BA046D/06/en/10.03
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Valid as of software version:
V 1.06.XX (amplifier)
V 1.03.XX (communication)

# *PROline promag 50*
# Electromagnetic Flow Measuring System

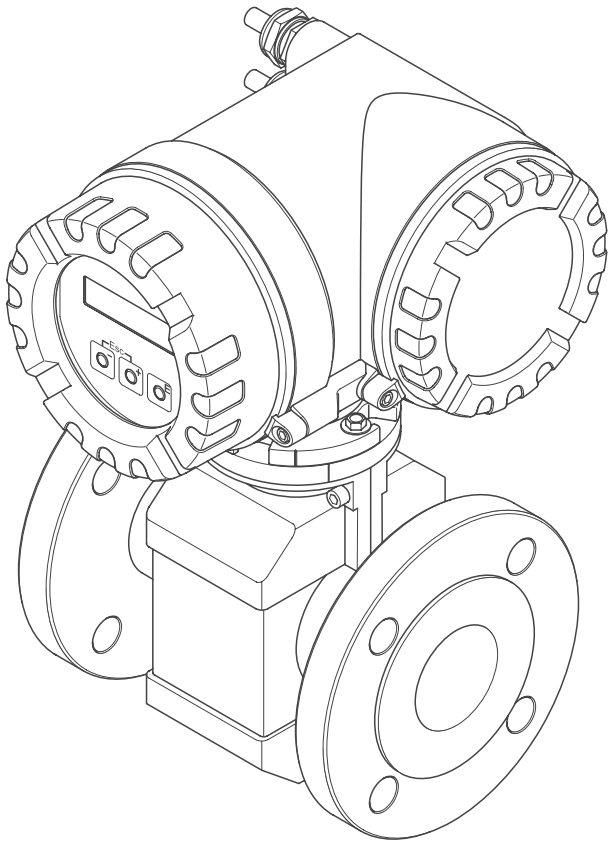








## Operating Instructions



Endress+Hauser
The Power of Know How

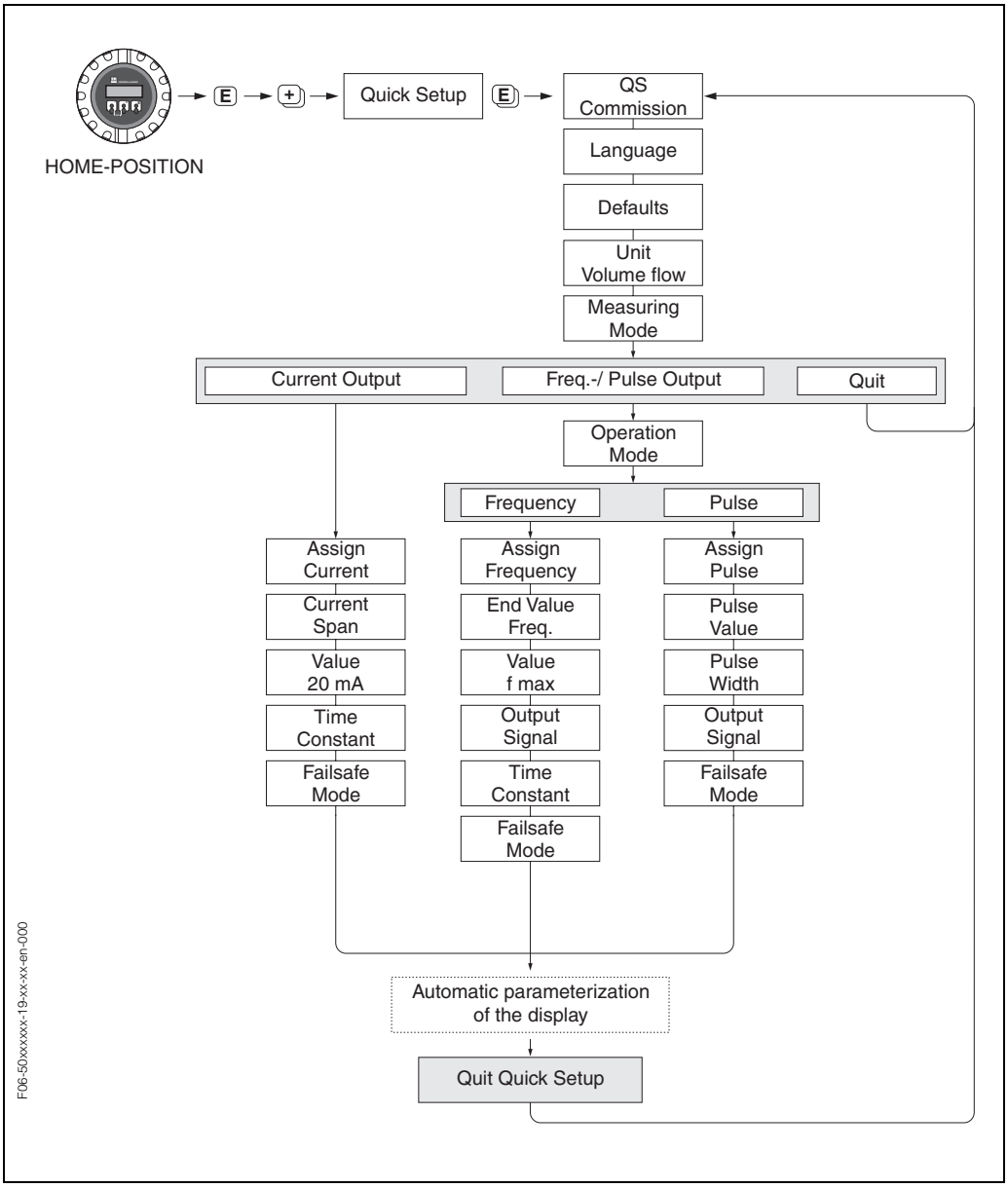
# Brief operating instructions

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

| | |
|---|---|
| **Safety instructions** | Page 7 |
| ▼ | |
| **Installation** | Page 13 |
| ▼ | |
| **Wiring** | Page 47 |
| ▼ | |
| **Display and operating elements** | Page 61 |
| ▼ | |
| **Commissioning with "QUICK SETUP"** | Page 80 ff. |
| You can commission the measuring device quickly and easily, using the special "Quick Setup" menu. It enables to configure important basic functions using the local display, for example display language, measured variables, units engineering, type of signal, etc.<br>The following adjustments can be made separately as necessary:<br>– Empty-pipe/full-pipe adjustment for empty pipe detection (EPD)<br>– Configuration of current output (active/passive) | |
| ▼ | |
| **Customer-specific cofiguration** | Page 62 ff. |
| Complex measuring operations necessitate additional functions that you can configure as necessary with the aid of the function matrix, and customize to suit the process parameters.<br>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. | |

Note!
Always start trouble-shooting with the checklist on Page 87, if faults occur after commissioning or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures.

# "QUICK SETUP" commissioning



# Contents

# 1 Safety instructions

## 1.1 Designated use

The measuring device described in this Operating Manual is to be used only for measuring the flow rate of conductive fluids in closed pipes. A minimum conductivity of 20 µS/cm is required for measuring demineralized water. Most fluids can be metered, provided they have a minimum conductivity of 5 µS/cm, for example:
- acids, alkalis,
- drinking water, wastewater, sewage sludge,
- milk, beer, wine, mineral water, etc.

Resulting from incorrect use or from use other than that designated the operational safety of the measuring devices can be suspended. The manufacturer accepts no liability for damages being produced from this.

## 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 authorized to perform such work by the facility's owner-operator. The specialist must have read and understood this Operating Manual and must follow the instructions it contains.
- The device must be operated by persons authorized and trained by the facility's owner-operator. Strict compliance with the instructions in the Operating Manual 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.
- If welding work is performed on the piping system, do not ground the welding appliance through the Promag flowmeter.
- 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 Manual. 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 certification body ( Ⓔx Europe, FM USA, Ⓒ Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/A1, and NAMUR recommendation NE 21 and NE 43.
- Depending on the application, the seals of the process connections of the Promag H sensor require periodic replacement.
- 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 Manual.

## 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 "Declaration of contamination" 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* "Declaration of contamination" 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 Manual 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 “Promag 50” flow measuring system consists of the following components:
- Promag 50 transmitter
- Promag W, Promag P or Promag H sensor

In the *compact version*, transmitter and sensor form a single mechanical unit; in the *remote version* they are installed separately.

### 2.1.1 Nameplate of the transmitter

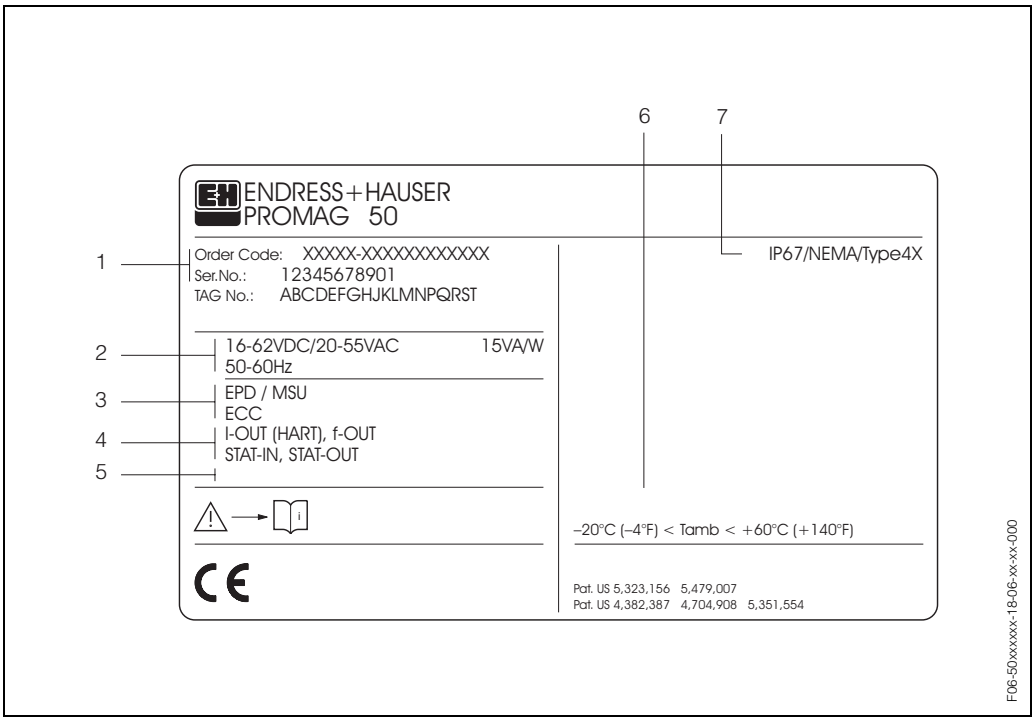



*Fig. 1: Nameplate specifications for the “Promag 50” transmitter (example)*

*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 Additional functions and software:*
*– EPD/MSU: with Empty Pipe Detection*
*– ECC: with Electrode Cleaning Circuitry*
*4 Outputs / inputs:*
*I-OUT (HART): with current output (HART)*
*f-OUT: with pulse/frequency output*
*STAT-IN: with status input (auxiliary input)*
*STAT-OUT: with status output (switch output)*
*5 Reserved for information on special products*
*6 Ambient temperature range*
*7 Degree of protection*

### 2.1.2 Nameplate of the sensor

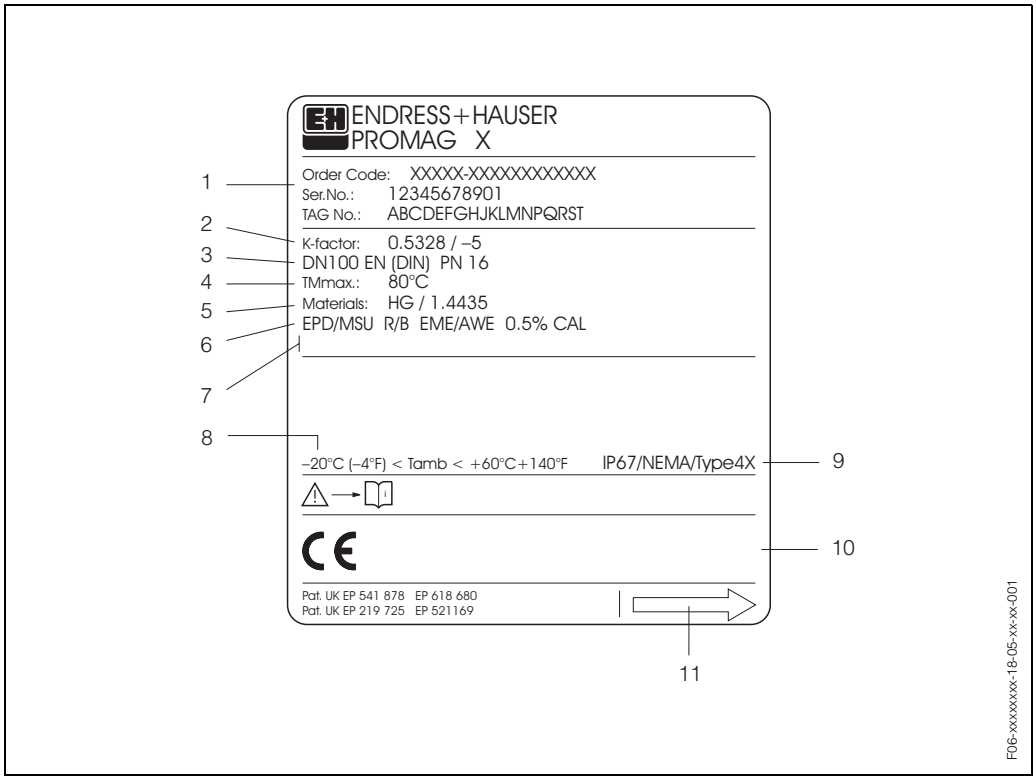



*Fig. 2: Nameplate specifications for the "Promag" sensor (example)*

*1 Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.*
*2 Calibration factor: 0.5328; zero point: –5*
*3 Nominal diameter: DN 100*
*Pressure rating: EN (DIN) PN 16 bar*
*4 TMmax +80 °C (max. fluid temperature)*
*5 Materials:*
*– Lining: hard rubber (HG)*
*– Measuring electrodes: stainless steel 1.4435*
*6 Additional information (examples):*
*– EPD/MSU: with Empty Pipe Detection electrode*
*– R/B: with reference electrode*
*– EME/AWE: with exchangeable measuring electrodes*
*– 0.5% CAL: with 0.5% calibration*
*7 Reserved for information on special products*
*8 Ambient temperature range*
*9 Degree of protection*
*10 Reserved for additional information on device version (approvals, certificates)*
*11 Flow direction*

## 2.2 CE mark, declaration of conformity

The devices are designed to meet state-of-the-art safety requirements in accordance with sound engineering practice. They 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" and with the EMC reqiurements of EN 61326/A1.
The measuring system described in this Operating Manual is therefore 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.

## 2.3 Registered trademarks

KALREZ ®, VITON ®
are registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP ®
is a registered trademark of Ladish & Co., Inc., Kenosha, USA

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

S-DAT ™, FieldTool ™, FieldCheck ™, Applicator ™
are registered trademarks of Endress+Hauser Flowtec AG, Reinach, CH

# 3 Installation

## 3.1 Incoming acceptance, transport and storage

### 3.1.1 Incoming acceptance

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

### 3.1.2 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.
- Do not remove the protective plates or caps on the process connections until the device is ready to install. This is particularly important in the case of sensors with PTFE linings.

**Special notes on flanged devices**

Caution!
- The wooden covers mounted on the flanges before the device leaves the factory protect the linings on the flanges during storage and transportation. Do not remove these covers until *immediately before* the device is installed in the pipe.
- Do not lift flanged devices by the transmitter housing, or the connection housing in the case of the remote version.

*Transporting flanged devices (DN ≤ 300):*
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.

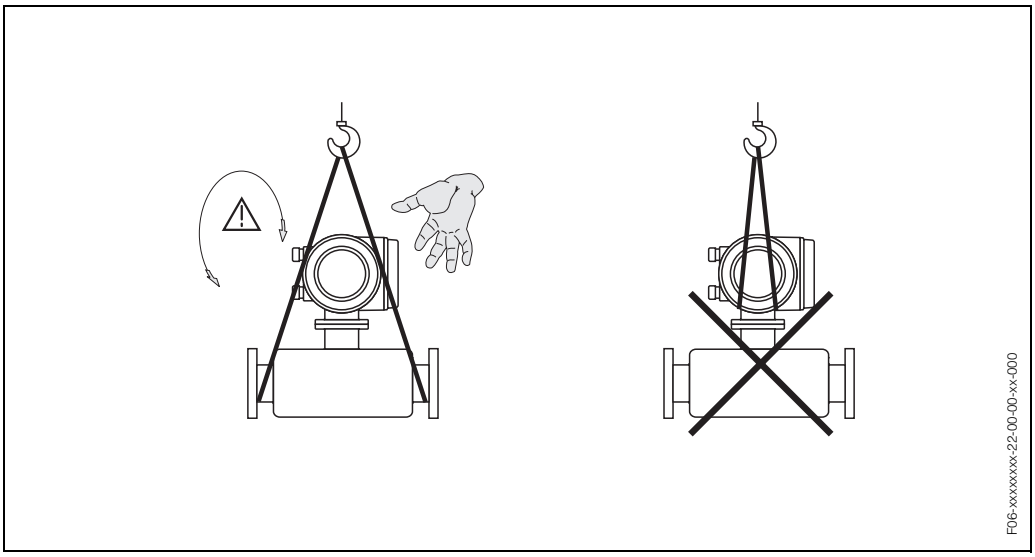



*Fig. 3: Transporting transmitters with DN ≤ 300*

*Transporting flanged devices (DN ≥ 350):*
Use only the metal eyes on the flanges for transporting the device, lifting it and positioning the sensor in the piping.

Caution!
Do not attempt to lift the sensor with the tines of a fork-lift truck beneath the metal casing. This would buckle the casing and damage the internal magnetic coils.

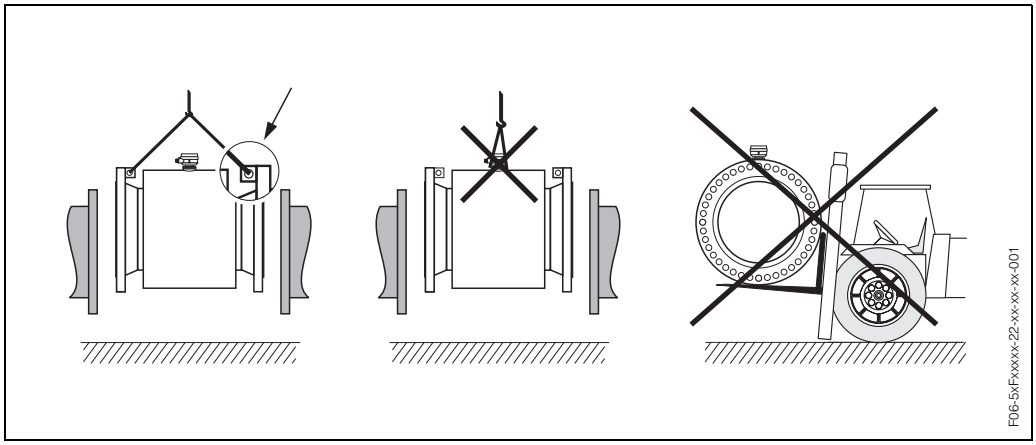



*Fig. 4: Transporting sensors with DN ≥ 350*

### 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 –10…+50 °C (preferably +20 °C).
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective plates or caps on the process connections until you are ready to install the device. This is particularly important in the case of sensors with PTFE linings.

## 3.2 Installation conditions

### 3.2.1 Dimensions

Dimensions and the fitting lengths of the transmitter and sensor are on Page 122 ff.

### 3.2.2 Mounting location

Correct measuring is possible only if the pipe is full. **Avoid** the following locations:
- Highest point of a pipeline. Risk of air accumulating
- Directly upstream a free pipe outlet in a vertical pipeline.

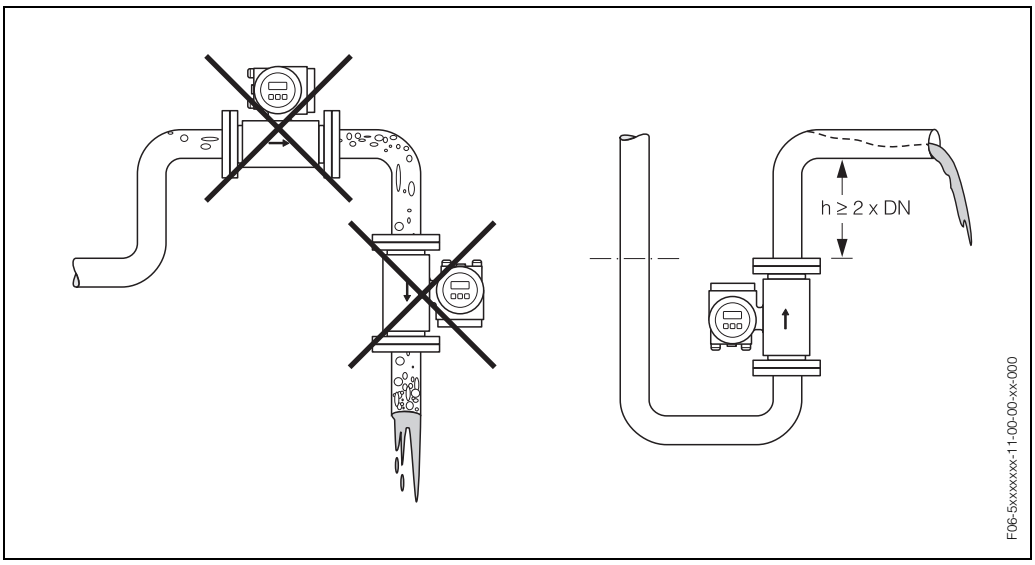



*Fig. 5: Location*

**Installation of pumps**
Do not install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the lining's resistance to partial vacuum can be found on → Page 113.

It might be necessary to install pulse dampers in systems incorporating reciprocating, diaphragm or peristaltic pumps. Information on the measuring system's resistance to vibration and shock can be found on → Page 110.

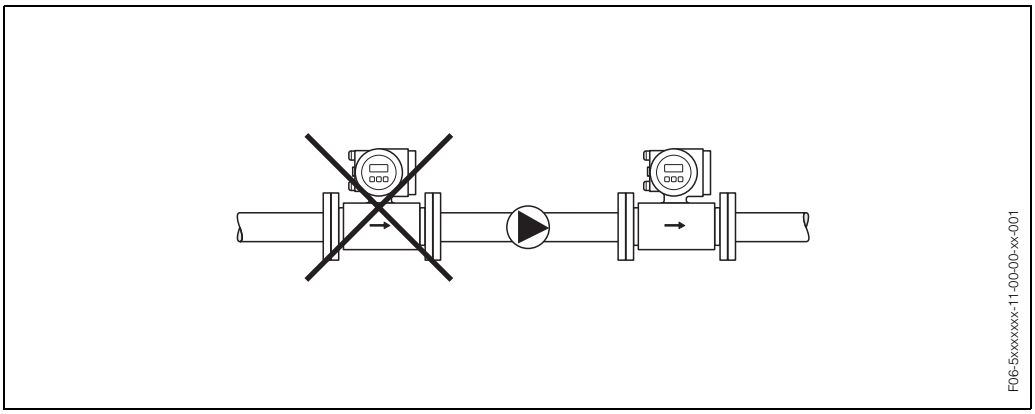



*Fig. 6: Installation of pumps*

**Partially filled pipes**
Partially filled pipes with gradients necessitate a drain-type configuration. The Empty Pipe Detection function (see Page 81) offers additional protection by detecting empty or partially filled pipes.

Caution!
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.

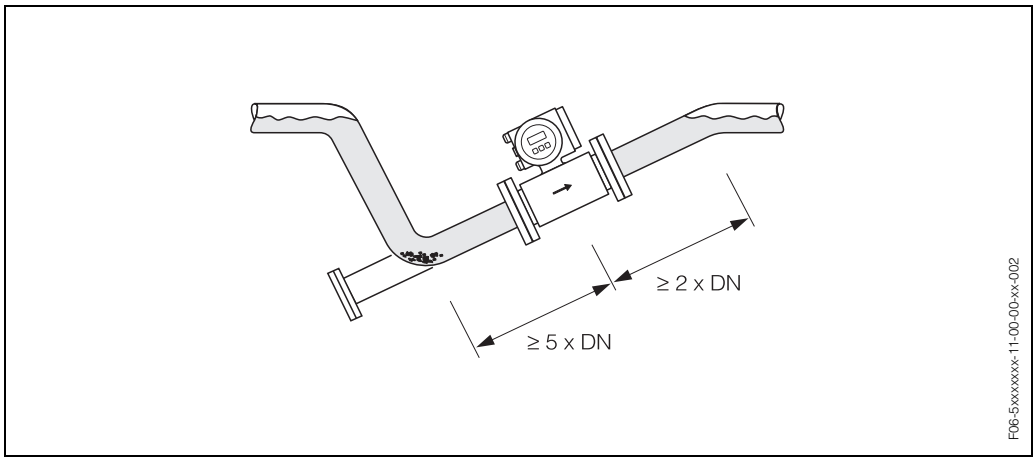



*Fig. 7: Installation in partially filled pipe*

**Down pipes**
Install a siphon or a vent valve downstream of the sensor in down pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. These measures also prevent the system losing prime, which could cause air inclusions.
Information on the lining's resistance to partial vacuum can be found on Page 113.

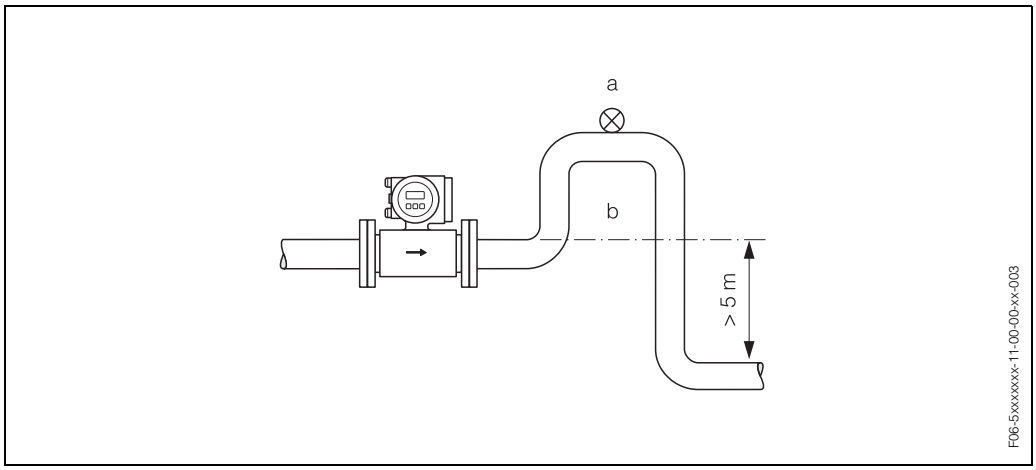



*Fig. 8: Measures for installation in a down pipe (a = vent valve; b = siphon)*

### 3.2.3 Orientation

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube. Promag, nevertheless, supplies a range of functions and accessories for correct measuring of problematic fluids:

- Electrode Cleaning Circuit (ECC) for applications with accretive fluids, e.g. electrically conductive deposits → "Description of Device Functions" manual.
- Empty Pipe Detection (EPD) ensures the detection of partially filled measuring tubes, e.g. in the case of degassing fluids or varying process pressure (see Page 81)
- Exchangeable Measuring Electrodes for abrasive fluids (see Page 102)

**Vertical orientation**
This is the ideal orientation for self-emptying piping systems and for use in conjunction with Empty Pipe Detection.

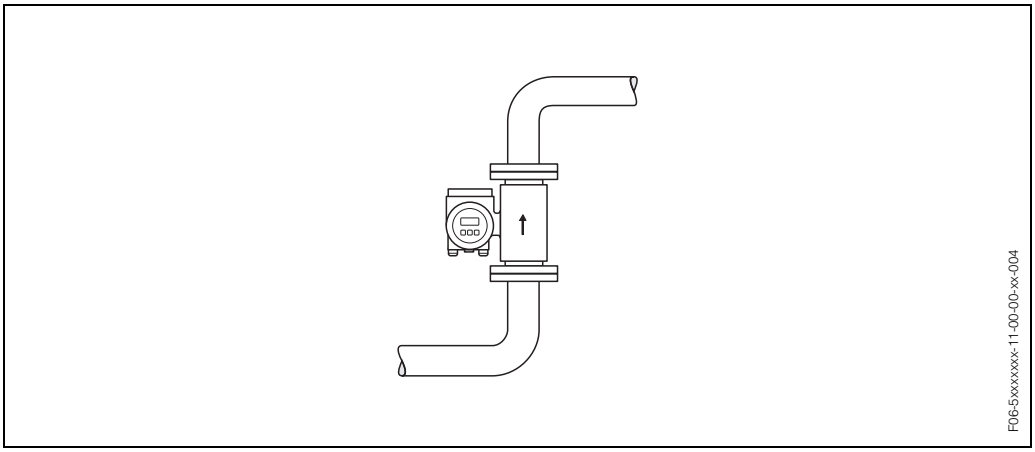



*Fig. 9: Vertical orientation*

**Horizontal orientation**
The measuring electrode plane should be horizontal. This prevents brief insulation of the two electrodes by entrained air bubbles.

Caution!
Empty Pipe Detection functions correctly only when the measuring device is installed horizontally and the transmitter housing is facing upward (Fig. 10). Otherwise there is no guarantee that Empty Pipe Detection will respond if the measuring tube is only partially filled or empty.

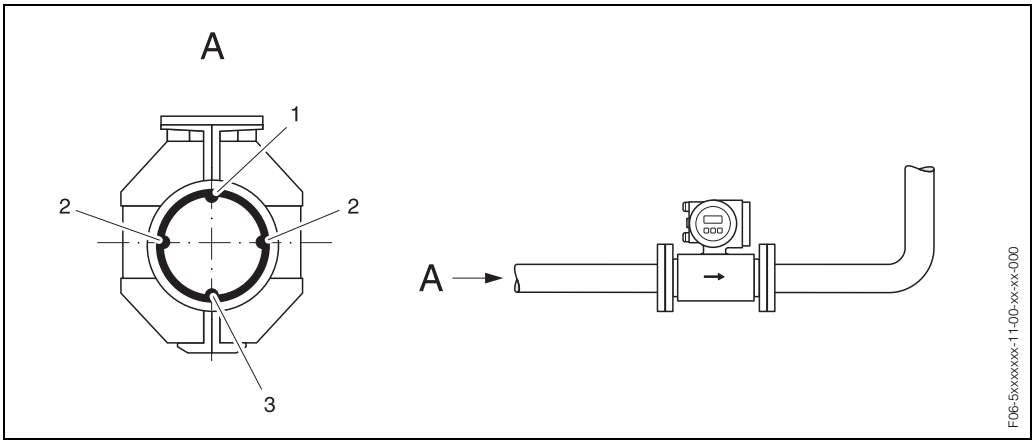



*Fig. 10: Horizontal orientation*

*1 EPD electrode for the detection of empty pipes (not with Promag H, DN 2...8)*
*2 Measurement electrodes for the signal acquisition*
*3 Reference electrode for the potential equalisation (not with Promag H)*

**Inlet and outlet runs**
If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc. Compliance with the following requirements for the inlet and outlet runs is necessary in order to ensure measuring accuracy.
- Inlet run ≥ 5 x DN
- Outlet run ≥ 2 x DN

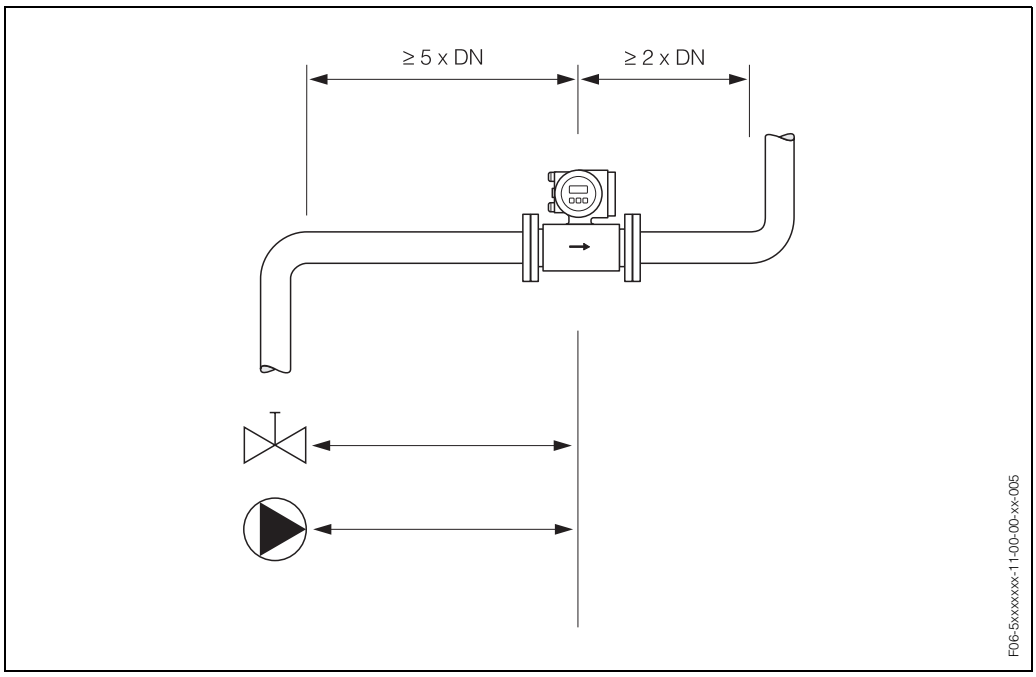



*Fig. 11: Inlet and outlet runs*

## 3.2.4 Vibrations

Secure the piping and the sensor if vibration is severe.

Caution!
It is advisable to install sensor and transmitter separately if vibration is excessively severe. Information on resistance to vibration and shock can be found on → Page 110.

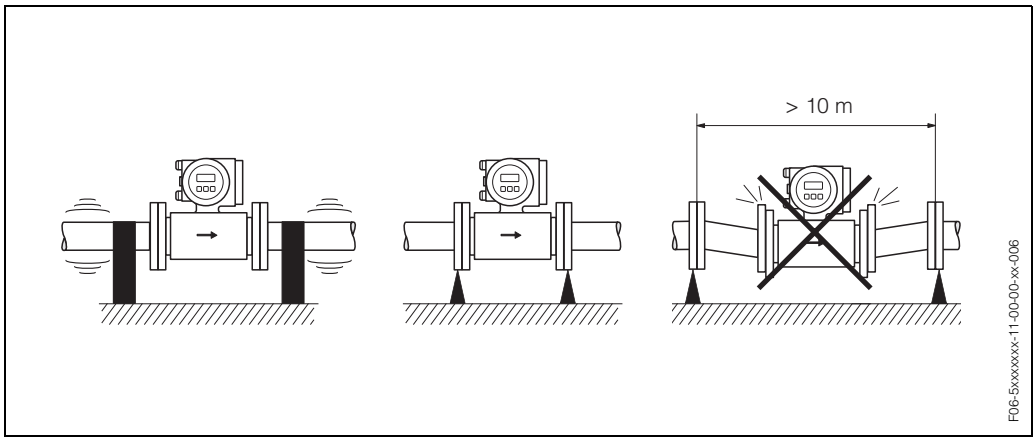



*Fig. 12: Measures to prevent vibration of the measuring device*

### 3.2.5 Foundations, supports

If the nominal diameter is DN ≥ 350, mount the transmitter on a foundation of adequate load-bearing strength.

Caution!
Risk of damage. Do not support the weight of the sensor on the metal casing: the casing would buckle and damage the internal magnetic coils.

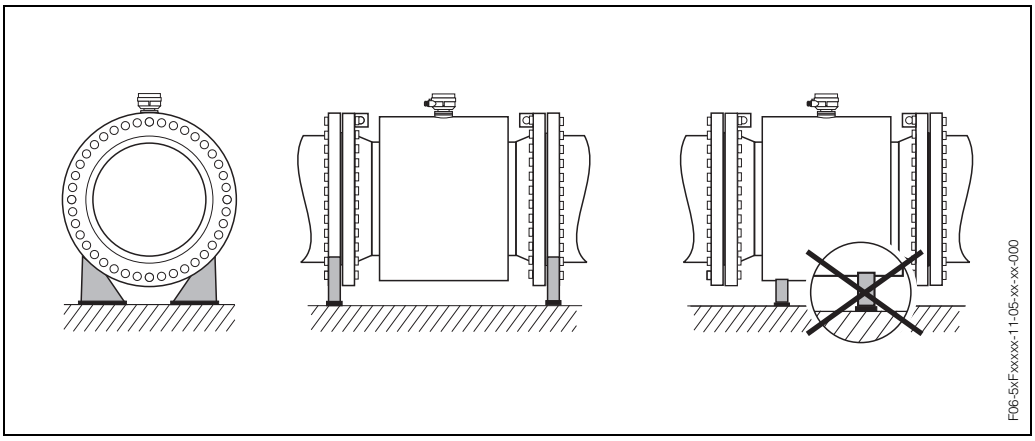



*Fig. 13: Correct support for large nominal diameters (DN ≥ 350)*

### 3.2.6 Adapters

Suitable adapters to (E) DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.

The nomogram shown here can be used to calculate the pressure loss caused by cross-section reduction:

Note!
The nomogram applies to fluids of viscosity similar to water.

1. Calculate the ratio of the diameters d/D.
2. From the nomogram read off the pressure loss as a function of flow velocity (*downstream* from the reduction) and the d/D ratio.

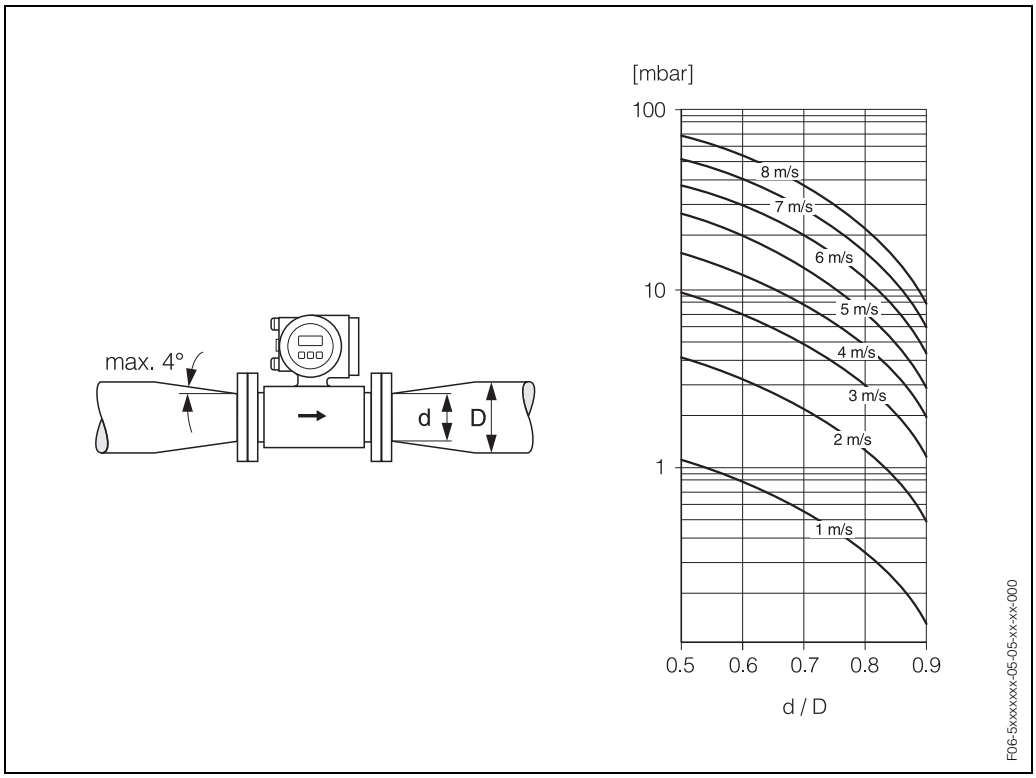



*Fig. 14: Pressure loss due to adapters*

### 3.2.7 Nominal diameter and flow rate

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is 2...3 m/s. The velocity of flow (v), moreover, has to be matched to the physical properties of the fluid:
- v < 2 m/s: for abrasive fluids such as potter's clay, lime milk, ore slurry, etc.
- v > 2 m/s: for fluids producing build-up such as wastewater sludge, etc.

Note!
Flow velocity can be increased, if necessary, by reducing the nominal diameter of the sensor (see Section 3.2.6).

