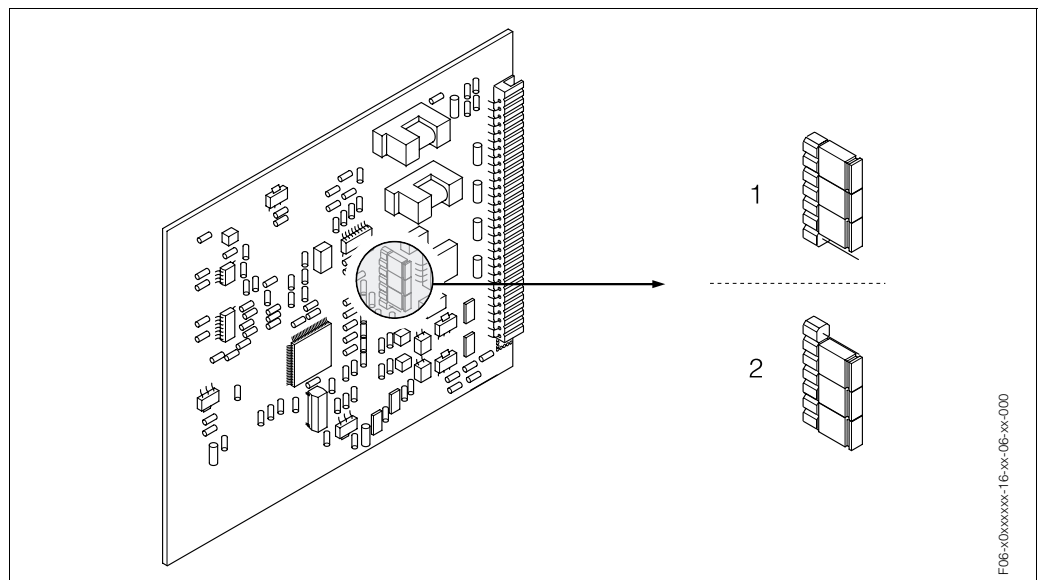


Fig. 18: Configuring the current output (I/O board)

- 1 Active current output (default)
- 2 Passive current output

## 7 Maintenance

The Promass 40 flow measuring system requires no special maintenance.

### Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.



## 8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The E+H service organisation can provide detailed information on the order codes of your choice.

| Accessory                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                   | Ordering code           |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Transmitter<br>Promass 40                      | Transmitter for replacement or for stock. Use the order code to define the following specifications:<br><ul style="list-style-type: none"> <li>– Approvals</li> <li>– Degree of protection / version</li> <li>– Cable entries</li> <li>– Display / power supply / operation</li> <li>– Software</li> <li>– Outputs / inputs</li> </ul>                                                                                        | 40XXX – XXXXX * * * * * |
| HART Communicator<br>DXR 275 handheld terminal | Handheld terminal for remote parameterisation and for obtaining measured values via the current output HART (4...20 mA).<br><br>Contact your E+H representative for more information.                                                                                                                                                                                                                                         | DXR275 – * * * * *      |
| Applicator <sup>TM</sup>                       | Software for selecting and configuring flowmeters.<br>Applicator <sup>TM</sup> can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC.<br><br>Contact your E+H representative for more information.                                                                                                                                                                                          | DKA40 – *               |
| FieldTool <sup>TM</sup>                        | Configuration and service software for flowmeters in the field:<br><ul style="list-style-type: none"> <li>– Commissioning, maintenance analysis</li> <li>– Configuring flowmeters</li> <li>– Service functions</li> <li>– Visualisation of process data</li> <li>– Trouble-shooting</li> <li>– Controlling the "FieldCheck<sup>TM</sup>" tester/simulator</li> </ul><br>Contact your E+H representative for more information. | DXS10 – * * * * *       |
| FieldCheck <sup>TM</sup>                       | Tester/simulator for testing flowmeters in the field.<br><br>When used in conjunction with the "Field-Tool <sup>TM</sup> " software package, test results can be imported into a database, printed and used for official certification.<br><br>Contact your E+H representative for more information.                                                                                                                          | DXC10 – * *             |



## 9 Trouble-shooting

### 9.1 Trouble-shooting instructions

Always start trouble-shooting with the checklists below, if faults occur after start-up or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures.

| Check the display                                                      |                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No display visible and no output signals present.                      | <ol style="list-style-type: none"> <li>1. Check the power supply → terminals 1, 2</li> <li>2. Check the power line fuse → Page 47<br/>85...260 V AC: 0.8 A slow-blow / 250 V<br/>20...55 V AC and 16...62 V DC: 2 A slow-blow / 250 V</li> <li>3. Measuring electronics defective → order spare parts → Page 44</li> </ol> |
| No display visible, but output signals are present.                    | <ol style="list-style-type: none"> <li>1. Check whether the ribbon cable connector of the display module is correctly plugged into the amplifier board → Page 46</li> <li>2. Display module defective → order spare parts → Page 44</li> <li>3. Measuring electronics defective → order spare parts → Page 44</li> </ol>   |
| Measured value indicated, but no signal at the current or pulse output | Measuring electronics defective → order spare parts → Page 44                                                                                                                                                                                                                                                              |



| Error messages on display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| <p>Errors which occur during commissioning or measuring operation are displayed immediately. Error messages consist of a variety of icons. The meanings of these icons are as follows:</p> <ul style="list-style-type: none"> <li>– Error type: <b>S</b> = system error, <b>P</b> = process error</li> <li>– Error message type: <b>!</b> = fault message, <b>!</b> = notice message</li> <li>– <b>MEDIUM INHOM.</b> = error designation, e.g. fluid is not homogeneous</li> <li>– <b>03:00:05</b> = duration of error occurrence (in hours, minutes and seconds)</li> <li>– <b># 702</b> = error number</li> </ul> <p> Caution:</p> <ul style="list-style-type: none"> <li>• Also observe the information on Page 26 ff.!</li> <li>• The measuring system interprets simulations and positive zero return as system errors, but displays them as information messages only.</li> </ul> |                                                          |
| Error number:<br>No. 001 – 400<br>No. 601 – 699                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | System error (device error) has occurred → Page 36       |
| Error number:<br>No. 500 – 600<br>No. 700 – 750                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Process error (application error) has occurred → Page 39 |



| Other error (without error message) |                                       |
|-------------------------------------|---------------------------------------|
| Some other error has occurred.      | Diagnosis and rectification → Page 41 |

## 9.2 System error messages



### Caution:

In the event of a serious fault, a flowmeter might have to be returned to the manufacturer for repair. The procedures on Page 6 must be carried out before you return a flowmeter to Endress+Hauser.

Always enclose a duly completed "Safety regulation" form. You will find a preprinted form at the back of this manual.

| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Error message / No.       | Cause                                                                                            | Remedy / spare part                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Serious system errors are always recognized by the instrument as "Fault message", and are shown as a lightning flash on the display. Fault messages immediately affect the inputs and outputs.</p> <p>Simulation and positive zero return, on the other hand, are classed and displayed as notice messages. Also observe the informations on → Page 26 ff. and 42.</p> <p>S = System error<br/> ⚡ = Fault message (with an effect on the inputs and outputs)<br/> ! = Information message (without an effect on the inputs and outputs)</p> |                           |                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| S<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CRITICAL FAILURE<br># 001 | Serious device error                                                                             | Replace the amplifier board. Spare parts → Page 44                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| S<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | AMP HW EEPROM<br># 011    | Amplifier:<br>Defective EEPROM                                                                   | Replace the amplifier board. Spare parts → Page 44                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| S<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | AMP SW EEPROM<br># 012    | Amplifier:<br>Error accessing EEPROM data                                                        | <p>The EEPROM data blocks in which an error has occurred are displayed in the "RESTORE DATA FAILURE" function. Press Enter to acknowledge the errors in question; default values are automatically inserted instead of the errored parameter values.</p> <p> Note:<br/> The measuring device has to be restarted if an error has occurred in a totalizer block (see error No. 111 / CHECKSUM TOTAL).</p> |
| S<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SENSOR HW DAT<br># 031    | Sensor:<br>1. S-DAT™ is defective.<br>2. S-DAT™ is not plugged into the I/O board or is missing. | <ol style="list-style-type: none"> <li>1. Replace the S-DAT™. Spare parts → Page 44<br/> Check the spare part set number to ensure that the new, replacement DAT is compatible with the measuring electronics.</li> <li>2. Plug the S-DAT™ into the I/O board → Page 46</li> </ol>                                                                                                                                                                                                            |

| Type   | Error message / No.        | Cause                                                                                                                                                                                                            | Remedy / spare part                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S<br>⚡ | SENSOR SW DAT<br># 032     | Sensor:<br>Error accessing the calibration values stored in the S-DAT™.                                                                                                                                          | <ol style="list-style-type: none"> <li>1. Check whether the S-DAT™ is correctly plugged into the amplifier board → Page 45</li> <li>2. Replace the S-DAT™ if it is defective. Spare parts → Page 44<br/>Before replacing the DAT, check that the new, replacement DAT is compatible with the measuring electronics. Check the: <ul style="list-style-type: none"> <li>– Spare part set number</li> <li>– Hardware revision code</li> </ul> </li> <li>3. Replace measuring electronics boards if necessary. Spare parts → Page 44</li> </ol> |
| S<br>⚡ | A / C COMPATIB.<br># 051   | The I/O board and the amplifier board are not compatible.                                                                                                                                                        | Use only compatible modules and boards. Check the compatibility of the modules used.<br>Check the: <ul style="list-style-type: none"> <li>– Spare part set number</li> <li>– Hardware revision code</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| S<br>⚡ | CHECKSUM TOTAL<br># 111    | Totalizer checksum error                                                                                                                                                                                         | <ol style="list-style-type: none"> <li>1. Restart the measuring device</li> <li>2. Replace the amplifier board if necessary. Spare parts → Page 44</li> </ol>                                                                                                                                                                                                                                                                                                                                                                               |
| S<br>⚡ | COMMUNICATION I/O<br># 261 | No data reception between amplifier and I/O board or faulty internal data transfer.                                                                                                                              | Check the BUS contacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| S<br>⚡ | CURRENT RANGE<br># 351     | Current output:<br>Flow is out of range.                                                                                                                                                                         | <ol style="list-style-type: none"> <li>1. Change the upper or lower limit setting, as applicable.</li> <li>2. Increase or reduce flow, as applicable.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                            |
| S<br>⚡ | FREQUENCY RANGE<br># 355   | Frequency output:<br>Flow is out of range.                                                                                                                                                                       | <ol style="list-style-type: none"> <li>1. Change the upper or lower limit setting, as applicable.</li> <li>2. Increase or reduce flow, as applicable.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                            |
| S<br>⚡ | PULSE RANGE<br># 359       | Pulse output:<br>Pulse output frequency is out of range.                                                                                                                                                         | <ol style="list-style-type: none"> <li>1. Increase the setting for pulse weighting</li> <li>2. Increase the max. pulse frequency, if the totalizer can handle a higher number of pulses.</li> <li>3. Reduce flow.</li> </ol>                                                                                                                                                                                                                                                                                                                |
| S<br>⚡ | FREQ. LIM<br># 379 / 380   | <p>The measuring tube oscillation frequency is outside the permitted range.</p> <p>Causes:</p> <ul style="list-style-type: none"> <li>– Damaged measuring tube</li> <li>– Sensor defective or damaged</li> </ul> | Contact your E+H service organisation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Type   | Error message / No.                  | Cause                                                                                                                                                                            | Remedy / spare part                                                                                                                                                                                         |
|--------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S<br>⚡ | FLUIDTEMP. LIM<br># 381 / 382        | The temperature sensor on the measuring tube is likely defective.                                                                                                                | Check the following electrical connections before you contact your E+H service organisation:<br>– Verify that the sensor signal cable connector is correctly plugged into the amplifier board<br>→ Page 45. |
| S<br>⚡ | EL. DYN. SENSOR<br># 385 / 386 / 387 | One of the measuring tube exciter coils (inlet or outlet) is likely defective.                                                                                                   | Check the following electrical connections before you contact your E+H service organisation:<br>– Verify that the sensor signal cable connector is correctly plugged into the amplifier board<br>→ Page 45. |
| S<br>⚡ | AMP. FAULT<br># 388 / 389 / 390      | Amplifier error                                                                                                                                                                  | Contact your E+H service organisation.                                                                                                                                                                      |
| S<br>! | POS. ZERO-RET.<br># 601              | Positive zero return active.<br><br> Caution:<br>This message has the highest display priority. | Switch off positive zero return                                                                                                                                                                             |
| S<br>! | SIM. CURR. OUT.<br># 611             | Simulation current output active                                                                                                                                                 | Switch off simulation                                                                                                                                                                                       |
| S<br>! | SIM. FREQ. OUT<br># 621              | Simulation frequency output active                                                                                                                                               | Switch off simulation                                                                                                                                                                                       |
| S<br>! | SIM. PULSE<br># 631                  | Simulation pulse output active                                                                                                                                                   | Switch off simulation                                                                                                                                                                                       |
| S<br>! | SIM. STAT. OUT.<br># 641             | Simulation status output active                                                                                                                                                  | Switch off simulation                                                                                                                                                                                       |
| S<br>! | SIM. STAT. IN<br># 671               | Simulation status input active                                                                                                                                                   | Switch off simulation                                                                                                                                                                                       |
| S<br>! | SIM. FAILSAFE<br># 691               | Simulation of response to error (outputs) active                                                                                                                                 | Switch off simulation                                                                                                                                                                                       |
| S<br>! | SIM. MEASURAND<br># 692              | Simulation of measuring variables (e.g. mass flow)                                                                                                                               | Switch off simulation                                                                                                                                                                                       |