## Promag W

**Flow rate characteristic values – Promag W (SI units)**

| Nominal diameter | | Recommended flow rate | Factory setting | | |
|---|---|---|---|---|---|
| [mm] | [inch] | min./max. full scale value (v ~ 0.3 or 10 m/s) | Full scale value (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cutoff (v ~ 0.04 m/s) |
| 25 | 1" | 9…300 $dm^3$/min | 75 $dm^3$/min | 0.50 $dm^3$ | 1 $dm^3$/min |
| 32 | 1 1/4" | 15…500 $dm^3$/min | 125 $dm^3$/min | 1.00 $dm^3$ | 2 $dm^3$/min |
| 40 | 1 1/2" | 25…700 $dm^3$/min | 200 $dm^3$/min | 1.50 $dm^3$ | 3 $dm^3$/min |
| 50 | 2" | 35…1100 $dm^3$/min | 300 $dm^3$/min | 2.50 $dm^3$ | 5 $dm^3$/min |
| 65 | 2 1/2" | 60…2000 $dm^3$/min | 500 $dm^3$/min | 5.00 $dm^3$ | 8 $dm^3$/min |
| 80 | 3" | 90…3000 $dm^3$/min | 750 $dm^3$/min | 5.00 $dm^3$ | 12 $dm^3$/min |
| 100 | 4" | 145…4700 $dm^3$/min | 1200 $dm^3$/min | 10.00 $dm^3$ | 20 $dm^3$/min |
| 125 | 5" | 220…7500 $dm^3$/min | 1850 $dm^3$/min | 15.00 $dm^3$ | 30 $dm^3$/min |
| 150 | 6" | 20…600 $m^3$/h | 150 $m^3$/h | 0.025 $m^3$ | 2.5 $m^3$/h |
| 200 | 8" | 35…1100 $m^3$/h | 300 $m^3$/h | 0.05 $m^3$ | 5.0 $m^3$/h |
| 250 | 10" | 55…1700 $m^3$/h | 500 $m^3$/h | 0.05 $m^3$ | 7.5 $m^3$/h |
| 300 | 12" | 80…2400 $m^3$/h | 750 $m^3$/h | 0.10 $m^3$ | 10 $m^3$/h |
| 350 | 14" | 110…3300 $m^3$/h | 1000 $m^3$/h | 0.10 $m^3$ | 15 $m^3$/h |
| 400 | 16" | 140…4200 $m^3$/h | 1200 $m^3$/h | 0.15 $m^3$ | 20 $m^3$/h |
| 450 | 18" | 180…5400 $m^3$/h | 1500 $m^3$/h | 0.25 $m^3$ | 25 $m^3$/h |
| 500 | 20" | 220…6600 $m^3$/h | 2000 $m^3$/h | 0.25 $m^3$ | 30 $m^3$/h |
| 600 | 24" | 310…9600 $m^3$/h | 2500 $m^3$/h | 0.30 $m^3$ | 40 $m^3$/h |
| 700 | 28" | 420…13500 $m^3$/h | 3500 $m^3$/h | 0.50 $m^3$ | 50 $m^3$/h |
| – | 30" | 480…15000 $m^3$/h | 4000 $m^3$/h | 0.50 $m^3$ | 60 $m^3$/h |
| 800 | 32" | 550…18000 $m^3$/h | 4500 $m^3$/h | 0.75 $m^3$ | 75 $m^3$/h |
| 900 | 36" | 690…22500 $m^3$/h | 6000 $m^3$/h | 0.75 $m^3$ | 100 $m^3$/h |
| 1000 | 40" | 850…28000 $m^3$/h | 7000 $m^3$/h | 1.00 $m^3$ | 125 $m^3$/h |
| – | 42" | 950…30000 $m^3$/h | 8000 $m^3$/h | 1.00 $m^3$ | 125 $m^3$/h |
| 1200 | 48" | 1250…40000 $m^3$/h | 10000 $m^3$/h | 1.50 $m^3$ | 150 $m^3$/h |
| – | 54" | 1550…50000 $m^3$/h | 13000 $m^3$/h | 1.50 $m^3$ | 200 $m^3$/h |
| 1400 | – | 1700…55000 $m^3$/h | 14000 $m^3$/h | 2.00 $m^3$ | 225 $m^3$/h |
| – | 60" | 1950…60000 $m^3$/h | 16000 $m^3$/h | 2.00 $m^3$ | 250 $m^3$/h |
| 1600 | – | 2200…70000 $m^3$/h | 18000 $m^3$/h | 2.50 $m^3$ | 300 $m^3$/h |
| – | 66" | 2500…80000 $m^3$/h | 20500 $m^3$/h | 2.50 $m^3$ | 325 $m^3$/h |
| 1800 | 72" | 2800…90000 $m^3$/h | 23000 $m^3$/h | 3.00 $m^3$ | 350 $m^3$/h |
| – | 78" | 3300…100000 $m^3$/h | 28500 $m^3$/h | 3.50 $m^3$ | 450 $m^3$/h |
| 2000 | – | 3400…110000 $m^3$/h | 28500 $m^3$/h | 3.50 $m^3$ | 450 $m^3$/h |

**Flow rate characteristic values – Promag W (US units)**

| Nominal diameter | | Recommended flow rate | Factory setting | | |
|---|---|---|---|---|---|
| [inch] | [mm] | min./max. full scale value (v ~ 0.3 or 10 m/s) | Full scale value (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cutoff (v ~ 0.04 m/s) |
| 1" | 25 | 2.5…80 gal/min | 18 gal/min | 0.20 gal | 0.25 gal/min |
| 1 1/4" | 32 | 4…130 gal/min | 30 gal/min | 0.20 gal | 0.50 gal/min |
| 1 1/2" | 40 | 7…190 gal/min | 50 gal/min | 0.50 gal | 0.75 gal/min |
| 2" | 50 | 10…300 gal/min | 75 gal/min | 0.50 gal | 1.25 gal/min |
| 2 1/2" | 65 | 16…500 gal/min | 130 gal/min | 1 gal | 2.0 gal/min |
| 3" | 80 | 24…800 gal/min | 200 gal/min | 2 gal | 2.5 gal/min |
| 4" | 100 | 40…1250 gal/min | 300 gal/min | 2 gal | 4.0 gal/min |
| 5" | 125 | 60…1950 gal/min | 450 gal/min | 5 gal | 7.0 gal/min |
| 6" | 150 | 90…2650 gal/min | 600 gal/min | 5 gal | 12 gal/min |
| 8" | 200 | 155…4850 gal/min | 1200 gal/min | 10 gal | 15 gal/min |
| 10" | 250 | 250…7500 gal/min | 1500 gal/min | 15 gal | 30 gal/min |
| 12" | 300 | 350…10600 gal/min | 2400 gal/min | 25 gal | 45 gal/min |
| 14" | 350 | 500…15000 gal/min | 3600 gal/min | 30 gal | 60 gal/min |
| 16" | 400 | 600…19000 gal/min | 4800 gal/min | 50 gal | 60 gal/min |
| 18" | 450 | 800…24000 gal/min | 6000 gal/min | 50 gal | 90 gal/min |
| 20" | 500 | 1000…30000 gal/min | 7500 gal/min | 75 gal | 120 gal/min |
| 24" | 600 | 1400…44000 gal/min | 10500 gal/min | 100 gal | 180 gal/min |
| 28" | 700 | 1900…60000 gal/min | 13500 gal/min | 125 gal | 210 gal/min |
| 30" | – | 2150…67000 gal/min | 16500 gal/min | 150 gal | 270 gal/min |
| 32" | 800 | 2450…80000 gal/min | 19500 gal/min | 200 gal | 300 gal/min |
| 36" | 900 | 3100…100000 gal/min | 24000 gal/min | 225 gal | 360 gal/min |
| 40" | 1000 | 3800…125000 gal/min | 30000 gal/min | 250 gal | 480 gal/min |
| 42" | – | 4200…135000 gal/min | 33000 gal/min | 250 gal | 600 gal/min |
| 48" | 1200 | 5500…175000 gal/min | 42000 gal/min | 400 gal | 600 gal/min |
| 54" | – | 9…300 Mgal/d | 75 Mgal/d | 0.0005 Mgal | 1.3 Mgal/d |
| – | 1400 | 10…340 Mgal/d | 85 Mgal/d | 0.0005 Mgal | 1.3 Mgal/d |
| 60" | – | 12…380 Mgal/d | 95 Mgal/d | 0.0005 Mgal | 1.3 Mgal/d |
| – | 1600 | 13…450 Mgal/d | 110 Mgal/d | 0.00075 Mgal | 1.7 Mgal/d |
| 66" | – | 14…500 Mgal/d | 120 Mgal/d | 0.00075 Mgal | 2.2 Mgal/d |
| 72" | 1800 | 16…570 Mgal/d | 140 Mgal/d | 0.00075 Mgal | 2.6 Mgal/d |
| 78" | – | 18…650 Mgal/d | 175 Mgal/d | 0.001 Mgal | 3.0 Mgal/d |
| – | 2000 | 20…700 Mgal/d | 175 Mgal/d | 0.001 Mgal | 3.0 Mgal/d |

## Promag P

**Flow rate characteristic values – Promag P (SI units)**

| Nominal diameter | | Recommended flow rate | Factory setting | | |
|---|---|---|---|---|---|
| [mm] | [inch] | min./max. full scale value (v ~ 0.3 or 10 m/s) | Full scale value (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cutoff (v ~ 0.04 m/s) |
| 15 | 1/2" | 4…100 $dm^3$/min | 25 $dm^3$/min | 0.20 $dm^3$ | 0.5 $dm^3$/min |
| 25 | 1" | 9…300 $dm^3$/min | 75 $dm^3$/min | 0.50 $dm^3$ | 1 $dm^3$/min |
| 32 | 1 1/4" | 15…500 $dm^3$/min | 125 $dm^3$/min | 1.00 $dm^3$ | 2 $dm^3$/min |
| 40 | 1 1/2" | 25…700 $dm^3$/min | 200 $dm^3$/min | 1.50 $dm^3$ | 3 $dm^3$/min |
| 50 | 2" | 35…1100 $dm^3$/min | 300 $dm^3$/min | 2.50 $dm^3$ | 5 $dm^3$/min |
| 65 | 2 1/2" | 60…2000 $dm^3$/min | 500 $dm^3$/min | 5.00 $dm^3$ | 8 $dm^3$/min |
| 80 | 3" | 90…3000 $dm^3$/min | 750 $dm^3$/min | 5.00 $dm^3$ | 12 $dm^3$/min |
| 100 | 4" | 145…4700 $dm^3$/min | 1200 $dm^3$/min | 10.00 $dm^3$ | 20 $dm^3$/min |
| 125 | 5" | 220…7500 $dm^3$/min | 1850 $dm^3$/min | 15.00 $dm^3$ | 30 $dm^3$/min |
| 150 | 6" | 20…600 $m^3$/h | 150 $m^3$/h | 0.025 $m^3$ | 2.5 $m^3$/h |
| 200 | 8" | 35…1100 $m^3$/h | 300 $m^3$/h | 0.05 $m^3$ | 5.0 $m^3$/h |
| 250 | 10" | 55…1700 $m^3$/h | 500 $m^3$/h | 0.05 $m^3$ | 7.5 $m^3$/h |
| 300 | 12" | 80…2400 $m^3$/h | 750 $m^3$/h | 0.10 $m^3$ | 10 $m^3$/h |
| 350 | 14" | 110…3300 $m^3$/h | 1000 $m^3$/h | 0.10 $m^3$ | 15 $m^3$/h |
| 400 | 16" | 140…4200 $m^3$/h | 1200 $m^3$/h | 0.15 $m^3$ | 20 $m^3$/h |
| 450 | 18" | 180…5400 $m^3$/h | 1500 $m^3$/h | 0.25 $m^3$ | 25 $m^3$/h |
| 500 | 20" | 220…6600 $m^3$/h | 2000 $m^3$/h | 0.25 $m^3$ | 30 $m^3$/h |
| 600 | 24" | 310…9600 $m^3$/h | 2500 $m^3$/h | 0.30 $m^3$ | 40 $m^3$/h |

**Flow rate characteristic values – Promag P (US units)**

| Nominal diameter | | Recommended flow rate | Factory setting | | |
|---|---|---|---|---|---|
| [inch] | [mm] | min./max. full scale value (v ~ 0.3 or ~ 10 m/s) | Full scale value (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cutoff (v ~ 0.04 m/s) |
| 1/2" | 15 | 1.0…27 gal/min | 6 gal/min | 0.05 gal | 0.10 gal/min |
| 1" | 25 | 2.5…80 gal/min | 18 gal/min | 0.20 gal | 0.25 gal/min |
| 1 1/4" | 32 | 4…130 gal/min | 30 gal/min | 0.20 gal | 0.50 gal/min |
| 1 1/2" | 40 | 7…190 gal/min | 50 gal/min | 0.50 gal | 0.75 gal/min |
| 2" | 50 | 10…300 gal/min | 75 gal/min | 0.50 gal | 1.25 gal/min |
| 2 1/2" | 65 | 16…500 gal/min | 130 gal/min | 1 gal | 2.0 gal/min |
| 3" | 80 | 24…800 gal/min | 200 gal/min | 2 gal | 2.5 gal/min |
| 4" | 100 | 40…1250 gal/min | 300 gal/min | 2 gal | 4.0 gal/min |
| 5" | 125 | 60…1950 gal/min | 450 gal/min | 5 gal | 7.0 gal/min |
| 6" | 150 | 90…2650 gal/min | 600 gal/min | 5 gal | 12 gal/min |
| 8" | 200 | 155…4850 gal/min | 1200 gal/min | 10 gal | 15 gal/min |
| 10" | 250 | 250…7500 gal/min | 1500 gal/min | 15 gal | 30 gal/min |
| 12" | 300 | 350…10600 gal/min | 2400 gal/min | 25 gal | 45 gal/min |
| 14" | 350 | 500…15000 gal/min | 3600 gal/min | 30 gal | 60 gal/min |
| 16" | 400 | 600…19000 gal/min | 4800 gal/min | 50 gal | 60 gal/min |
| 18" | 450 | 800…24000 gal/min | 6000 gal/min | 50 gal | 90 gal/min |
| 20" | 500 | 1000…30000 gal/min | 7500 gal/min | 75 gal | 120 gal/min |
| 24" | 600 | 1400…44000 gal/min | 10500 gal/min | 100 gal | 180 gal/min |

## Promag H

**Flow rate characteristic values – Promag H (SI units)**

| Nominal diameter | | Recommended flow rate | Factory settings | | |
|---|---|---|---|---|---|
| [mm] | inch] | min./max. full scale value (v ~ 0.3 or 10 m/s) | Full scale value (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cutoff (v ~ 0.04 m/s) |
| 2 | 1/12" | 0.06…1.8 $dm^3$/min | 0.5 $dm^3$/min | 0.005 $dm^3$ | 0.01 $dm^3$/min |
| 4 | 5/32" | 0.25…7 $dm^3$/min | 2 $dm^3$/min | 0.025 $dm^3$ | 0.05 $dm^3$/min |
| 8 | 5/16" | 1…30 $dm^3$/min | 8 $dm^3$/min | 0.10 $dm^3$ | 0.1 $dm^3$/min |
| 15 | 1/2" | 4…100 $dm^3$/min | 25 $dm^3$/min | 0.20 $dm^3$ | 0.5 $dm^3$/min |
| 25 | 1" | 9…300 $dm^3$/min | 75 $dm^3$/min | 0.50 $dm^3$ | 1 $dm^3$/min |
| 40 | 1 1/2" | 25…700 $dm^3$/min | 200 $dm^3$/min | 1.50 $dm^3$ | 3 $dm^3$/min |
| 50 | 2" | 35…1100 $dm^3$/min | 300 $dm^3$/min | 2.50 $dm^3$ | 5 $dm^3$/min |
| 65 | 2 1/2" | 60…2000 $dm^3$/min | 500 $dm^3$/min | 5.00 $dm^3$ | 8 $dm^3$/min |
| 80 | 3" | 90…3000 $dm^3$/min | 750 $dm^3$/min | 5.00 $dm^3$ | 12 $dm^3$/min |
| 100 | 4" | 145…4700 $dm^3$/min | 1200 $dm^3$/min | 10.00 $dm^3$ | 20 $dm^3$/min |

**Flow rate characteristic values – Promag H (US units)**

| Nominal diameter | | Recommended flow rate | Factory settings | | |
|---|---|---|---|---|---|
| [inch] | [mm] | min./max. full scale value (v ~ 0.3 or 10 m/s) | Full scale value (v ~ 2.5 m/s) | Pulse value (~ 2 Pulse/s) | Low flow cutoff (v ~ 0.04 m/s) |
| 1/12" | 2 | 0.015…0.5 gal/min | 0.1 gal/min | 0.001 gal | 0.002 gal/min |
| 5/32" | 4 | 0.07…2 gal/min | 0.5 gal/min | 0.005 gal | 0.008 gal/min |
| 5/16" | 8 | 0.25…8 gal/min | 2 gal/min | 0.02 gal | 0.025 gal/min |
| 1/2" | 15 | 1.0…27 gal/min | 6 gal/min | 0.05 gal | 0.10 gal/min |
| 1" | 22 | 2.5…65 gal/min | 18 gal/min | 0.20 gal | 0.25 gal/min |
| 1 1/2" | 40 | 7…190 gal/min | 50 gal/min | 0.50 gal | 0.75 gal/min |
| 2" | 50 | 10…300 gal/min | 75 gal/min | 0.50 gal | 1.25 gal/min |
| 2 1/2" | 65 | 16…500 gal/min | 130 gal/min | 1 gal | 2.0 gal/min |
| 3" | 80 | 24…800 gal/min | 200 gal/min | 2 gal | 2.5 gal/min |
| 4" | 100 | 40…1250 gal/min | 300 gal/min | 2 gal | 4.0 gal/min |

## 3.2.8 Length of connecting cable

In order to ensure measuring accuracy, comply with the following instructions when installing the remote version:
- Secure the cable run or route the cable in a conduit. Movement of the cable can falsify the measuring signal, particularly if the fluid conductivity is low.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalisation between sensor and transmitter, if necessary.
- The permissible cable length Lmax depends on the fluid conductivity (Fig. 15). A minimum conductivity of 20 µS/cm is required for measuring demineralized water.

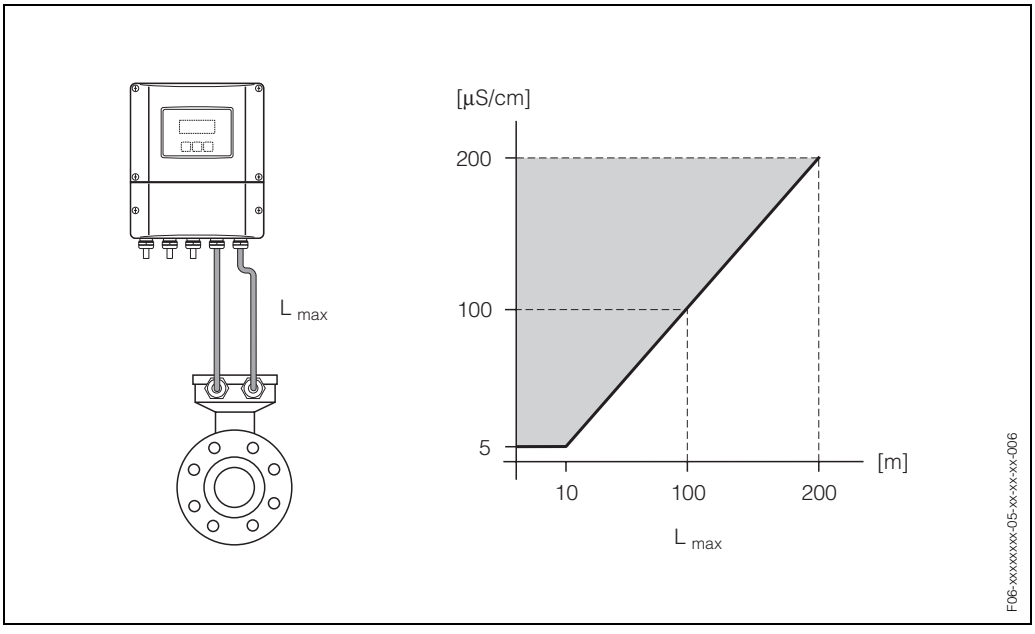



*Fig. 15: Permissible cable length for the remote version*

*Gray shaded area = permissible range*
*Lmax = length of connecting cable in [m]*
*Fluid conductivity in [µS/cm]*

# 3.3 Installation instructions

## 3.3.1 Installing the Promag W sensor

Note!
Bolts, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is designed for installation between the two piping flanges:
- Observe in any case the necessary screw tightening torques on Page 28 ff.
- The mounting of additional ground disks is described on Page 27.

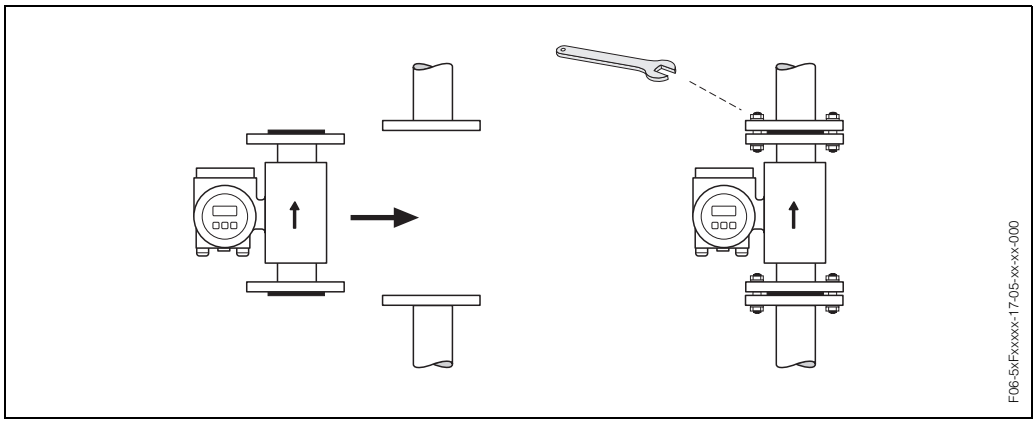



*Fig. 16: Installing the Promag W sensor*

**Seals**
Comply with the following instructions when installing seals:
- Hard rubber lining → additional seals are ***always*** necessary.
- Polyurethane lining → additional seals are recommended.
- For DIN flanges, use only seals according to DIN 2690.
- Make sure that the seals do not protrude into the piping cross-section.

Caution!
Risk of short circuit. Do not use electrically conductive sealing compound such as graphite. An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

**Ground cable (DN 25…2000)**
If necessary, the special ground cable for potential equalisation can be ordered as an accessory (see Page 85). Detailled assembly instructions → Page 57 ff.

**Assembly with ground disks (DN 25…300)**
Depending on the application, e.g. with lined or ungrounded pipes (see Page 56 ff.), it may be necessary to mount ground disks between the sensor and the pipe flange for potential equalisation. Ground disks can be ordered separately as an accessory from E+H (see Page 85).

Caution!
- In this case, when using ground disks (including seals) the total fitting length increases! Dimensions → Page 132.
- Hard rubber lining → install additional seals between the sensor and ground disk and between the ground disk and pipe flange.
- Polyurethane lining → only install additional seals between the ground disk and pipe flange.

1. Place the ground disk and additional seal(s) between the instrument and the pipe flange (Fig. 17).
2. Insert the bolts through the flange holes. Tighten the nuts so that they are still loose.
3. Now rotate the ground disk as shown in Fig. 17 until the handle strikes the bolts. This will center the ground disk automatically.
4. Now tighten the bolts to the required torque (see Page 28 ff.)
5. Connect the ground disk to ground → Page 58.

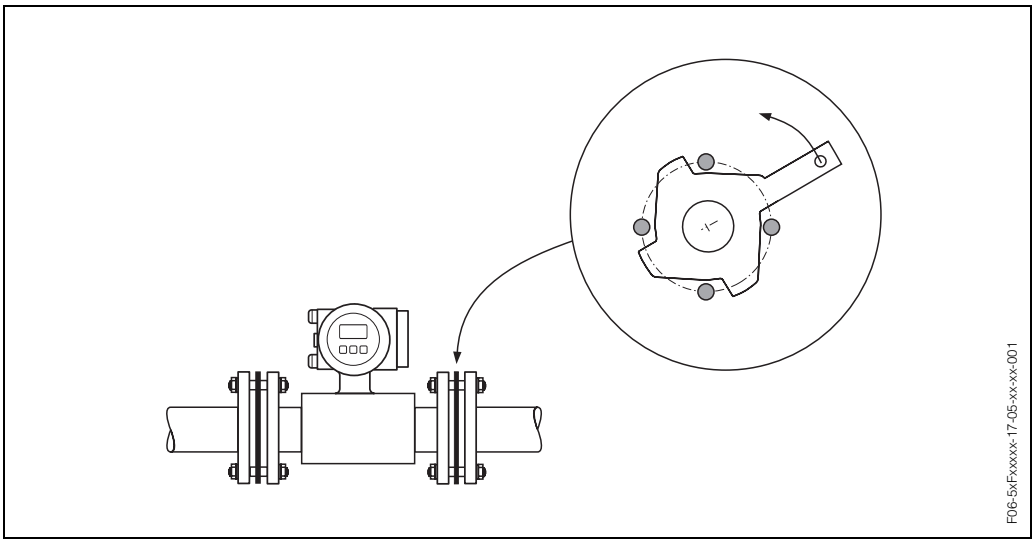



*Fig. 17: Assembly with ground disks (Promag W, DN 25…300)*

**Screw tightening torques (Promag W)**
Note the following points:
- The tightening torques listed below are for lubricated threads only.
- Always tighten threaded fasteners uniformly and in diagonally opposite sequence.
- Overtightening the fasteners will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

| Promag W Nominal diameter | EN (DIN) Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | | Hard rubber | Polyurethane |
| 25 | PN 40 | 4 x M 12 | – | 15 |
| 32 | PN 40 | 4 x M 16 | – | 24 |
| 40 | PN 40 | 4 x M 16 | – | 31 |
| 50 | PN 40 | 4 x M 16 | – | 40 |
| 65 * | PN 16 | 8 x M 16 | 32 | 27 |
| 65 | PN 40 | 8 x M 16 | 32 | 27 |
| 80 | PN 16 | 8 x M 16 | 40 | 34 |
| 80 | PN 40 | 8 x M 16 | 40 | 34 |
| 100 | PN 16 | 8 x M 16 | 43 | 36 |
| 100 | PN 40 | 8 x M 20 | 59 | 50 |
| 125 | PN 16 | 8 x M 16 | 56 | 48 |
| 125 | PN 40 | 8 x M 24 | 83 | 71 |
| 150 | PN 16 | 8 x M 20 | 74 | 63 |
| 150 | PN 40 | 8 x M 24 | 104 | 88 |
| 200 | PN 10 | 8 x M 20 | 106 | 91 |
| 200 | PN 16 | 12 x M 20 | 70 | 61 |
| 200 | PN 25 | 12 x M 24 | 104 | 92 |
| 250 | PN 10 | 12 x M 20 | 82 | 71 |
| 250 | PN 16 | 12 x M 24 | 98 | 85 |
| 250 | PN 25 | 12 x M 27 | 150 | 134 |
| 300 | PN 10 | 12 x M 20 | 94 | 81 |
| 300 | PN 16 | 12 x M 24 | 134 | 118 |
| 300 | PN 25 | 16 x M 27 | 153 | 138 |
| 350 | PN 10 | 16 x M 20 | 112 | 118 |
| 350 | PN 16 | 16 x M 24 | 152 | 165 |
| 350 | PN 25 | 16 x M 30 | 227 | 252 |
| 400 | PN 10 | 16 x M 24 | 151 | 167 |
| 400 | PN 16 | 16 x M 27 | 193 | 215 |
| 400 | PN 25 | 16 x M 33 | 289 | 326 |
| 450 | PN 10 | 20 x M 24 | 153 | 133 |
| 450 | PN 16 | 20 x M 27 | 198 | 196 |
| 450 | PN 25 | 20 x M 33 | 256 | 253 |
| 500 | PN 10 | 20 x M 24 | 155 | 171 |

| Promag W Nominal diameter | EN (DIN) Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | | Hard rubber | Polyurethane |
| 500 | PN 16 | 20 x M 30 | 275 | 300 |
| 500 | PN 25 | 20 x M 33 | 317 | 360 |
| 600 | PN 10 | 20 x M 27 | 206 | 219 |
| 600 * | PN 16 | 20 x M 33 | 415 | 443 |
| 600 | PN 25 | 20 x M 36 | 431 | 516 |
| 700 | PN 10 | 24 x M 27 | 246 | 246 |
| 700 | PN 16 | 24 x M 33 | 278 | 318 |
| 700 | PN 25 | 24 x M 39 | 449 | 507 |
| 800 | PN 10 | 24 x M 30 | 331 | 316 |
| 800 | PN 16 | 24 x M 36 | 369 | 385 |
| 800 | PN 25 | 24 x M 45 | 664 | 721 |
| 900 | PN 10 | 28 x M 30 | 316 | 307 |
| 900 | PN 16 | 28 x M 36 | 353 | 398 |
| 900 | PN 25 | 28 x M 45 | 690 | 716 |
| 1000 | PN 10 | 28 x M 33 | 402 | 405 |
| 1000 | PN 16 | 28 x M 39 | 502 | 518 |
| 1000 | PN 25 | 28 x M 52 | 970 | 971 |
| 1200 | PN 6 | 32 x M 30 | 319 | 299 |
| 1200 | PN 10 | 32 x M 36 | 564 | 568 |
| 1200 | PN 16 | 32 x M 45 | 701 | 753 |
| 1400 | PN 6 | 36 x M 33 | 430 | 398 |
| 1400 | PN 10 | 36 x M 39 | 654 | 618 |
| 1400 | PN 16 | 36 x M 45 | 729 | 762 |
| 1600 | PN 6 | 40 x M 33 | 440 | 417 |
| 1600 | PN 10 | 40 x M 45 | 946 | 893 |
| 1600 | PN 16 | 40 x M 52 | 1007 | 1100 |
| 1800 | PN 6 | 44 x M 36 | 547 | 521 |
| 1800 | PN 10 | 44 x M 45 | 961 | 895 |
| 1800 | PN 16 | 44 x M 52 | 1108 | 1003 |
| 2000 | PN 6 | 48 x M 39 | 629 | 605 |
| 2000 | PN 10 | 48 x M 45 | 1047 | 1092 |
| 2000 | PN 16 | 48 x M 56 | 1324 | 1261 |
| * Designed acc. to EN 1092-1 (not to DIN 2501) | | | | |

| Promag W Nominal diameter | | AWWA Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|---|
| [mm] | [inch] | | | Hard rubber | Polyurethane |
| 700 | 28" | Class D | 28 x 1 1/4" | 247 | 292 |
| 750 | 30" | Class D | 28 x 1 1/4 | 287 | 302 |
| 800 | 32" | Class D | 28 x 1 1/2" | 394 | 422 |
| 900 | 36" | Class D | 32 x 1 1/2" | 419 | 430 |
| 1000 | 40" | Class D | 36 x 1 1/2" | 420 | 477 |
| 1050 | 42" | Class D | 36 x 1 1/2" | 528 | 518 |
| 1200 | 48" | Class D | 44 x 1 1/2" | 552 | 531 |
| 1350 | 54" | Class D | 44 x 1 3/4" | 730 | 633 |
| 1500 | 60" | Class D | 52 x 1 3/4" | 758 | 832 |
| 1650 | 66" | Class D | 52 x 1 3/4" | 946 | 955 |
| 1800 | 72" | Class D | 60 x 1 3/4" | 975 | 1087 |
| 2000 | 78" | Class D | 64 x 2" | 853 | 786 |

| Promag W Nominal diameter | | ANSI Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|---|
| [mm] | [inch] | [lbs] | | Hard rubber | Polyurethane |
| 25 | 1" | Class 150 | 4 x 1/2" | – | 7 |
| 25 | 1" | Class 300 | 4 x 5/8" | – | 8 |
| 40 | 1 1/2" | Class 150 | 4 x 1/2" | – | 10 |
| 40 | 1 1/2" | Class 300 | 4 x 3/4" | – | 15 |
| 50 | 2" | Class 150 | 4 x 5/8" | – | 22 |
| 50 | 2" | Class 300 | 8 x 5/8" | – | 11 |
| 80 | 3" | Class 150 | 4 x 5/8" | 60 | 43 |
| 80 | 3" | Class 300 | 8 x 3/4" | 38 | 26 |
| 100 | 4" | Class 150 | 8 x 5/8" | 42 | 31 |
| 100 | 4" | Class 300 | 8 x 3/4" | 58 | 40 |
| 150 | 6" | Class 150 | 8 x 3/4" | 79 | 59 |
| 150 | 6" | Class 300 | 12 x 3/4" | 70 | 51 |
| 200 | 8" | Class 150 | 8 x 3/4" | 107 | 80 |
| 250 | 10" | Class 150 | 12 x 7/8" | 101 | 75 |
| 300 | 12" | Class 150 | 12 x 7/8" | 133 | 103 |
| 350 | 14" | Class 150 | 12 x 1" | 135 | 158 |
| 400 | 16" | Class 150 | 16 x 1" | 128 | 150 |
| 450 | 18" | Class 150 | 16 x 1 1/8" | 204 | 234 |
| 500 | 20" | Class 150 | 20 x 1 1/8" | 183 | 217 |
| 600 | 24" | Class 150 | 20 x 1 1/4" | 268 | 307 |

| Promag W Nominal diameter [mm] | JIS Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|
| | | | Hard rubber | Polyurethane |
| 25 | 10K | 4 x M 16 | – | 19 |
| 25 | 20K | 4 x M 16 | – | 19 |
| 32 | 10K | 4 x M 16 | – | 22 |
| 32 | 20K | 4 x M 16 | – | 22 |
| 40 | 10K | 4 x M 16 | – | 24 |
| 40 | 20K | 4 x M 16 | – | 24 |
| 50 | 10K | 4 x M 16 | – | 33 |
| 50 | 20K | 8 x M 16 | – | 17 |
| 65 | 10K | 4 x M 16 | 55 | 45 |
| 65 | 20K | 8 x M 16 | 28 | 23 |
| 80 | 10K | 8 x M 16 | 29 | 23 |
| 80 | 20K | 8 x M 20 | 42 | 35 |
| 100 | 10K | 8 x M 16 | 35 | 29 |
| 100 | 20K | 8 x M 20 | 56 | 48 |
| 125 | 10K | 8 x M 20 | 60 | 51 |
| 125 | 20K | 8 x M 22 | 91 | 79 |
| 150 | 10K | 8 x M 20 | 75 | 63 |
| 150 | 20K | 12 x M 22 | 81 | 72 |
| 200 | 10K | 12 x M 20 | 61 | 52 |
| 200 | 20K | 12 x M 22 | 91 | 80 |
| 250 | 10K | 12 x M 22 | 100 | 87 |
| 250 | 20K | 12 x M 24 | 159 | 144 |
| 300 | 10K | 16 x M 22 | 74 | 63 |
| 300 | 20K | 16 x M 24 | 138 | 124 |

### 3.3.2 Installing the Promag P sensor

Caution!
- The protective covers mounted on the two sensor flanges guard the PTFE lining, which is turned over the flanges. Consequently, do not remove these covers until *immediately before* the sensor is installed in the pipe.
- The covers must remain in place while the device is in storage.
- Make sure that the lining is not damaged or removed from the flanges.

Note!
Bolts, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is designed for installation between the two piping flanges.
- Observe in any case the necessary screw tightening torques on Page 35 ff.
- The mounting of additional ground disks is described on Page 33.

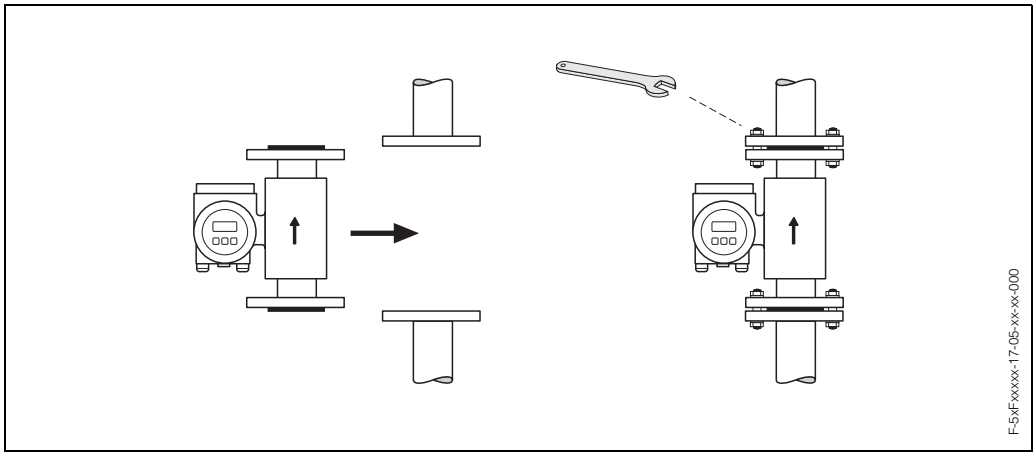



*Fig. 18: Installing the Promag P sensor*

**Seals**
Comply with the following instructions when installing seals:
- Measuring tube linings with PFA or PTFE → **No** seals are required.
- In case you use seals with DIN flanges, use only seals according to DIN 2690.
- Make sure that the seals do not protrude into the piping cross-section.

Caution!
Risk of short circuit. Do not use electrically conductive sealing compound such as graphite. An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

**Ground cable (DN 15…600)**
If necessary, a special ground cable for potential equalisation can be ordered as an accessory (see Page 85). Detailled assembly instructions → Page 57 ff.

**Assembly with ground disks (DN 15…300)**
Depending on the application, e.g. with lined or ungrounded pipes (see Page 56 ff.), it may be necessary to mount ground disks between the sensor and the pipe flange for the potential equalisation. Ground disks can be ordered separately as an accessory from E+H (see Page 85).

Caution!
- In this case, when using ground disks (including seals) the total fitting length increases! Dimensions → Page 132.
- PTFE and PFA lining → only install additional seals between the ground disk and pipe flange.

1. Place the ground disk and the additional seal between the instrument and the pipe flange (Fig. 19).
2. Insert the bolts through the flange holes. Tighten the nuts so that they are still loose.
3. Now rotate the ground disk as shown in Fig. 19 until the handle strikes the bolts. This will center the ground disk automatically.
4. Now tighten the bolts to the required torque (see Page 35 ff.)
5. Connect the ground disk to ground → Page 58.

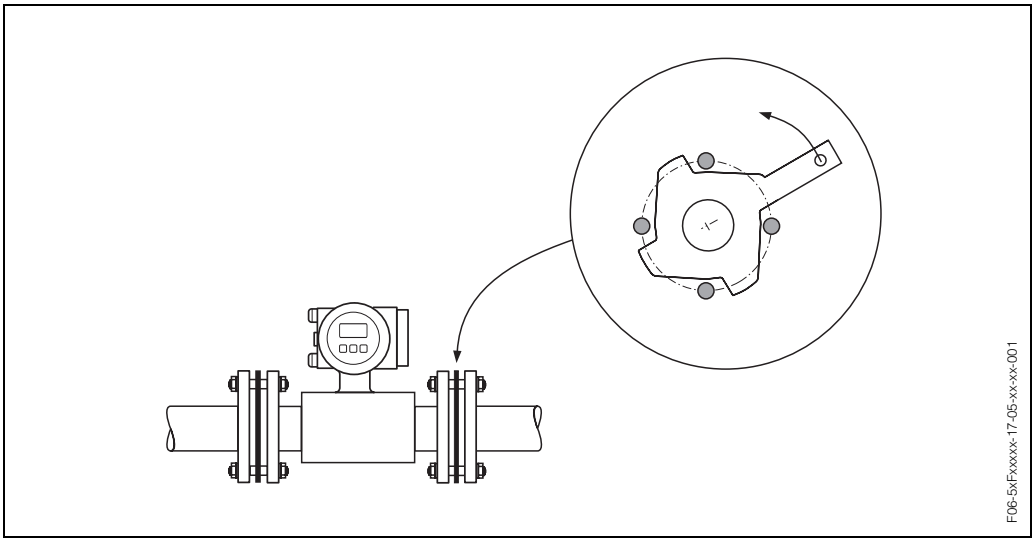



*Fig. 19: Assembly with ground disks (Promag P, DN 15…300)*

**Installing the high-temperature version (with PFA lining)**
The high-temperature version has a housing support for the thermal separation of sensor and transmitter. The high-temperature version is always used for applications in which high ambient temperatures are encountered *in conjunction with* high fluid temperatures. The high-temperature version is obligatory if the fluid temperature exceeds +150 °C.

Note!
You will find information on permissible temperature ranges on → Page 111

*Insulation*
Pipes generally have to be insulated if they carry very hot fluids, in order to avoid energy losses and to prevent accidental contact with pipes at temperatures that could cause injury. Guidelines regulating the insulation of pipes have to be taken into account.

Caution!
Risk of measuring electronics overheating. The housing support dissipates heat and its entire surface area must remain uncovered. Make sure that the sensor insulation does not extend past the top of the two sensor shells (Fig. 20).

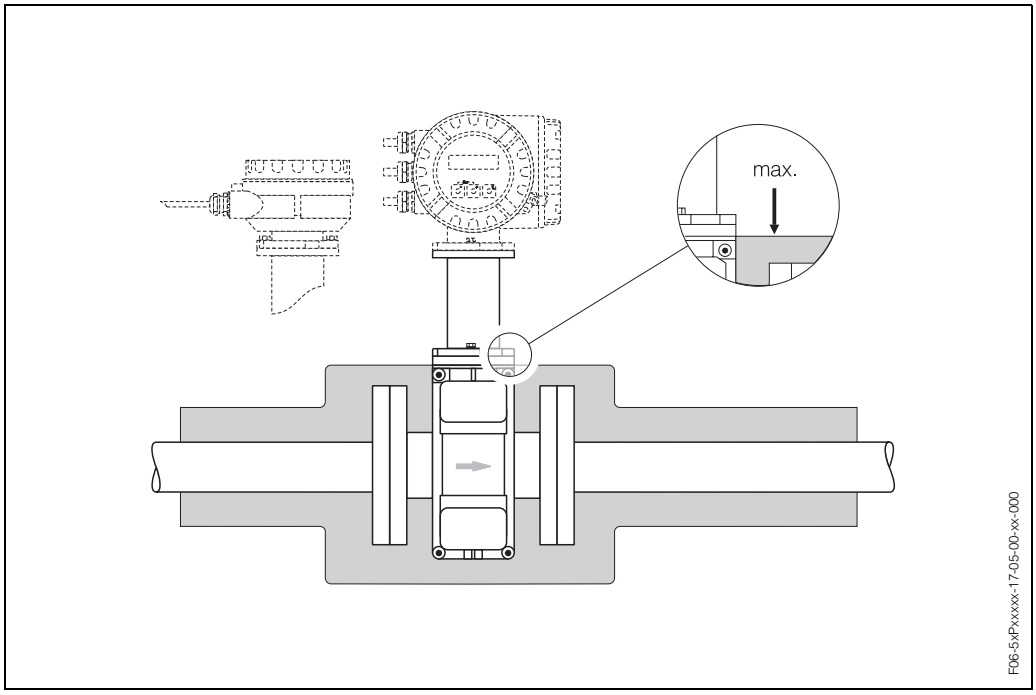



*Fig. 20: Promag P (high-temperature version): Insulating the pipe*

**Tightening torques for threaded fasteners (Promag P)**
Note the following points:
- The tightening torques listed below are for lubricated threads only.
- Always tighten threaded fasteners uniformly and in diagonally opposite sequence.
- Overtightening the fasteners will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

| Promag P Nominal diameter | EN (DIN) Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | | PTFE | PFA |
| 15 | PN 40 | 4 x M 12 | 11 | – |
| 25 | PN 40 | 4 x M 12 | 26 | 20 |
| 32 | PN 40 | 4 x M 16 | 41 | 35 |
| 40 | PN 40 | 4 x M 16 | 52 | 47 |
| 50 | PN 40 | 4 x M 16 | 65 | 59 |
| 65 * | PN 16 | 8 x M 16 | 43 | 40 |
| 65 | PN 40 | 8 x M 16 | 43 | 40 |
| 80 | PN 16 | 8 x M 16 | 53 | 48 |
| 80 | PN 40 | 8 x M 16 | 53 | 48 |
| 100 | PN 16 | 8 x M 16 | 57 | 51 |
| 100 | PN 40 | 8 x M 20 | 78 | 70 |
| 125 | PN 16 | 8 x M 16 | 75 | 67 |
| 125 | PN 40 | 8 x M 24 | 111 | 99 |
| 150 | PN 16 | 8 x M 20 | 99 | 85 |
| 150 | PN 40 | 8 x M 24 | 136 | 120 |
| 200 | PN 10 | 8 x M 20 | 141 | 101 |
| 200 | PN 16 | 12 x M 20 | 94 | 67 |
| 200 | PN 25 | 12 x M 24 | 138 | 105 |
| 250 | PN 10 | 12 x M 20 | 110 | – |
| 250 | PN 16 | 12 x M 24 | 131 | – |
| 250 | PN 25 | 12 x M 27 | 200 | – |
| 300 | PN 10 | 12 x M 20 | 125 | – |
| 300 | PN 16 | 12 x M 24 | 179 | – |
| 300 | PN 25 | 16 x M 27 | 204 | – |
| 350 | PN 10 | 16 x M 20 | 188 | – |
| 350 | PN 16 | 16 x M 24 | 254 | – |
| 350 | PN 25 | 16 x M 30 | 380 | – |
| 400 | PN 10 | 16 x M 24 | 260 | – |
| 400 | PN 16 | 16 x M 27 | 330 | – |
| 400 | PN 25 | 16 x M 33 | 488 | – |
| 450 | PN 10 | 20 x M 24 | 235 | – |
| 450 | PN 16 | 20 x M 27 | 300 | – |
| 450 | PN 25 | 20 x M 33 | 385 | – |
| 500 | PN 10 | 20 x M 24 | 265 | – |
| 500 | PN 16 | 20 x M 30 | 448 | – |

| Promag P Nominal diameter | EN (DIN) Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | | PTFE | PFA |
| 500 | PN 25 | 20 x M 33 | 533 | – |
| 600 | PN 10 | 20 x M 27 | 345 | – |
| 600 * | PN 16 | 20 x M 33 | 658 | – |
| 600 | PN 25 | 20 x M 36 | 731 | – |
| * Designed acc. to EN 1092-1 (not to DIN 2501) | | | | |

| Promag P Nominal diameter | | ANSI Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|---|
| [mm] | [inch] | [lbs] | | PTFE | PFA |
| 15 | 1/2" | Class 150 | 4 x 1/2" | 6 | – |
| 15 | 1/2" | Class 300 | 4 x 1/2" | 6 | – |
| 25 | 1" | Class 150 | 4 x 1/2" | 11 | 10 |
| 25 | 1" | Class 300 | 4 x 5/8" | 14 | 12 |
| 40 | 1 1/2" | Class 150 | 4 x 1/2" | 24 | 21 |
| 40 | 1 1/2" | Class 300 | 4 x 3/4" | 34 | 31 |
| 50 | 2" | Class 150 | 4 x 5/8" | 47 | 44 |
| 50 | 2" | Class 300 | 8 x 5/8" | 23 | 22 |
| 80 | 3" | Class 150 | 4 x 5/8" | 79 | 67 |
| 80 | 3" | Class 300 | 8 x 3/4" | 47 | 42 |
| 100 | 4" | Class 150 | 8 x 5/8" | 56 | 50 |
| 100 | 4" | Class 300 | 8 x 3/4" | 67 | 59 |
| 150 | 6" | Class 150 | 8 x 3/4" | 106 | 86 |
| 150 | 6" | Class 300 | 12 x 3/4" | 73 | 67 |
| 200 | 8" | Class 150 | 8 x 3/4" | 143 | 109 |
| 250 | 10" | Class 150 | 12 x 7/8" | 135 | – |
| 300 | 12" | Class 150 | 12 x 7/8" | 178 | – |
| 350 | 14" | Class 150 | 12 x 1" | 260 | – |
| 400 | 16" | Class 150 | 16 x 1" | 246 | – |
| 450 | 18" | Class 150 | 16 x 1 1/8" | 371 | – |
| 500 | 20" | Class 150 | 20 x 1 1/8" | 341 | – |
| 600 | 24" | Class 150 | 20 x 1 1/4" | 477 | – |

| Promag P Nominal diameter [mm] | JIS Pressure rating | Threaded fasteners | Max. tightening torque [Nm] | |
|---|---|---|---|---|
| | | | PTFE | PFA |
| 15 | 10K | 4 x M 12 | 16 | – |
| 15 | 20K | 4 x M 12 | 16 | – |
| 25 | 10K | 4 x M 16 | 32 | – |
| 25 | 20K | 4 x M 16 | 32 | – |
| 32 | 10K | 4 x M 16 | 38 | – |
| 32 | 20K | 4 x M 16 | 38 | – |
| 40 | 10K | 4 x M 16 | 41 | – |
| 40 | 20K | 4 x M 16 | 41 | – |
| 50 | 10K | 4 x M 16 | 54 | – |
| 50 | 20K | 8 x M 16 | 27 | – |
| 65 | 10K | 4 x M 16 | 74 | – |
| 65 | 20K | 8 x M 16 | 37 | – |
| 80 | 10K | 8 x M 16 | 38 | – |
| 80 | 20K | 8 x M 20 | 57 | – |
| 100 | 10K | 8 x M 16 | 47 | – |
| 100 | 20K | 8 x M 20 | 75 | – |
| 125 | 10K | 8 x M 20 | 80 | – |
| 125 | 20K | 8 x M 22 | 121 | – |
| 150 | 10K | 8 x M 20 | 99 | – |
| 150 | 20K | 12 x M 22 | 108 | – |
| 200 | 10K | 12 x M 20 | 82 | – |
| 200 | 20K | 12 x M 22 | 121 | – |
| 250 | 10K | 12 x M 22 | 133 | – |
| 250 | 20K | 12 x M 24 | 212 | – |
| 300 | 10K | 16 x M 22 | 99 | – |
| 300 | 20K | 16 x M 24 | 183 | – |

### 3.3.3 Installing the Promag H sensor

The Promag H is supplied to order, with or without pre-installed process connections. Pre-installed process connections are secured to the sensor with hex-head threaded fasteners.

Caution!
- If you intend using your own process connections, make up the process adapters as specified on Page 137 ff.
- The sensor might require support or additional attachments, depending on the application and the length of the piping run. A wall-mounting kit can be ordered separately from E+H as an accessory (see Page 85).

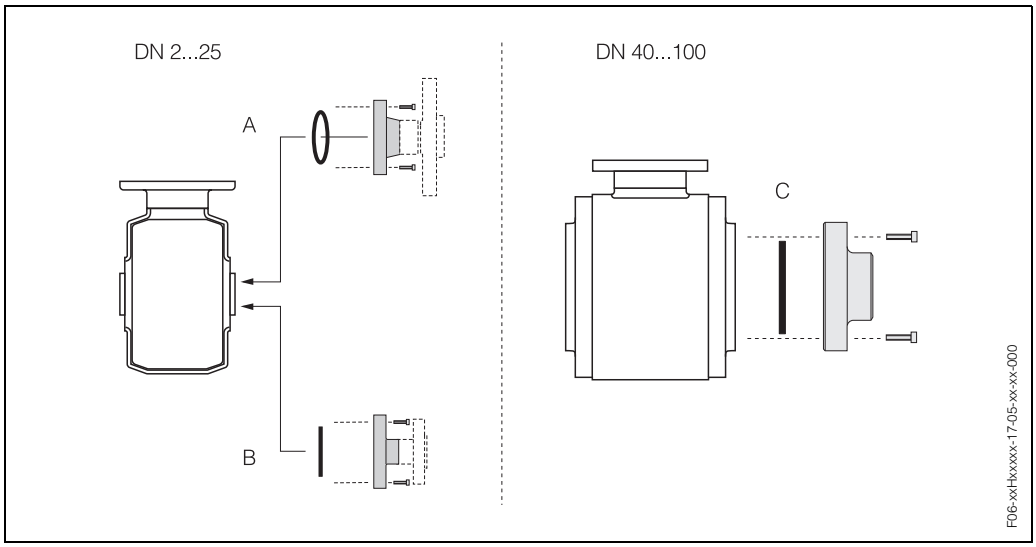



*Fig. 21: Promag H process connections (DN 2...25, DN 40...100)*

***A: DN 2…25 / process connections with O-rings:***
*Welding flanges (ISO 2463, IPS), flanges (DIN 2635, ANSI B16.5, JIS B2238), PVDF flanges (DIN 2501, ANSI B16.5, JIS B2238), external and internal pipe threads (ISO / DIN), hose connection, PVC adhesive fitting*

***B: DN 2…25 / process connections with aseptic gasket seals:***
*Weld nipples (DIN 11850, ODT), Tri-Clamp, Clamp (ISO 2852, DIN 32676), coupling (DIN 11851, DIN 11864-1, SMS 1145), flange DIN 11864-2*

***C: DN 40…100 / process connections with aseptic gasket seals:***
*Weld nipples (DIN 11850, ODT), Tri-Clamp, Clamp (ISO 2852, DIN 32676), coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145), flange DIN 11864-2*

**Seals**
When installing the process connections, make sure that the seals are clean and correctly centered.

Caution!
- With metallic process connections, you must fully tighten the screws. The process connection forms a metallic connection with the sensor, which ensures a defined compression of the seal.
- With plastic process connections, note the max. torques (for PVDF: 3.3 Nm; for PVC: 10 Nm). With plastic flanges, always use seals between connection and counter flange.
- The seals must be replaced periodically, depending on the application, particularly in the case of gasket seals (aseptic version)! The period between changes depends on the frequency of cleaning cycles, the cleaning temperature and the fluid temperature. Replacement seals can be ordered as accessories → Page 85.

**Usage and assembly of ground rings (DN 2…25)**
In case the process connections are made of plastic (e.g. flanges or adhesive fittings), the potential between the sensor and the fluid must be equalised using additional ground rings.
If the ground rings are not installed this can affect the accuracy of the measurements or cause the destruction of the sensor through the electrochemical erosion of the electrodes.

Caution!
- Depending on the option ordered, plastic disks may be installed at the process connections instead of ground rings. These plastic disks serve only as spacers and have no potential equalization function. In addition, they provide a sealing function at the interface between the sensor and process connection. For this reason, with process connections without ground rings, these plastic disks/seals must not be removed, or must always be installed.
- Ground rings can be ordered separately from E+H as accessories (see Page 85). When placing the order, make certain that the ground ring is compatible with the material used for the electrodes. Otherwise, there is a risk that the electrodes may be destroyed by electrochemical corrosion! Information about the materials can be found on Page 117.
- Ground rings, including the seals, are mounted within the process connections. Therefore, the fitting length is not affected. The dimensions of the ground rings can be found on Page 144.

1. Loosen the four hexagonal headed bolts (1) and remove the process connection from the sensor (5).
2. Remove the plastic disk (3), including the two O-ring seals (2, 4).
3. Place one seal (2) in the groove of the process connection.
4. Place the metal ground ring (3) on the process connection.
5. Now place the second seal (4) in the groove of the ground ring.
6. Finally, mount the process connection on the sensor again. With plastic process connections, note the max. torques (for PVDF: 3.3 Nm; for PVC: 10 Nm).

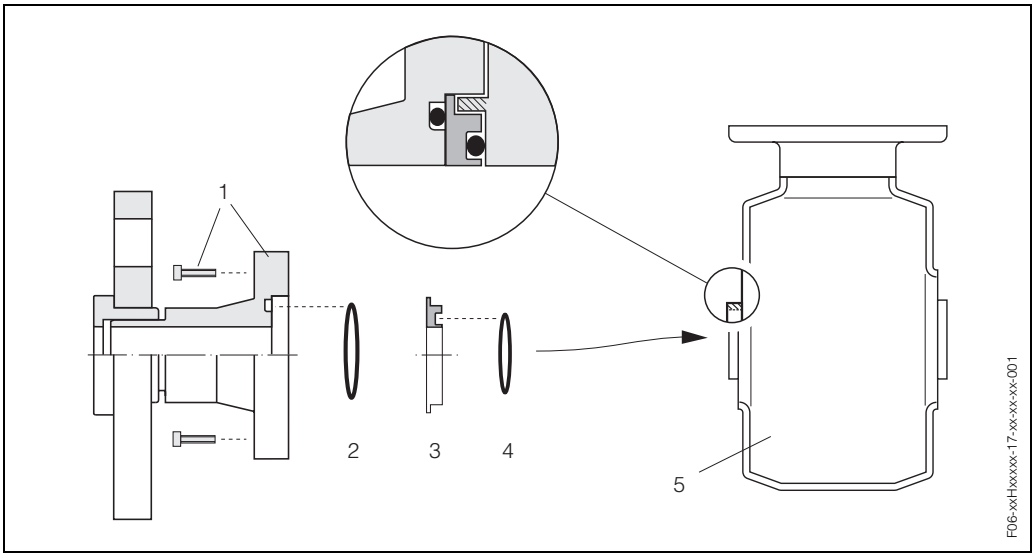



*Fig. 22: Installing ground rings with a Promag H (DN 2…25)*

*1 = Hexagonal headed bolts (process connection), 2 = O-ring seal for the process connection*
*3 = Plastic disk (placeholder) or ground ring, 4 = O-ring seal for the ground ring*
*5 = Sensor Promag H*

**Welding the sensor into the piping (weld nipples)**

Caution!
Risk of destroying the measuring electronics. Make sure that the welding machine is *not* grounded via the sensor or the transmitter.

1. Tack-weld the Promag H sensor into the pipe. A suitable welding jig can be ordered separately from E+H as an accessory (see Page 85).
2. Remove the threaded fasteners from the process-connection flange. Remove the sensor complete with seal from the pipe.
3. Weld the process connection to the pipe.
4. Reinstall the sensor in the pipe. Make sure that everything is clean and that the seal is correctly seated.

Note!
- If thin-walled foodstuffs pipes are not welded correctly, the heat could damage the installed seal. It is therefore advisable to remove the sensor and the seal prior to welding.
- The pipe has to be spread approximately 8 mm to permit disassembly.

**Cleaning with pigs**
If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube and process connection into account (see Page 133 ff.).

### 3.3.4 Turning the transmitter housing

**Turning the aluminum field 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.

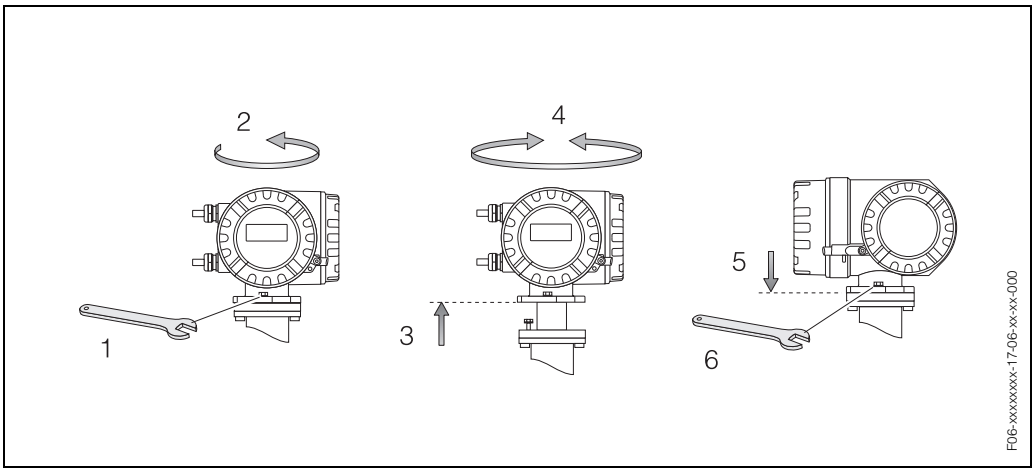



*Fig. 23: Turning the transmitter housing (aluminum field housing)*

**Turning the stainless-steel field housing**

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

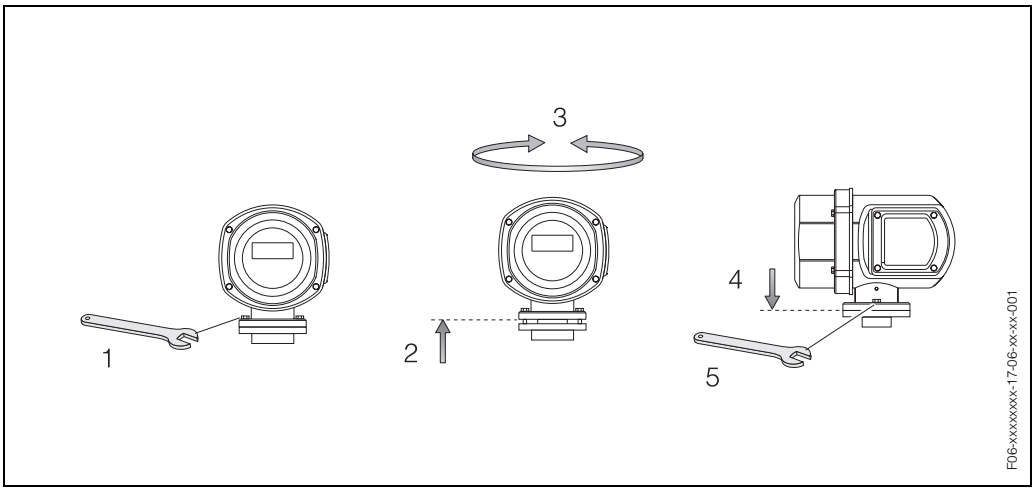



*Fig. 24: Turning the transmitter housing (stainless-steel field housing)*

### 3.3.5 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 plate.
3. Rotate the display to the desired position (max. 4 x 45° in each direction), and place it back into the electronics compartment cover plate.
4. Screw the cover of the electronics compartment firmly onto the transmitter housing.

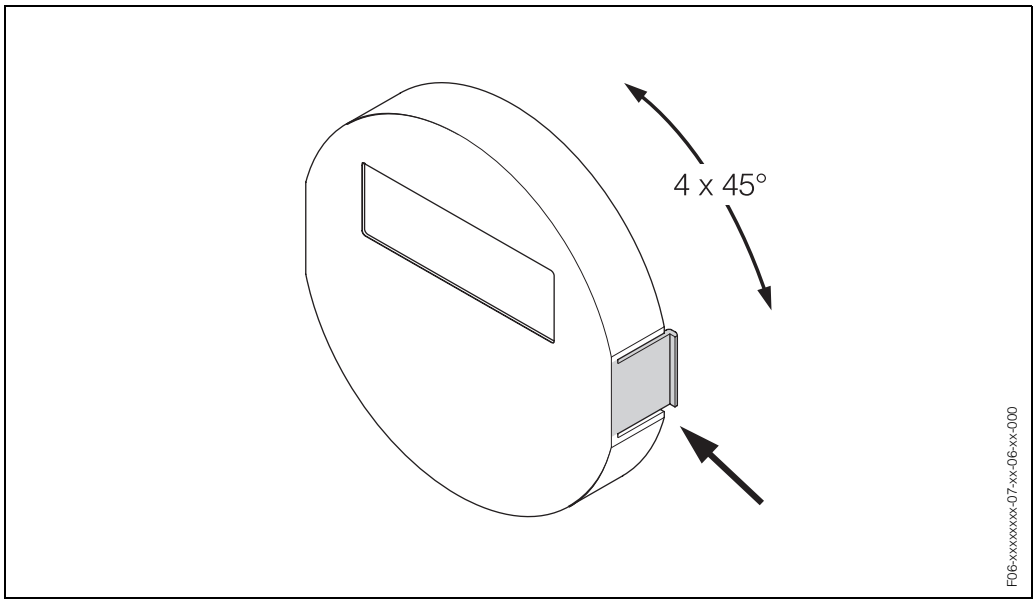



*Fig. 25: Turning the local display (field housing)*

### 3.3.6 Installing the wall-mount transmitter housing

There are various ways of installing the wall-mount transmitter housing:
- Mounted directly on the wall
- Installation in control panel (with separate mounting kit, accessories → Page 85)
- Pipe mounting (with separate mounting kit, accessories → Page 85)

Caution!
- Make sure that ambient temperature does not exceed the permissible range (–20…+60 °C). Install the device at a shady location. Avoid direct sunlight.
- Always install the wall-mount housing in such a way that the cable entries are pointing down.

**Direct wall mounting**

1. Drill the holes as illustrated in Fig. 26.
2. Remove the cover of the connection compartment (a).
3. Push the two securing screws (b) through the appropriate bores (c) in the housing.
   – Securing screws (M6): max. Ø 6.5 mm
   – Screw head: max. Ø 10.5 mm
4. Secure the transmitter housing to the wall as indicated.
5. Screw the cover of the connection compartment (a) firmly onto the housing.

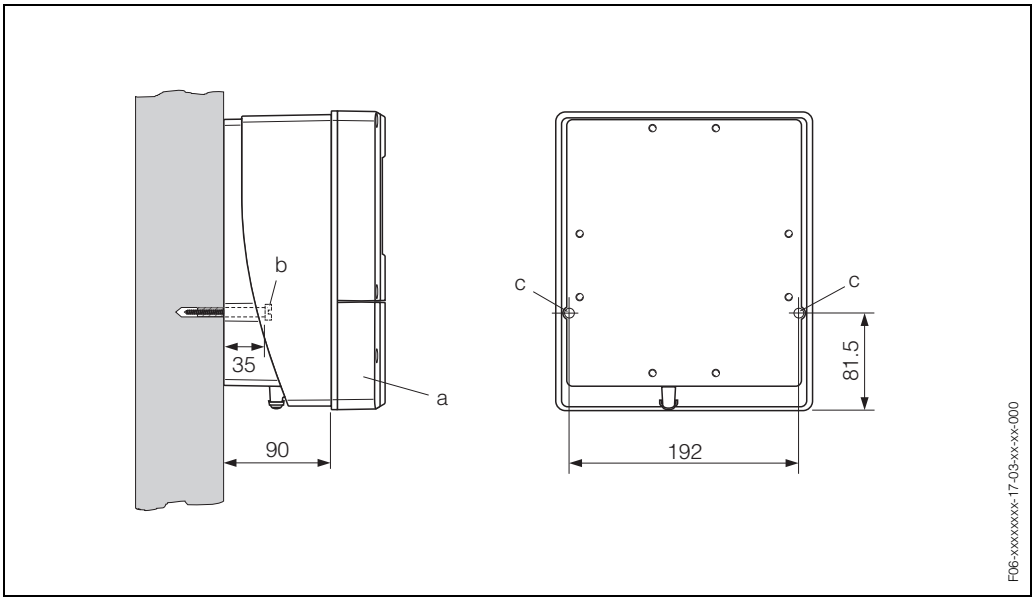



*Fig. 26: Mounted directly on the wall*

**Panel installation**

1. Prepare the opening in the panel (Fig. 27).
2. Slide the housing into the opening in the panel from the front.
3. Screw the fasteners onto the wall-mount housing.
4. Place the threaded rods in the fasteners and screw them down until the housing is seated tightly against the panel. Afterwards, tighten the locking nuts. Additional support is not necessary.

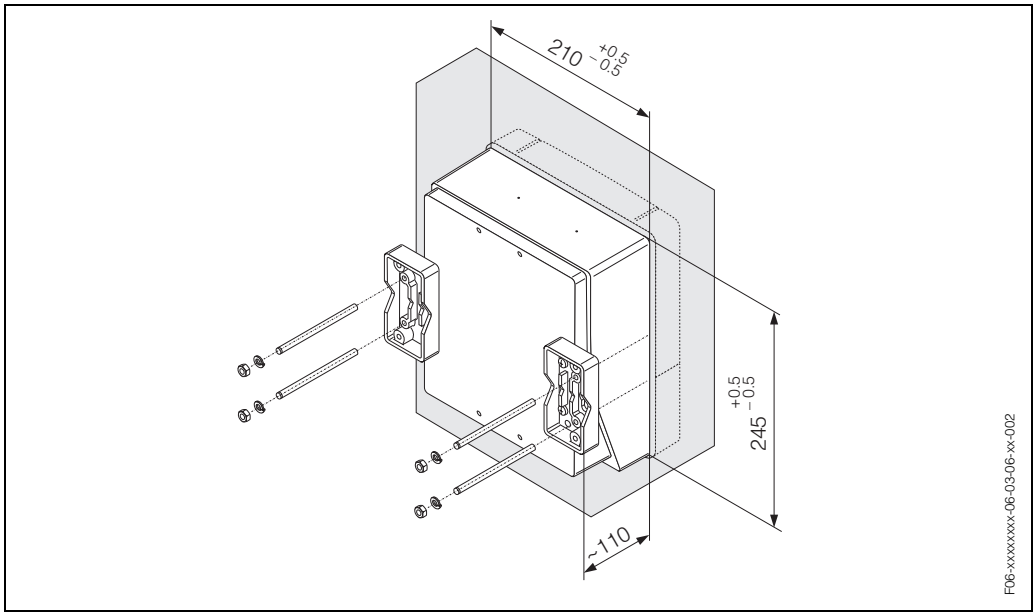



*Fig. 27: Panel Installation (wall-mount housing)*

**Pipe mounting**

The assembly should be performed by following the instructions in Fig. 28.

Caution!
If the device is mounted to a warm pipe, make certain that the housing temperature does not exceed +60 °C, which is the maximum permissible temperature.

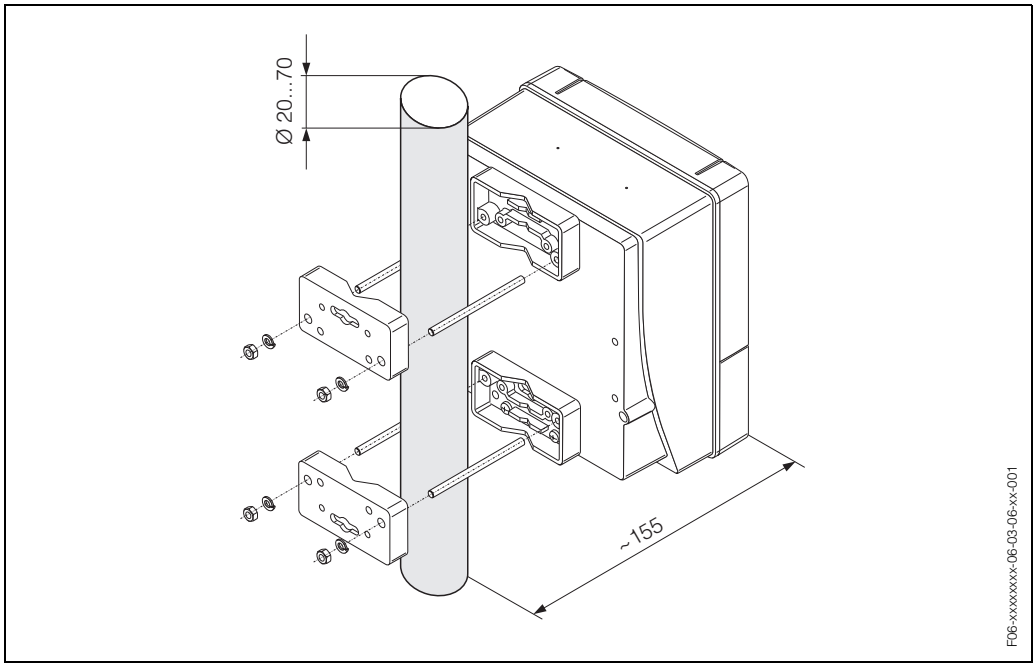



*Fig. 28: Pipe mounting (wall-mount housing)*

## 3.4 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, minimum fluid conductivity, measuring range, etc.? | see Page 107 ff. |
| **Installation** | Notes |
| Does the arrow on the sensor nameplate match the direction of flow through the pipe? | – |
| Is the plane of the measuring-electrode axis correct? | Horizontal |
| Is the position of the Empty Pipe Detection (EPD) electrode correct? | see Page 17 |
| Were all threaded fasteners tightened to the specified torques when the sensor was installed? | see Section 3.3 |
| Hard rubber lining and ground disks:<br>Were the correct seals installed (type, material, installation)? | Promag W → Page 26<br>Promag P → Page 32<br>Promag H → Page 38 |
| Are the measuring-point number and labeling correct (visual inspection)? | – |
| **Process environment / process conditions** | Notes |
| Are the inlet and outlet runs to respected? | Inlet run ≥ 5 x DN<br>Outlet run ≥ 2 x DN |
| Is the measuring device protected against moisture and direct sunlight? | – |
| Is the sensor adequately protected against vibration (attachment, support)? | Acceleration up to 2 g by analogy with IEC 68-2-6 (see Page 110) |

# 4 Wiring

Warning!
- When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to this Operating Manual. Please do not hesitate to contact your E+H representative if you have any questions.
- If you use remote versions, connect each sensor *only* to the transmitter having the same serial number. Measuring errors can occur if the devices are not connected in this way.

## 4.1 Connecting the remote version

### 4.1.1 Connecting Promag W / P / H

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.

Procedure (Fig. 29, Fig. 30):

1. Transmitter: Loosen the screws and remove cover (a) from the connection compartment.
2. Sensor: Remove cover (b) from the connection housing.
3. Feed signal cable (c) and coil cable (d) through the appropriate cable entries.

   Caution!
   – Make sure the connecting cables are secured (see Page 25).
   – Risk of damaging the coil driver. Always switch off the power supply before connecting or disconnecting the coil cable.
4. Preterminate signal cable and coil current cable:
   Promag W, P → Refer to the information on Page 49
   Promag H → Refer to the information on Page 50
5. Establish the connections between sensor and transmitter in accordance with the wiring diagram:
   → Fig. 29, Fig. 30
   → wiring diagram inside the cover

   Caution!
   Insulate the shields of cables that are not connected to eliminate the risk of short-circuits with neighboring cable shields inside the sensor connection housing.
6. Transmitter: Secure cover (a) on the connection compartment.
7. Sensor: Secure cover (b) on the connection housing.

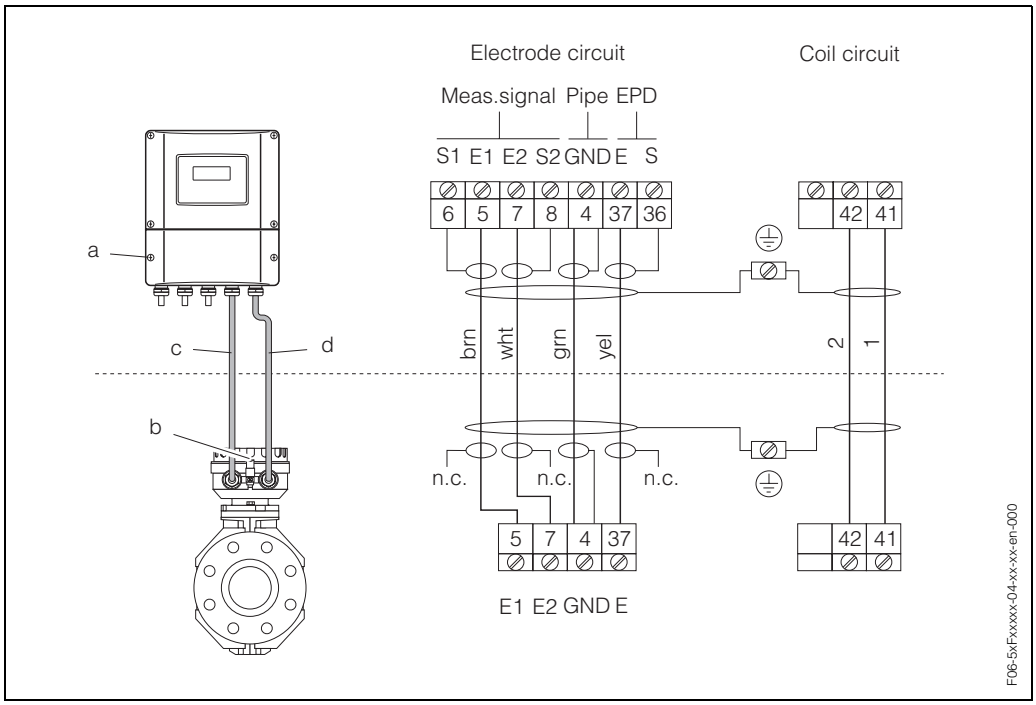



*Fig. 29: Connecting the remote version of Promag W/P*

*a = cover of the connection compartment, b = cover of the sensor connection housing, c = signal cable, d = coil current cable, n.c. = not connected, insulated cable shields*

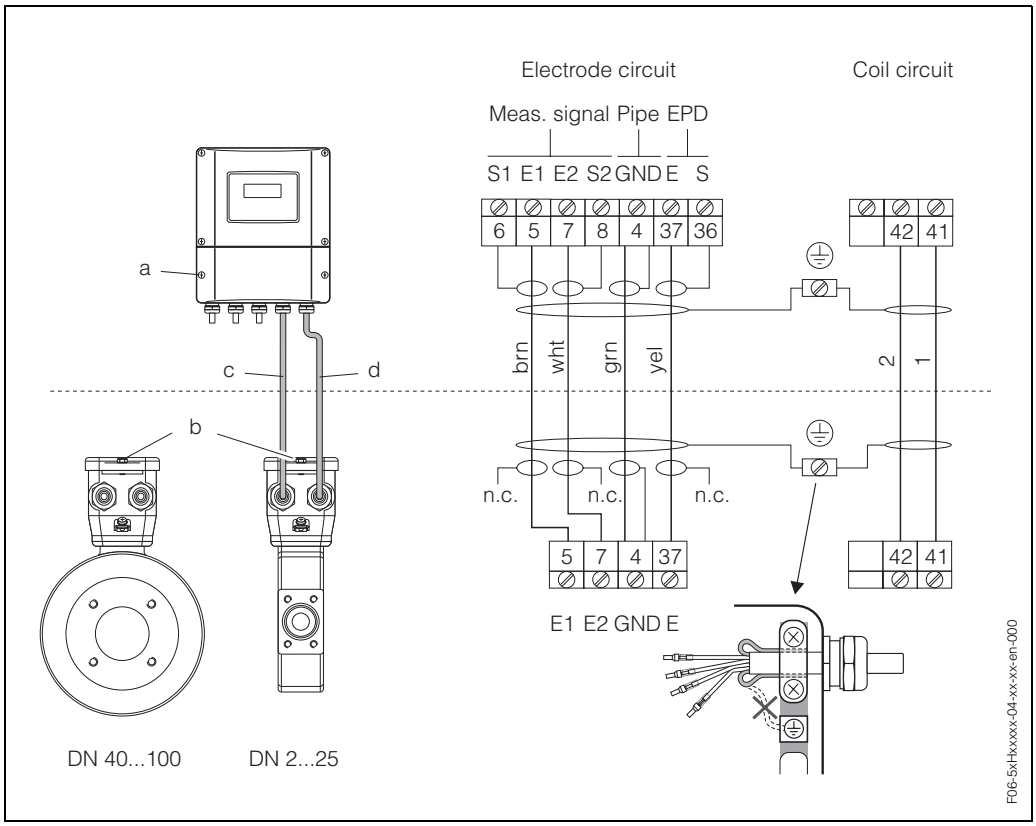



*Fig. 30: Connecting the remote version of Promag H*

*a = cover of the connection compartment, b = cover of the sensor connection housing, c = signal cable, d = coil current cable, n.c. = not connected, insulated cable shields*

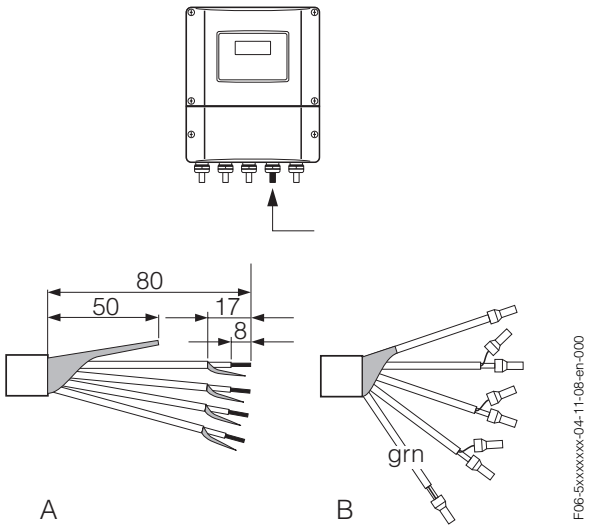
**Cable termination for the remote version**
**Promag W / Promag P**

Terminate the signal and coil current cables as shown in the figure below (Detail A).
Fit the fine-wire cores with cable end sleeves (Detail B).

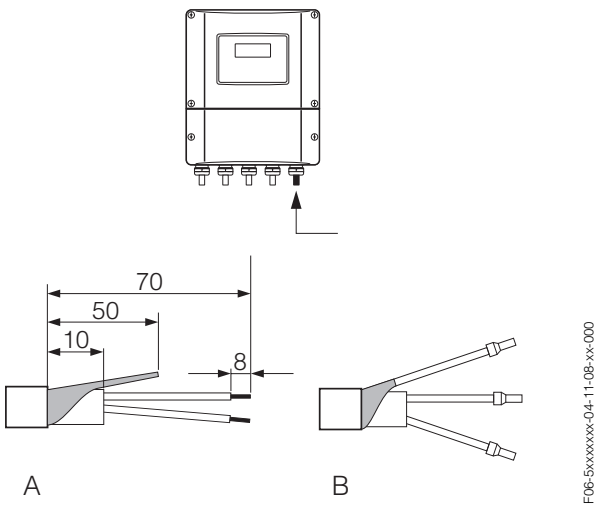
Caution!
When fitting the connectors, pay attention to the following points:
- *Signal cable* → Make sure that the cable end sleeves do not touch the wire shield on the sensor side. Minimum distance = 1 mm (exception "GND" = green cable).
- *Coil current cable* → Insulate one core of the three-core wire at the level of the core reinforcement; you only require two cores for the connection.

**TRANSMITTER**

Signal cable

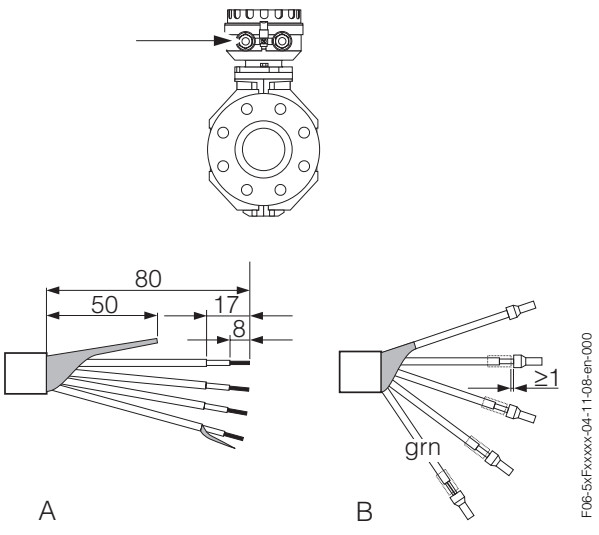



Coil current cable

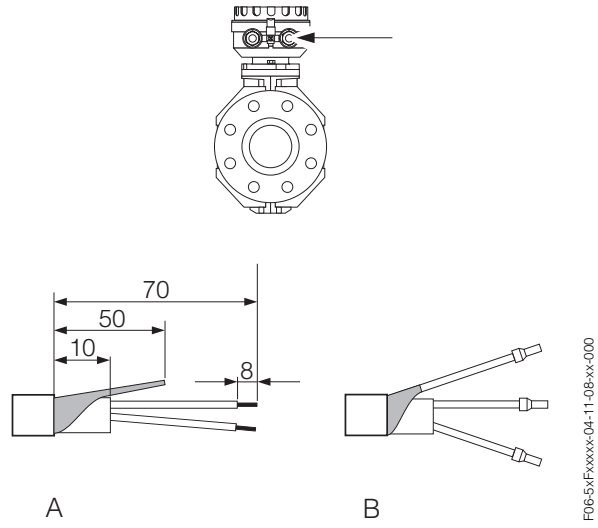



**SENSOR**

Signal cable




Coil current cable



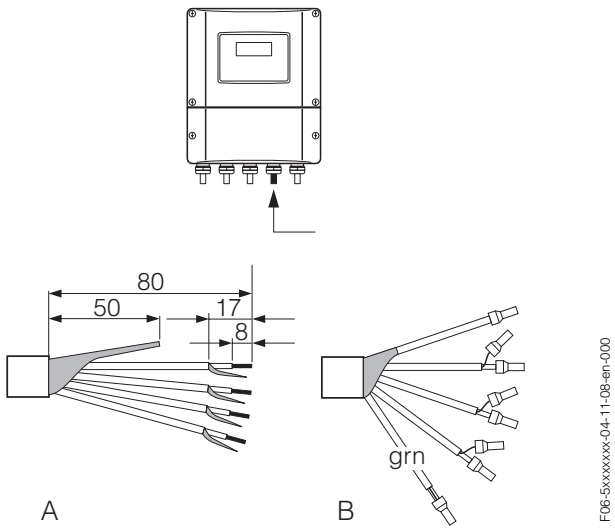
**Cable termination for the remote version**
**Promag H**

Terminate the signal and coil current cables as shown in the figure below (Detail A).
Fit the fine-wire cores with cable end sleeves (Detail B).

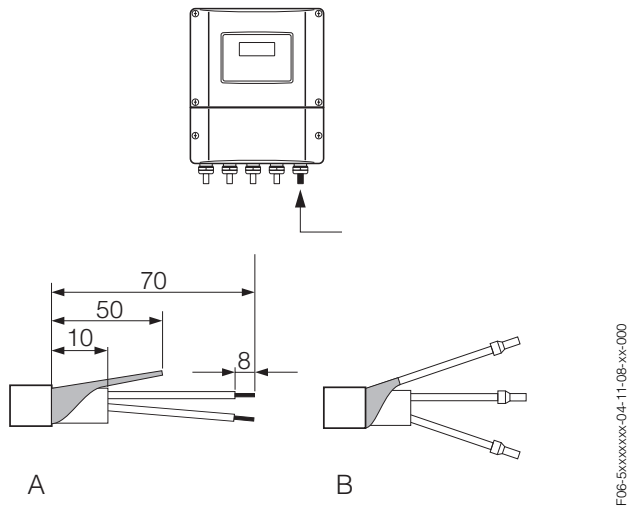
Caution!
When fitting the connectors, pay attention to the following points:
- *Signal cable* → Make sure that the cable end sleeves do not touch the wire shield on the sensor side. Minimum distance = 1 mm (exception "GND" = green cable).
- *Coil current cable* → Insulate one core of the three-core wire at the level of the core reinforcement; you only require two cores for the connection.
- On the sensor side, reverse both cable shields approx. 15 mm over the outer jacket. The strain relief ensures an electrical connection with the connection housing.

**TRANSMITTER**

Signal cable

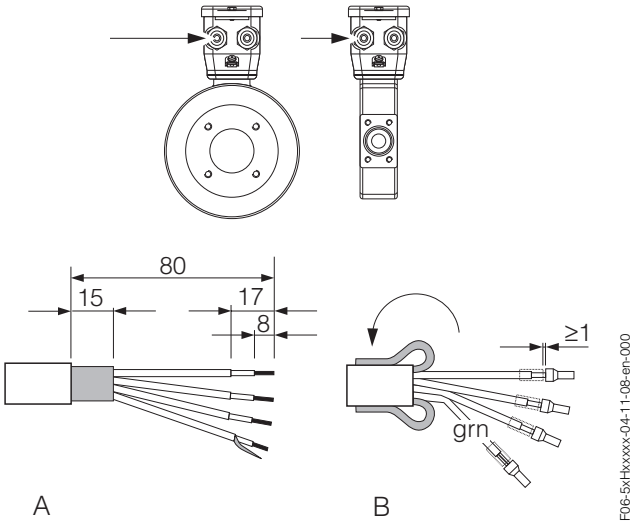



Coil current cable

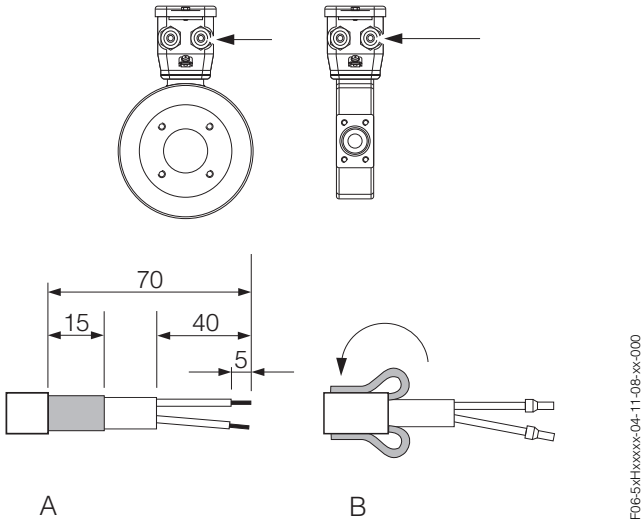



**SENSOR**

Signal cable




Coil current cable



### 4.1.2 Cable specifications

*Coil cable:*
- 2 x 0.75 mm$^2$ PVC cable with common, braided copper shield (Ø approx. 7 mm)
- Conductor resistance: ≤ 37 Ω/km
- Capacitance: core/core, shield grounded: ≤ 120 pF/m
- Permanent operating temperature: –20...+80 °
- Cable cross-section: max. 2.5 mm$^2$

*Signal cable:*
- 3 x 0.38 mm$^2$ PVC cable with common, braided copper shield (Ø approx. 7 mm) and individually shielded cores
- With Empty Pipe Detection (EPD): 4 x 0.38 mm$^2$ PVC cable with common, braided copper shield (Ø approx. 7 mm) and individually shielded cores
- Conductor resistance: ≤ 50 Ω/km
- Capacitance: core/shield: ≤ 420 pF/m
- Permanent operating temperature: –20...+80 °C
- Cable cross-section: max. 2.5 mm$^2$

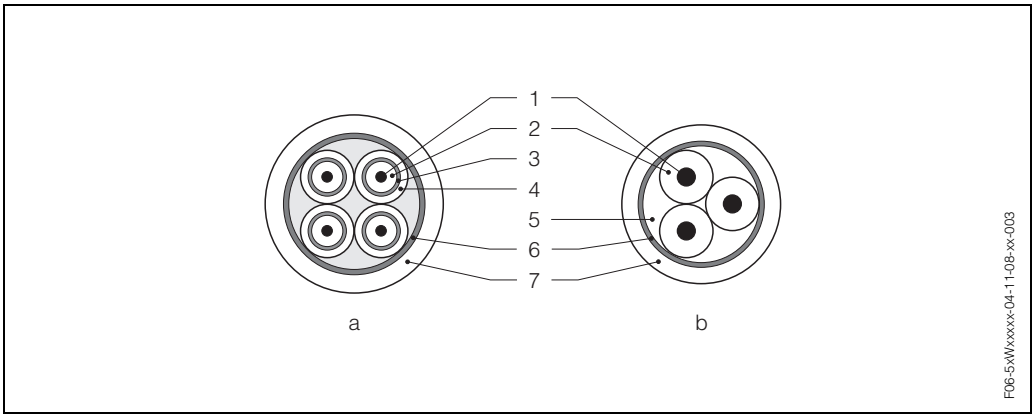



*Fig. 31: Cable cross-section (a = Signal cable, b = Coil current cable)*
*1 = Core, 2 = Core insulation, 3 = Core shield, 4 = Core jacket, 5 = Core reinforcement, 6 = Cable shield, 7 = Outer jacket*

As an option, E+H can also deliver reinforced connecting cables with an additional, reinforcing metal braid. We recommend such cables for the following cases:
- Directly buried cable
- Cables endangered by rodents
- Device operation which should comply with the IP 68 standard of protection

*Operation in zones of severe electrical interference:*
The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/A1, and NAMUR recommendation NE 21 and NE 43.