## 9.3 Process error messages

| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Error message / No.      | Cause                                                                                                                                                                                                                                                                              | Remedy                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Process errors can be defined as either "Fault" or "Information" messages and can thereby be weighted differently. Determination of this is done via the function matrix (see the "Description of Device Functions" Manual). The error types listed in the following correspond to the factory settings.</p> <p>Also observe the information on → Page 26 ff. and 42</p> <p>P = Process error<br/> ⚡ = Fault message (with an effect on the inputs and outputs)<br/> ! = Information message (without an effect on the inputs and outputs)</p> |                          |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| P<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | OSC. AMP. LIMIT<br># 586 | <p>The fluid properties do not allow a continuation of the measurement.</p> <p>Causes:</p> <ul style="list-style-type: none"> <li>– Extremely high viscosity</li> <li>– Process fluid is very inhomogeneous (gas or solid content)</li> </ul>                                      | Change or improve process conditions.                                                                                                                                                                                                                                                                                                                                                                                             |
| P<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TUBE NOT OSC<br># 587    | <p>Extreme process conditions exist. The measuring system can therefore not be started.</p>                                                                                                                                                                                        | Change or improve process conditions.                                                                                                                                                                                                                                                                                                                                                                                             |
| P<br>⚡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | NOISE LIMIT<br># 588     | <p>Overdriving of the internal analog to digital converter.</p> <p>Causes:</p> <ul style="list-style-type: none"> <li>– Cavitation</li> <li>– Extreme pressure pulses</li> <li>– High gas flow velocity</li> </ul> <p>A continuation of the measurement is no longer possible!</p> | Change or improve process conditions, e.g. by reducing the flow velocity.                                                                                                                                                                                                                                                                                                                                                         |
| P<br>!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | EMPTY PIPE<br># 700      | <p>The process fluid density is below the lower limit value set in the "EPD" function.</p> <p>Causes:</p> <ul style="list-style-type: none"> <li>– Air in the measuring tube</li> <li>– Partly filled measuring tube</li> </ul>                                                    | <ol style="list-style-type: none"> <li>1. Ensure that there is no gas content in the process liquid.</li> <li>2. Adapt the values in the "EPD" function to the current process conditions.</li> </ol>                                                                                                                                                                                                                             |
| P<br>!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | EXC. CURR. LIM<br># 701  | <p>The maximum current value for the measuring tube exciter coils has been reached, since certain process fluid characteristics are extreme, e.g. high gas or solid content.</p> <p>The instrument continues to work correctly.</p>                                                | <p>In particular with outgassing fluids and/or increased gas content, the following measures are recommended to increase system pressure:</p> <ol style="list-style-type: none"> <li>1. Install the device at the outlet side of a pump.</li> <li>2. Install the device at the lowest point of an ascending pipeline.</li> <li>3. Install a flow restriction, e.g. reducer or orifice, downstream from the instrument.</li> </ol> |

| Type   | Error message / No.        | Cause                                                                                                                                                                                                        | Remedy                                                                                                                                                                                                                                                                                                                                                          |
|--------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P<br>! | FLUID INHOM.<br># 702      | Frequency control is not stable, due to inhomogeneous process fluid, e.g. gas or solid content.                                                                                                              | In particular with outgassing fluids and/or increased gas content, the following measures are recommended to increase system pressure:<br>1. Install the device at the outlet side of a pump.<br>2. Install the device at the lowest point of an ascending pipeline.<br>3. Install a flow restriction, e.g. reducer or orifice, downstream from the instrument. |
| P<br>! | NOISE LIMIT<br># 703 / 704 | Overdriving of the internal analog to digital converter.<br><br>Causes:<br>– Cavitation<br>– Extreme pressure pulses<br>– High gas flow velocity<br><br>A continuation of the measurement is still possible! | Change or improve process conditions, e.g. by reducing the flow velocity.                                                                                                                                                                                                                                                                                       |
| P<br>! | FLOW LIMIT<br># 705        | The mass flow is too high. The electronics' measuring range will be exceeded.                                                                                                                                | Reduce flow                                                                                                                                                                                                                                                                                                                                                     |
| P<br>! | ADJ. ZERO FAIL<br># 731    | The zero point adjustment is not possible or has been cancelled                                                                                                                                              | Make sure that zero point adjustment is carried out at "zero flow" only ( $v = 0$ m/s) → Page 28                                                                                                                                                                                                                                                                |

## 9.4 Process errors without messages

| Symptoms                                                                                                                                                                                                                                                                 | Rectification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Remark:</p> <p>You may have to change or correct certain settings of the function matrix in order to rectify faults. The functions outlined below, such as DISPLAY DAMPING, for example, are described in detail in the "Description of Device Functions" manual.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Measured value reading fluctuates even though flow is steady.                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>1. Check the fluid for presence of gas bubbles.</li> <li>2. In the "TIME CONSTANT" function (CURRENT OUTPUT) → increase value</li> <li>3. In the "DISPLAY DAMPING" function (USER INTERFACE) → increase the value</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Measured value reading shown on display, even though the fluid is at a standstill and the measuring tube is full.                                                                                                                                                        | <ol style="list-style-type: none"> <li>1. Check the fluid for presence of gas bubbles.</li> <li>2. Activate the "LOW FLOW CUTOFF" function (PROCESS PARAMETER), i.e. enter or increase the value for the switching point.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>The fault cannot be rectified or some other fault not described above has occurred.</p> <p>In these instances, please contact your E+H service organisation.</p>                                                                                                      | <p>The following options are available for tackling problems of this nature:</p> <p><b>Request the services of an E+H service technician</b></p> <p>If you contact our service organisation to have a service technician sent out, please be ready with the following information:</p> <ul style="list-style-type: none"> <li>– Brief description of the fault</li> <li>– Nameplate specifications (Page 7 ff.): Order code and serial number</li> </ul> <p><b>Returning devices to E+H</b></p> <p>The procedures on Page 6 must be carried out before you return a flow-meter requiring repair or calibration to Endress+Hauser. Always enclose a duly completed "Safety regulation" form with the flow-meter. You will find a preprinted "Safety regulation" form at the back of this manual.</p> <p><b>Replace transmitter electronics</b></p> <p>Components in the measuring electronics defective → order replacement → Page 44</p> |

9.5 Response of outputs to errors



Note:  
The failsafe mode of totalizers, current, pulse and frequency outputs can be customised by means of various functions in the function matrix. You will find detailed information on these procedures in the “Description of Device Functions” manual.

*Positive zero return and failsafe mode:*  
You can use positive zero return to set the signals of the current, pulse and frequency outputs to their fallback value, for example when measuring has to be interrupted while a pipe is being cleaned. This function takes priority over all other device functions. Simulations, for example, are suppressed.

| Failsafe mode of outputs and totalizers                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
|                                                                                                                                                                                                                                                           | Process/system error is present                                                                                                                                                                                                                                                                                                                                                                                                 | Positive zero return is activated        |
| <div> Caution:<br/>System or process errors defined as “Notice messages” have no effect whatsoever on the inputs and outputs. See the information on → Page 26 ff.</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |
| Current output                                                                                                                                                                                                                                            | <div><i>MINIMUM CURRENT</i><br/>HART 4–20 mA (25 mA) → 2 mA<br/>HART 4–20 mA → 2 mA</div> <div><i>MAXIMUM CURRENT</i><br/>HART 4–20 mA (25 mA) → 25 mA<br/>HART 4–20 mA (NAMUR) → 22 mA</div> <div><i>HOLD VALUE</i><br/>Last valid value (preceding occurrence of the fault) is output.</div> <div><i>ACTUAL VALUE</i><br/>Fault is ignored, i.e. normal measured value output on the basis of ongoing flow measurement.</div> | Output signal corresponds to “zero flow” |
| Pulse output                                                                                                                                                                                                                                              | <div><i>FALLBACK VALUE</i><br/>Signal output → no pulses</div> <div><i>HOLD VALUE</i><br/>Last valid value (preceding occurrence of the fault) is output.</div> <div><i>ACTUAL VALUE</i><br/>Fault is ignored, i.e. normal measured value output on the basis of ongoing flow measurement.</div>                                                                                                                                | Output signal corresponds to “zero flow” |

| Failsafe mode of outputs and totalizers |                                                                                                                                                                                                                                                                                                                                                                                               |                                          |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
|                                         | Process/system error is present                                                                                                                                                                                                                                                                                                                                                               | Positive zero return is activated        |
| Frequency output                        | <p><i>FALLBACK VALUE</i><br/>Signal output → 0 Hz</p> <p><i>FAILSAFE LEVEL</i><br/>Output of the frequency specified in the FAILSAFE VALUE function (No. 4211).</p> <p><i>HOLD VALUE</i><br/>Last valid value (preceding occurrence of the fault) is output.</p> <p><i>ACTUAL VALUE</i><br/>Fault is ignored, i.e. normal measured value output on the basis of ongoing flow measurement.</p> | Output signal corresponds to "zero flow" |
| Totalizer                               | <p><i>STOP</i><br/>The totalizers are paused until the error is rectified.</p> <p><i>ACTUAL VALUE</i><br/>The fault is ignored. The totalizers continue to count in accordance with the current flow value.</p> <p><i>HOLD VALUE</i><br/>The totalizers continue to count the flow in accordance with the last valid flow value (before the error occurred).</p>                              | Totalizer stops                          |
| Status output                           | In the event of a fault or power supply failure:<br>Status → non-conductive                                                                                                                                                                                                                                                                                                                   | No effect on the status output           |

## 9.6 Spare parts

Section 9.1 contains a detailed trouble-shooting guide. The measuring device, moreover, provides additional support in the form of continuous self-diagnosis and error messages.

Fault rectification can entail replacing defective components with tested spare parts. The illustration below shows the available scope of spare parts.



Note:

You can order spare parts directly from your E+H service organisation by providing the serial number printed on the transmitter's nameplate (see Page 7).

Spare parts are shipped as sets comprising the following parts:

- Spare part
- Additional parts, small items (threaded fasteners, etc.)
- Mounting instructions
- Packaging

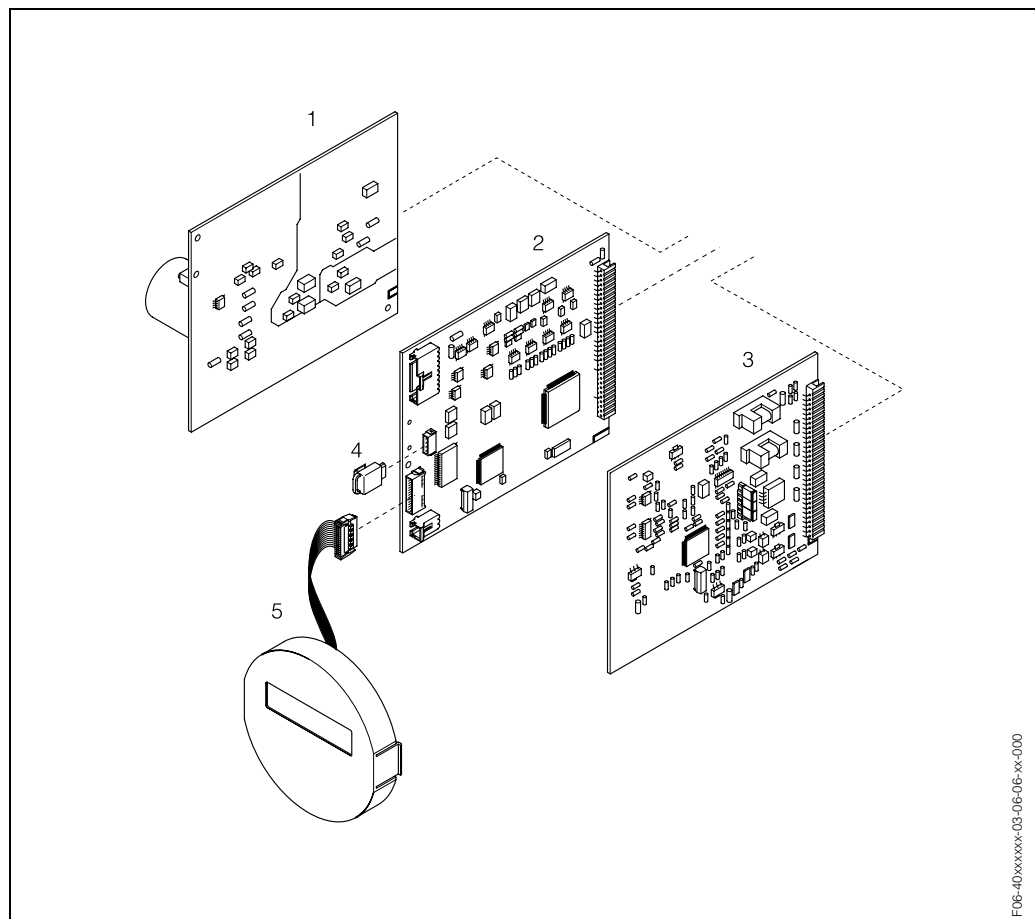


Fig. 19: Spare parts for Promass 40 transmitter

- 1 Power unit board (85...260 V AC, 20...55 V AC, 16...62 V DC)
- 2 Amplifier board
- 3 COM module (I/O board)
- 4 S-DAT™ (sensor data memory)
- 5 Display module

## 9.7 Removing and installing printed circuit boards



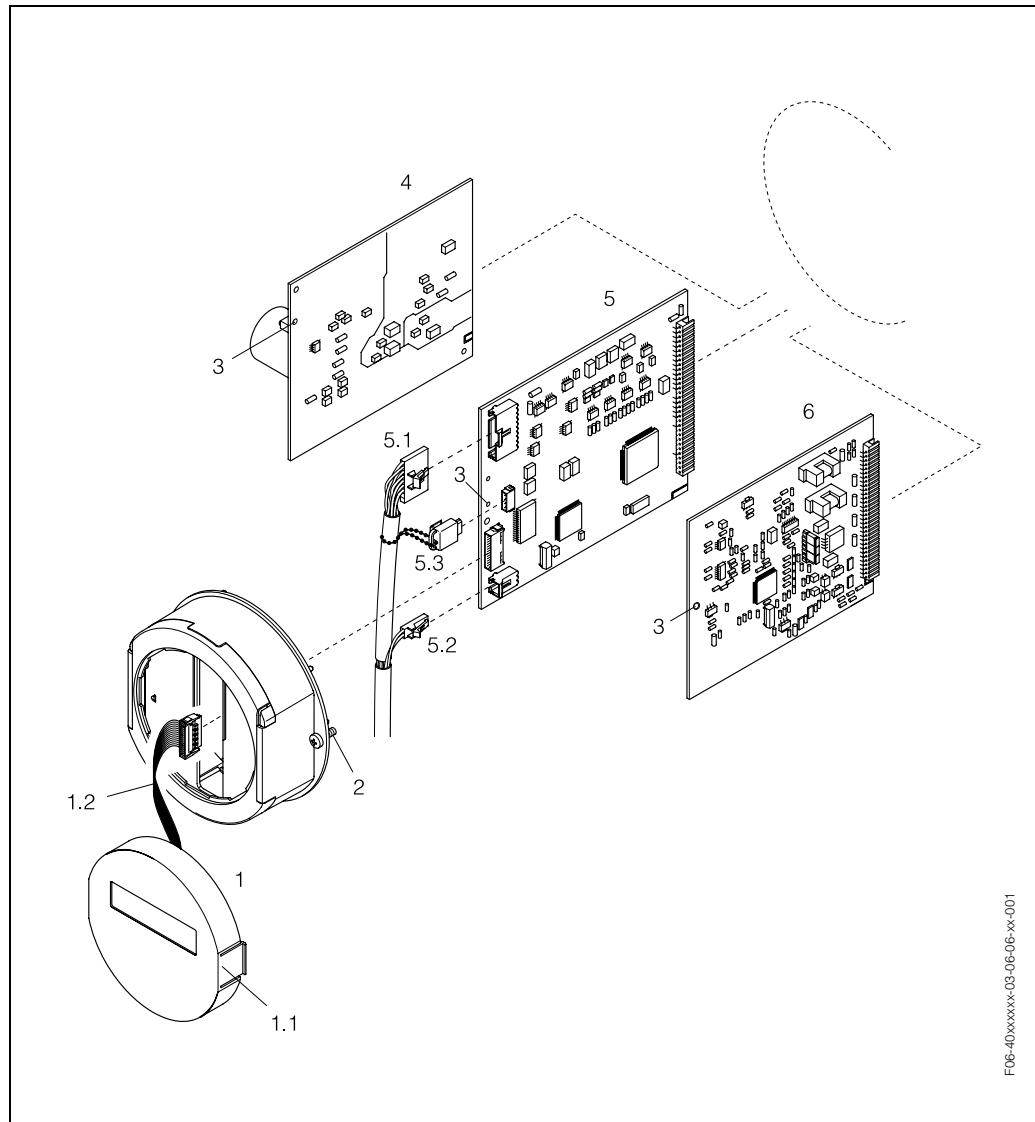
Warning:

- Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
  - Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface purposely built for electrostatically sensitive devices!
1. Unscrew cover of the electronics compartment from the transmitter housing.
  2. Remove the local display (1) as follows:
    - Press in the latches (1.1) at the side and remove the display module.
    - Disconnect the ribbon cable (1.2) of the display module from the amplifier board.
  3. Remove the screws and remove the cover (3) from the electronics compartment.
  4. Remove power unit board and I/O board (4, 6):  
Insert a thin pin into the hole (3) provided for the purpose and pull the board clear of its holder.
  5. Remove amplifier board (5):
    - Disconnect the plug of the sensor signal cable (5.1) including S-DAT™ (5.3) from the board.
    - Disconnect the plug of the excitation current cable (5.2) from the board.
    - Insert a thin pin into the hole (3) provided for the purpose and pull the board clear of its holder.
  6. Installation is the reverse of the removal procedure.



Caution:

Use only original Endress+Hauser parts.



F06-40xxxxx-03-06-06-xx-001

Fig. 20: removing and installing printed circuit boards

- 1 Local display
- 1.1 Latch
- 1.2 Ribbon cable (display module)
- 2 Screws of electronics compartment cover
- 3 Aperture for installing/removing boards
- 4 Power unit board
- 5 Amplifier board
- 5.1 Signal cable (sensor)
- 5.2 Excitation current cable (sensor)
- 5.3 S-DAT™ (sensor data memory)
- 6 I/O board

## 9.8 Replacing the device fuse



Warning:

Risk of electric shock. Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

The main fuse is on the power unit board (Fig. 21).

The procedure for replacing the fuse is as follows:

1. Switch off power supply.
2. Remove the power unit board → Page 45
3. Remove cap (1) and replace the device fuse (2).  
Use only fuses of the following type:
  - Power supply 20...55 V AC / 16...62 V DC → 2.0 A slow-blow / 250 V; 5.2 x 20 mm
  - Power supply 85...260 V AC → 0.8 A slow-blow / 250 V; 5.2 x 20 mm
  - Ex-rated devices → see the Ex documentation.
4. Assembly is the reverse of the disassembly procedure.



Caution:

Use only original Endress+Hauser parts.

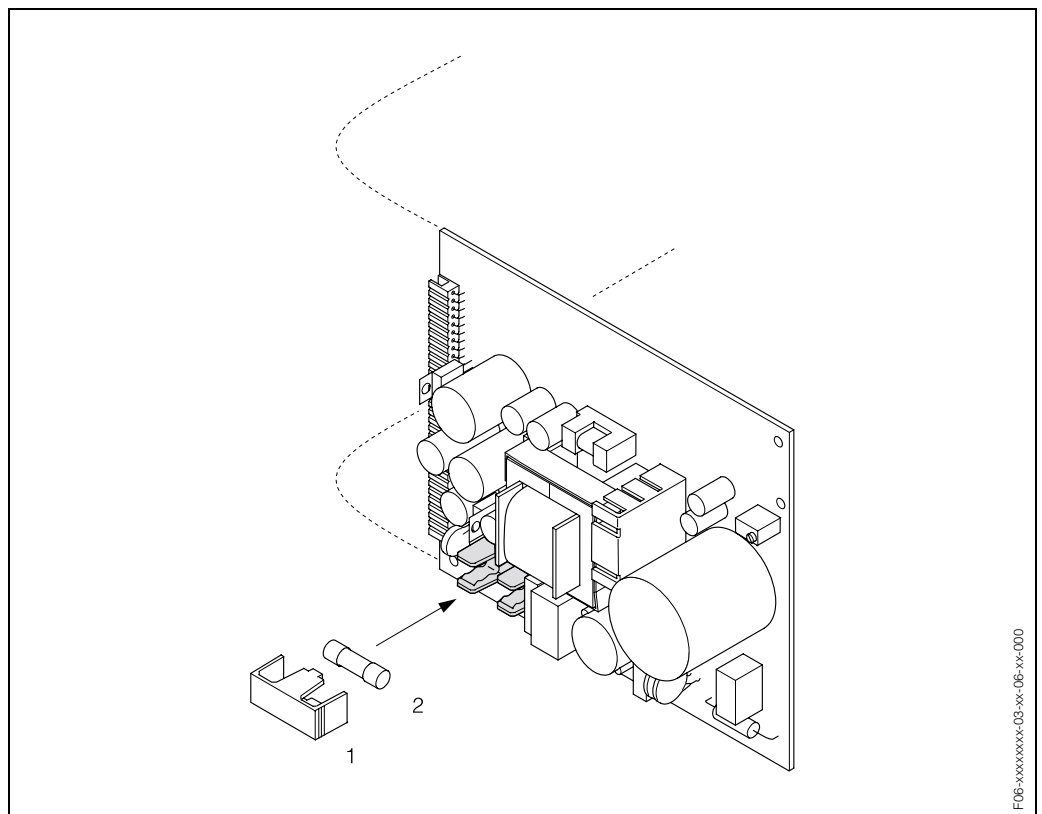


Fig. 21: Replacing the device fuse on the power unit board

- 1 Protective cap  
2 Device fuse

## 9.9 Software history

| Software version / date                                                              | Changes to software                                                                                                                             | Changes to documentation |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Amplifier:<br>V 1.00.XX / 11.2000<br><br>Communication (I/O):<br>V 1.00.XX / 11.2000 | Original software<br><br>Compatible with:<br>– FieldTool <sup>TM</sup><br>– HART communicator DXR 275<br>(OS 4.6 and higher) with rev. 1, DD 1. | –                        |

# 10 Technical data

## 10.1 Technical data at a glance

### 10.1.1 Applications

The measuring device is for mass flow and volume flow measurement of liquids and gases in sealed piping systems. Application examples:

- additives
- oils, fats
- acids, alkalis
- lacquers, paints
- suspensions
- gases.