Caution!
Grounding is by means of the ground terminals provided for the purpose inside the connection housing. Keep the stripped and twisted lengths of cable shield to the terminals as short as possible.

## 4.2 Connecting the measuring unit

### 4.2.1 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 in accordance with the wiring diagram:
   – Wiring diagram (aluminium housing) → Fig. 32
   – Wiring diagram (stainless steel housing) → Fig. 33
   – Wiring diagram (wall-mount housing) → Fig. 34
   – Terminal assignment → Page 54
4. Screw the cover of the connection compartment (f) firmly onto the transmitter housing.

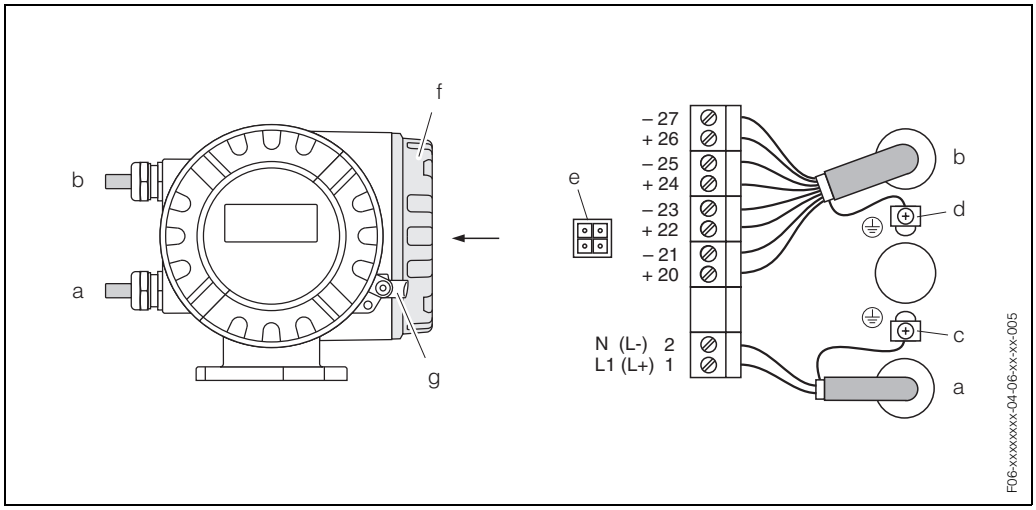



*Fig. 32: Connecting the transmitter (aluminium field housing). Cable cross-section: max. 2.5 mm²*

*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 54*
*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 Securing clamp*

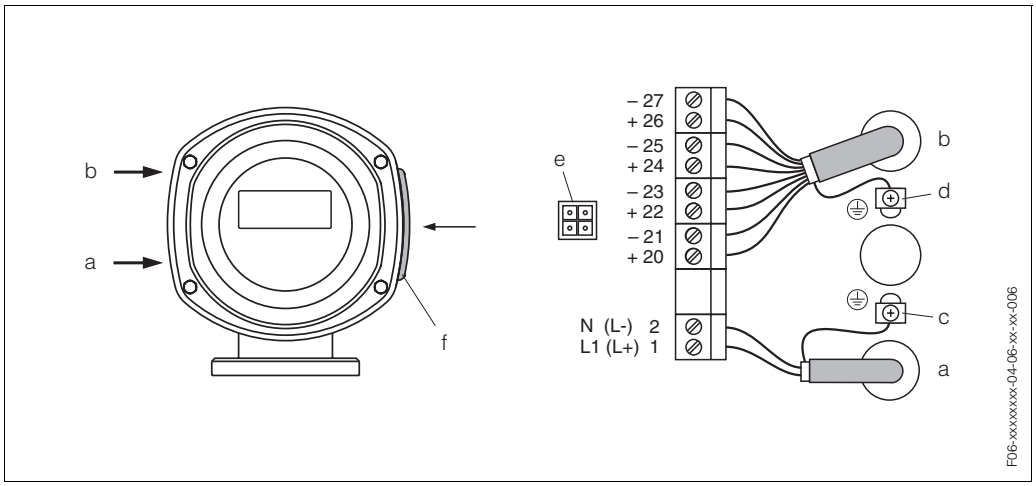



*Fig. 33: Connecting the transmitter (stainless-steel field housing). Cable cross-section: max. 2.5 mm²*

*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 54*
*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*

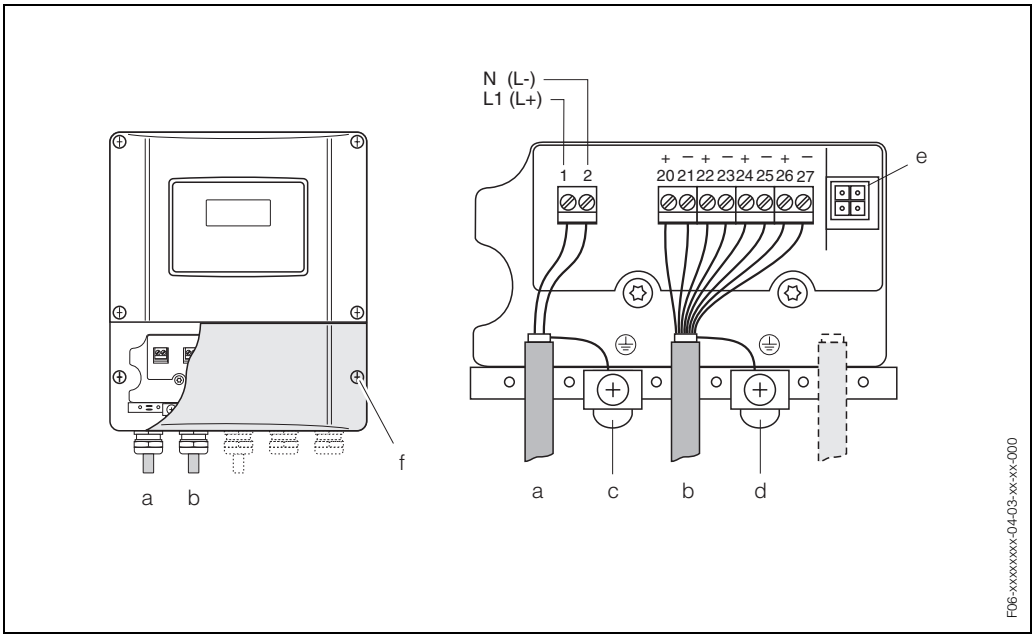



*Fig. 34: Connecting the transmitter (wall-mount housing). Cable cross-section: max. 2.5 mm²*

*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 54*
*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*

### 4.2.2 Terminal assignment

| Order variant | Terminal No. (inputs / outputs) | | | |
|---|---|---|---|---|
| | **20 (+) / 21 (–)** | **22 (+) / 23 (–)** | **24 (+) / 25 (–)** | **26 (+) / 27 (–)** |
| 50***-**********W | – | – | – | Current output HART |
| 50***-**********A | – | – | Frequency output | Current output HART |
| 50***-**********D | Status input | Status output | Frequency output | Current output HART |

*Status input (auxiliary input)*
galvanically isolated, 3...30 V DC, $R_i$ = 5 kΩ

*Status output*
Open collector, max. 30 V DC / 250 mA, galvanically isolated, freely configurable

*Frequency output (passive)*
Open collector, galvanically isolated, full scale frequency 2...1000 Hz ($f_{max}$ = 1.25 kHz)
30 V DC, 250 mA

*Current output (active/passive)*
galvanically isolated, active: 0/4...20 mA, $R_L$ < 700 Ω (HART: $R_L \geq 250$ Ω)
passive: 4…20 mA, supply voltage $V_S$: 18...30 V DC, $R_i \geq 150$ Ω

Ground connection, power supply → Page 52 ff.

### 4.2.3 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 Ω.
- After commissioning, make the following settings:
  CURRENT SPAN function → "4–20 mA HART" or "4–20 mA (25 mA) HART"
- See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

**Connection of the HART handheld communicator**

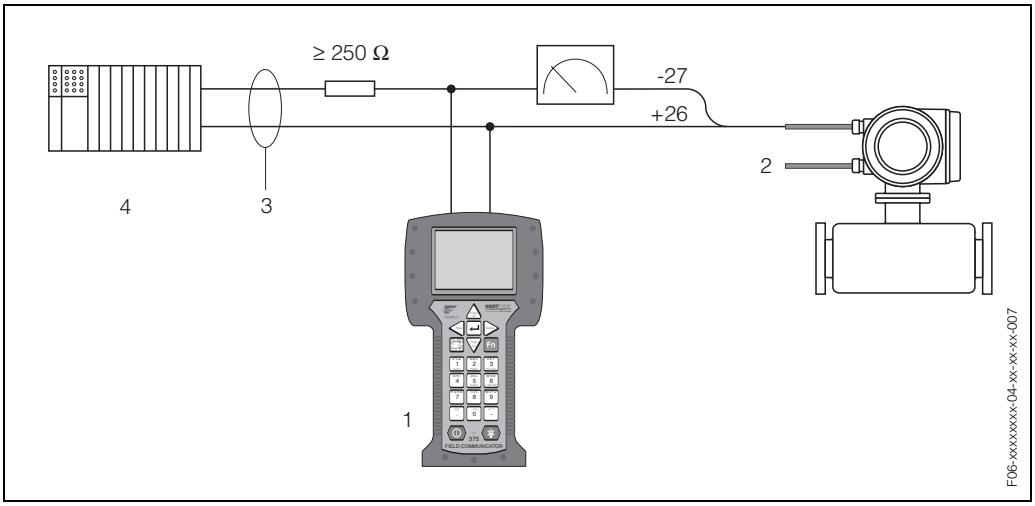



*Fig. 35: Electrical connection of the HART handheld communicator:*
*1 = HART communicator, 2 = power supply, 3 = shield, 4 = other evaluation devices or PLC with passive input*

**Connection of a PC with an operating software**
In order to connect a PC with an operating software (e.g. "FieldTool"), a HART modem (e.g. "Commubox FXA 191") is needed.

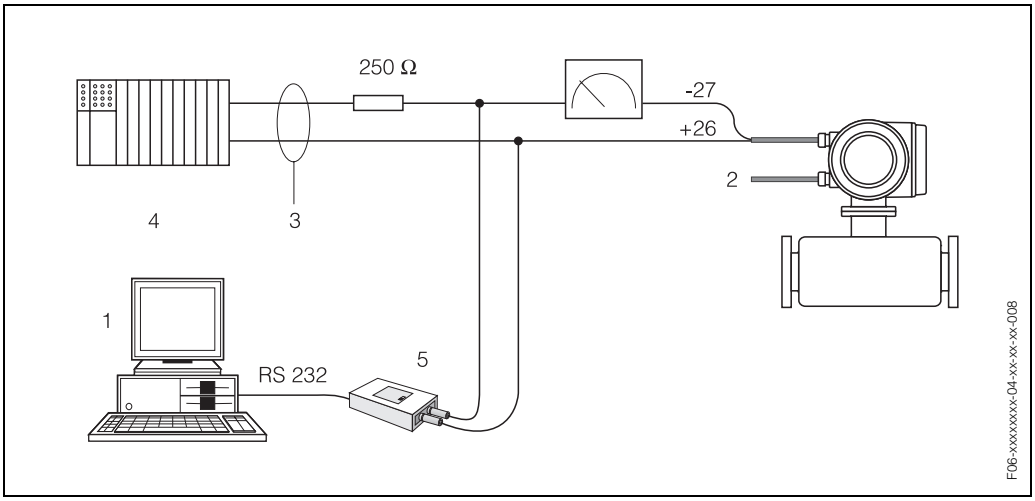



*Fig. 36: Electrical connection of a PC with an operating software:*
*1 = PC with an operating software, 2 = power supply, 3 = shield, 4 = other evaluation devices or PLC with passive input, 5 = HART modem, e.g. Commubox FXA 191*

## 4.3 Potential equalisation

### 4.3.1 Standard case

Perfect measurement is only ensured when the medium and the sensor have the same electrical potential. Most Promag sensors have a standard installed reference electrode which guarantees the required connection. This usually means that additional potential matching measures are unnecessary.

*Promag W:*
Reference electrode is standard

*Promag P:*
- Reference electrode is standard for electrode materials 1.4435, Alloy C-22 and tantalum.
- Reference electrode is optional for electrode material Pt/Rh.

*Promag H:*
- No reference electrode. The metallic process connection provides a permanent electrical connection to the fluid.
- If the process connections are made of a synthetic material, ground rings have to be used to ensure that potential is equalised (see Page 39). Ground rings can be ordered with the main product structure or as accessories → Page 85.

Note!
For installation in metal pipes, it is advisable to connect the ground terminal of the transmitter housing to the piping. Also, observe company-internal grounding guidelines.

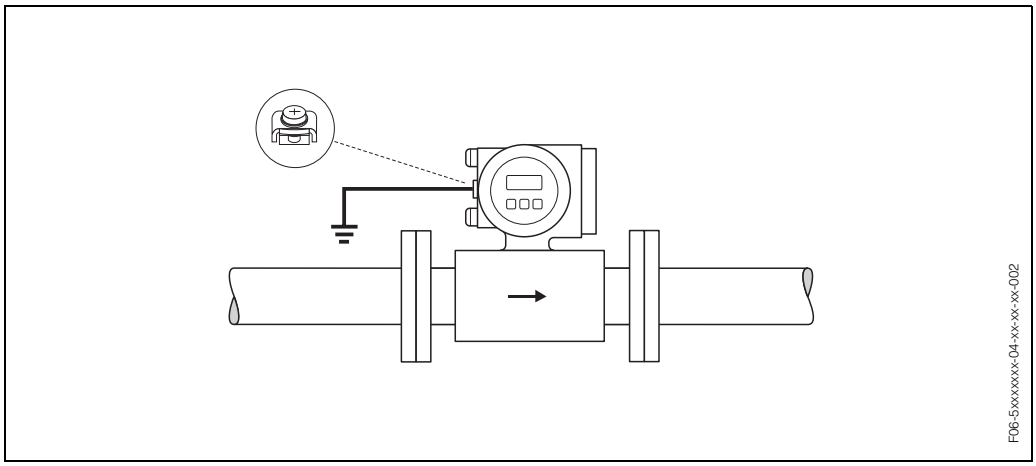



*Fig. 37: Potential equalisation by means of the transmitter's ground terminal*

Caution!
For sensors without reference electrodes or without metal process terminals, carry out potential equalisation as per the instructions for special cases described below. These special measures are particularly important when standard grounding practice cannot be ensured or extremely strong matching currents are expected.

### 4.3.2 Special cases

**Metal, ungrounded piping**
In order to prevent outside influences on measurement, it is advisable to use ground cables to connect each sensor flange to its corresponding pipe flange and ground the flanges. Connect the transmitter or sensor connection housing, as applicable, to ground potential by means of the ground terminal provided for the purpose (Fig. 38).

Caution!
Also, observe company-internal grounding guidelines.

Note!
The ground cable for flange-to-flange connections can be ordered separately as an accessory from E+H → Page 85.
- DN ≤ 300: The ground cable is in direct connection with the conductive flange coating and is secured by the flange screws.
- DN ≥ 350: The ground cable connects directly to the metal transport bracket.

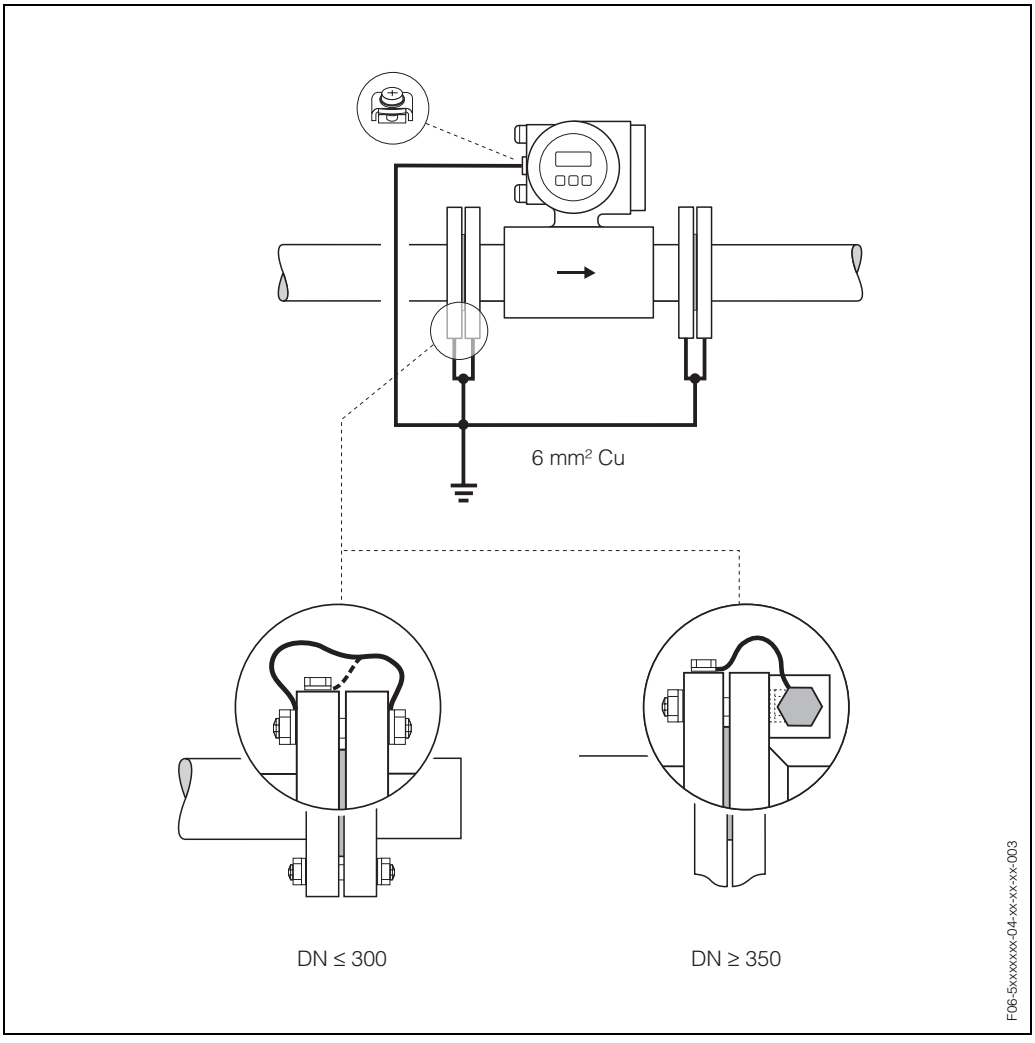



*Fig. 38: Potential equalisation with equalising currents in metallic, non-grounded piping systems*

**Plastic pipes and isolating lined pipes**
Normally, potential is matched using the reference electrodes in the measuring tube. However, in exceptional cases it is possible that, due to the grounding plan of a system, large matching cur-rents flow over the reference electrodes. This can lead to destruction of the sensor, e.g. through electrochemical decomposition of the electrodes. In such cases, e.g. for fibre-glass or PVC piping, it is recommended that you use additional ground disks for potential matching (Fig. 39).

Mounting of ground disks → Page 27, 33

Caution!
- Risk of damage by electrochemical corrosion. Note the electrochemical insulation rating, if the ground disks and measuring electrodes are made of different materials.
- Also, observe company-internal grounding guidelines.

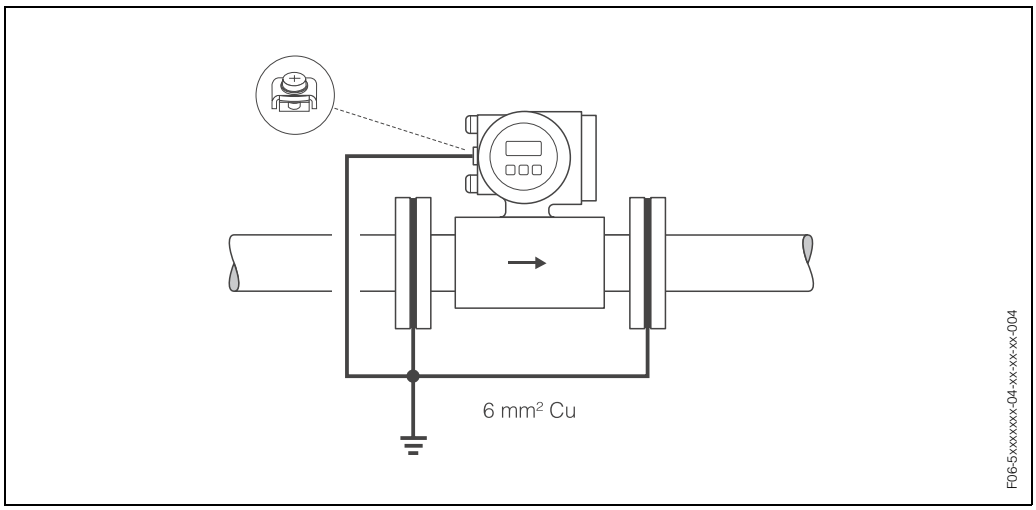



*Fig. 39: Potential equalisation/ground disks with plastic pipes or lined pipes*

**Lined pipes (cathodic protection)**
In such cases, install the measuring instrument without potential in the piping:
- When installing the measuring device, make sure that there is an electrical connection between the two piping runs (copper wire, 6 mm$^2$).
- Make sure that the installation materials do not establish a conductive connection to the measuring device and that the installation materials withstand the tightening torques applied when the threaded fasteners are tightened.
- Also comply with the regulations applicable to potential-free installation.

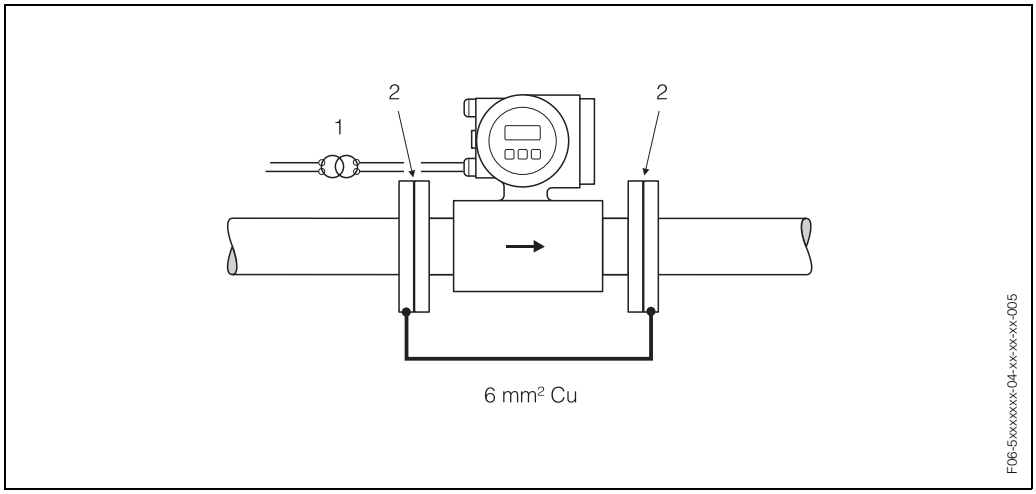



*Fig. 40: Potential equalisation and cathode protection*
*1 = isolating transformer power supply, 2 = electrically insulated*

## 4.4 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 108).
- Firmly tighten the cable entries (Fig. 41).
- The cables must loop down before they enter the cable entries (“water trap”, Fig. 41). This arrangement prevents moisture 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.

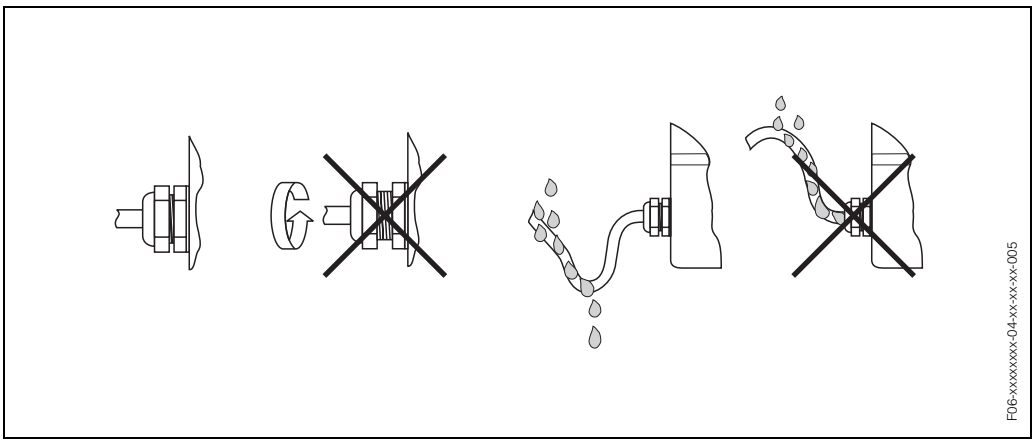



*Fig. 41: Installation instructions, cable entries*

Caution!
Do not loosen the threaded fasteners of the Promag sensor housing, as otherwise the degree of protection guaranteed by Endress+Hauser no longer applies.

Note!
The Promag W and Promag P sensors can be supplied with IP 68 rating (permanent immersion in water to a depth of 3 meters). In this case the transmitter must be installed remote from the sensor.

## 4.5 Electical 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 comply with the specifications? | see Page 51, 108 |
| 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 inside the cover of the terminal compartment |
| Are all screw terminals firmly tightened? | – |
| Have the measures for grounding/potential equalisation been correctly implemented? | see Page 56 ff. |
| Are all cable entries installed, firmly tightened and correctly sealed?<br>Cables looped as “water traps”? | see Page 59 |
| Are all housing covers installed and firmly tightened? | – |

# 5 Operation

## 5.1 Display and operating elements

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

The display area consists of two lines; this is where measured values are displayed, and/or status variables (direction of flow, partially filled pipe, bar graph, etc.). You can change the assignment of display lines to variables at will in order to customize the display to suit your needs and preferences (→ see the "Description of Device Functions" manual).

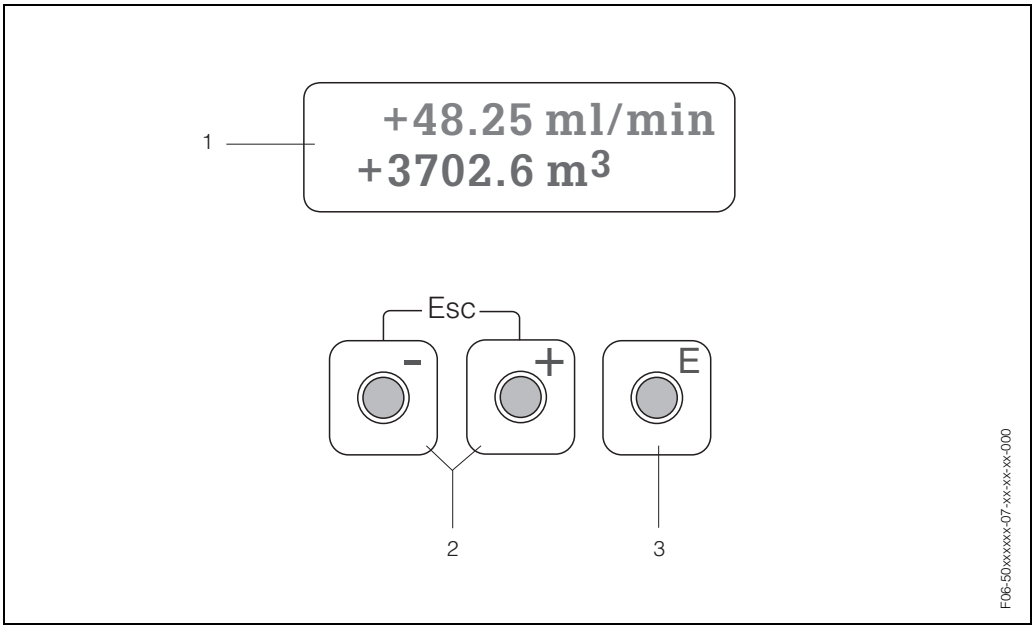



*Fig. 42: Display and operating elements*

***Liquid-crystal display (1)***

*The backlit, two-line liquid-crystal display shows measured values, dialog texts, error 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 primary measured values, e.g. volume flow in [ml/min] or in [%].*
*Lower display line: Shows supplementary measured variables and status variables, e.g. totalizer reading in [$m^3$], bar graph, measuring point designation*

***Push buttons (2)***

- *Enter numerical values, select parameters*
- *Select different function groups within the function matrix*

*Press the +/– keys simultaneously to trigger the following functions:*
- *Exit the function matrix step by step → HOME position*
- *Press and hold down +/– keys for longer than 3 seconds → Return directly to HOME position*
- *Cancel data entry*

***Enter push button (3)***

- *HOME position → Entry into the function matrix*
- *Save the numerical values you input or settings you change*

## 5.2 Brief operating instruction to the function matrix

Note!
- See the general notes on Page 63.
- Function descriptions → see the “Description of Device Functions” manual

1. HOME position → E → Enter the function matrix
2. Select a function group (e.g. CURRENT OUTPUT 1)
3. Select a function (e.g. TIME CONSTANT)

   Change parameter / enter numerical values:
   +/− → select or enter enable code, parameters, numerical values
   E → save your entries

4. Exit the function matrix:
   – Press and hold down Esc key (Esc −/+) for longer than 3 seconds → HOME position
   – Repeatedly press Esc key (Esc −/+) → return step by step to HOME position

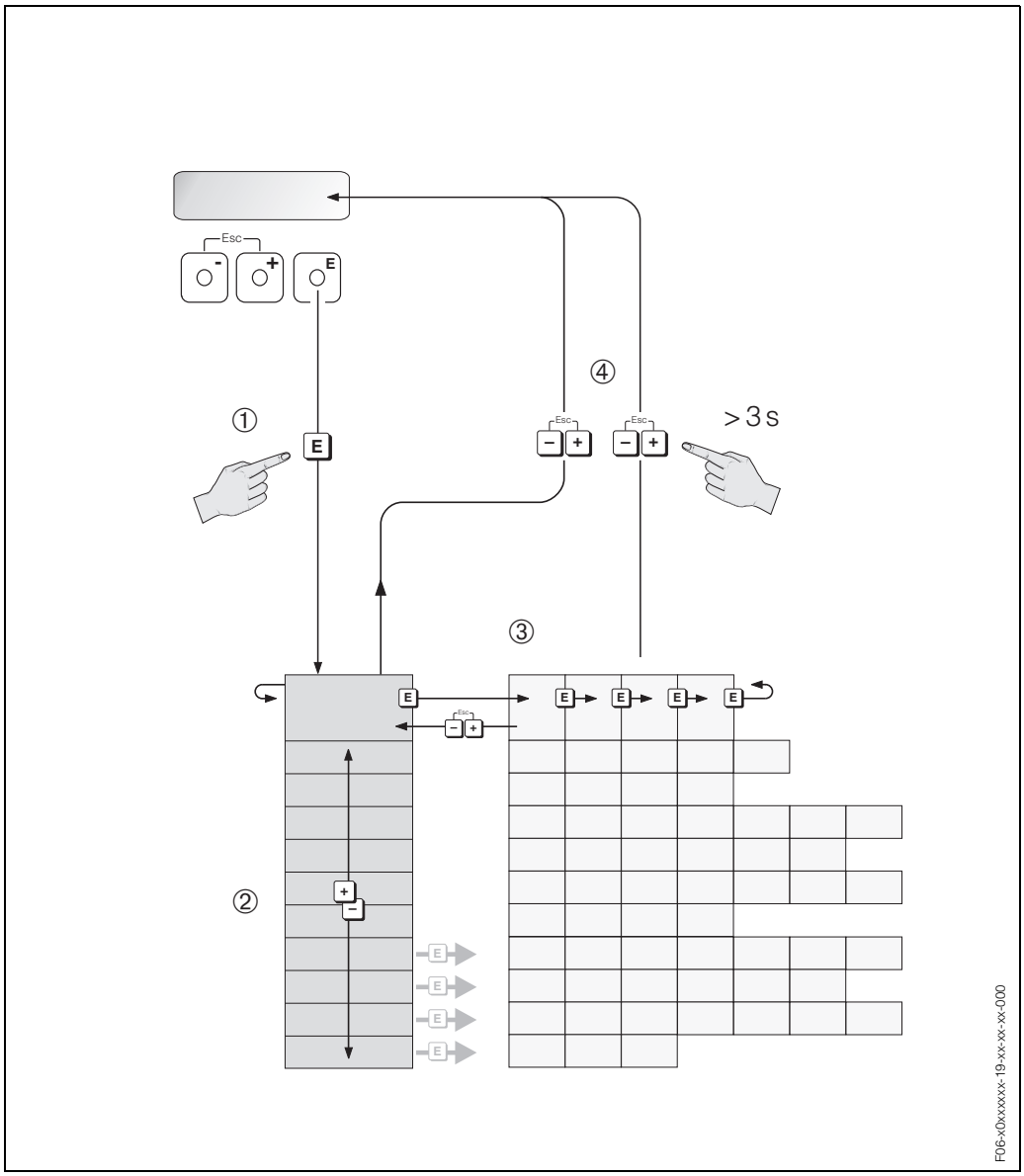



*Fig. 43: Selecting functions and configuring parameters (function matrix)*

### 5.2.1 General notes

The Quick Setup menu (see Page 80) is adequate for commissioning in most instances. Complex measuring operations on the other hand necessitate additional functions that you can configure as necessary and customize to suit your process parameters. The function matrix, therefore, comprises a multiplicity of additional functions which, for the sake of clarity, are arranged in a number of function groups.

Comply with the following instructions when configuring functions:
- You select functions as described on Page 62.
- You can switch off certain functions (OFF). If you do so, related functions in other function groups will no longer be displayed.
- Certain functions prompt you to confirm your data entries. Press ⊞ to select "SURE [ YES ]" and press E again to confirm. This saves your setting or starts a function, as applicable.
- Return to the HOME position is automatic if no key is pressed for 5 minutes.

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 parameterized values remain safely stored in the EEPROM.

Caution!
All functions are described in detail, including the function matrix itself, in the **"Description of Device Functions"** manual, which is a separate part of this Operating Instruction.

### 5.2.2 Enabling the programming mode

The function matrix can be disabled. Disabling the function matrix rules out the possibility of inadvertent changes to device functions, numerical values or factory settings. A numerical code (factory setting = 50) has to be entered before settings can be changed.
If you use a code number of your choice, you exclude the possibility of unauthorized persons accessing data (→ see the "Description of Device Functions" manual).

Comply with the following instructions when entering codes:
- If programming is disabled and the ⊞ key is pressed in any function, a prompt for the code automatically appears on the display.
- If "0" is entered as the customer's code, programming is always enabled.
- The E+H service organisation can be of assistance if you mislay your personal code.

Caution!
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 organization. Please contact Endress+Hauser if you have any questions.

### 5.2.3 Disabling the programming mode

Programming is disabled if you do not press a key within 60 seconds following automatic return to the HOME position.
You can also disable programming in the “ACCESS CODE” function by entering any number (other than the customer's code).

## 5.3 Error messages

**Type of error**
Errors which occur during commissioning or measuring operation 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 errors:* This group comprises all device errors, e.g. communication errors, hardware faults, etc. → see Page 88
- *Process errors:* This group comprises all application errors, e.g. empty pipe, etc. → see Page 92

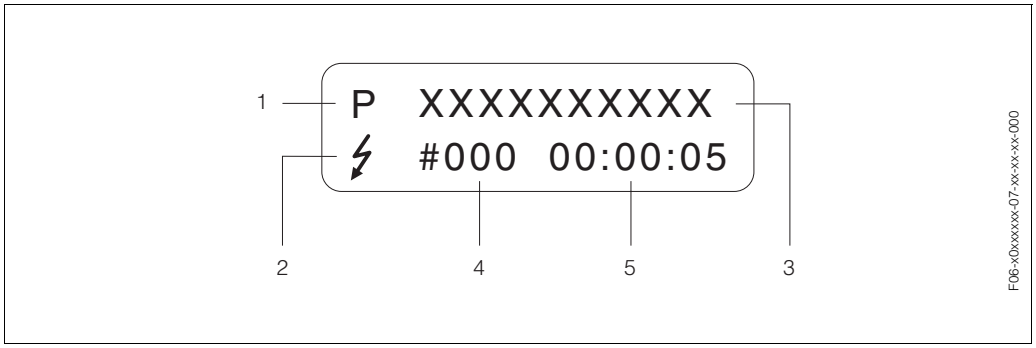



*Fig. 44: Error messages on the display (example)*

*1 Error type: P = process error, S = system error*
*2 Error message type: ϟ = fault message; ! = notice message*
*3 Error designation: e.g. EMPTY PIPE = measuring tube is only partly filled or completely empty*
*4 Error number: e.g. #401*
*5 Duration of most recent error occurrence in hours / minutes / seconds*

**Error message types**
Users have the option of weighting certain errors differently, in other words having them classed 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 classed 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 outputs of the measuring device.

*Fault message (ϟ)*
- Displayed as → Lightning flash *(ϟ)*, error type (S: system error, P: process error).
- The error in question has a direct effect on the outputs.
  The response of the outputs (failsafe mode) can be defined by means of functions in the function matrix (see Page 94).

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

## 5.4 Communication (HART)

In addition to local operation, the measuring device can be configured and measured values can be obtained by means of the HART protocol. Digital communication takes place using the 4–20 mA current output HART (see Page 55).

The HART protocol allows the transfer of measuring and device data between the HART master and the field devices for configuration and diagnostics purposes. The HART master, e.g. a handheld terminal or PC-based operating programs (such as FieldTool), require device description (DD) files which are used to access all the information in a HART device.
Information is exclusively transferred using so-called “commands”. There are three different command groups:

*Universal commands:*
All HART device support and use universal commands. The following functionalities are linked to them:
- Identify HART devices
- Reading digital measured values (volume flow, totalizer, etc.)

*Common practice commands:*
Common practice commands offer functions which are supported and can be executed by most but not all field devices.

*Device-specific commands:*
These commands allow access to device-specific functions which are not HART standard. Such commands access individual field device information, amongst other things, such as empty/full pipe calibration values, low flow cutoff settings, etc.

✎ Note!
Promag 50 has access to all three command classes. On Page 67, you will find a list with all the supported “Universal Commands” and “Common Practice Commands”.

### 5.4.1 Operating options

For the complete operation of the field device, including device-specific commands, there are Device Description (DD) files available to the user to provide the following operating aids and programs:

**HART Communicator DXR 375**
Selecting device functions with a HART Communicator is a process involving a number of menu levels and a special HART function matrix. The HART Communicator manual contains more detailed information on the device.

**FieldTool operating program**
FieldTool is a universal service and configuration software package designed for the PROline field devices. Connection is by means of a HART-Modem, e.g. Commubox FXA 191.

The functionality of FieldTool includes the following:
- Configuration of device functions
- Visualization of measuring values (including data logging)
- Data backup of device parameters
- Advanced device diagnosis
- Measuring-point documentation

You can find more information on FieldTool in the following E+H document:
System Information: SI 031D/06/en “FieldTool”

**Other operating programs**
- Operating program “AMS” (Fisher Rosemount)
- Operating program “SIMATIC PDM” (Siemens)

✎ Note!
The HART protocol requires the “4–20 mA HART” or “4–20 mA (25 mA) HART” setting in the CURRENT SPAN function.

### 5.4.2 Device and process variables

*Device variables:*
The following device variables are available using the HART protocol:

| Code (decimal) | Device variable |
|---|---|
| 0 | OFF (not assigned) |
| 1 | Volume flow |
| 250 | Totalizer 1 |
| 251 | Totalizer 2 |

*Process variables:*
At the factory, the process variables are assigned to the following device variables:
- Primary process variable (PV) → Volume flow
- Second process variable (SV) → Totalizer 1
- Third process variable (TV) → not assigned
- Fourth process variable (FV) → not assigned

✎ Note!
You can set or change the assignment of device variables to process variables using Command 51 (see Page 72).