### 10.1.2 Function and system design

|                     |                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measuring principle | Mass flow measurement by the Coriolis principle                                                                                                                  |
| Measuring system    | The measuring system consists of a transmitter and a sensor: <ul style="list-style-type: none"><li>• Promass 40 transmitter</li><li>• Promass E sensor</li></ul> |

### 10.1.3 Input

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measured variable | <ul style="list-style-type: none"><li>• Mass flow (proportional to the phase difference between two sensors mounted on the measuring tube to register a phase shift in the oscillation)</li><li>• Volume flow (calculated from mass flow and fluid density, which is proportional to the resonance frequency of the measuring tubes)</li><li>• Fluid temperature (registered by temperature sensors) for compensating temperature effects.</li></ul> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Measuring range

Measuring ranges for liquids:

| DN | Range of full scale values (liquids)<br>$\dot{m}_{\min(F)} \dots \dot{m}_{\max(F)}$ |
|----|-------------------------------------------------------------------------------------|
| 8  | 0...2000 kg/h                                                                       |
| 15 | 0...6500 kg/h                                                                       |
| 25 | 0...18000 kg/h                                                                      |
| 40 | 0...45000 kg/h                                                                      |
| 50 | 0...70000 kg/h                                                                      |

Measuring ranges for gases:

The full scale values depend on the density of the gas. Use the formula below to calculate the full scale values:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \frac{\rho_{(G)}}{320 \text{ [kg/m}^3\text{]}}$$

$\dot{m}_{\max(G)}$  = Max. full scale value for gas [kg/h]  
 $\dot{m}_{\max(F)}$  = Max. full scale value for liquid [kg/h]  
 $\rho_{(G)}$  = Gas density in [kg/m<sup>3</sup>] under process conditions

Calculation example for gas:

- Sensor type: Promass E, DN 50
- Gas: air with a density of 60.3 kg/m<sup>3</sup> (at 20 °C and 50 bar)
- Measuring range: 70000 kg/h

Max. possible full scale value:

$$\dot{m}_{\max(G)} = \frac{\dot{m}_{\max(F)} \cdot \rho_{(G)}}{320 \text{ kg/m}^3} = \frac{70000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3}{320 \text{ kg/m}^3} = 13190 \text{ kg/h}$$

Recommended full scale values:  
See Page 55 ("Limiting flow")

Operable flow range

Flowrates above the preset full scale value do not overload the amplifier, i.e. the totalizer values are registered correctly.

Input signal

Status input (auxiliary input):  
U = 3...30 V DC, R<sub>i</sub> = 5 kΩ, galvanically isolated.  
Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment.

### 10.1.4 Output

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output signal      | <p>Current output:<br/>Active/passive selectable, galvanically isolated, time constant selectable (0.05...100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C;<br/>resolution: 0.5 <math>\mu</math>A</p> <ul style="list-style-type: none"> <li>• active: 0/4...20 mA, <math>R_L &lt; 700 \Omega</math> (for HART: <math>R_L \geq 250 \Omega</math>)</li> <li>• passive: 4...20 mA, max. 30 V DC, <math>R_i \leq 150 \Omega</math></li> </ul> <p>Pulse / frequency output:<br/>Passive, open collector, 30 V DC, 250 mA, galvanically isolated.</p> <ul style="list-style-type: none"> <li>• Frequency output: full scale frequency 2...1000 Hz (<math>f_{\max} = 1250</math> Hz), on/off ratio 1:1, pulse width max. 10 s</li> <li>• Pulse output: pulse value and pulse polarity selectable, max. pulse width adjustable (0.05...2 s), max. pulse frequency selectable</li> </ul> |
| Signal on alarm    | <ul style="list-style-type: none"> <li>• Current output → failsafe mode selectable</li> <li>• Pulse/frequency output → failsafe mode selectable</li> <li>• Status output → "non-conductive" in the event of fault or power supply failure</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Load               | see "Output signal"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Switching output   | <p>Status output:<br/>Open collector, max. 30 V DC / 250 mA, galvanically isolated.<br/>Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Low flow cutoff    | Switch points for low flow cut off are selectable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Galvanic isolation | All circuits for inputs, outputs, and power supply are galvanically isolated from each other.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

### 10.1.5 Auxiliary energy

|                        |                                                                                                                                                                                                                    |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical connections | see Page 17 ff.                                                                                                                                                                                                    |
| Supply voltage         | 85...260 V AC, 45...65 Hz<br>20...55 V AC, 45...65 Hz<br>16...62 V DC                                                                                                                                              |
| Potential equalisation | No special measures for potential equalisation are required.<br>For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.                                 |
| Cable entries          | Power supply and signal cables (inputs/outputs): <ul style="list-style-type: none"> <li>• Cable entry M20 x 1.5 (8...12 mm)</li> <li>• Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, G 1/2"</li> </ul> |

|                      |                                                                                                                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power consumption    | AC: <15 VA (including sensor)<br>DC: <15 W (including sensor)<br><br>Switch-on current: <ul style="list-style-type: none"><li>• max. 13.5 A (&lt; 50 ms) at 24 V DC</li><li>• max. 3 A (&lt; 5 ms) at 260 V AC</li></ul>                                                                           |
| Power supply failure | Lasting min. 1 power cycle: <ul style="list-style-type: none"><li>• EEPROM saves measuring system data if power supply fails.</li><li>• S-DAT™ is an exchangeable data storage chip with sensor specific data:<br/>nominal diameter, serial number, calibration factor, zero point, etc.</li></ul> |

10.1.6 Performance characteristics

|                                |                                                                                                                                                                                                                                                                     |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference operating conditions | Error limits following ISO/DIS 11631: <ul style="list-style-type: none"><li>• 20...30 °C; 2...4 bar</li><li>• Calibration systems as per national norms</li><li>• Zero point calibrated under operating conditions</li><li>• Density adjustment performed</li></ul> |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                        |                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Maximum measured error | The following values refer to the pulse/frequency output.<br>Measured error at the current output is typically ±5 µA. |
|------------------------|-----------------------------------------------------------------------------------------------------------------------|

**Mass flow (liquid)**  
±0.5% ± [(zero point stability / measured value) x 100]% o.r.

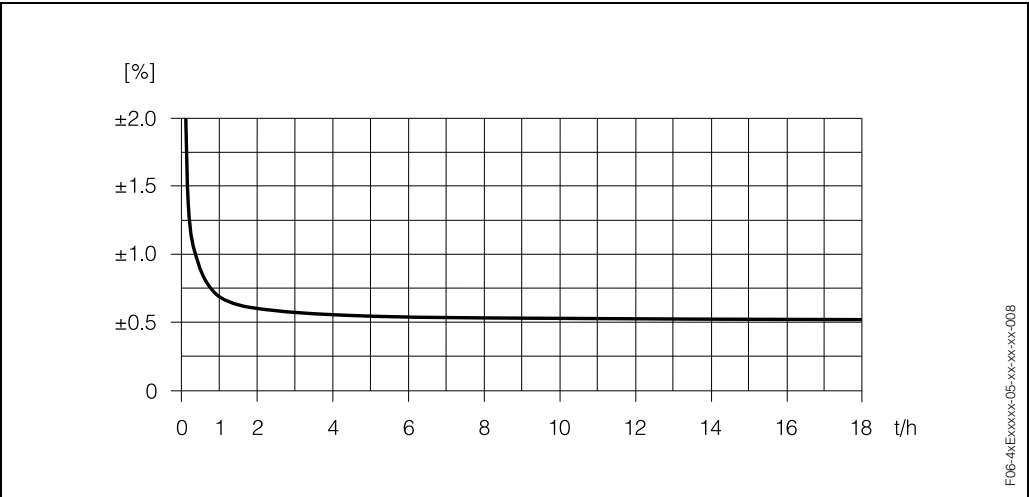
**Mass flow (gas)**  
±1.0% ± [(zero point stability / measured value) x 100]% o.r.

**Volume flow (liquid)**  
±0.7% ± [(zero point stability / measured value) x 100]% o.r.

o.r. = of reading

Zero point stability, Promass E:

| DN | Maximum full scale value<br>[kg/h] or [l/h] | Zero point stability<br>[kg/h] or [l/h] |
|----|---------------------------------------------|-----------------------------------------|
| 8  | 2000                                        | 0.20                                    |
| 15 | 6500                                        | 0.65                                    |
| 25 | 18000                                       | 1.8                                     |
| 40 | 45000                                       | 4.5                                     |
| 50 | 70000                                       | 7.0                                     |



Maximum measured error in % of reading (example: Promass 40 E / DN 25)

Calculation example (mass flow, liquid):  
Given: Promass 40 E / DN 25, flow = 8000 kg/h  
Measured error: ±0.5% ± [(zero point stability / measured value) x 100]% o.r.

Measured error →  $\pm 0.5\% \pm \frac{1.8 \text{ kg/h}}{8000 \text{ kg/h}} \cdot 100\% = \pm 0.523\%$

## Repeatability

**Flow measurement**

- Mass flow (liquid):  
 $\pm 0.25\% \pm [1/2 \times (\text{zero point stability} / \text{measured value}) \times 100]\% \text{ o.r.}$
- Mass flow (gas):  
 $\pm 0.5\% \pm [1/2 \times (\text{zero point stability} / \text{measured value}) \times 100]\% \text{ o.r.}$
- Volume flow (liquid):  
 $\pm 0.35\% \pm [1/2 \times (\text{zero point stability} / \text{measured value}) \times 100]\% \text{ o.r.}$

o.r. = of reading

Zero point stability: see "Max. measured error"

Calculation example (mass flow, liquid):

Given: Promass 40 E, DN 25, flow = 8000 kg/h

Repeatability:  $\pm 0.25\% \pm [1/2 \times (\text{zero point stability} / \text{measured value}) \times 100]\% \text{ o.r.}$ 

$$\text{Repeatability} \rightarrow \pm 0.25\% \pm 1/2 \cdot \frac{0.9 \text{ kg/h}}{8000 \text{ kg/h}} \cdot 100 \% = \pm 0.261\%$$

## Influence of medium temperature

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the Promass sensor is  $\pm 0.0003\%$  of the full scale value / °C.

## Influence of medium pressure

The effect on accuracy of mass flow due to a difference between calibration pressure and process pressure is negligible in the DN 8 ...40 range.

At DN 50 the effect is  $-0.009\% \text{ o.r.} / \text{bar}$  (o.r. = of reading).

**10.1.7 Operating conditions (installation)**

## Installation instructions

see Page 10 ff.

## Inlet and outlet runs

There are no installation requirements regarding inlet and outlet runs.

## System pressure

see Page 11

**10.1.8 Operating conditions (environment)**

## Ambient temperature

 $-20...+60 \text{ °C}$  (sensor, transmitter)

Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.

## Storage temperature

 $-40...+80 \text{ °C}$  (preferably  $+20 \text{ °C}$ )

## Degree of protection

Standard: IP 67 (NEMA 4X) for transmitter and sensor

## Shock resistance

According to IEC 68-2-31

## Vibration resistance

Acceleration up to 1 g, 10...150 Hz, following IEC 68-2-6

## Electromagnetic compatibility (EMC)

To EN 61326 and NAMUR recommendation NE 21

### 10.1.9 Operating conditions (process)

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Medium temperature range                | <p>Sensor:</p> <ul style="list-style-type: none"> <li>• –40...+125 °C</li> </ul> <p>Seals:</p> <ul style="list-style-type: none"> <li>• no internal seals</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Fluid pressure limit (nominal pressure) | <ul style="list-style-type: none"> <li>• Flanges: DIN PN 40...100 / ANSI CI 150, CI 300, CI 600 / JIS 10K, 20K, 40K, 63K</li> <li>• The Promass E sensor does not have a secondary containment</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Limiting flow                           | <p>See Page 50 ff. ("Measuring range")</p> <p>Select nominal diameter by optimising between required flow range and permissible pressure loss. See Page 50 ff. for a list of maximum possible full scale values.</p> <ul style="list-style-type: none"> <li>• The minimum recommended full scale value is approx. <math>\frac{1}{20}</math> of the maximum full scale value.</li> <li>• In most applications, 20...50% of the maximum full scale value can be considered ideal.</li> <li>• Select a lower full scale value for abrasive substances such as fluids with entrained solids (flow velocity &lt; 1 m/s).</li> <li>• For gas measurement the following rules apply:             <ul style="list-style-type: none"> <li>– Flow velocity in the measuring tubes should not be more than half the sonic velocity (0.5 Mach).</li> <li>– The maximum mass flow depends on the density of the gas (see formula on Page 50).</li> </ul> </li> </ul> |

Pressure loss

Pressure loss depends on the properties of the fluid and on the flow. The following formulas can be used to approximately calculate the pressure loss:

Pressure loss formulas for Promass E

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Reynolds number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $Re = \frac{2 \cdot \dot{m}}{\pi \cdot d \cdot \nu \cdot \rho}$                            |
| $Re \geq 2300$ <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $\Delta p = K \cdot \nu^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$                    |
| $Re < 2300$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $\Delta p = K1 \cdot \nu \cdot \dot{m} + \frac{K2 \cdot \nu^{0.25} \cdot \dot{m}^2}{\rho}$ |
| <div><div><math>\Delta p</math> = pressure loss [mbar]<br/><math>\nu</math> = kinematic viscosity [m<sup>2</sup>/s]<br/><math>\dot{m}</math> = mass flow [kg/s]</div><div><math>\rho</math> = fluid density [kg/m<sup>3</sup>]<br/><math>d</math> = inside diameter of measuring tubes [m]<br/><math>K...K2</math> = constants (depending on nominal diameter)</div></div> <div><sup>1)</sup> To compute the pressure loss for gases, always use the formula for <math>Re \geq 2300</math>.</div> |                                                                                            |

Pressure loss coefficient for Promass E

| DN | d [m]                 | K                 | K1                | K2                |
|----|-----------------------|-------------------|-------------------|-------------------|
| 8  | $5.35 \cdot 10^{-3}$  | $5.70 \cdot 10^7$ | $7.91 \cdot 10^7$ | $2.10 \cdot 10^7$ |
| 15 | $8.30 \cdot 10^{-3}$  | $7.62 \cdot 10^6$ | $1.73 \cdot 10^7$ | $2.13 \cdot 10^6$ |
| 25 | $12.00 \cdot 10^{-3}$ | $1.89 \cdot 10^6$ | $4.66 \cdot 10^6$ | $6.11 \cdot 10^5$ |
| 40 | $17.60 \cdot 10^{-3}$ | $4.42 \cdot 10^5$ | $1.35 \cdot 10^6$ | $1.38 \cdot 10^5$ |
| 50 | $26.00 \cdot 10^{-3}$ | $8.54 \cdot 10^4$ | $4.02 \cdot 10^5$ | $2.31 \cdot 10^4$ |

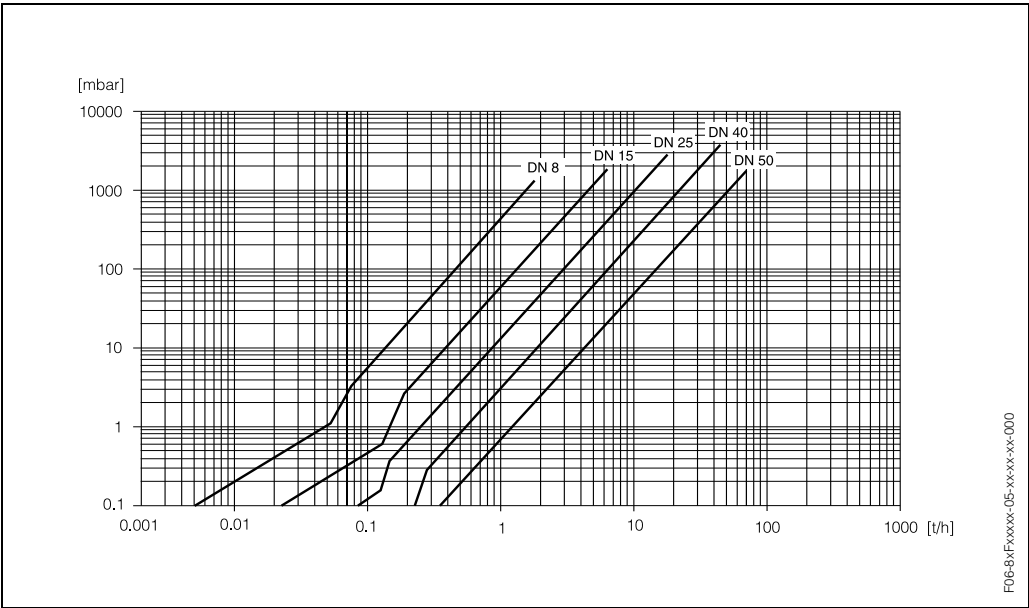


Fig. 22: Pressure loss diagram with water

### 10.1.10 Mechanical construction

Design / dimensions see Page 59 ff.

Weight

| Promass E / DN | 8 | 15 | 25 | 40 | 50 |
|----------------|---|----|----|----|----|
| Weight in [kg] | 8 | 8  | 10 | 15 | 22 |

Materials

Transmitter housing:

- Compact housing: powder coated die-cast aluminium

Sensor housing:

- Acid- and alkali-resistant outer surface;  
Stainless steel 1.4301/304

Process connections:

- Flanges DIN / ANSI / JIS → stainless steel 1.4404/316L
- Flange DIN 11864-2 → stainless steel 1.4404/316L
- VCO connection → stainless steel 1.4404 (316L)
- Hygienic coupling DIN 11851 / SMS 1145 → stainless steel 1.4404 (316L)
- Threaded unions ISO 2853 / DIN 11864-1 → stainless steel 1.4404/316L
- Tri-Clamp → stainless steel 1.4404 (316L)

Measuring tubes:

- Stainless steel 1.4539/904L

Seals:

- Welded process connections without internal seals

Material load diagram

The material load curves (pressure-temperature diagrams) for the process connections are to be found in the following documents:

- Technical Information Promass 40 E (TI 055D/06/en)

Process connections

- VCO coupling, flanges (DIN 2501, ANSI B16.5, JIS B2238)
- Sanitary connections: Tri-Clamp, threaded unions (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1), flange to DIN 11864-2

### 10.1.11 Human interface

Display element

- Liquid crystal display (option): illuminated, two lines with 16 characters per line
- Selectable display of different measured values and status variables

Remote operation

Operation by means of:

- HART protocol (handheld communicator)
- "FieldTool™" configuration and service program from Endress+Hauser

### 10.1.12 Certificates and approvals

|                                |                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ex Approvals                   | Information presently available in Ex versions (ATEX, FM, CSA) can be supplied by your E+H Sales Centre on request. All explosion protection data are given in separate documentation that you can order as necessary.                                                                                                                                                                   |
| Sanitary compatibility         | 3A authorization                                                                                                                                                                                                                                                                                                                                                                         |
| CE mark                        | The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.                                                                                                                                                                                                      |
| Other standards and guidelines | <p>EN 60529:<br/>Degrees of protection by housing (IP code)</p> <p>EN 61010:<br/>Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</p> <p>EN 61326 (IEC 1326):<br/>Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR NE 21:<br/>Association for Standards for Control and Regulation in the Chemical Industry</p> |

### 10.1.13 Ordering information

The E+H service organisation can provide detailed ordering information and information on the order codes on request.

### 10.1.14 Accessories

There are no accessories for transmitter and sensor.

### 10.1.15 Documentation

- ☐ System Information Promass 40 E (SI 033D/06/en)
- ☐ Technical Information Promass 40 (TI 055D/06/en)
- ☐ Description of Device Functions Promass 40 (BA 062D/06/en)
- ☐ Supplementary documentation on Ex-ratings: ATEX, FM, CSA

## 10.2 Dimensions

### Dimensions Promass E: flange connections (DIN, ANSI, JIS)

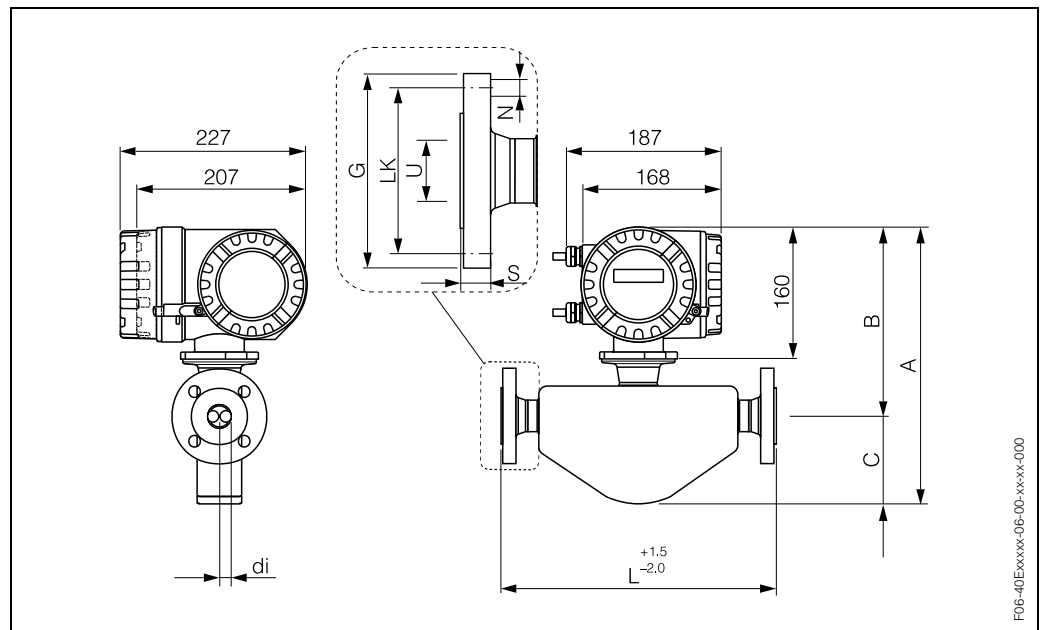


Fig. 23: Dimensions Promass E: flange connections (DIN, ANSI, JIS)

#### Flange DIN 2501 / DIN 2512N <sup>1)</sup> / PN 40: 1.4404/316L

| DN | A   | B   | C   | G   | L   | N       | S  | LK  | U    | di    |
|----|-----|-----|-----|-----|-----|---------|----|-----|------|-------|
| 8  | 317 | 224 | 93  | 95  | 232 | 4 x Ø14 | 16 | 65  | 17.3 | 5.35  |
| 15 | 331 | 226 | 105 | 95  | 279 | 4 x Ø14 | 16 | 65  | 17.3 | 8.30  |
| 25 | 337 | 231 | 106 | 115 | 329 | 4 x Ø14 | 18 | 85  | 28.5 | 12.00 |
| 40 | 358 | 237 | 121 | 150 | 445 | 4 x Ø18 | 18 | 110 | 43.1 | 17.60 |
| 50 | 423 | 253 | 170 | 165 | 556 | 4 x Ø18 | 20 | 125 | 54.5 | 26.00 |

<sup>1)</sup> Flange with groove to DIN 2512N available

#### Flange DIN 2501 / DIN 2512N <sup>1)</sup> / PN 64: 1.4404/316L

| DN | A   | B   | C   | G   | L   | N       | S  | LK  | U    | di    |
|----|-----|-----|-----|-----|-----|---------|----|-----|------|-------|
| 50 | 423 | 253 | 170 | 180 | 565 | 4 x Ø22 | 26 | 135 | 54.5 | 26.00 |