### 5.4.3 Universal / Common practice HART commands

The following table contains all the universal and common practice commands supported by Promag 50.

| **Command No.**<br>**HART command / Access type** | | **Command data**<br>(numeric data in decimal form) | **Response data**<br>(numeric data in decimal form) |
|---|---|---|---|
| **Universal Commands** | | | |
| 0 | Read unique device identifier<br><br>Access type = read | none | Device identification delivers information on the device and the manufacturer. It cannot be changed.<br><br>The response consists of a 12 byte device ID:<br>– Byte 0: fixed value 254<br>– Byte 1: Manufacturer ID, 17 = E+H<br>– Byte 2: Device type ID, 65 = Promag 50<br>– Byte 3: Number of preambles<br>– Byte 4: Universal commands rev. no.<br>– Byte 5: Device-specific commands rev. no.<br>– Byte 6: Software revision<br>– Byte 7: Hardware revision<br>– Byte 8: Additional device information<br>– Bytes 9-11: Device identification |
| 1 | Read primary process variable<br><br>Access type = read | none | – Byte 0: HART unit code of the primary process variable<br>– Bytes 1-4: Primary process variable<br><br>*Factory setting:*<br>Primary process variable = Volume flow<br><br>✎ Note!<br>• You can set the assignment of device variables to process variables using Command 51.<br>• Manufacturer-specific units are represented using the HART unit code “240”. |
| 2 | Read the primary process variable as current in mA and percentage of the set measuring range<br><br>Access type = read | none | – Bytes 0-3: actual current of the primary process variable in mA<br>– Bytes 4-7: Percentage of the set measuring range<br><br>*Factory setting:*<br>Primary process variable = Volume flow<br><br>✎ Note!<br>You can set the assignment of device variables to process variables using Command 51. |

| **Command No.**<br>**HART command / Access type** | | **Command data**<br>(numeric data in decimal form) | **Response data**<br>(numeric data in decimal form) |
|---|---|---|---|
| 3 | Read the primary process variable as current in mA and four (preset using Command 51) dynamic process variables<br><br>Access type = read | none | 24 bytes are sent as a response:<br>– Bytes 0-3: primary process variable current in mA<br>– Byte 4: HART unit code of the primary process variable<br>– Bytes 5-8: Primary process variable<br>– Byte 9: HART unit code of the second process variable<br>– Bytes 10-13: Second process variable<br>– Byte 14: HART unit code of the third process variable<br>– Bytes 15-18: Third process variable<br>– Byte 19: HART unit code of the fourth process variable<br>– Bytes 20-23: Fourth process variable<br><br>*Factory setting:*<br>• Primary process variable = Volume flow<br>• Second process variable = Totalizer 1<br>• Third process variable = not assigned<br>• Fourth process variable = not assigned<br><br>✎ Note!<br>• You can set the assignment of device variables to process variables using Command 51.<br>• Manufacturer-specific units are represented using the HART unit code “240”. |
| 6 | Set HART shortform address<br><br>Access type = write | Byte 0: desired address (0...15)<br><br>*Factory setting:*<br>0<br><br>✎ Note!<br>With an address >0 (multidrop mode), the current output of the primary process variable is set to 4 mA. | Byte 0: active address |
| 11 | Read unique device identification using the TAG (measuring point designation)<br><br>Access type = read | Bytes 0-5: TAG | Device identification delivers information on the device and the manufacturer. It cannot be changed.<br>The response consists of a 12 byte device ID if the given TAG agrees with the one saved in the device:<br><br>– Byte 0: fixed value 254<br>– Byte 1: Manufacturer ID, 17 = E+H<br>– Byte 2: Device type ID, 65 = Promag 50<br>– Byte 3: Number of preambles<br>– Byte 4: Universal commands rev. no.<br>– Byte 5: Device-specific commands rev. no.<br>– Byte 6: Software revision<br>– Byte 7: Hardware revision<br>– Byte 8: Additional device information<br>– Bytes 9-11: Device identification |
| 12 | Read user message<br><br>Access type = read | none | Bytes 0-24: User message<br><br>✎ Note!<br>You can write the user message using Command 17. |

| **Command No.**<br>**HART command / Access type** | | **Command data**<br>(numeric data in decimal form) | **Response data**<br>(numeric data in decimal form) |
|---|---|---|---|
| 13 | Read TAG, descriptor and date<br><br>Access type = read | none | – Bytes 0-5: TAG<br>– Bytes 6-17: descriptor<br>– Bytes 18-20: Date<br><br>✎ Note!<br>You can write the TAG, descriptor and date using Command 18. |
| 14 | Read sensor information on primary process variable | none | – Bytes 0-2: Sensor serial number<br>– Byte 3: HART unit code of sensor limits and measuring range of the primary process variable<br>– Bytes 4-7: Upper sensor limit<br>– Bytes 8-11: Lower sensor limit<br>– Bytes 12-15: Minimum span<br><br>✎ Note!<br>• The data relate to the primary process variable (= volume flow).<br>• Manufacturer-specific units are represented using the HART unit code “240”. |
| 15 | Read output information of primary process variable<br><br>Access type = read | none | – Byte 0: Alarm selection ID<br>– Byte 1: Transfer function ID<br>– Byte 2: HART unit code for the set measuring range of the primary process variable<br>– Bytes 3-6: upper range, value for 20 mA<br>– Bytes 7-10: lower range, value for 4 mA<br>– Bytes 11-14: Damping constant in [s]<br>– Byte 15: Write protection ID<br>– Byte 16: OEM dealer ID, 17 = E+H<br><br>*Factory setting:*<br>Primary process variable = Volume flow<br><br>✎ Note!<br>• You can set the assignment of device variables to process variables using Command 51.<br>• Manufacturer-specific units are represented using the HART unit code “240”. |
| 16 | Read the device production number<br><br>Access type = read | none | Bytes 0-2: Production number |
| 17 | Write user message<br><br>Access = write | You can save any 32-character long text in the device under this parameter:<br><br>Bytes 0-23: Desired user message | Displays the current user message in the device:<br><br>Bytes 0-23: Current user message in the device |

| **Command No.**<br>**HART command / Access type** | | **Command data**<br>(numeric data in decimal form) | **Response data**<br>(numeric data in decimal form) |
|---|---|---|---|
| 18 | Write TAG, descriptor and date<br><br>Access = write | With this parameter, you can store an 8 character TAG, a 16 character descriptor and a date:<br><br>– Bytes 0-5: TAG<br>– Bytes 6-17: descriptor<br>– Bytes 18-20: Date | Displays the current information in the device:<br><br>– Bytes 0-5: TAG<br>– Bytes 6-17: descriptor<br>– Bytes 18-20: Date |
| **Common Practice Commands** | | | |
| 34 | Write damping value for primary process variable<br><br>Access = write | Bytes 0-3: Damping value of the primary process variable in seconds<br><br>*Factory setting:*<br>Primary process variable = Volume flow | Displays the current damping value in the device:<br><br>Bytes 0-3: Damping value in seconds |
| 35 | Write measuring range of primary process variable<br><br>Access = write | Write the desired measuring range:<br>– Byte 0: HART unit code of the primary process variable<br>– Bytes 1-4: upper range, value for 20 mA<br>– Bytes 5-8: lower range, value for 4 mA<br><br>*Factory setting:*<br>Primary process variable = Volume flow<br><br>✎ Note!<br>• You can set the assignment of device variables to process variables using Command 51.<br>• If the HART unit code is not the correct one for the process variable, the device will continue with the last valid unit. | The currently set measuring range is displayed as a response:<br><br>– Byte 0: HART unit code for the set measuring range of the primary process variable<br>– Bytes 1-4: upper range, value for 20 mA<br>– Bytes 5-8: lower range, value for 4 mA<br><br>✎ Note!<br>Manufacturer-specific units are represented using the HART unit code “240”. |
| 38 | Device status reset (Configuration changed)<br><br>Access = write | none | none |
| 40 | Simulate output current of primary process variable<br><br>Access = write | Simulation of the desired output current of the primary process variable. An entry value of 0 exits the simulation mode:<br><br>Bytes 0-3: Output current in mA<br><br>*Factory setting:*<br>Primary process variable = Volume flow<br><br>✎ Note!<br>You can set the assignment of device variables to process variables using Command 51. | The momentary output current of the primary process variable is displayed as a response:<br><br>Bytes 0-3: Output current in mA |
| 42 | Perform master reset<br><br>Access = write | none | none |

| **Command No.**<br>**HART command / Access type** | | **Command data**<br>(numeric data in decimal form) | **Response data**<br>(numeric data in decimal form) |
|---|---|---|---|
| 44 | Write unit of primary process variable<br><br>Access = write | Set unit of primary process variable. Only unit which are suitable for the process variable are transferred to the device:<br><br>Byte 0: HART unit code<br><br>*Factory setting:*<br>Primary process variable = Volume flow<br><br>✎ Note!<br>• If the written HART unit code is not the correct one for the process variable, the device will continue with the last valid unit.<br>• If you change the unit of the primary process variable, this has no impact on the system units. | The current unit code of the primary process variable is displayed as a response:<br><br>Byte 0: HART unit code<br><br>✎ Note!<br>Manufacturer-specific units are represented using the HART unit code “240”. |
| 48 | Read additional device status<br><br>Access = read | none | The device status is displayed in extended form as the response:<br><br>Coding: see table on Page 73 |
| 50 | Read assignment of the device variables to the four process variables<br><br>Access = read | none | Display of the current variable assignment of the process variables:<br><br>– Byte 0: Device variable code to the primary process variable<br>– Byte 1: Device variable code to the second process variable<br>– Byte 2: Device variable code to the third process variable<br>– Byte 3: Device variable code to the fourth process variable<br><br>*Factory setting:*<br>• Primary process variable: Code 1 for volume flow<br>• Second process variable: Code 250 for totalizer 1<br>• Third process variable: Code 0 for OFF (not assigned)<br>• Fourth process variable: Code 0 for OFF (not assigned)<br><br>✎ Note!<br>You can set or change the assignment of device variables to process variables using Command 51. |

| **Command No.**<br>**HART command / Access type** | | **Command data**<br>(numeric data in decimal form) | **Response data**<br>(numeric data in decimal form) |
|---|---|---|---|
| 51 | Write assignments of the device variables to the four process variables<br><br>Access = write | Setting of the device variables to the four process variables:<br><br>– Byte 0: Device variable code to the primary process variable<br>– Byte 1: Device variable code to the second process variable<br>– Byte 2: Device variable code to the third process variable<br>– Byte 3: Device variable code to the fourth process variable<br><br>*Code of the supported device variables:*<br>See data on Page 66<br><br>*Factory setting:*<br>• Primary process variable = Volume flow<br>• Second process variable = Totalizer 1<br>• Third process variable = OFF (not assigned)<br>• Fourth process variable = OFF (not assigned) | The variable assignment of the process variables is displayed as a response:<br><br>– Byte 0: Device variable code to the primary process variable<br>– Byte 1: Device variable code to the second process variable<br>– Byte 2: Device variable code to the third process variable<br>– Byte 3: Device variable code to the fourth process variable |
| 53 | Write device variable unit<br><br>Access = write | This command set the unit of the given device variables. Only those units which suit the device variable are transferred:<br><br>– Byte 0: Device variable code<br>– Byte 1: HART unit code<br><br>*Code of the supported device variables:*<br>See data on Page 66<br><br>✎ Note!<br>• If the written unit is not the correct one for the device variable, the device will continue with the last valid unit.<br>• If you change the unit of the device variable, this has no impact on the system units. | The current unit of the device variables is displayed in the device as a response:<br><br>– Byte 0: Device variable code<br>– Byte 1: HART unit code<br><br>✎ Note!<br>Manufacturer-specific units are represented using the HART unit code “240”. |
| 59 | Write number of preambles in response message<br><br>Access = write | This parameter sets the number of preambles which are inserted in the response messages:<br><br>Byte 0: Number of preambles (2...20) | As a response, the current number of the preambles is displayed in the response message:<br><br>Byte 0: Number of preambles |

### 5.4.4 Device status / Error messages

You can read the extended device status, in this case, current error messages, via Command “48”. The command delivers information which are partly coded in bits (see table below).

Note!
You can find a detailed explanation of the device status and error messages and their elimination on Page 88 ff.

| Byte | Bit | Error No. | Short error description ( → Page 88 ff. ) |
|---|---|---|---|
| 0 | 0 | 001 | Serious device error |
| | 1 | 011 | Measuring amplifier has faulty EEPROM |
| | 2 | 012 | Error when accessing data of the measuring amplifier EEPROM |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 1 | 0 | not assigned | – |
| | 1 | 031 | S-DAT: defective or missing |
| | 2 | 032 | S-DAT: Error accessing saved values |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | 051 | I/O board and the amplifier board are not compatible. |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 2 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 3 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | 111 | Totalizer checksum error |
| | 4 | 121 | I/O board and the amplifier board are not compatible. |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |

| Byte | Bit | Error No. | Short error description ( → Page 88 ff. ) |
|---|---|---|---|
| 4 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | 251 | Internal communication fault on the measuring amplifier |
| | 4 | 261 | No data reception between amplifier and I/O board |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 5 | 0 | 321 | Coil current of the sensor is outside the tolerance. |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | 339 | Flow buffer:<br>The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds. |
| 6 | 0 | 340 | |
| | 1 | 341 | |
| | 2 | 342 | |
| | 3 | 343 | Frequency buffer:<br>The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds. |
| | 4 | 344 | |
| | 5 | 345 | |
| | 6 | 346 | |
| | 7 | 347 | Pulse buffer:<br>The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds. |
| 7 | 0 | 348 | |
| | 1 | 349 | |
| | 2 | 350 | |
| | 3 | 351 | Current output: flow is out of range. |
| | 4 | 352 | |
| | 5 | 353 | |
| | 6 | 354 | |
| | 7 | 355 | Frequency output: flow is out of range. |
| 8 | 0 | 356 | |
| | 1 | 357 | |
| | 2 | 358 | |
| | 3 | 359 | Pulse output: the pulse output frequency is out of range. |
| | 4 | 360 | |
| | 5 | 361 | |
| | 6 | 362 | |
| | 7 | not assigned | – |

| Byte | Bit | Error No. | Short error description ( → Page 88 ff. ) |
|---|---|---|---|
| 9 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 10 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | 401 | Measuring tube partially filled or empty |
| 11 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | 461 | EPD calibration not possible because the fluid's conductivity is either too low or too high. |
| | 3 | not assigned | – |
| | 4 | 463 | The EPD calibration values for empty pipe and full pipe are identical, therefore incorrect. |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 12 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | 501 | New amplifier software version is loaded.<br>Currently no other commands are possible. |

| Byte | Bit | Error No. | Short error description ( → Page 88 ff. ) |
|---|---|---|---|
| 13 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |
| 14 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | 601 | Positive zero return active |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | 611 | Simulation current output active |
| 15 | 0 | 612 | |
| | 1 | 613 | |
| | 2 | 614 | |
| | 3 | 621 | Simulation frequency output active |
| | 4 | 622 | |
| | 5 | 623 | |
| | 6 | 624 | |
| | 7 | 631 | Simulation pulse output active |
| 16 | 0 | 632 | |
| | 1 | 633 | |
| | 2 | 634 | |
| | 3 | 641 | Simulation status output active |
| | 4 | 642 | |
| | 5 | 643 | |
| | 6 | 644 | |
| | 7 | not assigned | – |
| 17 | 0 | not assigned | – |
| | 1 | not assigned | – |
| | 2 | not assigned | – |
| | 3 | not assigned | – |
| | 4 | not assigned | – |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | 671 | Simulation status input active |

| Byte | Bit | Error No. | Short error description ( → Page 88 ff. ) |
|---|---|---|---|
| 18 | 0 | 672 | Simulation status input active |
| | 1 | 673 | Simulation status input active |
| | 2 | 674 | Simulation status input active |
| | 3 | 691 | Simulation of response to error (outputs) active |
| | 4 | 692 | Simulation of volume flow active |
| | 5 | not assigned | – |
| | 6 | not assigned | – |
| | 7 | not assigned | – |

# 6 Commissioning

## 6.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:
- Checklist for “Installation check” → Page 45
- Checklist for “Electrical connection check” → Page 60

## 6.2 Commissioning

### 6.2.1 Switching on the measuring device

Once the connection checks (see Page 60) 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 post switch-on self-tests. As this procedure progresses the following sequence of messages appears on the local display:

| | |
|---|---|
| **PROMAG 50**<br>**START UP ...** | Start-up message |
| ▼ | |
| **SW AMPLIFIER**<br>**V XX.XX.XX** | Current software version (example) |
| ▼ | |
| **SYSTEM OK**<br>**→ OPERATION** | Beginning of normal measuring mode |
| ▼ | |

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

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

### 6.2.2 "Commissioning" Quick Setup menu

This Quick Setup menu guides you systematically through the setup procedure for all the major device functions that have to be configured for standard measuring operation.

Note!
In the case of measuring devices **without** a local display, the individual parameters and functions must be configured by means of a configuration program, such as FieldTool from E+H.

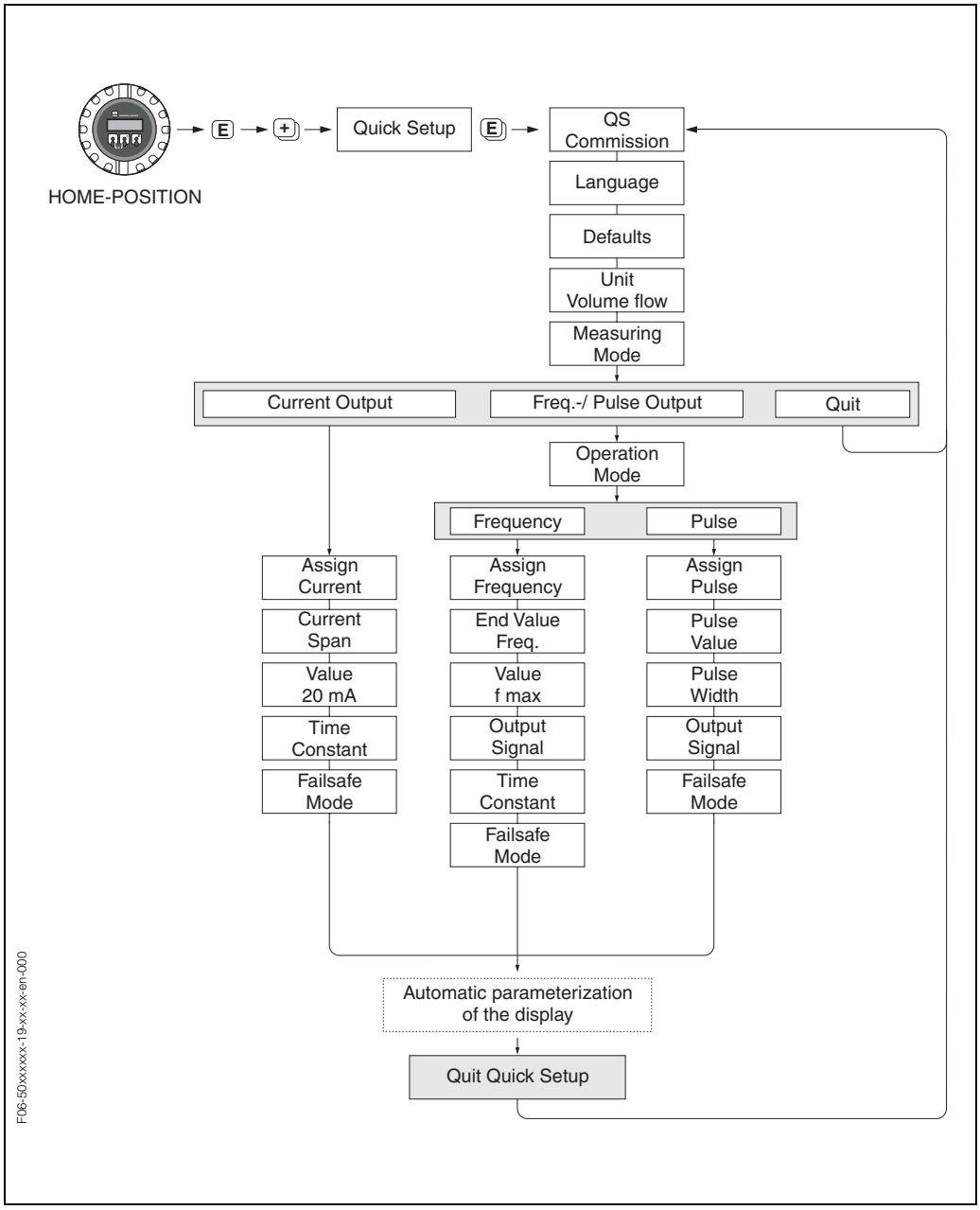



*Fig. 45: Quick Setup for commissioning*

### 6.2.3 Empty-pipe/full-pipe adjustment

Flow cannot be measured correctly unless the measuring tube is completely full.
This status can be permanently monitored using the Empty Pipe Detection:
- EPD = Empty Pipe Detection (with the help of an EPD electrode)
- OED = Open Electrode Detection (Empty Pipe Detection with the help of the measuring electrodes, if the sensor is not equipped with an EPD electrode or the orientation is not suitable for using EPD).

Caution!
A detailed description and other helpful hints for the empty-pipe/full-pipe adjustment procedure can be found in the separate "Description of Device Functions" Manual:
- EPD/OED ADJUSTMENT → Carrying out the adjustment.
- EPD → Switching on and off EPD/OED.
- EPD RESPONSE TIME → Input of the response time for EPD/OED.

Note!
- The EPD function is not available unless the sensor is fitted with an EPD electrode.
- The devices are already calibrated at the factory with water (approx. 500 µS/cm). If the fluid conductivity differs from this reference, empty-pipe/full-pipe adjustment has to be performed again on site.
- The default setting for EPD/OED when the devices are delivered is OFF; the function has to be activated if required.
- The EPD/OED process error can be output by means of the configurable status output.

**Performing empty-pipe and full-pipe adjustment (EPD/OED)**

1. Select the appropriate function in the function matrix:
   HOME → E → ⊞ → PROCESS PARAMETER → E → ⊞ → EPD/OED ADJUSTMENT
2. Empty the piping. In case of an EPD adjustment, the wall of the measuring tube should be wetted with fluid for the adjustment procedure but this is not the case with an OED adjustment.
3. Start empty-pipe adjustment: Select "EMPTY PIPE ADJUST" or "OED EMPTY ADJUST" and press E to confirm.
4. After empty-pipe adjustment, fill the piping with fluid.
5. Start full-pipe adjustment: Select "FULL PIPE ADJUST" or "OED FULL ADJUST" and press E to confirm.
6. Having completed the adjustment, select the setting "OFF" and exit the function by pressing E .
7. Now select the "EPD" function. Switch on Empty Pipe Detection by selecting the following settings:
   – EPD → Select ON STANDARD or ON SPECIAL and press E to confirm.
   – OED → Select OED and confirm with E .

   Caution!
   The adjustment coefficients must be valid before you can activate the EPD/OED function. If adjustment is incorrect the following messages might appear on the display:
   – FULL = EMPTY
     The adjustment values for empty pipe and full pipe are identical. In cases of this nature you **must** repeat empty-pipe or full-pipe adjustment!
   – ADJUSTMENT NOT OK
     Adjustment is not possible because the fluid's conductivity is out of range.

### 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.
- Wait at least 10 minutes for heat to dissipate before opening an Ex-rated device.

1. Switch off power suppy.
2. Remove the I/O board → Page 97, 99
3. Position the jumper according to Fig. 46.

Caution!
Risk of destroying the measuring device. Set the jumpers exactly as shown in Fig. 46. 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.

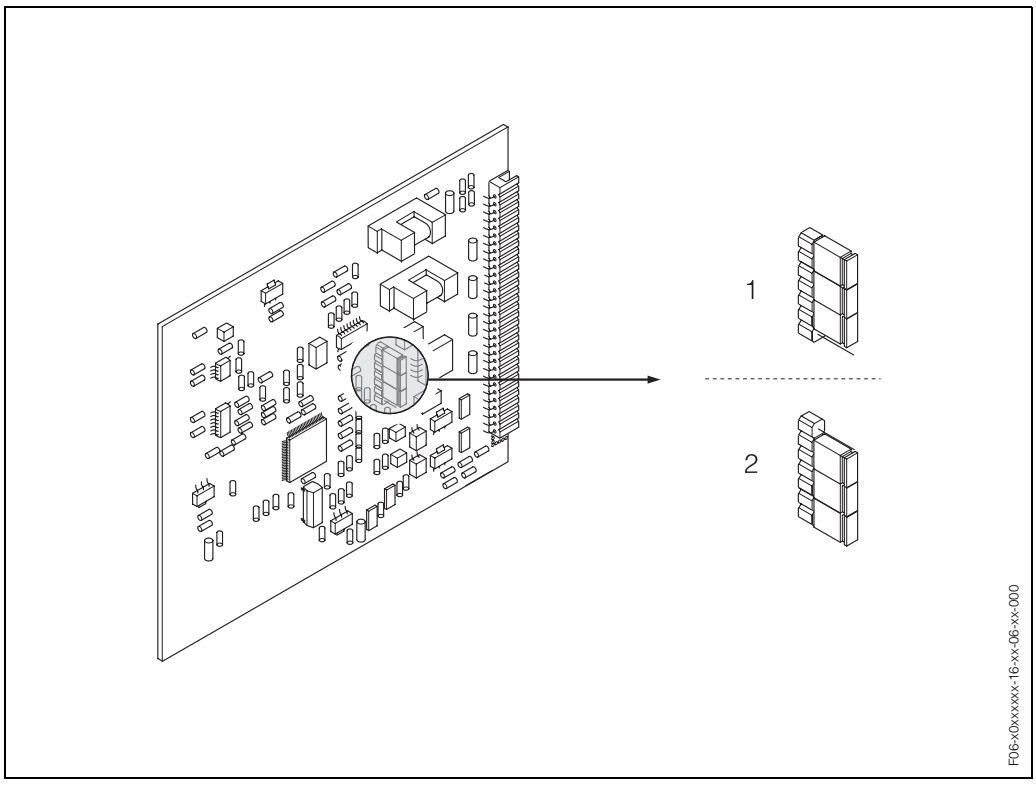



*Fig. 46: Configuring the current output (I/O board)*

*1 Active current output (Factory setting)*
*2 Passive current output*

## 6.3 Data storage device (S-DAT)

The S-DAT is an exchangeable data storage device in which all sensor relevant parameters are stored, i.e., diameter, serial number, calibration factor, zero point.

# 7 Maintenance

The Promag 50 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.

**Seals**
The seals of the Promag H sensor must be replaced periodically, particularly in the case of gasket seals (aseptic version). The period between changes depends on the frequency of cleaning cycles, the cleaning temperature and the fluid temperature.

Replacement seals (accessories) → Page 85.

# 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 | Order code |
|---|---|---|
| Transmitter Promag 50 | Transmitter for replacement or for stock. Use the order code to define the following specifications:<br>– Approvals<br>– Degree of protection / version<br>– Cable type for the remote version<br>– Cable entries<br>– Display / power supply / operation<br>– Software<br>– Outputs / inputs | 50XXX – XXXXX * * * * * * * * |
| Mounting kit for transmitter Promag 50/53 | Mounting kit for wall-mounted housing (remote version). Suitable for:<br>– Wall mounting<br>– Post mounting<br>– Installation in control panel<br><br>Mounting set for aluminium housings. Suitable for pipe mounting (3/4"...32") | DK5WM – * |
| Cable for remote version | Coil and signal cables, various lengths. Reinforced cable on request. | DK5CA – * * |
| Ground cable for Promag W, P | A set consists of two ground cables. | DK5GC – * * * |
| Ground disk for Promag W, P | Ground disk for potential equalisation | DK5GD – * * * |
| Mounting kit for Promag H | Mounting kit for Promag H, comprising:<br>– 2 process connections (see Page 137 ff.)<br>– Threaded fasteners<br>– Seals | DKH * * – * * * |
| Adapter connection for Promag A, H | Adapter connections for installing Promag 50 H instead of Promag 30/33 A or Promag 30/33 H DN 25. | DK5HA – * * * * * |
| Ground rings for Promag H | If the process connections are made of PVC or PVDF, ground rings are necessary to ensure that potential is matched.<br><br>Set of ground rings, comprising:<br>– 2 ground rings | DK5HR – * * * |
| Set of seals for Promag H | For regular replacement of the seals of the Promag H sensor. | DK5HS – * * * |
| Wall-mounting kit for Promag H | Wall-mounting kit for the Promag H sensor | DK5HM – * * |
| Welding jig for Promag H | Weld nipple as process connection: welding jig for installation in pipe. | DK5HW – * * * |

| Accessory | Description | Order code |
|---|---|---|
| HART Communicator DXR 375 hand-held terminal | Hand-held terminal for remote parameterisation and for fetching measured values via the current output HART (4...20 mA).<br><br>Contact your E+H representative for more information. | DXR375 – * * * * * |
| Applicator | Software for selecting and configuring flowmeters.<br>Applicator 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. | DKA80 – * |
| FieldTool | Configuration and service software for flowmeters in the field:<br>– Commissioning, maintenance analysis<br>– Configuring flowmeters<br>– Service functions<br>– Visualisation of process data<br>– Trouble-shooting<br>– Controlling the “FieldCheck” tester/ simulator<br><br>Contact your E+H representative for more information. | DXS10 – * * * * * |
| FieldCheck | Tester/simulator for testing flowmeters in the field. When used in conjunction with the “FieldTool” 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 checklist 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. | 1. Check the power supply → terminals 1, 2<br>2. Check the power line fuse → Page 101<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<br>3. Measuring electronics defective → order spare parts → Page 96 |
| No display visible, but output signals are present. | 1. Check whether the ribbon-cable connector of the display module is correctly plugged into the amplifier board → Page 98, 100<br>2. Display module defective → order spare parts → Page 96<br>3. Measuring electronics defective → order spare parts → Page 96 |
| Display texts are in a foreign language. | Switch off power supply. Press and hold down both the ± buttons and switch on the measuring device. The display text will appear in English (default) and is displayed at maximum contrast. |
| Measured value indicated, but no signal at the current or pulse output | Measuring electronics defective → order spare parts → Page 96 |

▼

| **Error messages on display** | |
|---|---|
| Errors which occur during commissioning or measuring operation are displayed immediately.<br>Error messages consist of a variety of icons: the meanings of these icons are as follows (example):<br><br>– Error type: **S** = system error, **P** = process error<br>– Error message type: ϟ = fault message, **!** = notice message<br>– **EMPTY PIPE** = Type of error, e.g. measuring tube is only partly filled or completely empty<br>– **03:00:05** = duration of error occurrence (in hours, minutes and seconds)<br>– **# 401** = error number<br><br>Caution!<br>• See the information on Page 64!<br>• The measuring system interprets simulations and positive zero return as system errors, but displays them as notice message only. | |
| Error number:<br>No. 001 – 399<br>No. 501 – 699 | System error (device error) has occurred → Page 88 |
| Error number:<br>No. 401 – 499 | Process error (application error) has occurred → Page 92 |

▼

| **Other error (without error message)** | |
|---|---|
| Some other error has occurred. | Diagnosis and rectification → Page 93 |

## 9.2 System error messages

Serious system errors are **always** recognised by the instrument as “Fault message”, and are shown as a lightning flash (ϟ) on the display. Fault messages immediately affect the inputs and outputs. Simulations and positive zero return, on the other hand, are classed and displayed as notice 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 8 must be carried out before you return a flowmeter to Endress+Hauser.
Always enclose a duly completed “Declaration of contamination” form. You will find a preprinted blank of the this form at the back of this manual.

Note!
The listed error message types below correspond to the factory setting.
Also observe the information on Page 64 and 94.

| Type | Error message / No. | Cause | Remedy / spare part |
|---|---|---|---|
| S = System error<br>ϟ = Fault message (with an effect on the outputs)<br>! = Notice message (without an effect on the outputs) | | | |
| **No. # 0xx → Hardware error** | | | |
| S<br>ϟ | CRITICAL FAILURE<br>**# 001** | Serious device error | Replace the amplifier board.<br>Spare parts → Page 96 |
| S<br>ϟ | AMP HW EEPROM<br>**# 011** | Amplifier:<br>Defective EEPROM | Replace the amplifier board.<br>Spare parts → Page 96 |
| S<br>ϟ | AMP SW EEPROM<br>**# 012** | Amplifier:<br>Error accessing EEPROM data | The EEPROM data blocks in which an error has occurred are displayed in the “TROUBLE-SHOOTING” function.<br>Press Enter to acknowledge the errors in question; default values are automatically inserted instead of the errored parameter values.<br><br>Note!<br>The measuring device must be restarted after fault elimination. |
| S<br>ϟ | SENSOR HW DAT<br>**# 031** | Sensor DAT:<br>1. S-DAT is defective.<br>2. S-DAT is not plugged into the amplifier board or is missing. | 1. Replace the S-DAT.<br>Spare parts → Page 96<br>Check the spare part set number to ensure that the new, replacement DAT is compatible with the measuring electronics.<br>2. Plug the S-DAT into the amplifier board → Page 98, 100 |

| Type | Error message / No. | Cause | Remedy / spare part |
|---|---|---|---|
| S ϟ | SENSOR SW DAT **# 032** | Sensor: Error accessing the calibration values stored in the S-DAT. | 1. Check whether the S-DAT is correctly plugged into the amplifier board → Page 98, 100<br>2. Replace the S-DAT if it is defective. Spare parts → Page 96. Before replacing the DAT, check that the new, replacement DAT is compatible with the measuring electronics. Check the:<br>– Spare part set number<br>– Hardware revision code<br>3. Replace measuring electronics boards if necessary. Spare parts → Page 96 |
| S ϟ | A / C COMPATIB. **# 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. Check the:<br>– Spare part set number<br>– Hardware revision code |
| **No. # 1xx → Software error** | | | |
| S ϟ | GAIN ERROR AMP **# 101** | Gain deviation compared to reference gain is greater than 2%. | Replace amplifier board. Spare parts → Page 96 |
| S ϟ | CHECKSUM TOTAL **# 111** | Totalizer checksum error | 1. Restart the measuring device<br>2. Replace the amplifier board if necessary. Spare parts → Page 96 |
| S **!** | A / C COMPATIB. **# 121** | Due to different software versions, I/O board and amplifier board are only partially compatible (possibly restricted functionality).<br><br>✎ Note!<br>– The indication on the display as notice message appears only for 30 seconds (with listing in "Previous system condition" function).<br>– This condition can occur if only one electronics board has been exchanged; the extended software functionality is not available. The previously existing software functionality is still working and the measurement possible. | Module with lower software version has either to be actualizied by FieldTool with the required software version or the module has to be replaced.<br><br>Spare parts → Page 96 |
| **No. # 2xx → Error in DAT / no communication** | | | |
| S ϟ | COMMUNIC. AMP. **# 251** | Internal communication error on the amplifier board. | Replace amplifier board. Spare parts → Page 96 |
| S ϟ | COMMUNICATION I/O **# 261** | No data reception between amplifier and I/O board or faulty internal data transfer. | Check the BUS contacts |

| Type | Error message / No. | Cause | Remedy / spare part |
|---|---|---|---|
| **No. # 3xx → System limits exceeded** | | | |
| S<br>ϟ | TOL. COIL CURR.<br>**# 321** | Sensor:<br>Coil current is out of tolerance. | 1. Remote version:<br>Switch off the power supply before connecting or disconnecting the cable of the coil (terminals 41/42).<br>2. Remote version:<br>Switch off power supply and check wiring of terminals 41/42 → Page 47 ff.<br>3. Switch off the power supply and check the connectors of the coil cable → Page 98, 100<br>4. Replace measuring electronics boards if necessary.<br>Spare parts → Page 96 |
| S<br>**!** | STACK CUR OUT n<br>**# 339…342** | The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds. | 1. Change the upper or lower limit setting, as applicable.<br>2. Increase or reduce flow, as applicable.<br><br>Recommendations in the event of fault category = FAULT MESSAGE (ϟ):<br>– Configure the fault response of the output to "ACTUAL VALUE" (see Page 94), so that the temporary buffer can be cleared.<br>– Clear the temporary buffer by the measures described under Item 1. |
| S<br>**!** | STACK FREQ. OUT n<br>**# 343…346** | | |
| S<br>**!** | STACK PULSE OUT n<br>**# 347…350** | The temporarily buffered flow portions (measuring mode for pulsating flow) could not be cleared or output within 60 seconds. | 1. Increase the setting for pulse weighting<br>2. Increase the max. pulse frequency, if the totalizer can handle a higher number of pulses.<br>3. Reduce flow<br><br>Recommendations in the event of fault category = FAULT MESSAGE (ϟ):<br>– Configure the fault response of the output to "ACTUAL VALUE" (see Page 94), so that the temporary buffer can be cleared.<br>– Clear the temporary buffer by the measures described under Item 1. |
| S<br>**!** | CURRENT RANGE n<br>**# 351…354** | Current output:<br>Flow is out of range. | 1. Change the upper or lower limit setting, as applicable.<br>2. Increase or reduce flow, as applicable. |
| S<br>**!** | FREQ. RANGE n<br>**# 355…358** | Frequency output:<br>Flow is out of range. | 1. Change the upper or lower limit setting, as applicable.<br>2. Increase or reduce flow, as applicable. |

| Type | Error message / No. | Cause | Remedy / spare part |
|---|---|---|---|
| S<br>**!** | PULSE RANGE n<br>**# 359…362** | Pulse output:<br>Pulse output frequency is out of range. | 1. Increase the setting for pulse weighting<br>2. When selecting the pulse width, choose a value that can still be processed by a connected counter (e.g. mechanical counter, PLC etc.).<br><br>*Determine the pulse width:*<br>– Variant 1: Enter the minimum duration that a pulse must be present at the connected counter to ensure its registration.<br>– Variant 2: Enter the maximum (pulse) frequency as the half "reciprocal value" that a pulse must be present at the connected counter to ensure its registration.<br><br>Example:<br>The maximum input frequency of the connected counter is 10 Hz. The pulse width to be entered is:<br><br>$\frac{1}{2 \cdot 10\ \text{Hz}} = 50\ \text{ms}$<br><br>3. Reduce flow. |
| **No. # 5xx → Application error** | | | |
| S<br>**!** | SW.-UPDATE ACT.<br>**# 501** | New amplifier or communication (I/O module) software version is loaded. Currently no other functions are possible. | Wait until the procedure is finished. The device will restart automatically. |
| S<br>**!** | UP-/DOWNLOAD ACT<br>**# 502** | Up- or downloading the device data via configuration program. Currently no other functions are possible. | Wait until the procedure is finished. |
| **No. # 6xx → Simulation mode active** | | | |
| S<br>**!** | POS. ZERO-RETURN<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. n<br>**# 611…614** | Simulation current output active | Switch off simulation |
| S<br>**!** | SIM. FREQ. OUT. n<br>**# 621…624** | Simulation frequency output active | Switch off simulation |
| S<br>**!** | SIM. PULSE n<br>**# 631…634** | Simulation pulse output active | Switch off simulation |
| S<br>**!** | SIM. STAT. OUT n<br>**# 641…644** | Simulation status output active | Switch off simulation |
| S<br>**!** | SIM. STATUS IN<br>**# 671…674** | Simulation status input active | Switch off simulation |

| Type | Error message / No. | Cause | Remedy / spare part |
|---|---|---|---|
| S<br>**!** | SIM. FAILSAFE<br>**# 691** | Simulation of response to error (outputs) active | Switch off simulation |
| S<br>**!** | SIM. VOL. FLOW<br>**# 692** | Simulation of volume flow active | Switch off simulation |
| S<br>**!** | DEV. TEST ACT.<br>**# 698** | The measuring device is being checked on site via the test and simulation device. | – |

## 9.3 Process error messages

Process errors can be defined as either “Fault” or “Notice” messages and can thereby be weighted differently. Determination of this is done via the function matrix (see the “Description of Device Functions” Manual).

Note!
The error types listed in the following correspond to the factory settings.
Also observe the information on Page 64 ff. and 94.

| Type | Error message / No. | Cause | Remedy |
|---|---|---|---|
| P = Process error<br>ϟ = Fault message (with an effect on the outputs)<br>! = Notice message (without an effect on the outputs) | | | |
| P<br>ϟ | EMPTY PIPE<br>**# 401** | Measuring tube partially filled or empty | 1. Check the process conditions of the plant<br>2. Fill the measuring tube |
| P<br>**!** | ADJ. NOT OK<br>**# 461** | EPD/OED calibration not possible because the fluid's conductivity is either too low or too high. | The EPD/OED function cannot be used with fluids of this nature. |
| P<br>ϟ | FULL = EMPTY<br>**# 463** | The EPD/OED calibration values for empty pipe and full pipe are identical, therefore incorrect. | Repeat calibration, making sure procedure is correct → Page 81 |

## 9.4 Process errors without messages

| Symptoms | Rectification |
|---|---|
| Remark:<br>You may have to change or correct certain settings in functions in the function matrix in order to rectify the fault. The functions outlined below, such as DISPLAY DAMPING, for example, are described in detail in the "Description of Device Functions" manual. | |
| Flow values are negative, even though the fluid is flowing forwards through the pipe. | 1. Remote version:<br>– Switch off the power supply and check the wiring → Page 47 ff.<br>– If necessary, reverse the connections at terminals 41 and 42<br>2. Change the setting in the "INSTALLATION DIRECTION SENSOR" function accordingly |
| Measured-value reading fluctuates even though flow is steady. | 1. Check grounding and potential equalization → Page 56 ff.<br>2. Check the fluid for presence of gas bubbles.<br>3. In the "TIME CONSTANT" function (current output) → increase the value<br>4. In the "DISPLAY DAMPING" function → increase the value |
| Measured-value reading shown on display, even though the fluid is at a standstill and the measuring tube is full. | 1. Check grounding and potential equalization → Page 56 ff.<br>2. Check the fluid for presence of gas bubbles.<br>3. Activate the "LOW FLOW CUTOFF" function, i.e. enter or increase the value for the switching point. |
| Measured-value reading on display, even though measuring tube is empty. | 1. Perform empty-pipe/full-pipe adjustment and then switch on Empty Pipe detection → Page 81<br>2. Remote version: Check the terminals of the EPD cable → Page 47 ff.<br>3. Fill the measuring tube. |
| The current output signal is always 4 mA, irrespective of the flow signal at any given time. | 1. Select the "BUS ADDRESS" function and change the setting to "0".<br>2. Value for creepage too high. Reduce corresponding value in the "Low flow cutoff" functions (ON-/OFF-VALUE). |
| The fault cannot be rectified or some other fault not described above has arisen.<br><br>In these instances, please contact your E+H service organization. | The following options are available for tackling problems of this nature:<br><br>**Request the services of an E+H service technician**<br>If you contact our service organization to have a service technician sent out, please be ready to quote the following information:<br>– Brief description of the fault<br>– Nameplate specifications (Page 9 ff.): order code, serial number<br><br>**Returning devices to E+H**<br>The procedures on Page 8 must be carried out before you return a flowmeter requiring repair or calibration to Endress+Hauser.<br>Always enclose a duly completed "Declaration of Conformity" form with the flowmeter. You will find a preprinted form at the back of this manual.<br><br>**Replace transmitter electronics**<br>Components in the measuring electronics defective → order spare parts → Page 96 |

## 9.5 Response of outputs to errors

Note!
The failsafe mode of totalizers, current, pulse and frequency outputs can be customized 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 current | Positive zero return is activated |
| Caution!<br>System or process errors defined as “Notice messages” have no effect whatsoever on the inputs and outputs. See the information on Page 64 ff. | | |
| Current output | *MINIMUM CURRENT*<br>The current output will be set to the lower value of the signal on alarm level depending on the setting selected in the CURRENT SPAN (see the “Description of Device Functions” manual).<br><br>*MAXIMUM CURRENT*<br>The current output will be set to the higher value of the signal on alarm level depending on the setting selected in the CURRENT SPAN (see the “Description of Device Functions” manual).<br><br>*HOLD VALUE*<br>Measured value display on the basis of the last saved value preceding occurrence of the fault.<br><br>*ACTUAL VALUE*<br>Measured value display on the basis of the current flow measurement. The fault is ignored. | Output signal corresponds to “zero flow” |
| Pulse output | *FALLBACK VALUE*<br>Signal output → no pulses<br><br>*HOLD VALUE*<br>Last valid value (preceding occurrence of the fault) is output.<br><br>*ACTUAL VALUE*<br>Fault is ignored, i.e. normal measured-value output on the basis of ongoing flow measurement. | Output signal corresponds to “zero flow” |

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

## 9.6 Spare parts

Chap. 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 (Page 9 ff.).