<sup>1)</sup> Flange with groove to DIN 2512N available

#### Flange DIN 2501 / DIN 2512N <sup>1)</sup> / PN 100: 1.4404/316L

| DN | A   | B   | C   | G   | L   | N       | S  | LK  | U    | di    |
|----|-----|-----|-----|-----|-----|---------|----|-----|------|-------|
| 8  | 317 | 224 | 93  | 105 | 261 | 4 x Ø14 | 20 | 75  | 17.3 | 5.35  |
| 15 | 331 | 226 | 105 | 105 | 295 | 4 x Ø14 | 20 | 75  | 17.3 | 8.30  |
| 25 | 337 | 231 | 106 | 140 | 360 | 4 x Ø18 | 24 | 100 | 28.5 | 12.00 |
| 40 | 358 | 237 | 121 | 170 | 486 | 4 x Ø22 | 26 | 125 | 42.5 | 17.60 |
| 50 | 423 | 253 | 170 | 195 | 581 | 4 x Ø26 | 28 | 145 | 53.9 | 26.00 |

<sup>1)</sup> Flange with groove to DIN 2512N available

| Flange ANSI B16.5 / CI 150: 1.4404/316L |        |     |     |     |       |     |           |      |       |      |       |
|-----------------------------------------|--------|-----|-----|-----|-------|-----|-----------|------|-------|------|-------|
| DN                                      |        | A   | B   | C   | G     | L   | N         | S    | LK    | U    | di    |
| 8                                       | 3/8"   | 317 | 224 | 93  | 88.9  | 232 | 4 x Ø15.7 | 11.2 | 60.5  | 15.7 | 5.35  |
| 15                                      | 1/2"   | 331 | 226 | 105 | 88.9  | 279 | 4 x Ø15.7 | 11.2 | 60.5  | 15.7 | 8.30  |
| 25                                      | 1"     | 337 | 231 | 106 | 108.0 | 329 | 4 x Ø15.7 | 14.2 | 79.2  | 26.7 | 12.00 |
| 40                                      | 1 1/2" | 358 | 237 | 121 | 127.0 | 445 | 4 x Ø15.7 | 17.5 | 98.6  | 40.9 | 17.60 |
| 50                                      | 2"     | 423 | 253 | 170 | 152.4 | 556 | 4 x Ø19.1 | 19.1 | 120.7 | 52.6 | 26.00 |

| Flange ANSI B16.5 / CI 300: 1.4404/316L |        |     |     |     |       |     |           |      |       |      |       |
|-----------------------------------------|--------|-----|-----|-----|-------|-----|-----------|------|-------|------|-------|
| DN                                      |        | A   | B   | C   | G     | L   | N         | S    | LK    | U    | di    |
| 8                                       | 3/8"   | 317 | 224 | 93  | 95.2  | 232 | 4 x Ø15.7 | 14.2 | 66.5  | 15.7 | 5.35  |
| 15                                      | 1/2"   | 331 | 226 | 105 | 95.2  | 279 | 4 x Ø15.7 | 14.2 | 66.5  | 15.7 | 8.30  |
| 25                                      | 1"     | 337 | 231 | 106 | 123.9 | 329 | 4 x Ø19.0 | 17.5 | 88.9  | 26.7 | 12.00 |
| 40                                      | 1 1/2" | 358 | 237 | 121 | 155.4 | 445 | 4 x Ø22.3 | 20.6 | 114.3 | 40.9 | 17.60 |
| 50                                      | 2"     | 423 | 253 | 170 | 165.1 | 556 | 8 x Ø19.0 | 22.3 | 127.0 | 52.6 | 26.00 |

| Flange ANSI B16.5 / CI 600: 1.4404/316L |        |     |     |     |       |     |           |      |       |      |       |
|-----------------------------------------|--------|-----|-----|-----|-------|-----|-----------|------|-------|------|-------|
| DN                                      |        | A   | B   | C   | G     | L   | N         | S    | LK    | U    | di    |
| 8                                       | 3/8"   | 317 | 224 | 93  | 95.3  | 261 | 4 x Ø15.7 | 20.6 | 66.5  | 13.9 | 5.35  |
| 15                                      | 1/2"   | 331 | 226 | 105 | 95.3  | 295 | 4 x Ø15.7 | 20.6 | 66.5  | 13.9 | 8.30  |
| 25                                      | 1"     | 337 | 231 | 106 | 124.0 | 380 | 4 x Ø19.1 | 23.9 | 88.9  | 24.3 | 12.00 |
| 40                                      | 1 1/2" | 358 | 237 | 121 | 155.4 | 496 | 4 x Ø22.4 | 28.7 | 114.3 | 38.1 | 17.60 |
| 50                                      | 2"     | 423 | 253 | 170 | 165.1 | 583 | 8 x Ø19.1 | 31.8 | 127.0 | 49.2 | 26.00 |

| <b>Flange JIS B2238 / 10K: 1.4404/316L</b> |     |     |     |     |     |         |    |     |    |       |
|--------------------------------------------|-----|-----|-----|-----|-----|---------|----|-----|----|-------|
| DN                                         | A   | B   | C   | G   | L   | N       | S  | LK  | U  | di    |
| 50                                         | 423 | 253 | 170 | 155 | 556 | 4 x Ø19 | 16 | 120 | 50 | 26.00 |

| <b>Flange JIS B2238 / 20K: 1.4404/316L</b> |     |     |     |     |     |         |    |     |    |       |
|--------------------------------------------|-----|-----|-----|-----|-----|---------|----|-----|----|-------|
| DN                                         | A   | B   | C   | G   | L   | N       | S  | LK  | U  | di    |
| 8                                          | 317 | 224 | 93  | 95  | 232 | 4 x Ø15 | 14 | 70  | 15 | 5.35  |
| 15                                         | 331 | 226 | 105 | 95  | 279 | 4 x Ø15 | 14 | 70  | 15 | 8.30  |
| 25                                         | 337 | 231 | 106 | 125 | 329 | 4 x Ø19 | 16 | 90  | 25 | 12.00 |
| 40                                         | 358 | 237 | 121 | 140 | 445 | 4 x Ø19 | 18 | 105 | 40 | 17.60 |
| 50                                         | 423 | 253 | 170 | 155 | 556 | 8 x Ø19 | 18 | 120 | 50 | 26.00 |

| <b>Flange JIS B2238 / 40K: 1.4404/316L</b> |     |     |     |     |     |         |    |     |    |       |
|--------------------------------------------|-----|-----|-----|-----|-----|---------|----|-----|----|-------|
| DN                                         | A   | B   | C   | G   | L   | N       | S  | LK  | U  | di    |
| 8                                          | 317 | 224 | 93  | 115 | 261 | 4 x Ø19 | 20 | 80  | 15 | 5.35  |
| 15                                         | 331 | 226 | 105 | 115 | 300 | 4 x Ø19 | 20 | 80  | 15 | 8.30  |
| 25                                         | 337 | 231 | 106 | 130 | 375 | 4 x Ø19 | 22 | 95  | 25 | 12.00 |
| 40                                         | 358 | 237 | 121 | 160 | 496 | 4 x Ø23 | 24 | 120 | 38 | 17.60 |
| 50                                         | 423 | 253 | 170 | 165 | 601 | 8 x Ø19 | 26 | 130 | 50 | 26.00 |

| <b>Flange JIS B2238 / 63K: 1.4404/316L</b> |     |     |     |     |     |         |    |     |    |       |
|--------------------------------------------|-----|-----|-----|-----|-----|---------|----|-----|----|-------|
| DN                                         | A   | B   | C   | G   | L   | N       | S  | LK  | U  | di    |
| 8                                          | 317 | 224 | 93  | 120 | 282 | 4 x Ø19 | 23 | 85  | 12 | 5.35  |
| 15                                         | 331 | 226 | 105 | 120 | 315 | 4 x Ø19 | 23 | 85  | 12 | 8.30  |
| 25                                         | 337 | 231 | 106 | 140 | 383 | 4 x Ø23 | 27 | 100 | 22 | 12.00 |
| 40                                         | 358 | 237 | 121 | 175 | 515 | 4 x Ø25 | 32 | 130 | 35 | 17.60 |
| 50                                         | 423 | 253 | 170 | 185 | 616 | 8 x Ø23 | 34 | 145 | 48 | 26.00 |

Dimensions Promass E: VCO connections

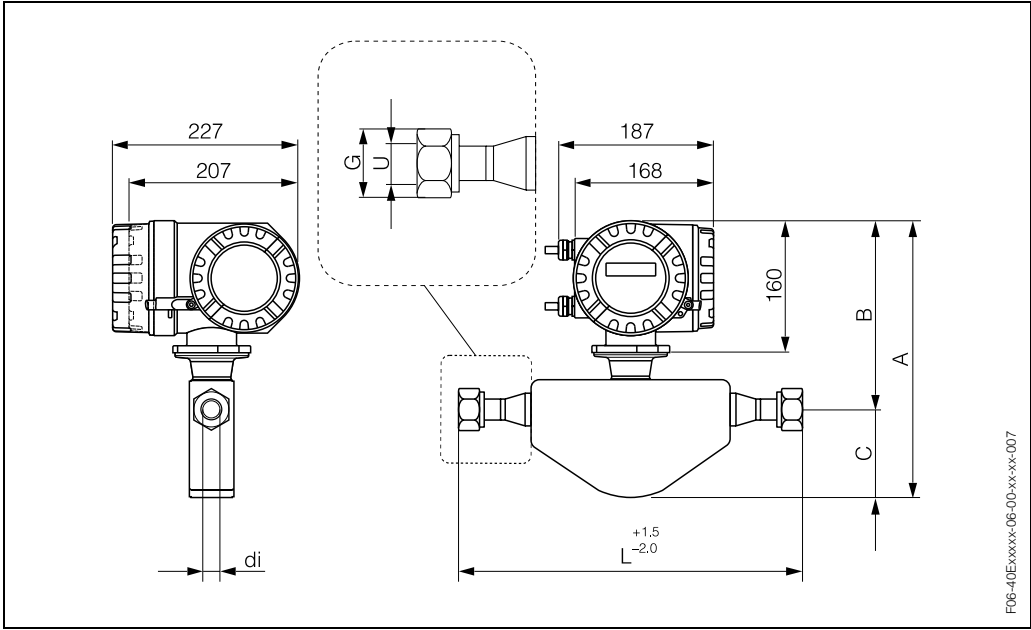


Fig. 24: Dimensions Promass E: VCO connections

| 8-VCO-4 (1/2"): 1.4404/316L |     |     |    |       |     |      |      |
|-----------------------------|-----|-----|----|-------|-----|------|------|
| DN                          | A   | B   | C  | G     | L   | U    | di   |
| 8                           | 317 | 224 | 93 | SW 1" | 252 | 10.2 | 5.35 |

| 12-VCO-4 (3/4"): 1.4404/316L |     |     |     |           |     |      |      |
|------------------------------|-----|-----|-----|-----------|-----|------|------|
| DN                           | A   | B   | C   | G         | L   | U    | di   |
| 15                           | 331 | 226 | 105 | SW 1 1/2" | 305 | 15.7 | 8.30 |

Dimensions Promass E: Tri-Clamp connections

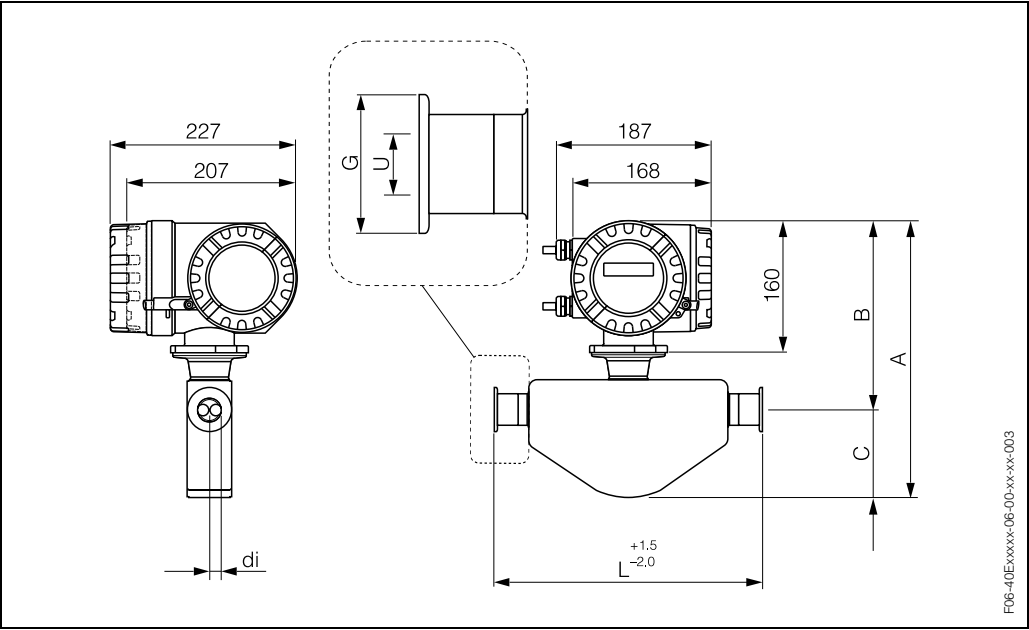


Fig. 25: Dimensions Promass E: Tri-Clamp connections

| Tri-Clamp: 1.4404/316L                            |        |     |     |     |      |     |      |       |
|---------------------------------------------------|--------|-----|-----|-----|------|-----|------|-------|
| DN                                                | Clamp  | A   | B   | C   | G    | L   | U    | di    |
| 8                                                 | 1"     | 317 | 224 | 93  | 50.4 | 229 | 22.1 | 5.35  |
| 15                                                | 1"     | 331 | 226 | 105 | 50.4 | 273 | 22.1 | 8.30  |
| 25                                                | 1"     | 337 | 231 | 106 | 50.4 | 324 | 22.1 | 12.00 |
| 40                                                | 1 1/2" | 358 | 237 | 121 | 50.4 | 456 | 34.8 | 17.60 |
| 50                                                | 2"     | 423 | 253 | 170 | 63.9 | 562 | 47.5 | 26.00 |
| 3-A version also available (Ra ≤ 0.8 µm/150 grit) |        |     |     |     |      |     |      |       |

| 1/2" Tri-Clamp: 1.4404/316L                       |       |     |     |     |      |     |     |      |
|---------------------------------------------------|-------|-----|-----|-----|------|-----|-----|------|
| DN                                                | Clamp | A   | B   | C   | G    | L   | U   | di   |
| 8                                                 | 1/2"  | 317 | 224 | 93  | 25.0 | 229 | 9.5 | 5.35 |
| 15                                                | 1/2"  | 331 | 226 | 105 | 25.0 | 273 | 9.5 | 8.30 |
| 3-A version also available (Ra ≤ 0.8 µm/150 grit) |       |     |     |     |      |     |     |      |

Dimensions Promass E: DIN 11851 connections (hygienic coupling)

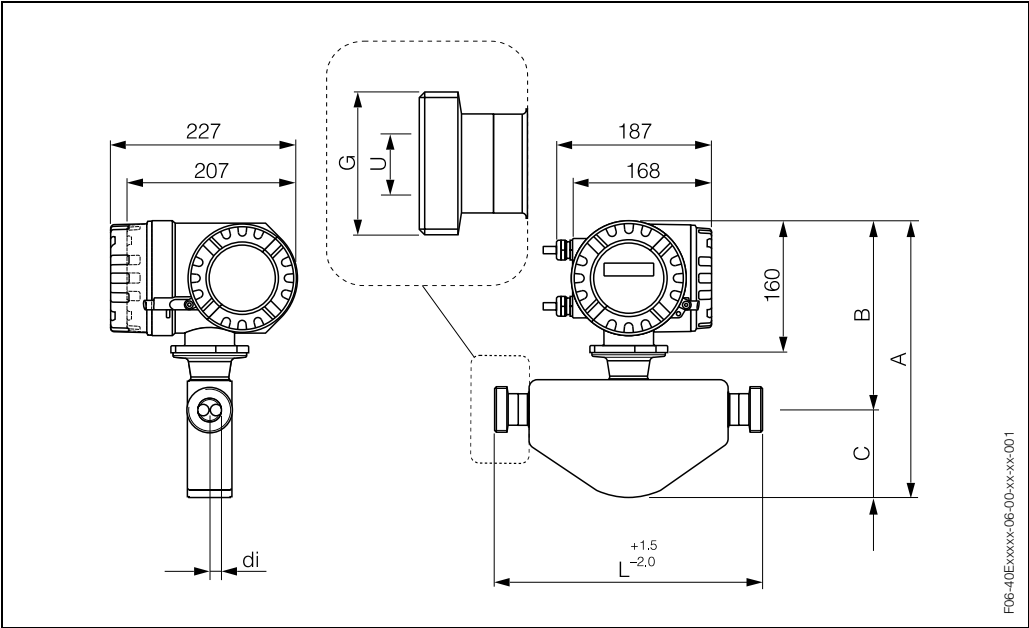


Fig. 26: Dimensions Promass E: DIN 11851 connections (hygienic coupling)

| Hygienic coupling DIN 11851: 1.4404/316L          |     |     |     |              |     |    |       |
|---------------------------------------------------|-----|-----|-----|--------------|-----|----|-------|
| DN                                                | A   | B   | C   | G            | L   | U  | di    |
| 8                                                 | 317 | 224 | 93  | Rd 34 x 1/8" | 229 | 16 | 5.35  |
| 15                                                | 331 | 226 | 105 | Rd 34 x 1/8" | 273 | 16 | 8.30  |
| 25                                                | 337 | 231 | 106 | Rd 52 x 1/6" | 324 | 26 | 12.00 |
| 40                                                | 358 | 237 | 121 | Rd 65 x 1/6" | 456 | 38 | 17.60 |
| 50                                                | 423 | 253 | 170 | Rd 78 x 1/6" | 562 | 50 | 26.00 |
| 3-A version also available (Ra ≤ 0.8 µm/150 grit) |     |     |     |              |     |    |       |

Dimensions Promass E: DIN 11864-1 Form A connections (threaded unions)

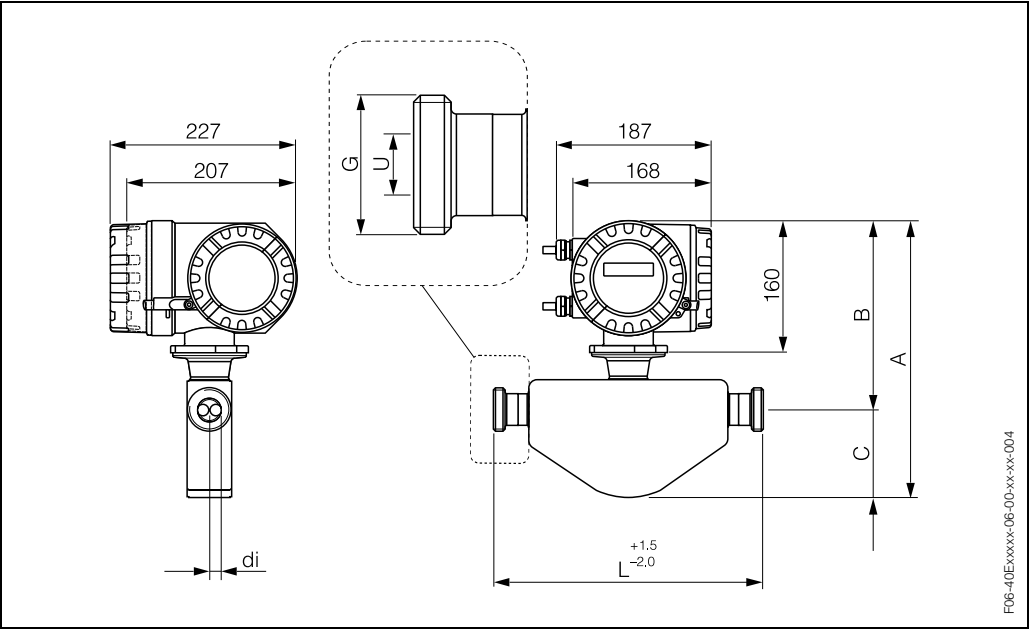


Fig. 27: Dimensions Promass E: DIN 11864-1 Form A connections (threaded unions)

| Threaded union DIN 11864-1 Form A: 1.4404/316L    |     |     |     |              |     |    |                |
|---------------------------------------------------|-----|-----|-----|--------------|-----|----|----------------|
| DN                                                | A   | B   | C   | G            | L   | U  | d <sub>i</sub> |
| 8                                                 | 317 | 224 | 93  | Rd 28 x 1/8" | 229 | 10 | 5.35           |
| 15                                                | 331 | 226 | 105 | Rd 34 x 1/8" | 273 | 16 | 8.30           |
| 25                                                | 337 | 231 | 106 | Rd 52 x 1/6" | 324 | 26 | 12.00          |
| 40                                                | 358 | 237 | 121 | Rd 65 x 1/6" | 456 | 38 | 17.60          |
| 50                                                | 423 | 253 | 170 | Rd 78 x 1/6" | 562 | 50 | 26.00          |
| 3-A version also available (Ra ≤ 0.8 µm/150 grit) |     |     |     |              |     |    |                |

Dimensions Promass E: flange connections DIN 11864-2 Form A

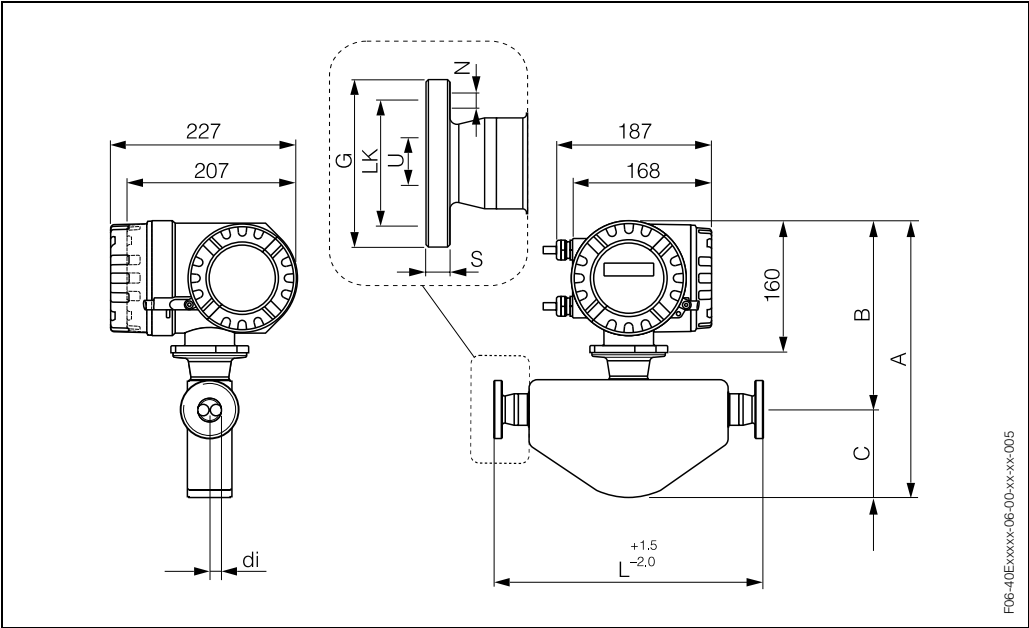


Fig. 28: Dimensions Promass E: flange connections DIN 11864-2 Form A

| Flange DIN 11864-2 Form A: 1.4404/316L            |     |     |     |    |     |        |    |    |    |       |
|---------------------------------------------------|-----|-----|-----|----|-----|--------|----|----|----|-------|
| DN                                                | A   | B   | C   | G  | L   | N      | S  | LK | U  | di    |
| 8                                                 | 317 | 224 | 93  | 54 | 249 | 4 x Ø9 | 10 | 37 | 10 | 5.35  |
| 15                                                | 331 | 226 | 105 | 59 | 293 | 4 x Ø9 | 10 | 42 | 16 | 8.30  |
| 25                                                | 337 | 231 | 106 | 70 | 344 | 4 x Ø9 | 10 | 53 | 26 | 12.00 |
| 40                                                | 358 | 237 | 121 | 82 | 456 | 4 x Ø9 | 10 | 65 | 38 | 17.60 |
| 50                                                | 423 | 253 | 170 | 94 | 562 | 4 x Ø9 | 10 | 77 | 50 | 26.00 |
| 3-A version also available (Ra ≤ 0.8 µm/150 grit) |     |     |     |    |     |        |    |    |    |       |