Spare parts are shipped as sets comprising the following parts:
- Spare part
- Additional parts, small items (threaded fasteners, etc.)
- Mounting instructions
- Packaging

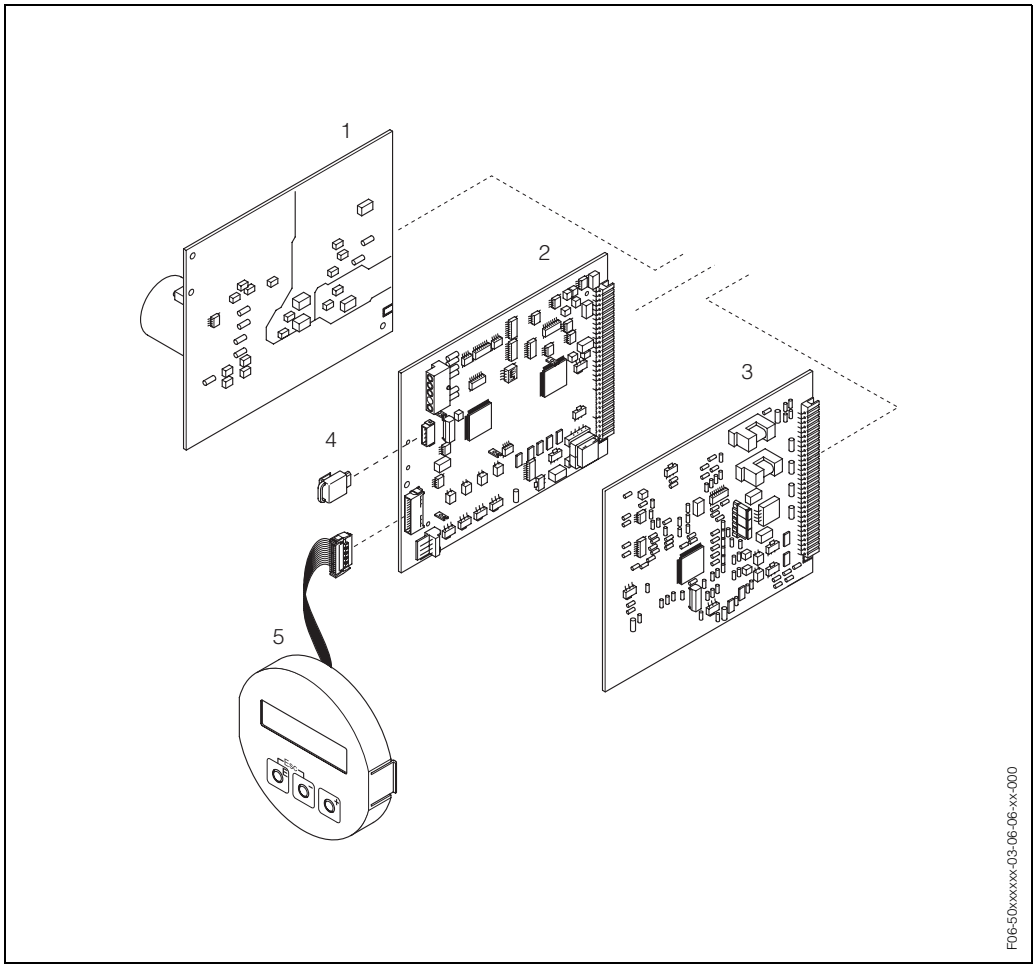



*Fig. 47: Spare parts for Promag 50 transmitter (field and wall-mounted housings)*

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

## 9.7 Removing and installing printed circuit boards

**Field housing: removing and installing printed circuit boards (Fig. 48)**

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 purpose-built for electrostatically sensitive devices!
- If you cannot guarantee that the dielectric strength of the device is maintained in the following steps, then an appropriate inspection must be carried out in accordance with the manufacturer's specifications.

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 (2) from the electronics compartment.
4. Remove power supply board and I/O board (4, 6):
   Insert a suitable tool into the holes (3) provided for the purpose and pull the board clear of its holder.
5. Remove amplifier board (5):
   – Disconnect the plug of the electrode signal cable (5.1) including S-DAT (5.3) from the board.
   – Loosen the plug locking of the coil current cable (5.2) and gently disconnect the plug from the board, i.e. without moving it to and fro.
   – 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.

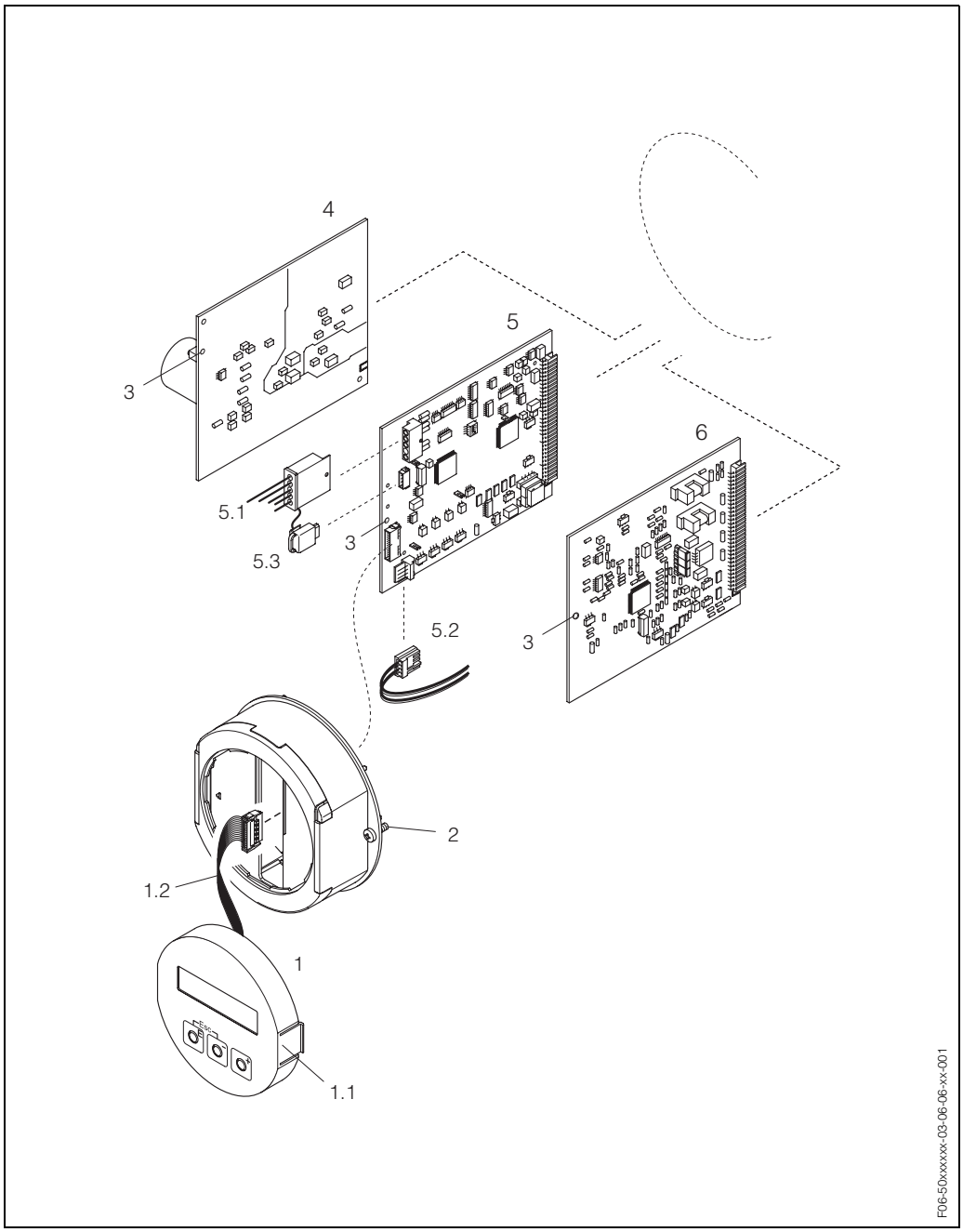



*Fig. 48: Field housing: removing and installing printed circuit boards*

*1 Local display*
*1.1 Latch*
*1.2 Ribbon cable (display module)*
*2 Screws of electronics compartment cover*
*3 Aperture for tool, removal/installation*
*4 Power supply board*
*5 Amplifier board*
*5.1 Electrode signal cable (sensor)*
*5.2 Coil current cable (sensor)*
*5.3 S-DAT (sensor data memory)*
*6 I/O board*

**Wall-mounted housing: removing and installing printed circuit boards (Fig. 49)**

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, purpose-built for electrostatically sensitive devices.
- If you cannot guarantee that the dielectric strength of the device is maintained in the following steps, then an appropriate inspection must be carried out in accordance with the manufacturer's specifications.

1. Remove the screws and open the hinged cover (1) of the housing.
2. Remove screws of the electronics module (2). Then push up electronics module and pull it as far as possible out of the wall-mounted housing.
3. Disconnect the following cable plugs from amplifier board (7):
   – Electrode signal cable plug (7.1) including S-DAT (7.3)
   – Plug of coil current cable (7.2). To do so, loosen the plug locking of the coil current cable and gently disconnect the plug from the board, i.e. without moving it to and fro.
   – Ribbon cable plug (3) of the display module
4. Remove the screws and remove the cover (4) from the electronics compartment.
5. Remove the boards (6, 7, 8):
   Insert a suitable tool into the hole (5) 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.

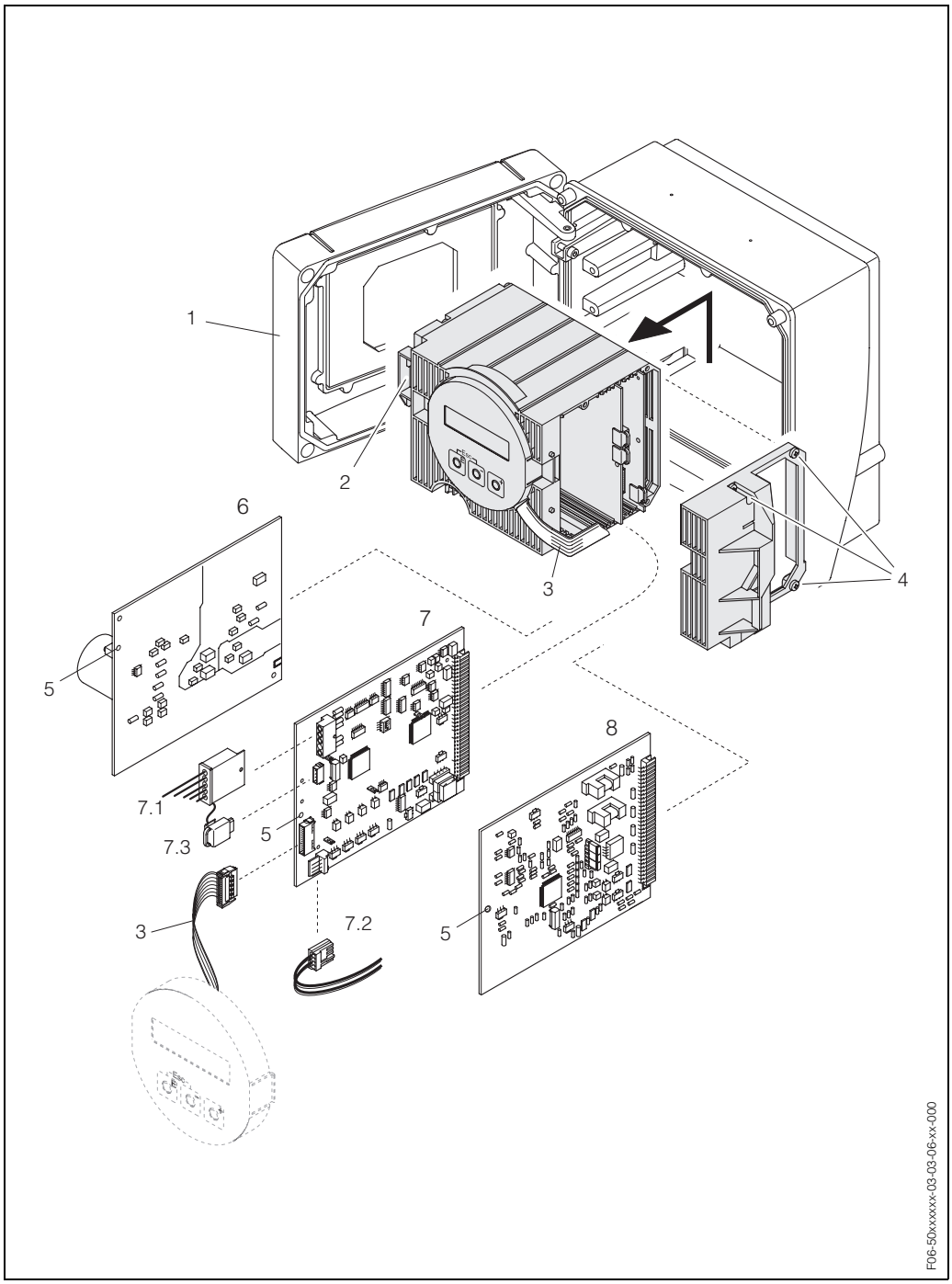



*Fig. 49: Wall-mounted housing: removing and installing printed circuit boards*

*1 Housing cover*
*2 Electronics module*
*3 Ribbon cable (display module)*
*4 Cover of electronics compartment (3 screws)*
*5 Aperture for tool, removal/installation*
*6 Power supply board*
*7 Amplifier board*
*7.1 Electrode signal cable (sensor)*
*7.2 Coil current cable (sensor)*
*7.3 S-DAT (sensor data memory)*
*8 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 supply board (Fig. 50).
The procedure for replacing the fuse is as follows:

1. Switch off power supply.
2. Remove the power supply board → Page 97, 99
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.

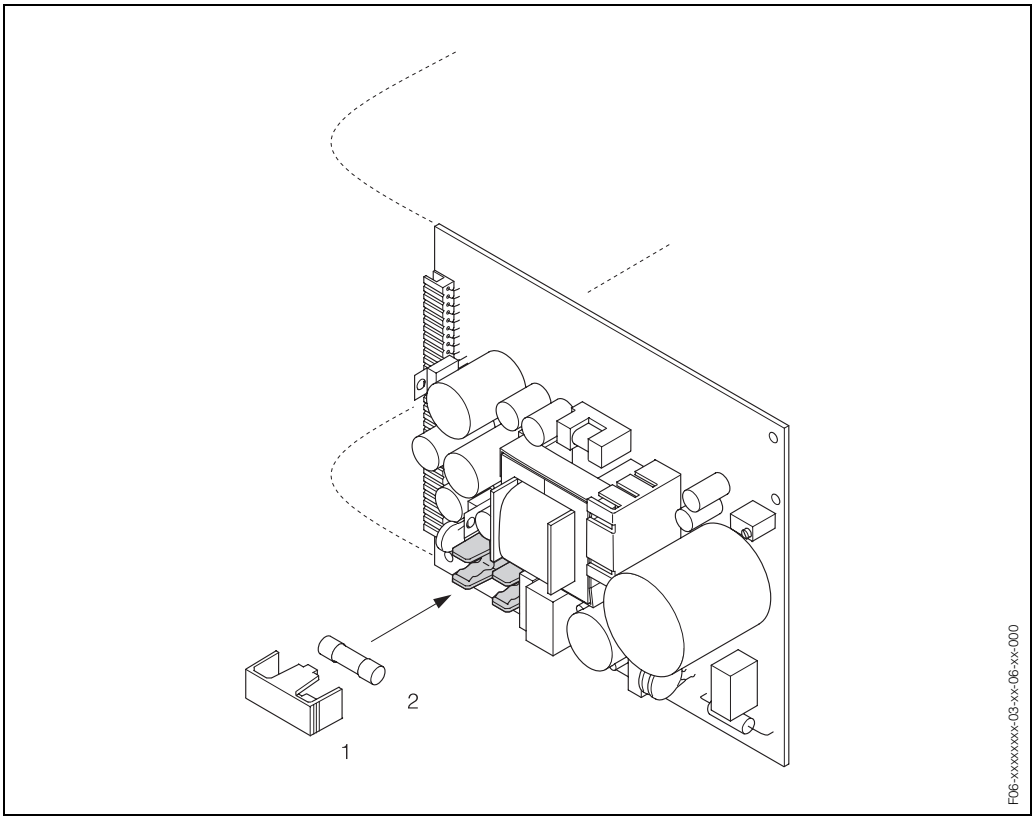



*Fig. 50: Replacing the device fuse on the power supply board*

*1 Protective cap*
*2 Device fuse*

## 9.9 Replacing exchangeable measuring electrodes

The Promag W sensor (DN 350...2000) is available with exchangeable measuring electrodes as an option. This design permits the measuring electrodes to be replaced or cleaned under process conditions (see Page 103).

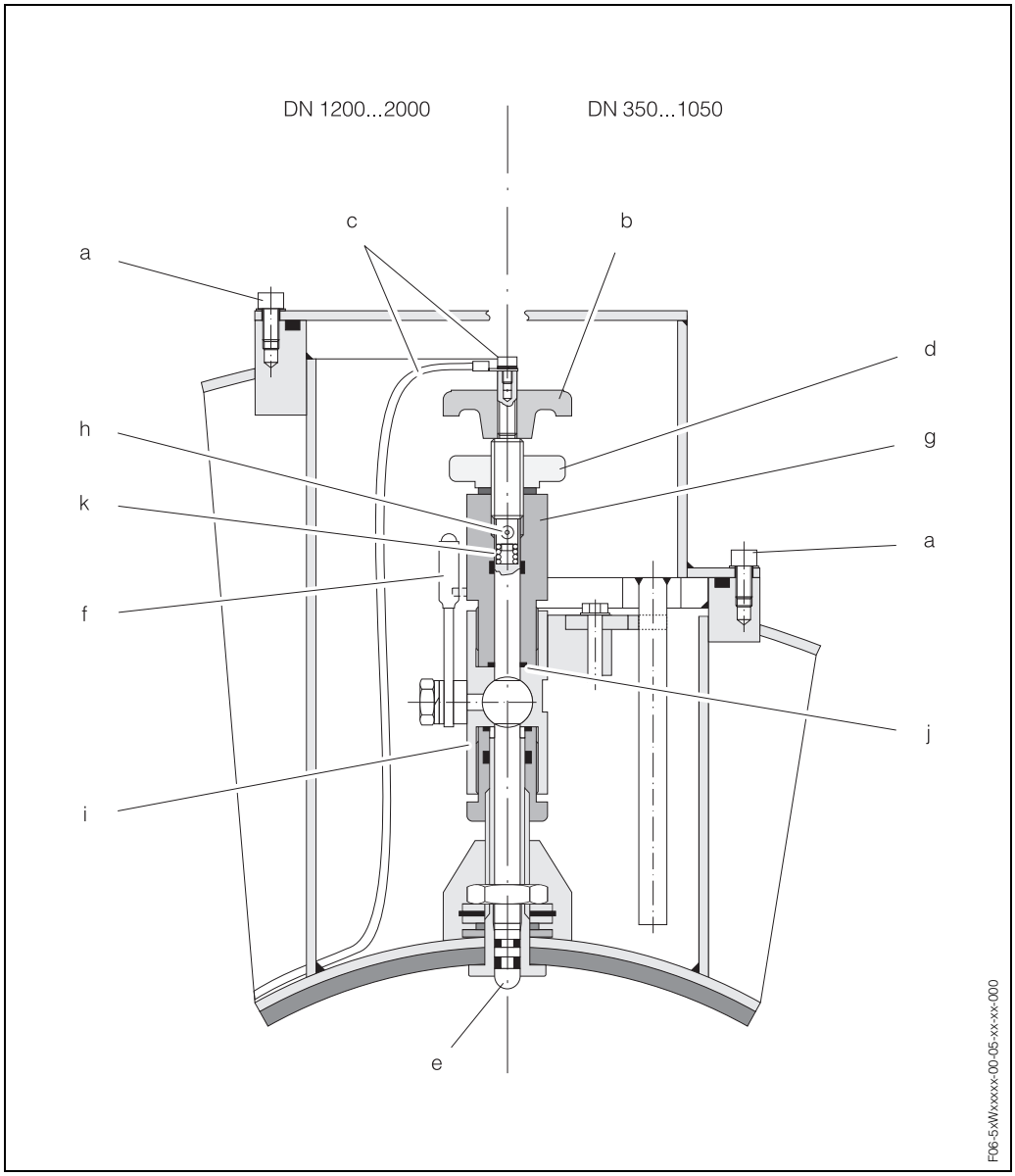



*Fig. 51: Apparatus for replacing exchangeable measuring electrodes (Replacing → Page 103)*

*a Allen screw*
*b Handle*
*c Electrode cable*
*d Knurled nut (locknut)*
*e Measuring electrode*
*f Stop cock*
*g Retaining cylinder*
*h Locking pin (for handle)*
*i Ball-valve housing*
*j Seal (retaining cylinder)*
*k Coil spring*

| Removing the electrode | | Installing the electrode | |
|---|---|---|---|
| 1 | Loosen Allen screw (a) and remove the cover. | 1 | Insert new electrode (e) into retaining cylinder (g) from below. Make sure that the seals at the tip of the electrode are clean. |
| 2 | Remove electrode cable (c) secured to handle (b). | 2 | Mount handle (b) on the electrode and insert locking pin (h) to secure it in position.<br><br>☞ Caution!<br>Make sure that coil spring (k) is inserted. This is essential to ensure correct electrical contact and correct measuring signals. |
| 2 | Loosen knurled nut (d) by hand. This knurled nut acts as a locknut. | 2 | Pull the electrode back until the tip of the electrode no longer protrudes from retaining cylinder (g). |
| 3 | Remove electrode (e) by turning handle (b). The electrode can now be pulled out of retaining cylinder (g) as far as a defined stop.<br><br>⚠ Warning!<br>Risk of injury. Under process conditions (pressure in the piping system) the electrode can recoil suddenly against its stop. Apply counter-pressure while releasing the electrode. | 3 | Screw the retaining cylinder (g) onto ball-valve housing (i) and tighten it by hand. Seal (j) on the cylinder must be correctly seated and clean.<br><br>✎ Note!<br>Make sure that the rubber hoses on retaining cylinder (g) and stop cock (f) are of the same color (red or blue). |
| 4 | Close stop cock (f) after pulling out the electrode as far as it will go.<br><br>⚠ Warning!<br>Do not subsequently open the stop cock, in order to prevent fluid escaping. | 4 | Open stop cock (f) and turn handle (b) to screw the electrode all the way into the retaining cylinder. |
| 5 | Remove the electrode complete with retaining cylinder (g). | 5 | Screw knurled nut (d) onto the retaining cylinder. This firmly locates the electrode in position. |
| 6 | Remove handle (b) from electrode (e) by pressing out locking pin (h). Take care not to lose coil spring (k). | 6 | Use the Allen screw to secure electrode cable (c) to handle (b).<br><br>☞ Caution!<br>Make sure that the machine screw securing the electrode cable is firmly tightened. This is essential to ensure correct electrical contact and correct measuring signals. |
| 7 | Remove the old electrode and insert the new electrode. Replacement electrodes can be ordered separately from E+H. | 7 | Reinstall the cover and tighten (a) Allen screw. |

## 9.10 Software history

| Software version / date | Changes to software | Changes to documentation |
|---|---|---|
| **Amplifier:** | | |
| V 1.00.00 / 04.2000 | Original software.<br><br>Compatible with:<br>– FieldTool<br>– Commuwin II (version 2.05.03 and higher)<br>– HART Communicator DXR 275 (from OS 4.6) with Rev. 1, DD 1. | – |
| V 1.01.00 / 08.2000 | Software expansion<br>(functional adaptations) | none |
| V 1.01.01 / 09.2000 | Software adaptation | none |
| V 1.02.00 / 06.2001 | Software expansion:<br>New functionalities | • General instrument functions<br>• “OED” software function |
| V 1.03.00 / 03.2002 | Software expansion:<br>Suitability for custody transfer measurement Promag 50/51 | none |
| V 1.04.00 / 08.2002 | Software adaptation /<br>software expansion | Special documentation:<br>• Current span NAMUR NE 43<br>• EPD (new mode)<br>• Failsafe mode function<br>• Acknowledge fault function<br>• Trouble-shooting function<br>• System and process error messages<br>• Response of status output |
| V 1.06.00 / 10.2003 | Software expansion:<br>New / revised functionalities | • Device functions in general<br>• Language groups<br>• Second Totalizer<br>• Adjustable backlight (display)<br>• Operation hours counter<br>• Access code for counter<br>• Reset function (fault history)<br>• Up-/download with FieldTool |
| **Communication module (Inputs/Outputs)** | | |
| V 1.00.00 / 04.2000 | Original software | – |
| V 1.01.00 / 09.2000 | Software expansion<br>(functional adaptations) | none |
| V 1.02.00 / 06.2001 | Software expansion:<br>New functionalities | “Pulse width” software function |

| | | |
|---|---|---|
| V 1.02.01 / 08.2003 | Software expansion:<br>New / revised functionalities | Special documentation:<br>• Current span NAMUR NE 43<br>• Failsafe mode function<br>• Trouble-shooting function<br>• System and process error messages<br>• Response of status output |
| V 1.03.00 / 10.2003 | Software expansion:<br>New / revised functionalities | • Device functions in general<br>• Simulation function for pulse output<br>• Flow direction pulse output selectable |

✎ Note!
Usually, an upload or download between the different software versions is only possible with a special service software.

# 10 Technical data

## 10.1 Technical data at a glance

### 10.1.1 Application

| | |
|---|---|
| Application | • Measuring the flow rate of fluids in closed piping systems.<br>• A minimum conductivity of ≥ 5 µS/cm is required for measuring; the minimum conductivity required in the case of demineralised water is ≥ 20 µS/cm.<br>• Applications in measuring, control and regulation technology<br><br>Liner specific applications:<br>• Promag W (DN 25...2000):<br>– Polyurethane lining for applications with cold water and for slightly abrasive fluids.<br>– Hard rubber lining for all applications with water (especially for trinking water)<br>• Promag P (DN 15...600):<br>– PTFE lining for standard applications in chemical and process industries.<br>– PFA lining for all applications in chemical and process industries; especially for high process temperatures and applications with temperature shocks.<br>• Promag H (DN 2...100):<br>PFA lining for all applications in chemical, process and food industries; especially for high process temperatures, for applications with temperature shocks and for applications with CIP or SIP cleaning processes. |

### 10.1.2 Function and system design

| | |
|---|---|
| Measuring principle | Electromagnetic flow measurement on the basis of Faraday's Law. |
| Measuring system | The measuring system consists of a transmitter and a sensor.<br>Two versions are available:<br>• Compact version: transmitter and sensor form a single mechanical unit.<br>• Remote version: transmitter and sensor are installed separately.<br><br>*Transmitter:*<br>• Promag 50<br><br>*Sensor:*<br>• Promag W (DN 25...2000)<br>• Promag P (DN 15...600)<br>• Promag H (DN 2...100) |

### 10.1.3 Input

| | |
|---|---|
| Measured variable | Flow rate (proportional to induced voltage) |
| Measuring range | Typically v = 0.01…10 m/s with the specified measuring accuracy |
| Operable flow range | Over 1000 : 1 |
| Input signals | Status input (auxiliary input):<br>U = 3…30 V DC, $R_i$ = 5 kΩ, galvanically isolated<br>Configurable for: totalizer reset, positive zero return |

### 10.1.4 Output

| | |
|---|---|
| Output signal | Current output:<br>active/passive selectable, galvanically isolated, time constant selectable (0.01…100 s), full scale value selectable, temperature coefficient: typically 0.005% o.f.s./ °C; resolution: 0.5 µA<br>• active: 0/4…20 mA, $R_L$ < 700 Ω (for HART: $R_L$ ≥ 250 Ω)<br>• passive: 4…20 mA, supply voltage $V_s$: 18...30 V DC, $R_i$ ≥ 150 Ω<br><br>Pulse / frequency output:<br>passive, open collector, 30 V DC, 250 mA, galvanically isolated<br>• Frequency output: full scale frequency 2…1000 Hz ($f_{max}$ = 1250 Hz), on/off ratio 1:1, pulse width max. 10 s<br>• Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.5…2000 ms) |
| Signal on alarm | • Current output → failsafe mode selectable (e.g. to NAMUR recommendation NE 43)<br>• Pulse/frequency output → failsafe mode selectable<br>• Status output → “non-conductive” by fault or power supply failure<br><br>Details → Page 94 |
| Load | see “output signal” |
| Switching output | Status output:<br>Open collector, max. 30 V DC / 250 mA, galvanically isolated<br>Configurable for: error messages, Empty Pipe Detection (EPD/OED), flow direction, limit values |
| Low flow cutoff | Switch points for low flow cutoff are selectable |
| Galvanic isolation | All circuits for inputs, outputs, and power supply are galvanically isolated from each other. |

### 10.1.5 Power supply

| | |
|---|---|
| Electrical connections | see Page 47 ff. |
| Cable entry | Power-supply and signal cables (inputs/outputs):<br>• Cable entry M20 x 1.5 (8…12 mm)<br>• Threads for cable entries, PG 13.5 (5…15 mm), 1/2" NPT, G 1/2"<br><br>Connecting cable for remote version:<br>• Cable entry M20 x 1.5 (8…12 mm)<br>• Threads for cable entries, PG 13.5 (5…15 mm), 1/2" NPT, G 1/2" |
| Cable specifications | see Page 51 |
| Supply voltage | 85…260 V AC, 45…65 Hz<br>20…55 V AC, 45…65 Hz<br>16…62 V DC |

Power consumption

AC: <15 VA (including sensor)
DC: <15 W (including sensor)

Switch-on current:
- max. 13.5 A (< 50 ms) at 24 V DC
- max. 3 A (< 5 ms) at 260 V AC

Power supply failure

Lasting min. 1 power cycle
- EEPROM saves measuring system data if power supply fails
- S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point, etc.)

Potential equalisation

see Page 56 ff.

### 10.1.6 Performance characteristics

Reference operating conditions

To DIN 19200 and VDI/VDE 2641:
- Fluid temperature: +28 °C ± 2 K
- Ambient temperature: +22 °C ± 2 K
- Warm-up time: 30 minutes

Installation:
- Inlet run >10 x DN
- Outlet run > 5 x DN
- Sensor and transmitter grounded.
- Sensor centered relative to the pipe.

Maximum measured error

Pulse output:
- ± 0.5% o.r. ± 1 mm/s (o.r. = of reading)
- Option: ± 0.2% o.r. ± 2 mm/s (o.r. = of reading)

Current output: plus typically ± 5 µA

Supply-voltage fluctuations have no effect within the specified range.

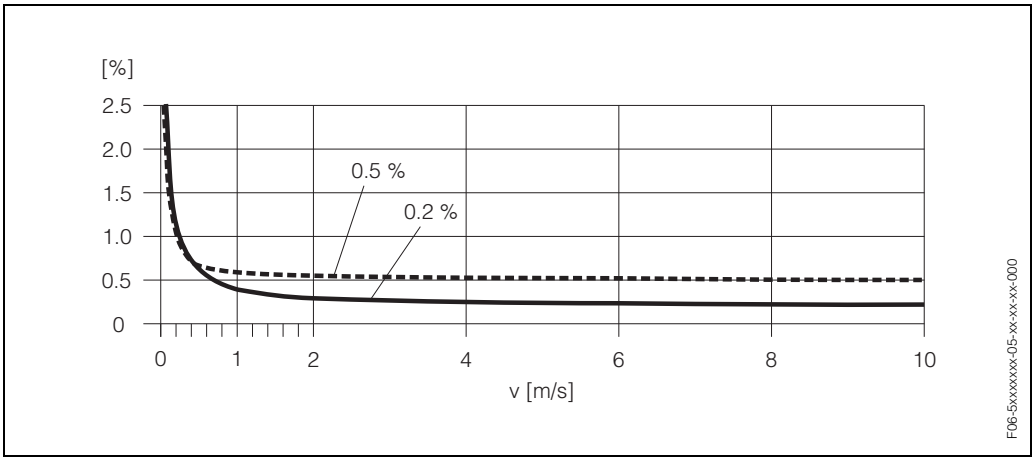



*Fig. 52: Max. measured error in % of reading*

Repeatability

max. ± 0.1% o.r. ± 0.5 mm/s (o.r. = of reading)

### 10.1.7 Operating conditions

| | |
|---|---|
| | **Installation** |
| Installation instructions | Any orientation (vertical, horizontal)<br>Restrictions and additional installation instructions → see Page 15 ff. |
| Inlet and outlet runs | Inlet run: typically ≥ 5 x DN<br>Outlet run: typically ≥ 2 x DN |
| Length of connecting cable | For the remote version the permissible cable length $L_{max}$ depends on the conductivity of the medium → Page 25.<br>A minimum conductivity of 20 µS/cm is required for measuring demineralized water. |
| | **Environment** |
| Ambient temperature | Standard: –20…+60 °C (sensor, transmitter)<br>Optional: –40...+60 °C (transmitter)<br><br>Note the following points:<br>• Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.<br>• If both fluid and ambient temperatures are high, install the transmitter at a remote location from the sensor (→ “Medium temperature range”). |
| Storage temperature | –10…+50 °C (preferably +20 °C) |
| Degree of protection | • Standard: IP 67 (NEMA 4X) for transmitter and sensor<br>• Optional: IP 68 (NEMA 6P) for remote version of Promag W and P sensor |
| Shock and vibration resistance | Acceleration up to 2 g by analogy with IEC 68-2-6<br>(high-temperature version: no data available) |
| CIP cleaning | Promag W: not possible<br>Promag P: possible (note max. temperature)<br>Promag H: possible (note max. temperature) |
| SIP cleaning | Promag W: not possible<br>Promag P: possible with PFA (note max. temperature)<br>Promag H: possible (note max. temperature) |
| Electromagnetic compatibility (EMC) | To EN 61326/A1 and NAMUR recommendation NE 21 and NE 43 |

## Process

Medium temperature range

The permissible fluid temperature depends on the lining of the measuring tube:

**Promag W**
0…+80 °C for hard rubber (DN 65…2000)
–20…+50 °C for polyurethane (DN 25…2000)

**Promag P**
–40…+130 °C for PTFE (DN 15…600), for restrictions → refer to diagrams
–20…+180 °C for PFA (DN 25…200), for restrictions → refer to diagrams

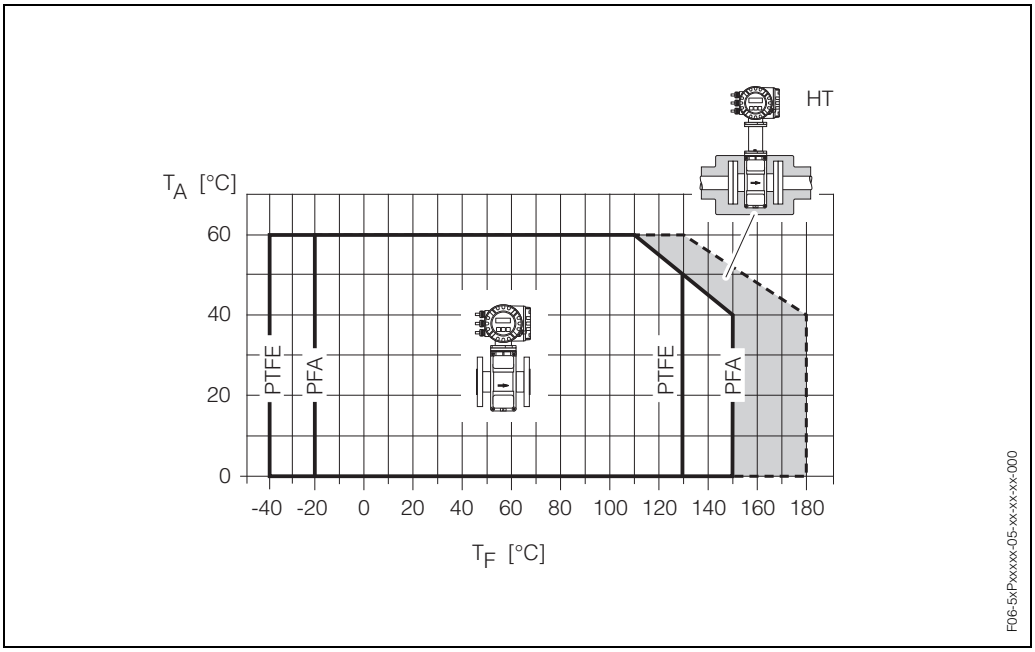



*Fig. 53: Compact version Promag P (with PFA or PTFE lining)*
*$T_A$ = ambient temperature, $T_F$ = fluid temperature, HT = high-temperature version, with insulation*

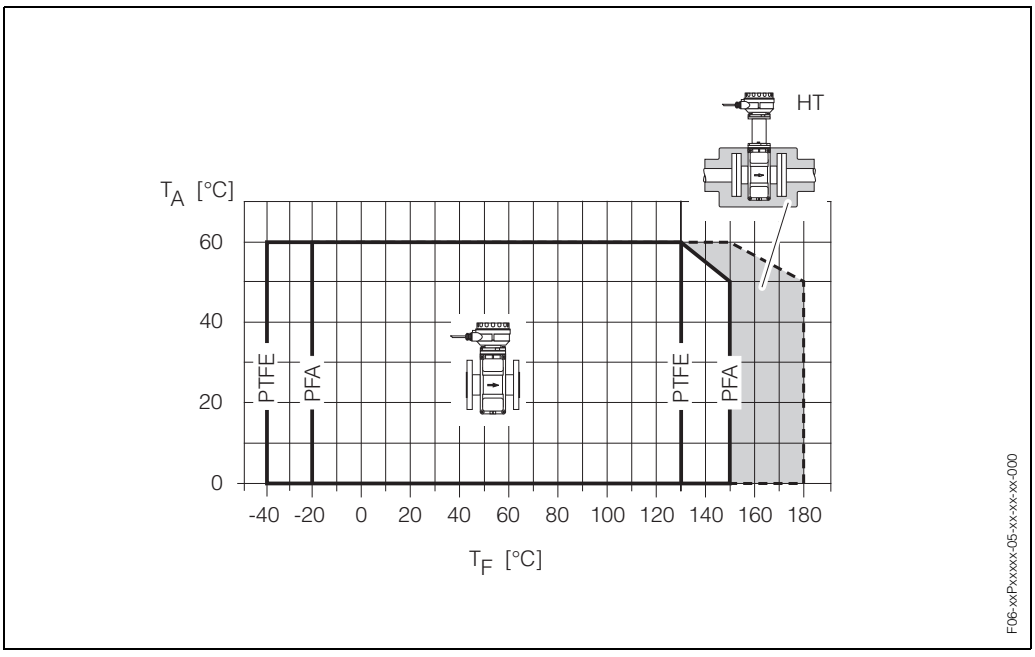



*Fig. 54: Remote version Promag P (with PFA or PTFE lining)*
*$T_A$ = ambient temperature, $T_F$ = fluid temperature, HT = high-temperature version, with insulation*

**Promag H**
Sensor:
- DN 2…25: –20…+150 °C
- DN 40…100: –20…+150 °C

Seal:
- EPDM: –20…+130 °C
- Silicone: –20…+150 °C
- Viton: –20…+150 °C
- Kalrez: –20…+150 °C

Conductivity

Minimum conductivity:
- ≥ 5 µS/cm for fluids generally
- ≥ 20 µS/cm for demineralised water

Note that in the case of the remote version, the requisite conductivity is also influenced by the length of the connecting cable → Page 25.

Limiting medium pressure range (nominal pressure)

Promag W
- EN 1092-1 (DIN 2501): PN 6 (DN 1200…2000), PN 10 (DN 200…2000), PN 16 (DN 65…2000), PN 25 (DN 200…1000), PN 40 (DN 25…150)
- ANSI B16.5: Class 150 (1…24"), Class 300 (1…6")
- AWWA: Class D (28…78")
- JIS B2238: 10K (DN 50…300), 20K (DN 25…300)

Promag P
- EN 1092-1 (DIN 2501): PN 10 (DN 200…600), PN 16 (DN 65…600), PN 25 (DN 200…600), PN 40 (DN 15…150)
- ANSI B16.5: Class 150 (1/2…24"), Class 300 (1/2…6")
- JIS B2238: 10K (DN 50…300), 20K (DN 15…300)

Promag H:
The permissible nominal pressure depends on the process connection and seal:
- 40 bar: flange, weld nipple (with O-ring seal)
- 16 bar: all other process connections

Pressure tightness (liner)

| Promag W Nominal diameter | | Measuring tube lining | Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] at various fluid temperatures | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | | 25 °C | 70 °C | 80° C | 100 °C | 130 °C | 150 °C | 180 °C |
| 25…2000 | 1…78" | Polyurethane | 0 | 0 | – | – | – | – | – |
| 65…2000 | 3…78" | Hard rubber | 0 | 0 | 0 | – | – | – | – |

| Promag P Nominal diameter | | Measuring tube lining | Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] at various fluid temperatures | | | | | |
|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | | 25 °C | 80 °C | 100 °C | 130 °C | 150 °C | 180 °C |
| 15 | 1/2" | PTFE | 0 | 0 | 0 | 100 | – | – |
| 25 | 1" | PTFE / PFA | 0 / 0 | 0 / 0 | 0 / 0 | 100 / 0 | – / 0 | – / 0 |
| 32 | – | PTFE / PFA | 0 / 0 | 0 / 0 | 0 / 0 | 100 / 0 | – / 0 | – / 0 |
| 40 | 1 1/2" | PTFE / PFA | 0 / 0 | 0 / 0 | 0 / 0 | 100 / 0 | – / 0 | – / 0 |
| 50 | 2" | PTFE / PFA | 0 / 0 | 0 / 0 | 0 / 0 | 100 / 0 | – / 0 | – / 0 |
| 65 | – | PTFE / PFA | 0 / 0 | * | 40 / 0 | 130 / 0 | – / 0 | – / 0 |
| 80 | 3" | PTFE / PFA | 0 / 0 | * | 40 / 0 | 130 / 0 | – / 0 | – / 0 |
| 100 | 4" | PTFE / PFA | 0 / 0 | * | 135 / 0 | 170 / 0 | – / 0 | – / 0 |
| 125 | – | PTFE / PFA | 135 / 0 | * | 240 / 0 | 385 / 0 | – / 0 | – / 0 |
| 150 | 6" | PTFE / PFA | 135 / 0 | * | 240 / 0 | 385 / 0 | – / 0 | – / 0 |
| 200 | 8" | PTFE / PFA | 200 / 0 | * | 290 / 0 | 410 / 0 | – / 0 | – / 0 |
| 250 | 10" | PTFE | 330 | * | 400 | 530 | – | – |
| 300 | 12" | PTFE | 400 | * | 500 | 630 | – | – |
| 350 | 14" | PTFE | 470 | * | 600 | 730 | – | – |
| 400 | 16" | PTFE | 540 | * | 670 | 800 | – | – |
| 450 | 18" | PTFE | Partial vacuum is impermissible | | | | | |
| 500 | 20" | PTFE | | | | | | |
| 600 | 24" | PTFE | | | | | | |

* No value can be quoted.

| Promag H Nominal diameter | | Measuring tube lining | Resistance of measuring tube lining to partial vacuum Limit values for abs. pressure [mbar] at various fluid temperatures | | | | | |
|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | | 25 °C | 80 °C | 100 °C | 130 °C | 150 °C | 180 °C |
| 2…100 | 1/12…4" | PFA | 0 | 0 | 0 | 0 | 0 | 0 |

Limiting flow

see Page 20

Pressure loss

- No pressure loss if the sensor is installed in a pipe of the same nominal diameter (Promag H: only DN 8 and larger).
- Pressure losses for configurations incorporating adapters according to (E) DIN EN 545 → Page 20

## 10.1.8 Mechanical construction

Design / dimensions see Page 122 ff.