Dimensions Promass E: ISO 2853 connections (threaded unions)

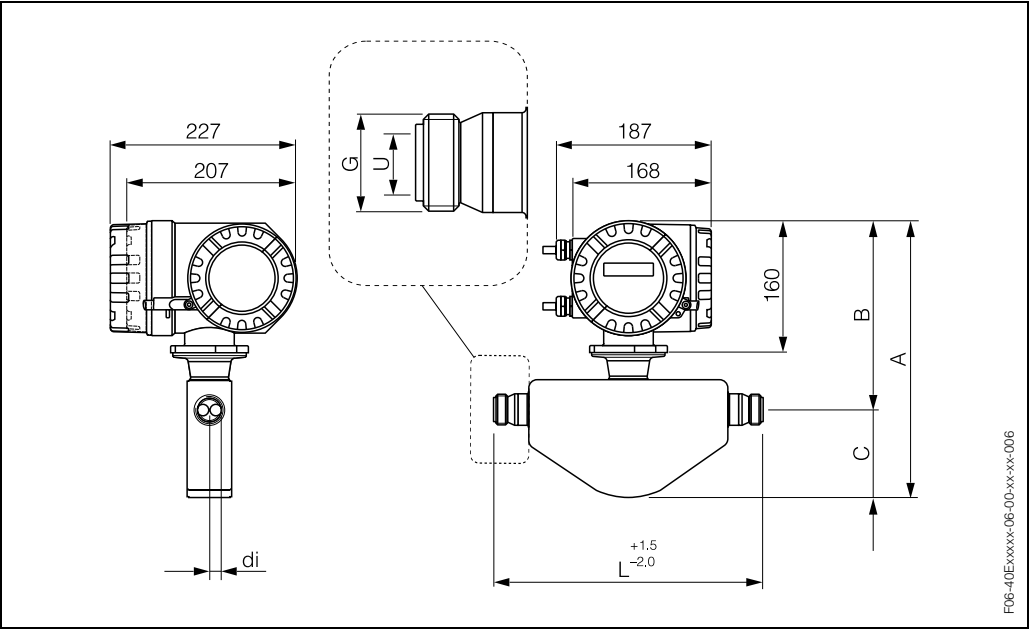


Fig. 29: Dimensions Promass E: ISO 2853 connections (threaded unions)

| Threaded union ISO 2853: 1.4404/316L                                                                        |     |     |     |                 |     |      |       |
|-------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----------------|-----|------|-------|
| DN                                                                                                          | A   | B   | C   | G <sup>1)</sup> | L   | U    | di    |
| 8                                                                                                           | 317 | 224 | 93  | 37.13           | 229 | 22.6 | 5.35  |
| 15                                                                                                          | 331 | 226 | 105 | 37.13           | 273 | 22.6 | 8.30  |
| 25                                                                                                          | 337 | 231 | 106 | 37.13           | 324 | 22.6 | 12.00 |
| 40                                                                                                          | 358 | 237 | 121 | 52.68           | 456 | 35.6 | 17.60 |
| 50                                                                                                          | 423 | 253 | 170 | 64.16           | 562 | 48.6 | 26.00 |
| <sup>1)</sup> Max. thread diameter to ISO 2853 Annex A<br>3-A version also available (Ra ≤ 0.8 µm/150 grit) |     |     |     |                 |     |      |       |

Dimensions Promass E: SMS 1145 connections (hygienic coupling)

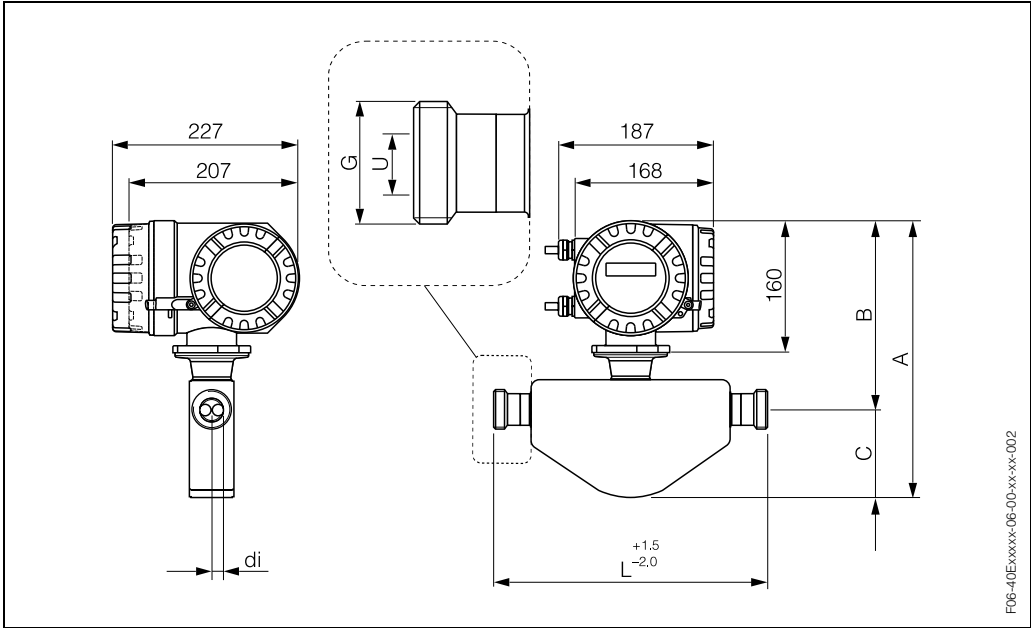


Fig. 30: Dimensions Promass E: SMS 1145 connections (hygienic coupling)

| Hygienic coupling SMS 1145: 1.4404/316L           |     |     |     |              |     |      |       |
|---------------------------------------------------|-----|-----|-----|--------------|-----|------|-------|
| DN                                                | A   | B   | C   | G            | L   | U    | di    |
| 8                                                 | 317 | 224 | 93  | Rd 40 x 1/6" | 229 | 22.5 | 5.35  |
| 15                                                | 331 | 226 | 105 | Rd 40 x 1/6" | 273 | 22.5 | 8.30  |
| 25                                                | 337 | 231 | 106 | Rd 40 x 1/6" | 324 | 22.5 | 12.00 |
| 40                                                | 358 | 237 | 121 | Rd 60 x 1/6" | 456 | 35.5 | 17.60 |
| 50                                                | 423 | 253 | 170 | Rd 70 x 1/6" | 562 | 48.5 | 26.00 |
| 3-A version also available (Ra ≤ 0.8 µm/150 grit) |     |     |     |              |     |      |       |

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# Gefahrgutblatt für Reparaturen an E+H-Geräten

## Safety regulation form for repairs of E+H instruments

### Bulletin de marchandises dangereuses pour réparations des instruments E+H

Lieber Kunde, bitte helfen Sie uns mit Ihren Informationen, damit wir Ihre Reparatur schnell, exakt und risikofrei durchführen können.  
Dear customer, please help us with your information to handle your repair fast, exact and free of any risks for the technicians.  
Cher client, aidez-nous avec vos informations, afin que nous puissions exécuter vos réparations rapidement, exactement et sans risques.

Firma / company / entreprise:

\_\_\_\_\_

Abt. / dept. / service: \_\_\_\_\_

Anschrift / address / adresse: \_\_\_\_\_

Name / name / nom: \_\_\_\_\_

\_\_\_\_\_

Tel. / phone: \_\_\_\_\_

\_\_\_\_\_

Fax: \_\_\_\_\_

Sensortyp / type of sensor / modèle de détecteur:

\_\_\_\_\_

Auswertegerät / type of instrument / type d'appareil:

\_\_\_\_\_

Seriennummer / serial no. / numéro de série:

\_\_\_\_\_

Seriennummer / serial no. / numéro de série:

\_\_\_\_\_

#### Prozessdaten / process data / données des opérations

Medium:

\_\_\_\_\_

#### Gereinigt mit / cleaned with / nettoyé avec

Medium:

\_\_\_\_\_

Chemische Formel:

Chemical formula:

Formule chimique:

\_\_\_\_\_



Ungefährlich  
Safe to handle  
Sans danger

#### Aggregatzustand / state of aggregation / état d'agrégation

flüssig/liquid  
liquide

☐

fest/solid  
solide

☐

gasförmig/gaseous  
gazéiforme

☐

pulverig/powdery  
poudreux

☐

#### Ex-Anlage / Ex-Zone / Ex-plan

Ja  
Yes  
Oui

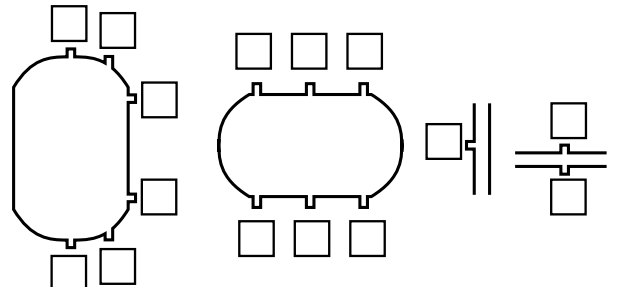
☐

Nein  
No  
Non

☐

Zone  
Class

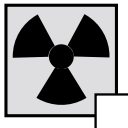
#### Einbauort / mounting place / lieu de montage



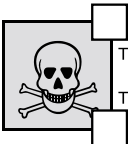
#### Sicherheitshinweise / safety regulations / normes de sécurité



Umweltgefährlich  
Dangerous for the env.  
Dangereux pour l'envir.



Radioaktiv  
Radioactive  
Radioactif



Giftig  
Toxic  
Toxique



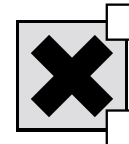
Entzündlich  
Flammable  
Inflammable



Brandfördernd  
Oxidizing  
Comburant



Expl.gefährlich  
Explosive  
Explosif



Schädlich / Reizend  
Harmful / Irritant  
Nocif / Irritant



Ätzend  
Corrosive  
Corrosif



Ungefährlich  
Safe to handle  
Sans danger

► Hiermit bestätigen wir, dass die zurückgeschickten Geräte frei sind von jeglichen Gefahr- oder Giftstoffen (Säuren, Laugen, Lösungsmitteln, usw.). Radioaktiv kontaminierte Geräte müssen vor Einsendung entsprechend den Strahlenschutzvorschriften dekontaminiert werden. Falls spezielle Handhabungsvorschriften nötig sind, legen Sie diese bitte bei.  
► We herewith confirm that the returned instruments are free of any dangerous or toxic materials (acids, caustics, solvents, etc.). Radioactive contaminated instruments must be decontaminated according to nuclear safety regulations prior to shipment. If special handling regulations are required, please attach.  
► Par la présente, nous certifions que les instruments en retour sont exempts de tous risques de contamination ou de matières toxiques. Avant expédition les instruments contaminés par de la radio-activité doivent être décontaminés en référence aux prescriptions des règles de sécurité en vigueur contre les radiations nucléaires. Au cas où des règles de manipulations spécifiques sont nécessaires, veuillez les joindre s. v. p.

Datum / date:

Firmenstempel / stamp / cachet: \_\_\_\_\_

Unterschrift:

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