Weight

**Weight data of Promag W in kg**

| Nominal diameter | | Compact version | | | | | | Remote versin (without cable) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Sensor | | | | Wall housing |
| [mm] | [inch] | EN (DIN) | | JIS | | ANSI/AWWA | | EN (DIN) | | JIS | | ANSI/AWWA | | |
| 25 | 1" | PN 40 | 7.3 | 10K | 7.3 | Class 150 | 7.3 | PN 40 | 5.3 | 10K | 5.3 | Class 150 | 5.3 | 6.0 |
| 32 | 1 1/4" | | 8.0 | | 7.3 | | – | | 6.0 | | 5.3 | | – | 6.0 |
| 40 | 1 1/2" | | 9.4 | | 8.3 | | 9.4 | | 7.4 | | 6.3 | | 7.4 | 6.0 |
| 50 | 2" | | 10.6 | | 9.3 | | 10.6 | | 8.6 | | 7.3 | | 8.6 | 6.0 |
| 65 | 2 1/2" | PN 16 | 12.0 | | 11.1 | | – | PN 16 | 10.0 | | 9.1 | | – | 6.0 |
| 80 | 3" | | 14.0 | | 12.5 | | 14.0 | | 12.0 | | 10.5 | | 12.0 | 6.0 |
| 100 | 4" | | 16.0 | | 14.7 | | 16.0 | | 14.0 | | 12.7 | | 14.0 | 6.0 |
| 125 | 5" | | 21.5 | | 21.0 | | – | | 19.5 | | 19.0 | | – | 6.0 |
| 150 | 6" | | 25.5 | | 24.5 | | 25.5 | | 23.5 | | 22.5 | | 23.5 | 6.0 |
| 200 | 8" | PN 10 | 45 | | 41.9 | | 45 | PN 10 | 43 | | 39.9 | | 43 | 6.0 |
| 250 | 10" | | 65 | | 69.4 | | 75 | | 63 | | 67.4 | | 73 | 6.0 |
| 300 | 12" | | 70 | | 72.3 | | 110 | | 68 | | 70.3 | | 108 | 6.0 |
| 350 | 14" | | 115 | | | | 175 | | 113 | | | | 173 | 6.0 |
| 400 | 16" | | 135 | | | | 205 | | 133 | | | | 203 | 6.0 |
| 450 | 18" | | 175 | | | | 255 | | 173 | | | | 253 | 6.0 |
| 500 | 20" | | 175 | | | | 285 | | 173 | | | | 283 | 6.0 |
| 600 | 24" | | 235 | | | | 405 | | 233 | | | | 403 | 6.0 |
| 700 | 28" | | 355 | | | Class D | 400 | | 353 | | | Class D | 398 | 6.0 |
| – | 30" | | – | | | | 460 | | – | | | | 458 | 6.0 |
| 800 | 32" | | 435 | | | | 550 | | 433 | | | | 548 | 6.0 |
| 900 | 36" | | 575 | | | | 800 | | 573 | | | | 798 | 6.0 |
| 1000 | 40" | | 700 | | | | 900 | | 698 | | | | 898 | 6.0 |
| – | 42" | PN 6 | – | | | | 1100 | PN 6 | – | | | | 1098 | 6.0 |
| 1200 | 48" | | 850 | | | | 1400 | | 848 | | | | 1398 | 6.0 |
| – | 54" | | – | | | | 2200 | | – | | | | 2198 | 6.0 |
| 1400 | – | | 1300 | | | | – | | 1298 | | | | – | 6.0 |
| – | 60" | | – | | | | 2700 | | – | | | | 2698 | 6.0 |
| 1600 | – | | 1700 | | | | – | | 1698 | | | | – | 6.0 |
| – | 66" | | – | | | | 3700 | | – | | | | 3698 | 6.0 |
| 1800 | 72" | | 2200 | | | | 4100 | | 2198 | | | | 4098 | 6.0 |
| – | 78" | | – | | | | 4600 | | – | | | | 4598 | 6.0 |
| 2000 | – | | 2800 | | | | – | | 2798 | | | | – | 6.0 |

Transmitter Promag (compact version): 3.4 kg
(Weight data valid for standard pressure ratings and without packaging material)

**Weight data of Promag P in kg**

| Nominal diameter | | Compact version | | | | | | Remote version (without cable) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sensor | | | | | | Wall housing |
| [mm] | [inch] | EN (DIN) | | JIS | | ANSI | | EN (DIN) | | JIS | | ANSI | | |
| 15 | 1/2" | PN 40 | 6.5 | 10K | 6.5 | Class 150 | 6.5 | PN 40 | 4.5 | 10K | 4.5 | Class 150 | 4.5 | 6.0 |
| 25 | 1" | | 7.3 | | 7.3 | | 7.3 | | 5.3 | | 5.3 | | 5.3 | 6.0 |
| 32 | 1 1/4" | | 8.0 | | 7.3 | | – | | 6.0 | | 5.3 | | – | 6.0 |
| 40 | 1 1/2" | | 9.4 | | 8.3 | | 9.4 | | 7.4 | | 6.3 | | 7.4 | 6.0 |
| 50 | 2" | | 10.6 | | 9.3 | | 10.6 | | 8.6 | | 7.3 | | 8.6 | 6.0 |
| 65 | 2 1/2" | PN 16 | 12.0 | | 11.1 | | – | PN 16 | 10.0 | | 9.1 | | – | 6.0 |
| 80 | 3" | | 14.0 | | 12.5 | | 14.0 | | 12.0 | | 10.5 | | 12.0 | 6.0 |
| 100 | 4" | | 16.0 | | 14.7 | | 16.0 | | 14.0 | | 12.7 | | 14.0 | 6.0 |
| 125 | 5" | | 21.5 | | 21.0 | | – | | 19.5 | | 19.0 | | – | 6.0 |
| 150 | 6" | | 25.5 | | 24.5 | | 25.5 | | 23.5 | | 22.5 | | 23.5 | 6.0 |
| 200 | 8" | PN 10 | 45 | | 41.9 | | 45 | PN 10 | 43 | | 39.9 | | 43 | 6.0 |
| 250 | 10" | | 65 | | 69.4 | | 75 | | 63 | | 67.4 | | 73 | 6.0 |
| 300 | 12" | | 70 | | 72.3 | | 110 | | 68 | | 70.3 | | 108 | 6.0 |
| 350 | 14" | | 115 | | | | 175 | | 113 | | | | 173 | 6.0 |
| 400 | 16" | | 135 | | | | 205 | | 133 | | | | 203 | 6.0 |
| 450 | 18" | | 175 | | | | 255 | | 173 | | | | 253 | 6.0 |
| 500 | 20" | | 175 | | | | 285 | | 173 | | | | 283 | 6.0 |
| 600 | 24" | | 235 | | | | 405 | | 233 | | | | 403 | 6.0 |

Transmitter Promag (compact version): 3.4 kg
High-temperature version: +1.5 kg
(Weight data valid for standard pressure ratings and without packaging material)

**Weight data of Promag H in kg**

| Nominal diameter | | Compact version | Remote version (without cable) | |
|---|---|---|---|---|
| [mm] | [inch] | DIN | Sensor | Wall housing |
| 2 | 1/12" | 5.2 | 2.5 | 6.0 |
| 4 | 5/32" | 5.2 | 2.5 | 6.0 |
| 8 | 5/16" | 5.3 | 2.5 | 6.0 |
| 15 | 1/2" | 5.4 | 2.6 | 6.0 |
| 25 | 1" | 5.5 | 2.8 | 6.0 |
| 40 | 1 1/2" | 6.5 | 4.5 | 6.0 |
| 50 | 2" | 9.0 | 7.0 | 6.0 |
| 65 | 2 1/2" | 9.5 | 7.5 | 6.0 |
| 80 | 3" | 19.0 | 17.0 | 6.0 |

Transmitter Promag (compact version): 3.4 kg
(Weight data valid for standard pressure ratings and without packaging material)

Materials

**Promag W**

Transmitter housing:
- Compact housing: powder coated die-cast aluminium or stainless steel field housing (1.4301/316L)
- Wall-mounted housing: powder coated die-cast aluminium

Sensor housing:
- DN 25…300: powder-coated die-cast aluminium
- DN 350…2000: painted steel (Amerlock 400)

Measuring tube:
- DN < 350: stainless steel 1.4301 or 1.4306/304L; non-stainless flange material with Al/Zn protective coating
- DN > 300: stainless steel 1.4301/304; non-stainless flange material with Amerlock 400 paint

Flange:
- EN 1092-1 (DIN 2501): Stainless steel 1.4571, ST37 / FE 410W B (DN < 350 with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- ANSI: A105, 316L (DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)
- AWWA: A36
- JIS: S20C, SUS 316L (DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)

Ground disks: : 1.4435/316L or Alloy C-22
Electrodes: 1.4435 or Alloy C-22, tantalum
Seals: Seals to DIN 2690

**Promag P**

Transmitter housing:
- Compact housing: powder coated die-cast aluminium or stainless steel field housing
- Wall-mounted housing: powder coated die-cast aluminium

Sensor housing:
- DN 25…300: powder-coated die-cast aluminium
- DN 350…600: painted steel (Amerlock 400)

Measuring tube:
- DN < 350: stainless steel 1.4301 or 1.4306/304L; non-stainless flange material with Al/Zn protective coating
- DN > 300: stainless steel 1.4301/304; non-stainless flange material with Amerlock 400 paint

Flange:
- EN 1092-1 (DIN 2501): Stainless steel 1.4571, ST37 / FE 410W B (DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)
- ANSI: A105, 316L (DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)
- JIS: S20C, SUS 316L (DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)

Ground disks: 1.4435/316L or Alloy C-22
Electrodes: 1.4435, platinum/rhodium 80/20 or Alloy C-22, tantalum
Seals: Seals to DIN 2690

**Promag H**

Transmitter housing:
- Compact housing: powder coated die-cast aluminium or stainless-steel field housing 1.4301/316L
- Wall-mounted housing: powder coated die-cast aluminium

Sensor housing: 1.4301
Wall mounting (holder panel): 1.4301

Measuring tube: stainless steel 1.4301 or 1.4306/304L

Flange:
- All connections 1.4404/316L
- Flanges (EN (DIN), ANSI, JIS) made of PVDF
- Adhesive fitting made of PVC

Ground rings: 1.4435/316L, Option: tantalum, Alloy C-22

Electrodes:
- Standard: 1.4435
- Option: Alloy C-22, tantalum, platinum/rhodium 80/20 (up to DN 25 only)

Seals:
- DN 2…25: O-ring (EPDM, Viton, Kalrez) or gasket seal (EPDM, silicone, Viton)
- DN 40…100: gasket seal (EPDM, silicone)

Material load diagram

The material load diagrams (pressure-temperature graphs) for the process connections are to be found in the following documents:
- Technical Information “Promag 50/53 W” (TI 046D/06/en)
- Technical Information “Promag 50/53 P” (TI 047D/06/en)
- Technical Information “Promag 50/53 H” (TI 048D/06/en)

Fitted electrodes

Promag W:
Measuring, reference and EPD electrodes
- Standard available with 1.4435, Alloy C-22, tantalum
- Optional: exchangeable measuring electrodes made of 1.4435 (DN 350…2000)

Promag P:
Measuring, reference and EPD electrodes
- Standard available with 1.4435, Alloy C-22, tantalum
- Optional: reference electrode and EPD electrodes made of platinum/rhodium 80/20

Promag H:
Measuring electrodes and EPD electrodes
- Standard available with 1.4435, Alloy C-22, tantalum, platinum/rhodium 80/20
- DN 2…4: without EPD electrode

Process connections

Promag W:
Flange connection: EN 1092-1 compliant (dimensions to DIN 2501; DN 65 PN 16 and DN 600 PN 16 exclusively to EN 1092-1), ANSI, AWWA, JIS

Promag P:
Flange connection: EN 1092-1 compliant (dimensions to DIN 2501; DN 65 PN 16 and DN 600 PN 16 exclusively to EN 1092-1), ANSI, JIS

Promag H:
- With O-ring: weld nipples (ISO 2463, IPS), flanges (EN (DIN), ANSI, JIS), PVDF flanges (DIN, ANSI, JIS), external pipe thread, internal pipe thread, hose connection, PVC adhesive fittings
- With gasket seals: weld nipples (DIN 11850, ODT), clamps (ODT, ISO 2852, DIN 32676), threaded fasteners (DIN 11851, DIN 11864-1, ISO 2853, SMS1145), flanges (DIN 11864-2)

Surface roughness

- PFA liner: ≤ 0.4 µm
- Electrodes:
  – 1.4435, Alloy C-22: 0.3...0.5 µm
  – Tantalum, platinum/rhodium: 0.3...0.5 µm
- Process connection Promag H: ≤ 0.8 µm

(all data relate to parts in contact with medium)

### 10.1.9 Human interface

Display elements

- Liquid-crystal display: illuminated, two lines with 16 characters per line
- Custom configurations for presenting different measured values and status variables
- 2 totalizers

Operating elements

- Local operation with three push buttons (–, +, E)
- “Quick Setup” menus for straightforward commissioning

Language group

Language groups for operation in different countries:
- Western Europe and America:
  English, German, Spanish, Italian, French, Dutch and Portuguese
- Northern/eastern Europe:
  English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
- Southern/eastern Asia:
  English, Japanese and Indonesian

Remote operation

Operation via HART protocol

### 10.1.10 Certificates and approvals

Ex Approvals

Information about currently available Ex versions (ATEX, FM, CSA) can be supplied by your E+H Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.

Sanitary compatibility

Promag W:
No applicable approvals or certification

Promag P:
No applicable approvals or certification

Promag H:
- 3A authorization and EHEDG-tested
- Seals in conformity with FDA (except Kalrez seals)

Pressure Equipment Directive

Measuring devices with a nominal diameter smaller than or equal to DN 25 correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice. Where necessary (depending on the medium and process pressure), there are additional optional approvals to Category II/III for larger nominal diameters.

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

EN 60529
Degrees of protection by housing (IP code)

EN 61010
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures

EN 61326/A1 (IEC 1326)
Electromagnetic compatibility (EMC requirements)

NAMUR NE 21
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.

NAMUR NE 43
Standardisation of the signal level for the breakdown information of digital transmitters with analogue output signal.

### 10.1.11 Ordering information

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

### 10.1.12 Accessories

Various accessories, which can be ordered separately from E+H, are available for the transmitter and the sensor (see Page 85). The E+H service organisation can provide detailed information on request.

### 10.1.13 Supplementary documentation

- System Information Promag (SI 028D/06/en)
- Technical Information Promag 50/53 W (TI 046D/06/en)
- Technical Information Promag 50/53 P (TI 047D/06/en)
- Technical Information Promag 50/53 H (TI 048D/06/en)
- Description of Device Functions Promag 50 (BA 049D/06/en)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

## 10.2 Measuring-tube specifications

| Promag W Nominal diameter | | Pressure rating | | | | Inside diameter of measuring tube | |
|---|---|---|---|---|---|---|---|
| [mm] | [inch] | EN (DIN) [bar] | ANSI [lbs] | AWWA | JIS | Hard rubber | Polyurethane |
| 25 | 1" | PN 40 | Cl 150 | – | 20K | – | 24 |
| 32 | – | PN 40 | – | – | 20K | – | 32 |
| 40 | 1 1/2" | PN 40 | Cl 150 | – | 20K | – | 38 |
| 50 | 2" | PN 40 | Cl 150 | – | 10K | – | 50 |
| 65 | – | PN 16 | – | – | 10K | 66 | 66 |
| 80 | 3" | PN 16 | Cl 150 | – | 10K | 79 | 79 |
| 100 | 4" | PN 16 | Cl 150 | – | 10K | 102 | 102 |
| 125 | – | PN 16 | – | – | 10K | 127 | 127 |
| 150 | 6" | PN 16 | Cl 150 | – | 10K | 156 | 156 |
| 200 | 8" | PN 10 | Cl 150 | – | 10K | 204 | 204 |
| 250 | 10" | PN 10 | Cl 150 | – | 10K | 258 | 258 |
| 300 | 12" | PN 10 | Cl 150 | – | 10K | 309 | 309 |
| 350 | 14" | PN 10 | Cl 150 | – | – | 342 | 342 |
| 400 | 16" | PN 10 | Cl 150 | – | – | 392 | 392 |
| 450 | 18" | PN 10 | Cl 150 | – | – | 437 | 437 |
| 500 | 20" | PN 10 | Cl 150 | – | – | 492 | 492 |
| 600 | 24" | PN 10 | Cl 150 | – | – | 594 | 594 |
| 700 | 28" | PN 10 | – | Class D | – | 692 | 692 |
| – | 30" | – | – | Class D | – | 742 | 742 |
| 800 | 32" | PN 10 | – | Class D | – | 794 | 794 |
| 900 | 36" | PN 10 | – | Class D | – | 891 | 891 |
| 1000 | 40" | PN 10 | – | Class D | – | 994 | 994 |
| – | 42" | – | – | Class D | – | 1043 | 1043 |
| 1200 | 48" | PN 6 | – | Class D | – | 1197 | 1197 |
| – | 54" | – | – | Class D | – | 1339 | 1339 |
| 1400 | – | PN 6 | – | – | – | 1402 | 1402 |
| – | 60" | – | – | Class D | – | 1492 | 1492 |
| 1600 | – | PN 6 | – | – | – | 1600 | 1600 |
| – | 66" | – | – | Class D | – | 1638 | 1638 |
| 1800 | 72" | PN 6 | – | Class D | – | 1786 | 1786 |
| 2000 | 78" | PN 6 | – | Class D | – | 1989 | 1989 |

| Promag P Nominal diameter | | Pressure rating | | | Inside diameter of measuring tube | |
|---|---|---|---|---|---|---|
| [mm] | [inch] | EN (DIN) [bar] | ANSI [lbs] | JIS | with PFA [mm] | with PTFE [mm] |
| 15 | 1/2" | PN 40 | Cl 150 | 20K | – | 15 |
| 25 | 1" | PN 40 | Cl 150 | 20K | 23 | 26 |
| 32 | – | PN 40 | – | 20K | 32 | 35 |
| 40 | 1 1/2" | PN 40 | Cl 150 | 20K | 36 | 41 |
| 50 | 2" | PN 40 | Cl 150 | 10K | 48 | 52 |
| 65 | – | PN 16 | – | 10K | 63 | 67 |
| 80 | 3" | PN 16 | Cl 150 | 10K | 75 | 80 |
| 100 | 4" | PN 16 | Cl 150 | 10K | 101 | 104 |
| 125 | – | PN 16 | – | 10K | 126 | 129 |
| 150 | 6" | PN 16 | Cl 150 | 10K | 154 | 156 |
| 200 | 8" | PN 10 | Cl 150 | 10K | 201 | 202 |
| 250 | 10" | PN 10 | Cl 150 | 10K | – | 256 |
| 300 | 12" | PN 10 | Cl 150 | 10K | – | 306 |
| 350 | 14" | PN 10 | Cl 150 | – | – | 337 |
| 400 | 16" | PN 10 | Cl 150 | – | – | 387 |
| 450 | 18" | PN 10 | Cl 150 | – | – | 432 |
| 500 | 20" | PN 10 | Cl 150 | – | – | 487 |
| 600 | 24" | PN 10 | Cl 150 | – | – | 593 |

| Promag H Nominal diameter | | Pressure ratings * | Inside diameter of measuring tube ** |
|---|---|---|---|
| [mm] | [inch] | [bar] | PFA |
| 2 | 1/12" | PN 16 / PN 40 | 2.25 |
| 4 | 5/32" | PN 16 / PN 40 | 4.5 |
| 8 | 5/16" | PN 16 / PN 40 | 9.0 |
| 15 | 1/2" | PN 16 / PN 40 | 16.0 |
| – | 1" | PN 16 / PN 40 | 22.6 |
| 25 | – | PN 16 / PN 40 | 26.0 |
| 40 | 1 1/2" | PN 16 / PN 40 | 35.3 |
| 50 | 2" | PN 16 / PN 40 | 48.1 |
| 65 | 2 1/2" | PN 16 / PN 40 | 59.9 |
| 80 | 3" | PN 16 / PN 40 | 72.6 |
| 100 | 4" | PN 16 / PN 40 | 97.5 |

* The pressure rating depends on the process connections and the seals (see Page 112).
** Inside diameters of process connections → see Page 137 ff.

## 10.3 Dimensions wall-mounted housing

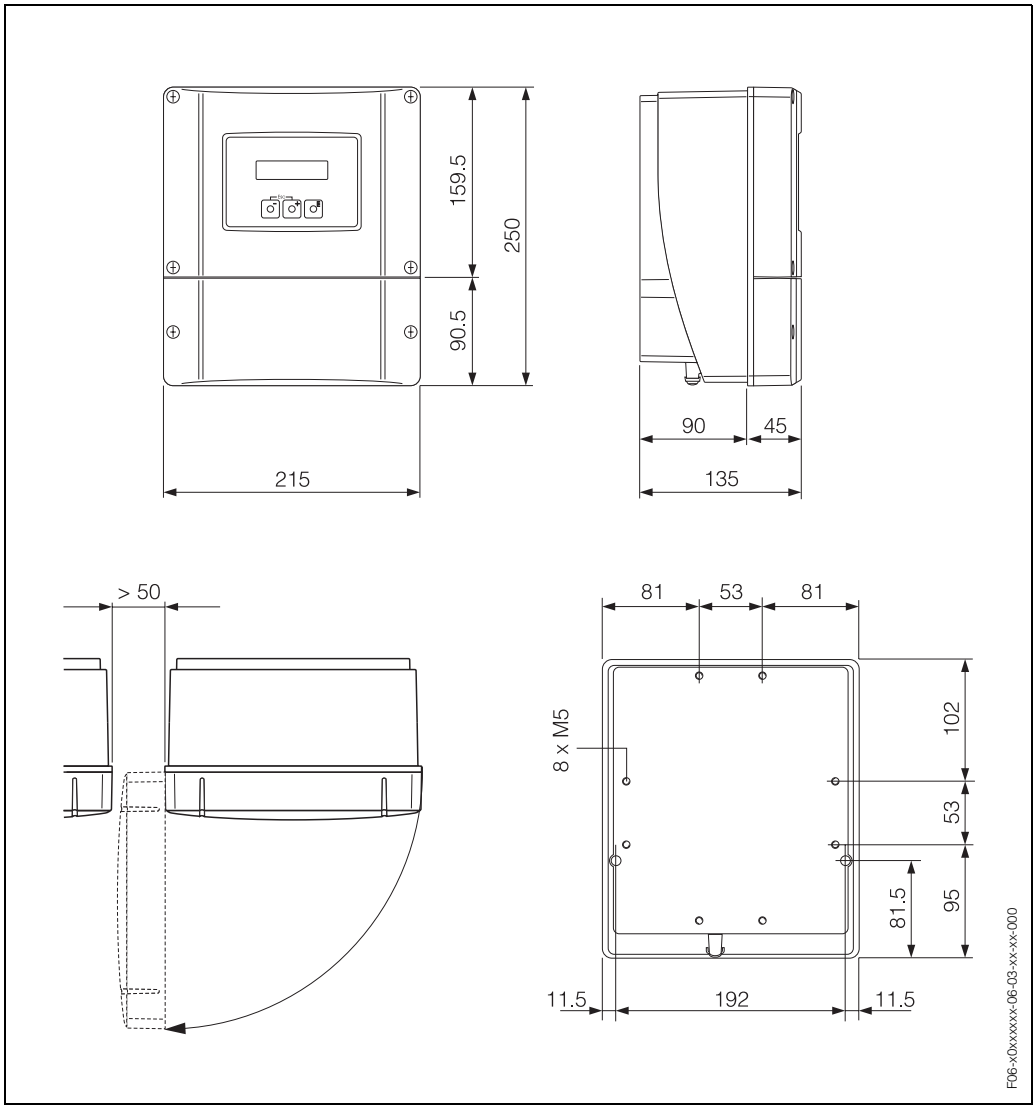



*Fig. 55: Dimensions wall-mounted housing (for panel installation and pipe mounting → Page 44)*

## 10.4 Dimensions Promag 50 W

**Promag W / DN ≤ 300 (compact version)**

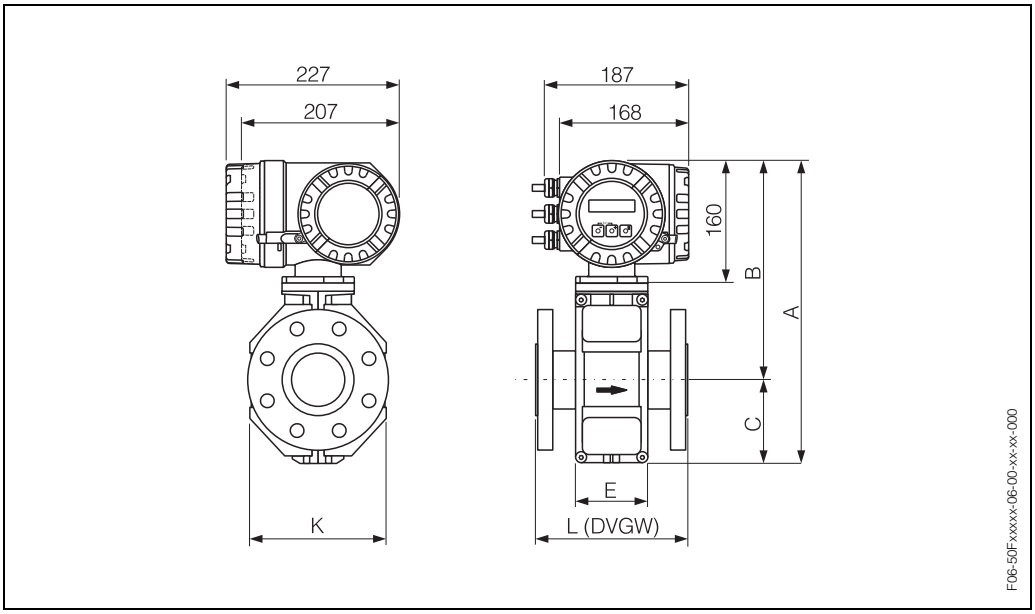



*Fig. 56: Dimensions Promag W / DN ≤ 300 (compact version)*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) / JIS [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 25 | 1" | 200 | 341 | 257 | 84 | 120 | 94 |
| 32 | – | 200 | 341 | 257 | 84 | 120 | 94 |
| 40 | 1 1/2" | 200 | 341 | 257 | 84 | 120 | 94 |
| 50 | 2" | 200 | 341 | 257 | 84 | 120 | 94 |
| 65 | – | 200 | 391 | 282 | 109 | 180 | 94 |
| 80 | 3" | 200 | 391 | 282 | 109 | 180 | 94 |
| 100 | 4" | 250 | 391 | 282 | 109 | 180 | 94 |
| 125 | – | 250 | 472 | 322 | 150 | 260 | 140 |
| 150 | 6" | 300 | 472 | 322 | 150 | 260 | 140 |
| 200 | 8" | 350 | 527 | 347 | 180 | 324 | 156 |
| 250 | 10" | 450 | 577 | 372 | 205 | 400 | 156 |
| 300 | 12" | 500 | 627 | 397 | 230 | 460 | 166 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

### Promag W / DN ≤ 300 (remote version)

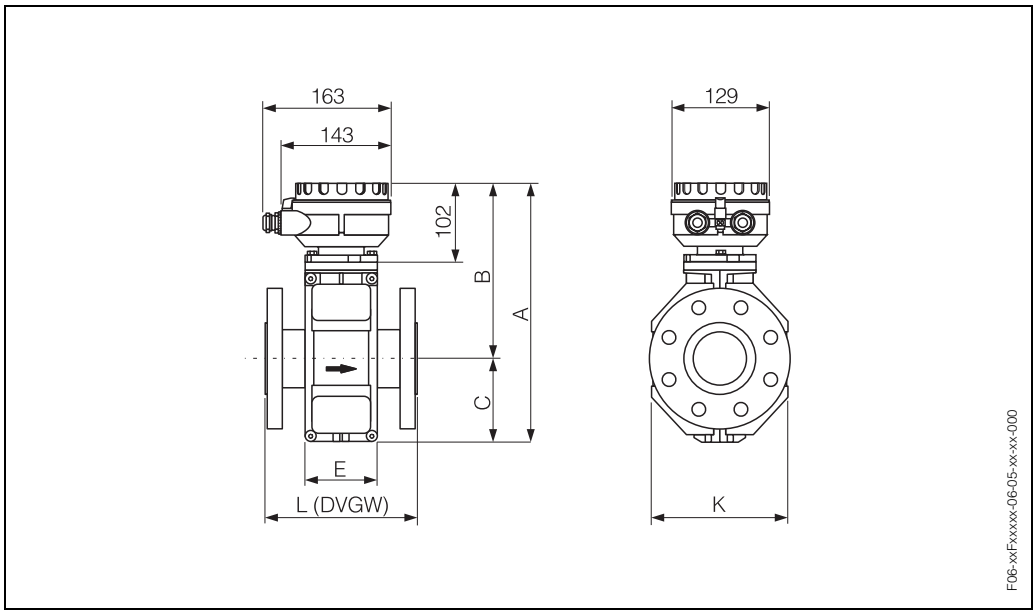



*Fig. 57: Dimensions Promag W / DN ≤ 300 (remote version)*
*Dimensions wall-mounted housing → see Page 122*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) / JIS [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 25 | 1" | 200 | 286 | 202 | 84 | 120 | 94 |
| 32 | – | 200 | 286 | 202 | 84 | 120 | 94 |
| 40 | 1 1/2" | 200 | 286 | 202 | 84 | 120 | 94 |
| 50 | 2" | 200 | 286 | 202 | 84 | 120 | 94 |
| 65 | – | 200 | 336 | 227 | 109 | 180 | 94 |
| 80 | 3" | 200 | 336 | 227 | 109 | 180 | 94 |
| 100 | 4" | 250 | 336 | 227 | 109 | 180 | 94 |
| 125 | – | 250 | 417 | 267 | 150 | 260 | 140 |
| 150 | 6" | 300 | 417 | 267 | 150 | 260 | 140 |
| 200 | 8" | 350 | 472 | 292 | 180 | 324 | 156 |
| 250 | 10" | 450 | 522 | 317 | 205 | 400 | 156 |
| 300 | 12" | 500 | 572 | 342 | 230 | 460 | 166 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

**Promag W / DN ≥ 350 (compact version)**

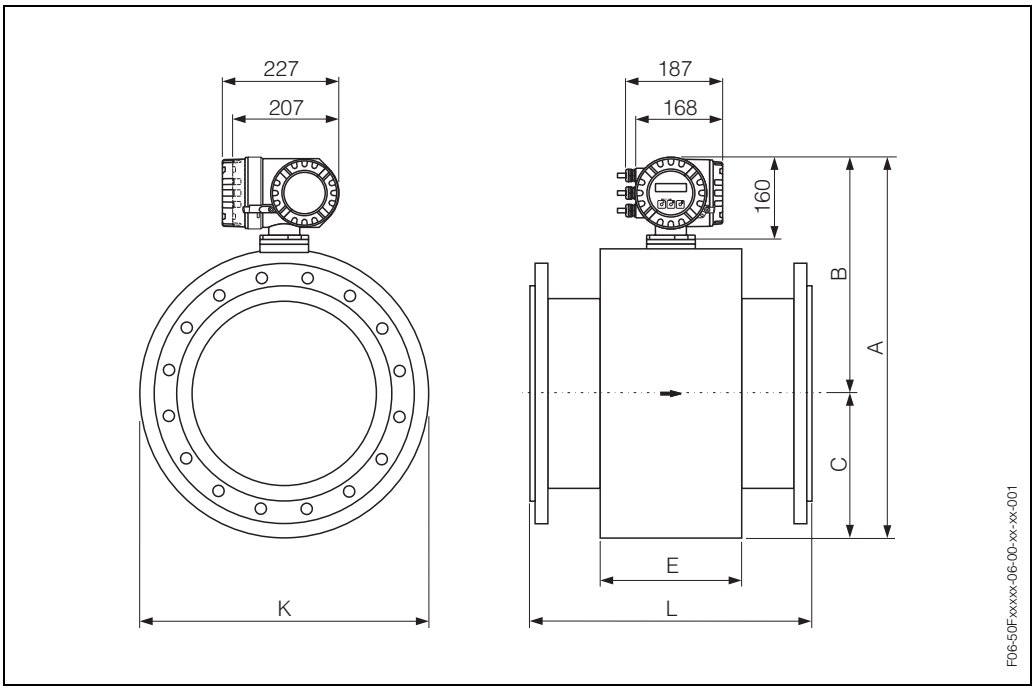



*Fig. 58: Dimensions Promag W / DN ≥ 350 (compact version)*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 350 | 14" | 550 | 738.5 | 456.5 | 282.0 | 564 | 276 |
| 400 | 16" | 600 | 790.5 | 482.5 | 308.0 | 616 | 276 |
| 450 | 18" | 650 | 840.5 | 507.5 | 333.0 | 666 | 292 |
| 500 | 20" | 650 | 891.5 | 533.0 | 358.5 | 717 | 292 |
| 600 | 24" | 780 | 995.5 | 585.0 | 410.5 | 821 | 402 |
| 700 | 28" | 910 | 1198.5 | 686.5 | 512.0 | 1024 | 589 |
| 750 | 30" | 975 | 1198.5 | 686.5 | 512.0 | 1024 | 626 |
| 800 | 32" | 1040 | 1241.5 | 708.0 | 533.5 | 1067 | 647 |
| 900 | 36" | 1170 | 1394.5 | 784.5 | 610.0 | 1220 | 785 |
| 1000 | 40" | 1300 | 1546.5 | 860.5 | 686.0 | 1372 | 862 |
| 1050 | 42" | 1365 | 1598.5 | 886.5 | 712.0 | 1424 | 912 |
| 1200 | 48" | 1560 | 1796.5 | 985.5 | 811.0 | 1622 | 992 |
| 1350 | 54" | 1755 | 1998.5 | 1086.5 | 912.0 | 1824 | 1252 |
| 1400 | 56" | 1820 | 2148.5 | 1161.5 | 987.0 | 1974 | 1252 |
| 1500 | 60" | 1950 | 2196.5 | 1185.5 | 1011.0 | 2022 | 1392 |
| 1600 | 64" | 2080 | 2286.5 | 1230.5 | 1056.0 | 2112 | 1482 |
| 1650 | 66" | 2145 | 2360.5 | 1267.5 | 1093.0 | 2186 | 1482 |
| 1800 | 72" | 2340 | 2550.5 | 1362.5 | 1188.0 | 2376 | 1632 |
| 2000 | 78" | 2600 | 2650.5 | 1412.5 | 1238.0 | 2476 | 1732 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

### Promag W / DN ≥ 350 (remote version)

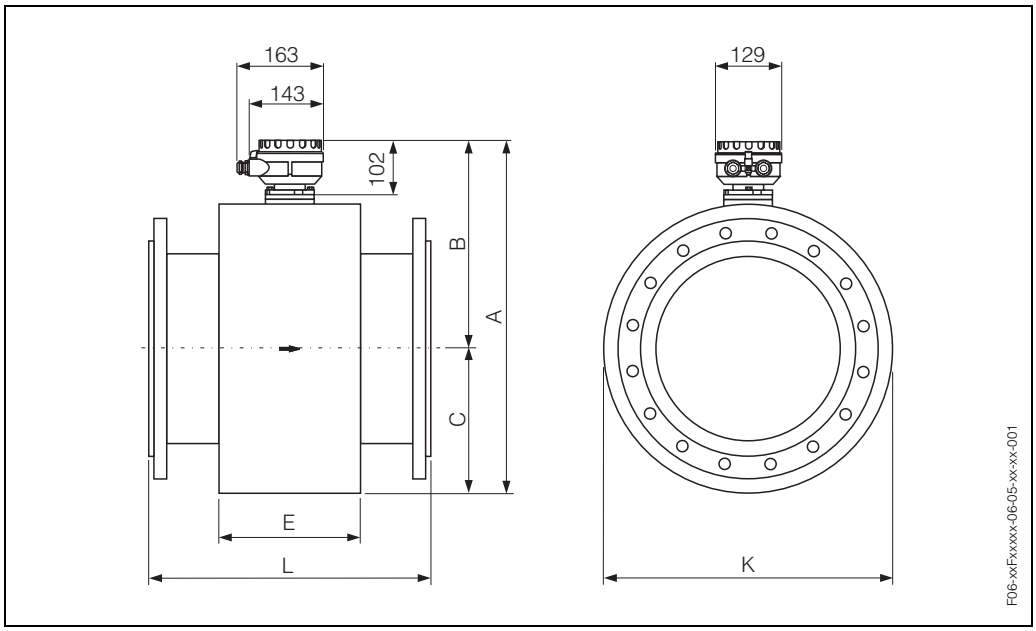



*Fig. 59: Dimensions Promag W / DN ≥ 350 (remote version)*
*Dimensions wall-mounted housing → see Page 122*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 350 | 14" | 550 | 683.5 | 401.5 | 282.0 | 564 | 276 |
| 400 | 16" | 600 | 735.5 | 427.5 | 308.0 | 616 | 276 |
| 450 | 18" | 650 | 785.5 | 452.5 | 333.0 | 666 | 292 |
| 500 | 20" | 650 | 836.5 | 478.0 | 358.5 | 717 | 292 |
| 600 | 24" | 780 | 940.5 | 530.0 | 410.5 | 821 | 402 |
| 700 | 28" | 910 | 1143.5 | 631.5 | 512.0 | 1024 | 589 |
| 750 | 30" | 975 | 1143.5 | 631.5 | 512.0 | 1024 | 626 |
| 800 | 32" | 1040 | 1186.5 | 653.0 | 533.5 | 1067 | 647 |
| 900 | 36" | 1170 | 1339.5 | 729.5 | 610.0 | 1220 | 785 |
| 1000 | 40" | 1300 | 1491.5 | 805.5 | 686.0 | 1372 | 862 |
| 1050 | 42" | 1365 | 1543.5 | 831.5 | 712.0 | 1424 | 912 |
| 1200 | 48" | 1560 | 1741.5 | 930.5 | 811.0 | 1622 | 992 |
| 1350 | 54" | 1755 | 1943.5 | 1031.5 | 912.0 | 1824 | 1252 |
| 1400 | 56" | 1820 | 2093.5 | 1106.5 | 987.0 | 1974 | 1252 |
| 1500 | 60" | 1950 | 2141.5 | 1130.5 | 1011.0 | 2022 | 1392 |
| 1600 | 64" | 2080 | 2231.5 | 1175.5 | 1056.0 | 2112 | 1482 |
| 1650 | 66" | 2145 | 2305.5 | 1212.5 | 1093.0 | 2186 | 1482 |
| 1800 | 72" | 2340 | 2495.5 | 1307.5 | 1188.0 | 2376 | 1632 |
| 2000 | 78" | 2600 | 2595.5 | 1357.5 | 1238.0 | 2476 | 1732 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

## 10.5 Dimensions Promag 50 P

**Promag P / DN ≤ 300 (compact version)**

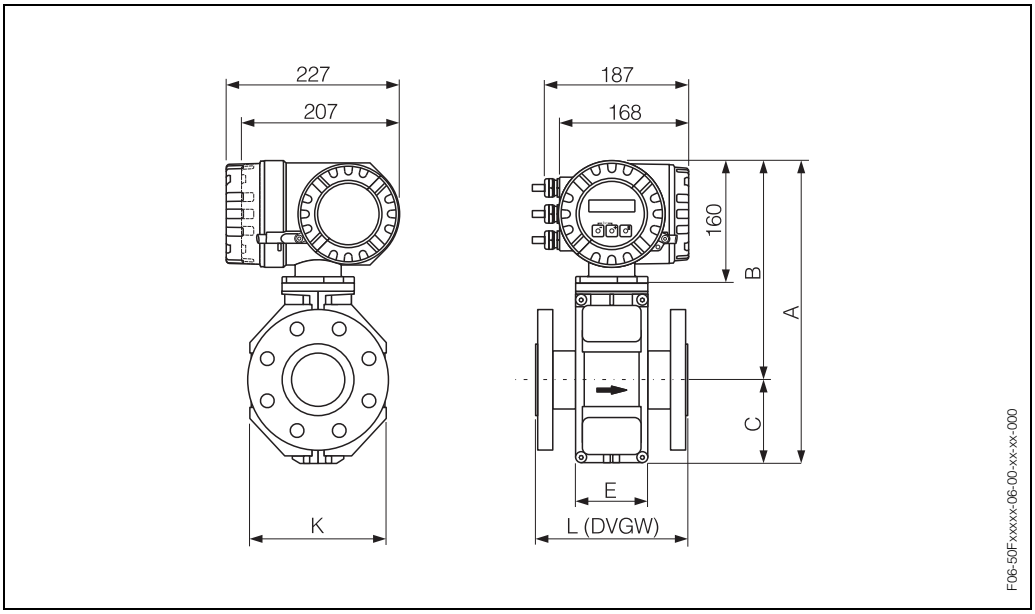



*Fig. 60: Dimensions Promag P / DN ≤ 300 (compact version)*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) / JIS [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 15 | 1/2" | 200 | 341 | 257 | 84 | 120 | 94 |
| 25 | 1" | 200 | 341 | 257 | 84 | 120 | 94 |
| 32 | – | 200 | 341 | 257 | 84 | 120 | 94 |
| 40 | 1 1/2" | 200 | 341 | 257 | 84 | 120 | 94 |
| 50 | 2" | 200 | 341 | 257 | 84 | 120 | 94 |
| 65 | – | 200 | 391 | 282 | 109 | 180 | 94 |
| 80 | 3" | 200 | 391 | 282 | 109 | 180 | 94 |
| 100 | 4" | 250 | 391 | 282 | 109 | 180 | 94 |
| 125 | – | 250 | 472 | 322 | 150 | 260 | 140 |
| 150 | 6" | 300 | 472 | 322 | 150 | 260 | 140 |
| 200 | 8" | 350 | 527 | 347 | 180 | 324 | 156 |
| 250 | 10" | 450 | 577 | 372 | 205 | 400 | 156 |
| 300 | 12" | 500 | 627 | 397 | 230 | 460 | 166 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

### Promag P / DN ≤ 300 (remote version)

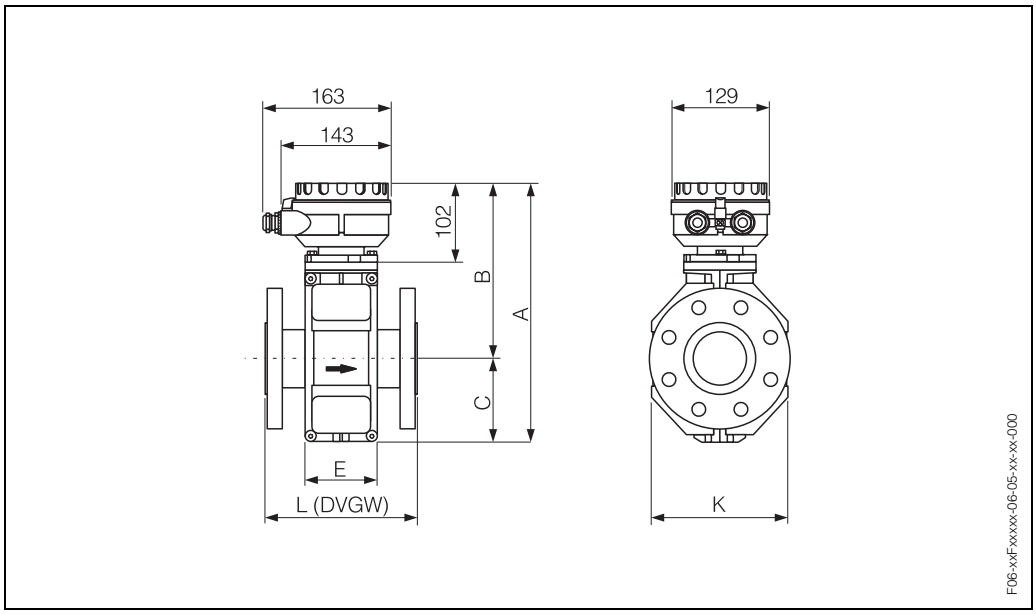



*Fig. 61: Dimensions Promag P / DN ≤ 300 (remote version)*
*Dimensions wall-mounted housing → see Page 122*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) / JIS [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 15 | 1/2" | 200 | 286 | 202 | 84 | 120 | 94 |
| 25 | 1" | 200 | 286 | 202 | 84 | 120 | 94 |
| 32 | – | 200 | 286 | 202 | 84 | 120 | 94 |
| 40 | 1 1/2" | 200 | 286 | 202 | 84 | 120 | 94 |
| 50 | 2" | 200 | 286 | 202 | 84 | 120 | 94 |
| 65 | – | 200 | 336 | 227 | 109 | 180 | 94 |
| 80 | 3" | 200 | 336 | 227 | 109 | 180 | 94 |
| 100 | 4" | 250 | 336 | 227 | 109 | 180 | 94 |
| 125 | – | 250 | 417 | 267 | 150 | 260 | 140 |
| 150 | 6" | 300 | 417 | 267 | 150 | 260 | 140 |
| 200 | 8" | 350 | 472 | 292 | 180 | 324 | 156 |
| 250 | 10" | 450 | 522 | 317 | 205 | 400 | 156 |
| 300 | 12" | 500 | 572 | 342 | 230 | 460 | 166 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

**Promag P / DN ≤ 300 / high-temperature version (compact version)**

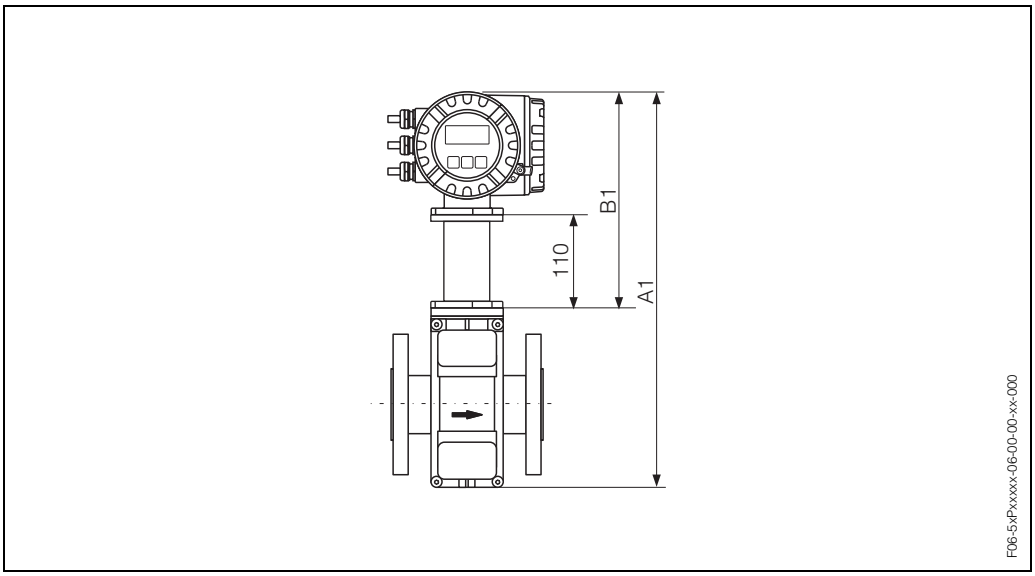



*Abb. 62: Dimensions of high-temperature version (Promag P, DN ≤ 300, compact)*
*Dimensions A1, B1 = A, B of standard version plus 110 mm*

**Promag P / DN ≤ 300 / high-temperature version (remote version)**

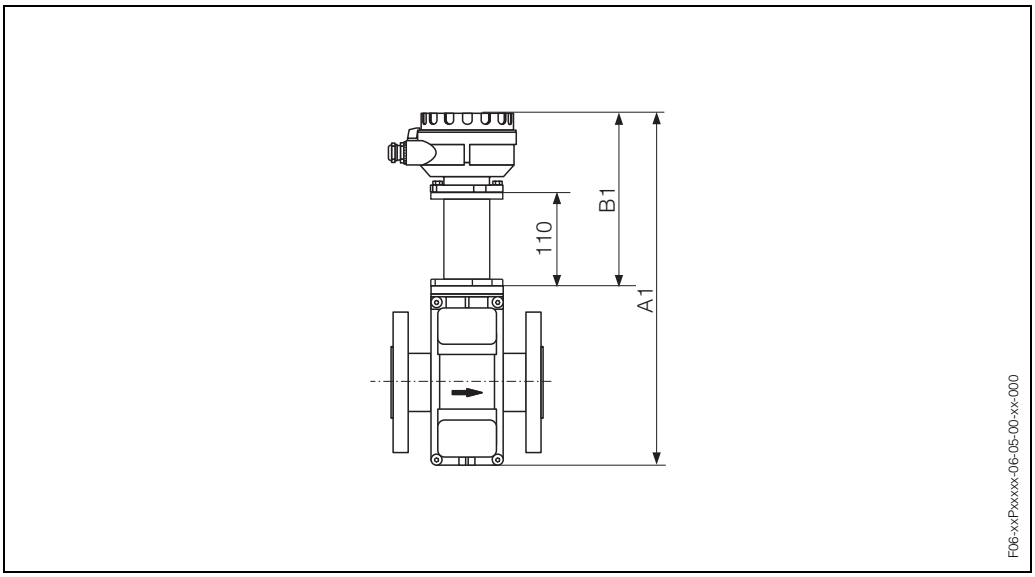



*Fig. 63: Dimensions of high-temperature version (Promag P, DN ≤ 300, remote)*
*Dimensions A1, B1 = A, B of standard version plus 110 mm*

**Promag P / DN ≥ 350 (compact version)**

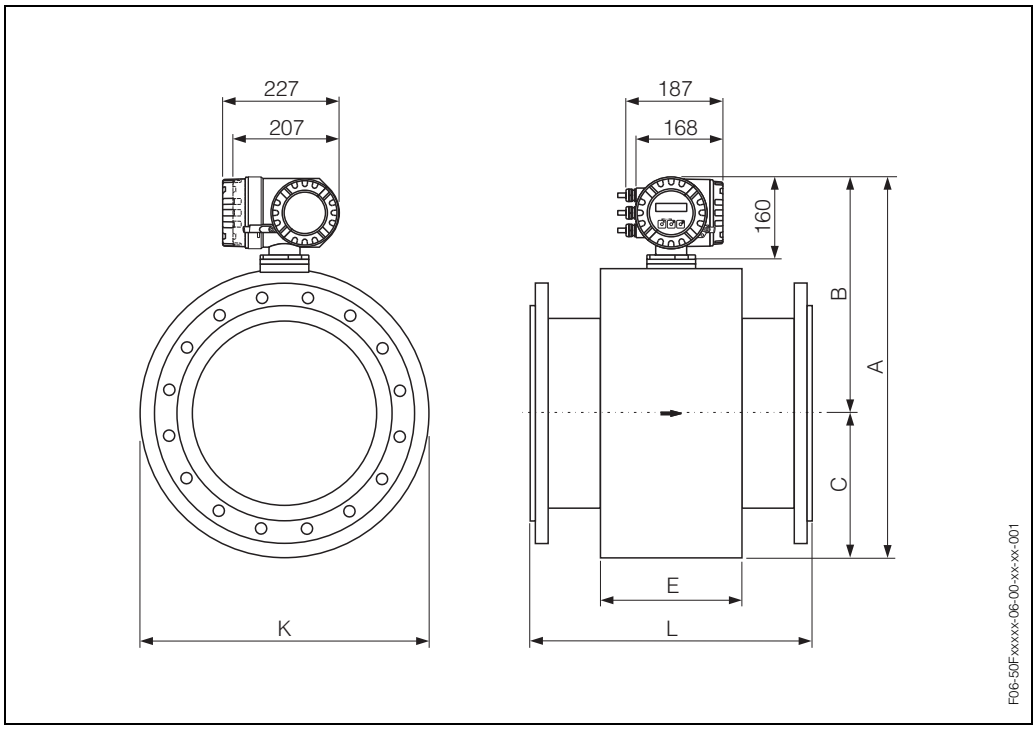



*Fig. 64: Dimensions Promag P / DN ≥ 350 (compact version)*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 350 | 14" | 550 | 738.5 | 456.5 | 282.0 | 564 | 276 |
| 400 | 16" | 600 | 790.5 | 482.5 | 308.0 | 616 | 276 |
| 450 | 18" | 650 | 840.5 | 507.5 | 333.0 | 666 | 292 |
| 500 | 20" | 650 | 891.5 | 533.0 | 358.5 | 717 | 292 |
| 600 | 24" | 780 | 995.5 | 585.0 | 410.5 | 821 | 402 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

**Promag P / DN ≥ 350 (remote version)**

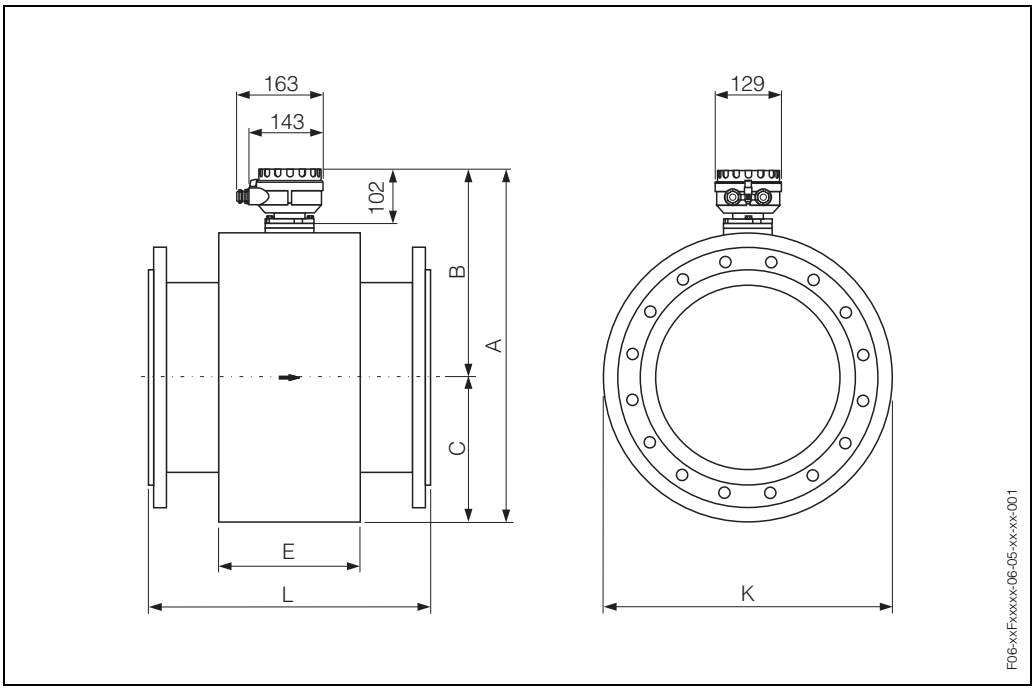



*Fig. 65: Dimensions Promag P / DN ≥ 350 (remote version)*
*Dimensions wall-mounted housing → see Page 122*

| DN | | L | A | B | C | K | E |
|---|---|---|---|---|---|---|---|
| EN (DIN) [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 350 | 14" | 550 | 683.5 | 401.5 | 282.0 | 564 | 276 |
| 400 | 16" | 600 | 735.5 | 427.5 | 308.0 | 616 | 276 |
| 450 | 18" | 650 | 785.5 | 452.5 | 333.0 | 666 | 292 |
| 500 | 20" | 650 | 836.5 | 478.0 | 358.5 | 717 | 292 |
| 600 | 24" | 780 | 940.5 | 530.0 | 410.5 | 821 | 402 |
| The fitting length (L) is always the same, regardless of the pressure rating. | | | | | | | |

## 10.6 Dimensions of ground disks (Promag W, P)

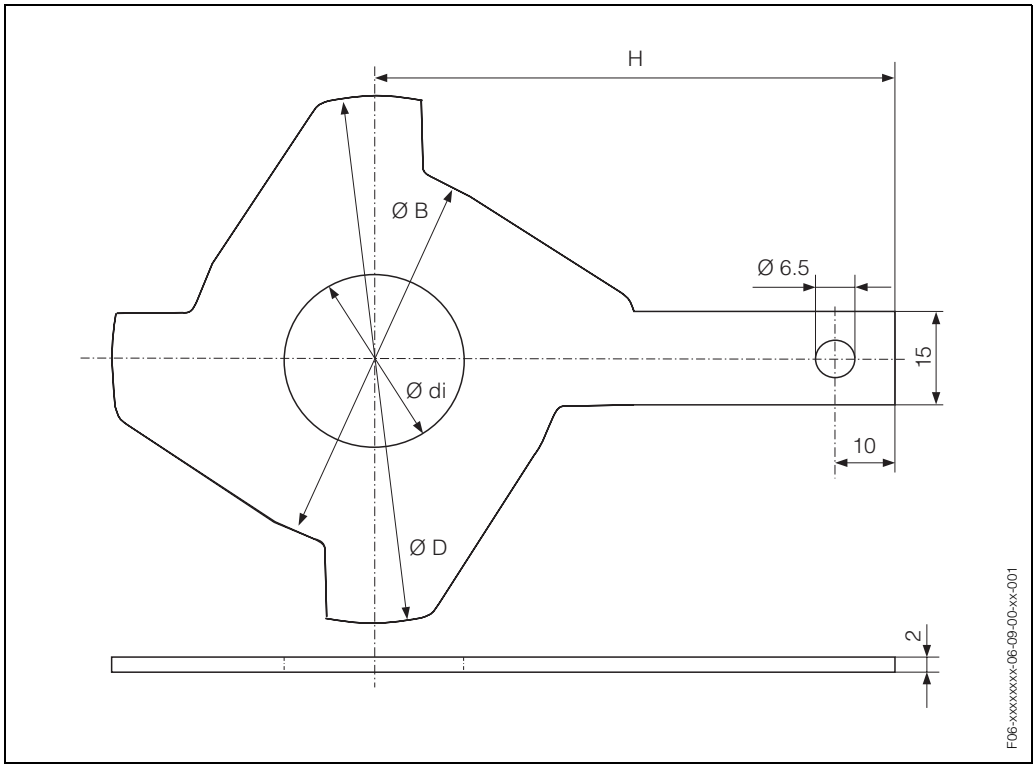



*Fig. 66: Dimensions of ground disks (Promag W, P / DN 15…300)*

| DN [1] | | di | B | D | H |
|---|---|---|---|---|---|
| EN (DIN) / JIS [mm] | ANSI [inch] | [mm] | [mm] | [mm] | [mm] |
| 15 | 1/2" | 19 | 43 | 61.5 | 73 |
| 25 | 1" | 30 | 62 | 77.5 | 87.5 |
| 32 | – | 38.5 | 80 | 87.5 | 94.5 |
| 40 | 1 1/2" | 44.5 | 82 | 101 | 103 |
| 50 | 2" | 56.5 | 101 | 115.5 | 108 |
| 65 | – | 72.5 | 121 | 131.5 | 118 |
| 80 | 3" | 85 | 131 | 154.5 | 135 |
| 100 | 4" | 110 | 156 | 186.5 | 153 |
| 125 | – | 135 | 187 | 206.5 | 160 |
| 150 | 6" | 163 | 217 | 256 | 184 |
| 200 | 8" | 210.5 | 267 | 288 | 205 |
| 250 | 10" | 265 | 328 | 359 | 240 |
| 300 [2] | 12" [2] | 317 | 375 | 413 | 273 |
| 300 [3] | 12" [3] | 317 | 375 | 404 | 268 |

[1] Ground disks can, with the exception of DN 300, be used for all flange norms / pressure ratings.
[2] PN 10/16, Class 150
[3] PN 25, JIS 10K/20K

## 10.7 Dimensions Promag 50 H

**Promag H / DN 2...25 (compact version)**

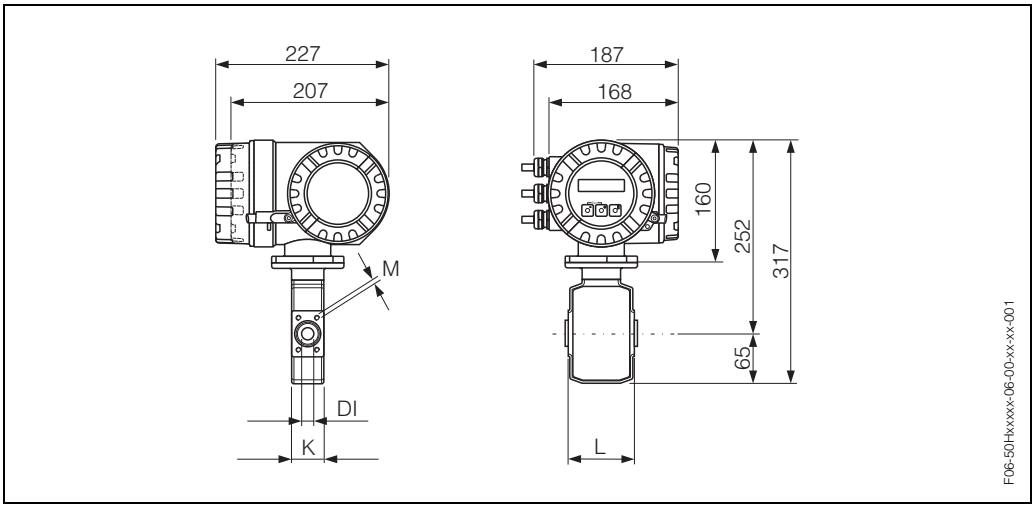



*Fig. 67: Dimensions Promag H / DN 2...25 (compact version, aluminum field housing)*

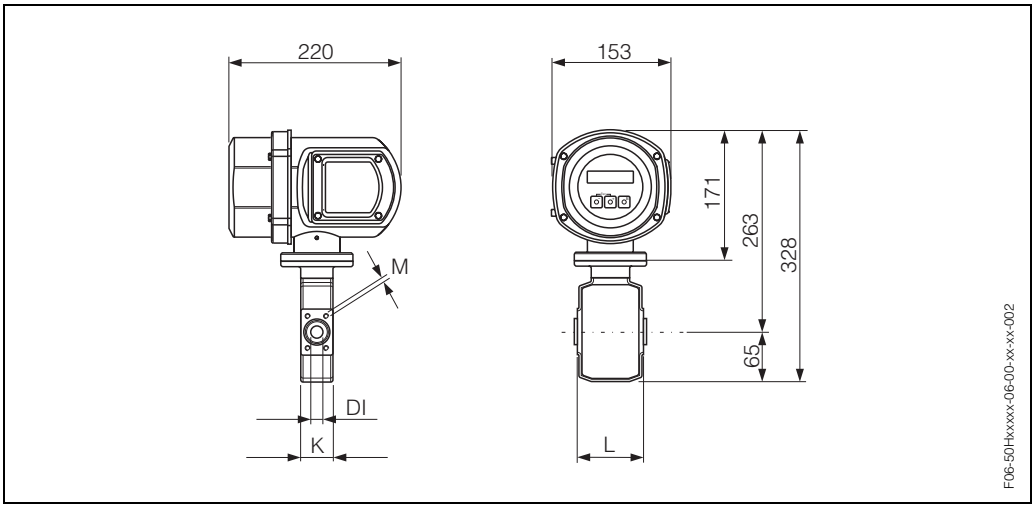



*Fig. 68: Dimensions Promag H / DN 2...25 (compact version, stainless-steel field housing)*

| DN | | PN ** | DI | L | K | M |
|---|---|---|---|---|---|---|
| [mm] | [inch] | [bar] | [mm] | [mm] | [mm] | [mm] |
| 2 | – | 16/40 | 2.25 | 86 | 43 | M 6x4 |
| 4 | – | 16/40 | 4.5 | 86 | 43 | M 6x4 |
| 8 | – | 16/40 | 9.0 | 86 | 43 | M 6x4 |
| 15 | – | 16/40 | 16.0 | 86 | 43 | M 6x4 |
| – | 1" | 16/40 | 22.6 | 86 | 53 | M 6x4 |
| 25 | – | 16/40 | 26.0 | 86 | 53 | M 6x4 |

Overall fitting length will depend on the process connections → Page 137 ff.

** The permissible nominal pressure depends on the process connection and seal:
- 40 bar: flange EN 1092-1 (DIN 2501), welded nipples for DIN EN ISO 1127 pipes and ODT (with O-ring seal)
- 16 bar: all other process connections

### Promag H / DN 2...25 (remote version)

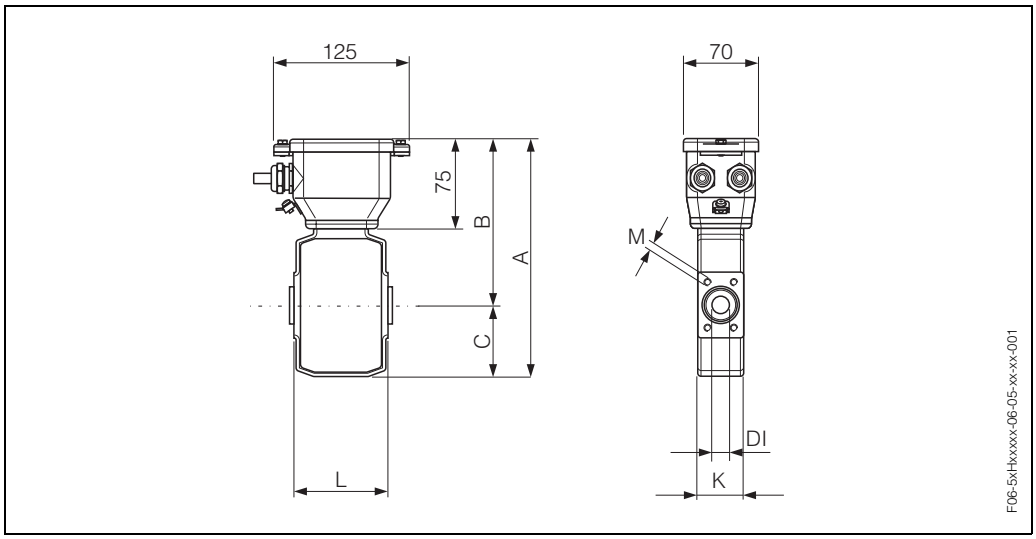



*Fig. 69: Dimensions Promag H / DN 2...25 (remote version)*
*Dimensions wall-mounted housing → see Page 122*

| DN | | PN * | DI | L | A | B | C | K | M |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | [bar] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 2 | – | 16/40 | 2.25 | 86 | 213 | 148 | 65 | 43 | M 6x4 |
| 4 | – | 16/40 | 4.5 | 86 | 213 | 148 | 65 | 43 | M 6x4 |
| 8 | – | 16/40 | 9.0 | 86 | 213 | 148 | 65 | 43 | M 6x4 |
| 15 | – | 16/40 | 16.0 | 86 | 213 | 148 | 65 | 43 | M 6x4 |
| – | 1" | 16/40 | 22.6 | 86 | 213 | 148 | 65 | 53 | M 6x4 |
| 26 | – | 16/40 | 26.0 | 86 | 213 | 148 | 65 | 53 | M 6x4 |

Overall fitting length will depend on the process connections → Page 137 ff.

* The permissible nominal pressure depends on the process connection and seal:
– 40 bar: flange EN 1092-1 (DIN 2501), welded nipples for DIN EN ISO 1127 pipes and ODT (with O-ring seal)
– 16 bar: all other process connections

### Wall mounting set for Promag H / DN 2...25

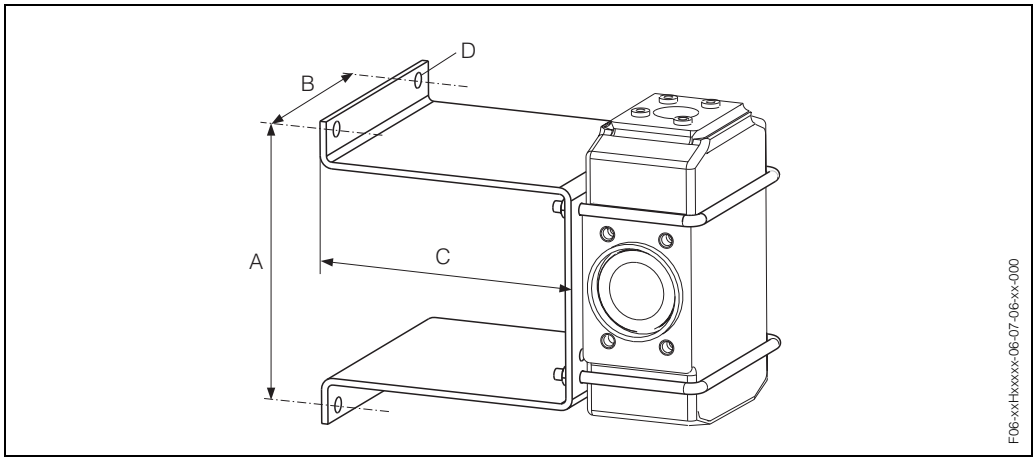



*Fig. 70: Wall mounting set for Promag H / DN 2...25*
*A = 125 mm, B = 88 mm, C = 120 mm, D = Ø 7 mm*

**Promag H / DN 40...100 (compact version)**

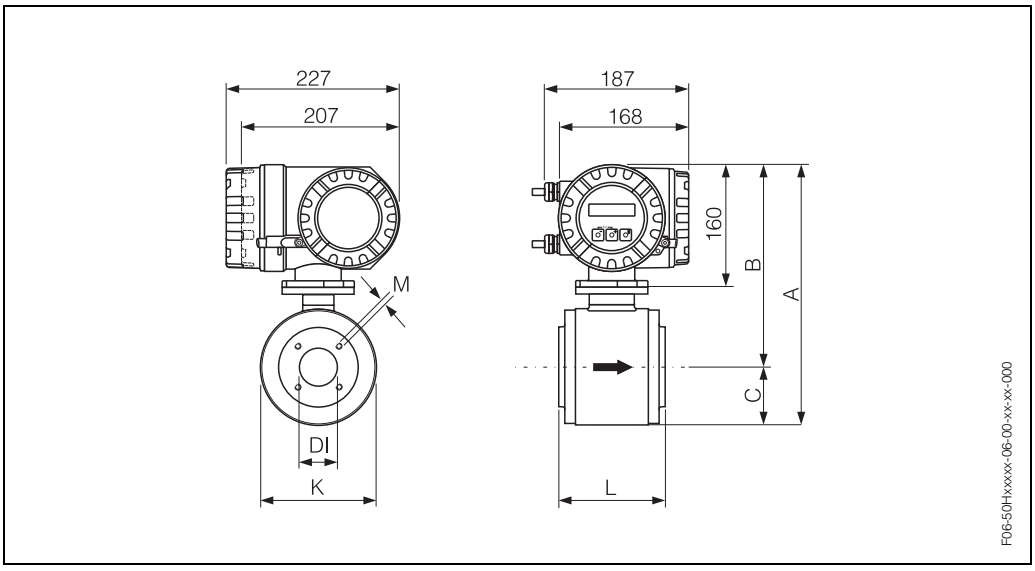



*Fig. 71: Dimensions Promag H / DN 40...100 (compact version, aluminum field housing)*

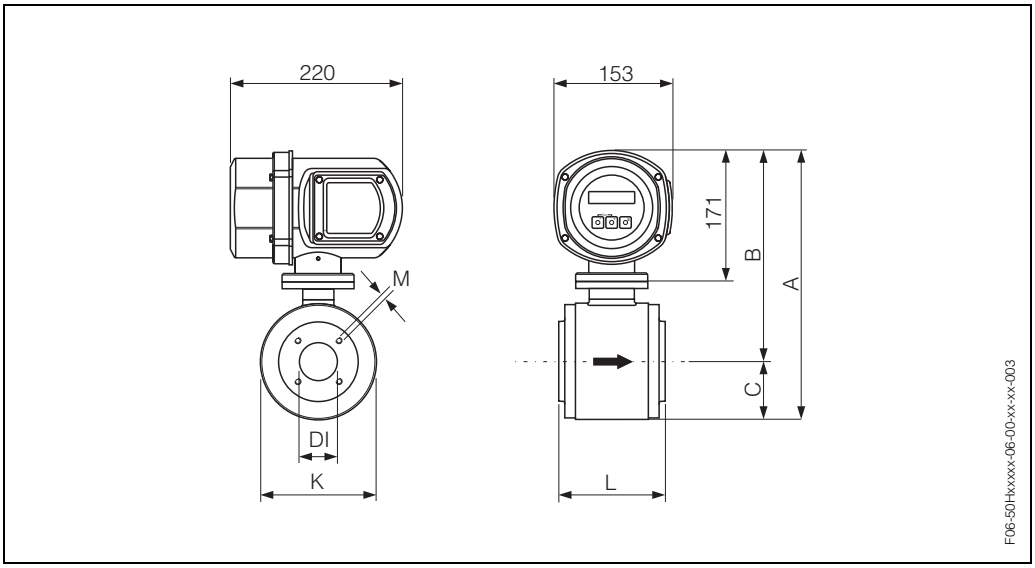



*Fig. 72: Dimensions Promag H / DN 40...100 (compact version, stainless-steel field housing)*

| DN | | PN | DI | L | A * | B * | C | K | M |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | [bar] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 40 | 1 1/2" | 16 | 35.3 | 140 | 319 (330) | 255 (266) | 64 | 128 | M 6x4 |
| 50 | 2" | 16 | 48.1 | 140 | 344 (355) | 267 (278) | 77 | 153 | M 8x4 |
| 65 | 2 1/2" | 16 | 59.9 | 140 | 344 (355) | 267 (278) | 77 | 153 | M 8x4 |
| 80 | 3" | 16 | 72.6 | 200 | 394 (405) | 292 (303) | 102 | 203 | M 12x4 |
| 100 | 4" | 16 | 97.5 | 200 | 394 (405) | 292 (303) | 102 | 203 | M 12x4 |

Overall fitting length will depend on the process connections → Page 145 ff.
* () = Dimensions stainless steel field housing

### Promag H / DN 40...100 (remote version)

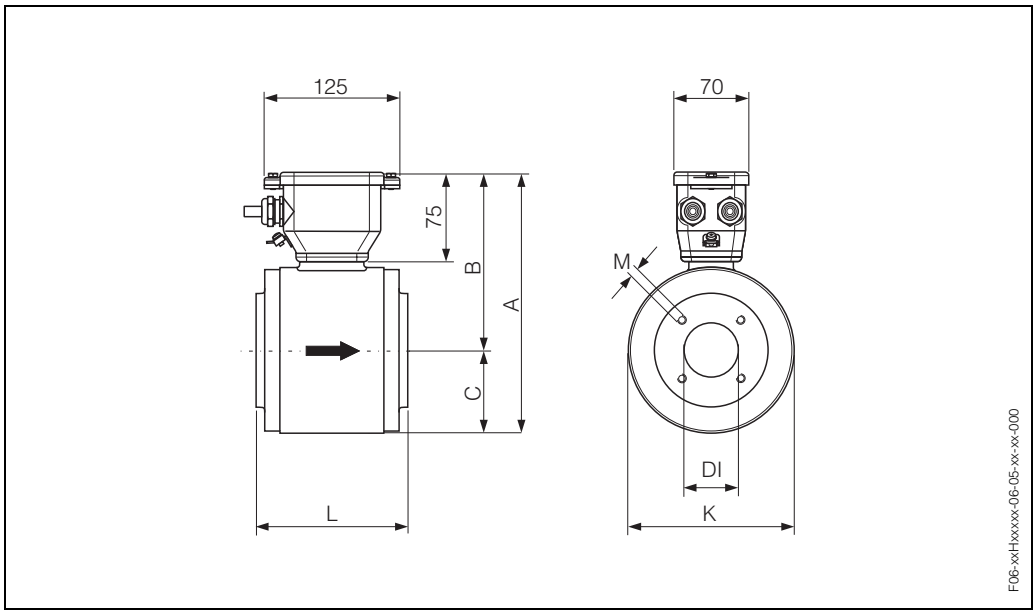



*Fig. 73: Dimensions Promag H / DN 40...100 (remote version)*
*Dimensions wall-mounted housing → see Page 122*

| DN | | PN | DI | L | A | B | C | K | M |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | [bar] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 40 | 1 1/2" | 16 | 35.3 | 140 | 216 | 151.5 | 64.5 | 128 | M 6x4 |
| 50 | 2" | 16 | 48.1 | 140 | 241 | 164.0 | 77.0 | 153 | M 8x4 |
| 65 | 2 1/2" | 16 | 59.9 | 140 | 241 | 164.0 | 77.0 | 153 | M 8x4 |
| 80 | 3" | 16 | 72.6 | 200 | 290 | 188.5 | 101.5 | 203 | M 12x4 |
| 100 | 4" | 16 | 97.5 | 200 | 290 | 188.5 | 101.5 | 203 | M 12x4 |
| Fitting length depends on process connections → Page 145 ff. | | | | | | | | | |

## 10.8 Process connections Promag H (DN 2...25)

**Front view of sensor Promag H / DN 2...25 (without process connections)**

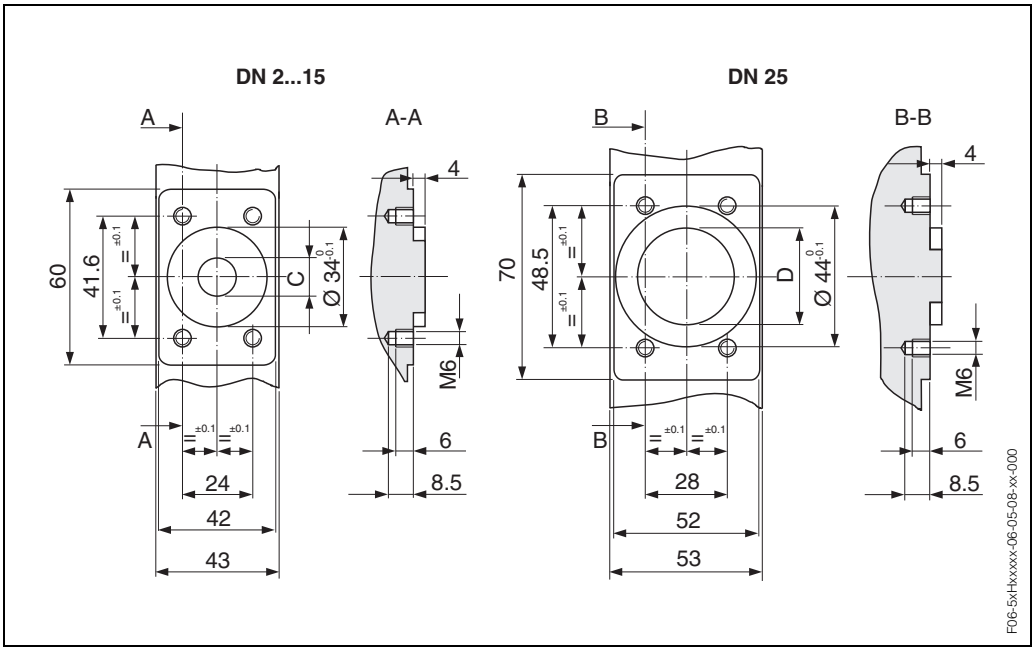
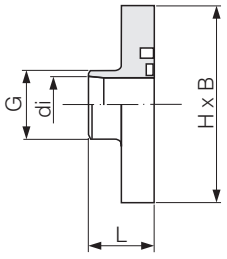
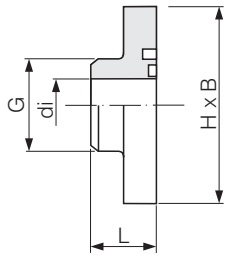


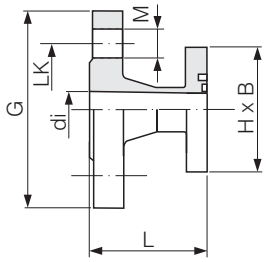

*Fig. 74: Dimensions front view of sensor DN 2…25*

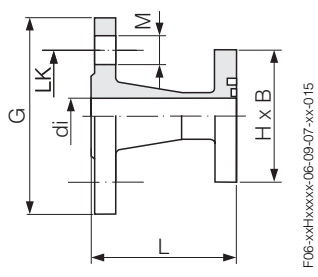
| **DN** [mm] | **C** [mm] | **D (DIN)** [mm] | **D (ANSI)** [mm] |
|---|---|---|---|
| 2...8 | 9 | – | – |
| 15 | 16 | – | – |
| 25 (DIN) | – | 26 | – |
| 25 (1" ANSI) | – | – | 22.6 |

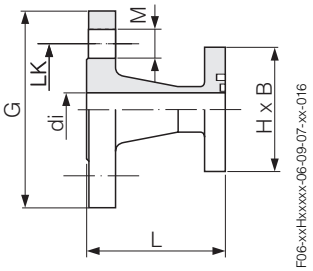
## Process connections with O-ring seals (DN 2…25)

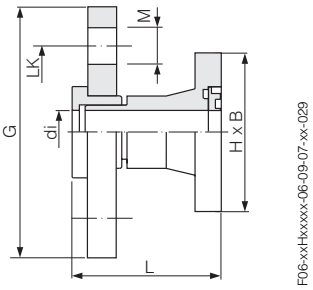
| **Weld nipples 1.4404 / 316L** 5*H**-B********** | **Sensor** DN [mm] | **Fits to** Piping DIN EN ISO 1127 | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|
|   | 2…8 | 13.5 x 1.6 | 10.3 | 13.5 | 20.3 | 60 x 42 |
| | 15 | 21.3 x 1.6 | 18.1 | 21.3 | 20.3 | 60 x 42 |
| | 25 (DIN) | 33.7 x 2 | 29.7 | 33.7 | 20.3 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | |

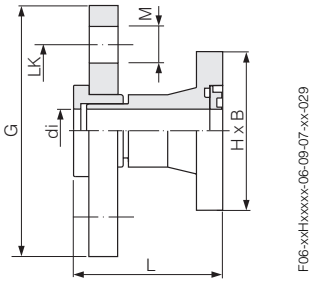
| **Weld nipples for IPS pipe 1.4404 / 316L** 5*H**-C********** | **Sensor** DN [mm] | **Fits to** Piping OD/SMS | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|
|   | 2…8 | 13.5 x 2.3 | 9.0 | 13.5 | 20.3 | 60 x 42 |
| | 15 | 21.3 x 2.65 | 16.0 | 21.3 | 20.3 | 60 x 42 |
| | 25 (1" ANSI) | 33.7 x 3.25 | 27.2 | 33.7 | 22.3 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | |

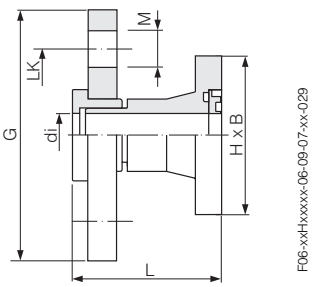
| **Flange PN 40 EN 1092-1 (DIN 2501), 1.4404 / 316L** 5*H**-D********** | **Sensor** DN [mm] | **Fits to** Flange EN1092-1 (DIN 2501) | **di** [mm] | **G** [mm] | **L** [mm] | **LK** [mm] | **M** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|---|
|   | 2…8 | DN 15 | 17.3 | 95 | 56.2 | 65 | 14 | 60 x 42 |
| | 15 | DN 15 | 17.3 | 95 | 56.2 | 65 | 14 | 60 x 42 |
| | 25 (DIN) | DN 25 | 28.5 | 115 | 56.2 | 85 | 14 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm<br>Fitting length to DVGW (200 mm) | | | | | | | |

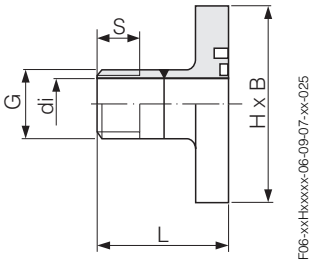
| **Flange Cl 150 / ANSI 16.5 1.4404 / 316L** 5*H**-E********** | **Sensor** DN [mm] | **Fits to** Flange ANSI 16.5 | **di** [mm] | **G** [mm] | **L** [mm] | **LK** [mm] | **M** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|---|
|   | 2…8 | 1/2" | 15.7 | 89 | 66.0 | 60.5 | 15.7 | 60 x 42 |
| | 15 | 1/2" | 16.0 | 89 | 66.0 | 60.5 | 15.7 | 60 x 42 |
| | 25 (1" ANSI) | 1" | 26.7 | 108 | 71.8 | 79.2 | 15.7 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | | | |

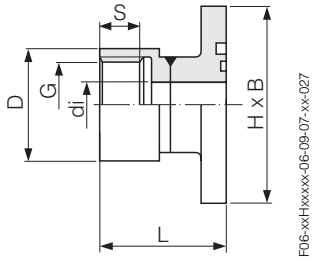
| **Flange 20 K / JIS B2238 1.4404 / 316L** 5*H**-F********** | **Sensor** DN [mm] | **Fits to** Flange B2238 | **di** [mm] | **G** [mm] | **L** [mm] | **LK** [mm] | **M** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | ND 10 | 15 | 95 | 67 | 70 | 15 | 60 x 42 |
| | 15 | ND 15 | 16 | 95 | 67 | 70 | 15 | 60 x 42 |
| | 25 (DIN) | ND 25 | 26 | 125 | 67 | 95 | 19 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | | | |

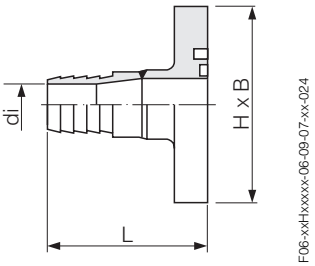
| **Flange PN 16 / EN 1092-1 (DIN 2501), PVDF** 5*H**-G********** | **Sensor** DN [mm] | **Fits to** Flange EN1092-1 (DIN 2501) | **di** [mm] | **G** [mm] | **L** [mm] | **M** [mm] | **LK** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | DN 15 | 15.7 | 95 | 57 | 14 | 65 | 60 x 42 |
| | 15 | DN 15 | 15.7 | 95 | 57 | 14 | 65 | 60 x 42 |
| | 25 (DIN) | DN 25 | 27.3 | 115 | 57 | 14 | 85 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– Fitting length to DVGW (200 mm)<br>– The requisite ground rings can be ordered as accessories (Order No. DK5HR-****) | | | | | | | |

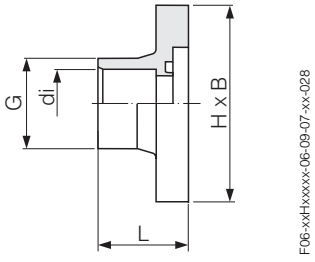
| **Flange Cl 150 / ANSI 16.5 PVDF** 5*H**-H********** | **Sensor** DN [mm] | **Fits to** Flange ANSI 16.5 | **di** [mm] | **G** [mm] | **L** [mm] | **M** [mm] | **LK** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | 1/2" | 15.7 | 95 | 57 | 16 | 60 | 60 x 42 |
| | 15 | 1/2" | 15.7 | 95 | 57 | 16 | 60 | 60 x 42 |
| | 25 (1" ANSI) | 1" | 27.3 | 115 | 57 | 16 | 79 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– The requisite ground rings can be ordered as accessories (Order No. DK5HR-****) | | | | | | | |

| **Flange 10 K / JIS B2238 PVDF** 5*H**-J********** | **Sensor** DN [mm] | **Fits to** Flange B2238 | **di** [mm] | **G** [mm] | **L** [mm] | **M** [mm] | **LK** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | ND 15 | 15.7 | 95 | 57 | 15 | 70 | 60 x 42 |
| | 15 | ND 15 | 15.7 | 95 | 57 | 15 | 70 | 60 x 42 |
| | 25 (DIN) | ND 25 | 27.3 | 125 | 57 | 19 | 90 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– The requisite ground rings can be ordered as accessories (Order No. DK5HR-****) | | | | | | | |

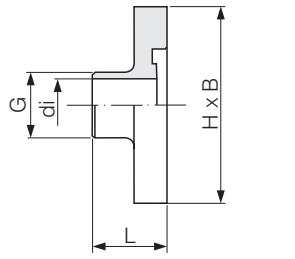
| **External pipe thread ISO 228 / DIN 2999, 1.4404 / 316L**<br>5*H**-K********** | **Sensor**<br>DN [mm] | **Fits to**<br>Internal thread [inch] | **di**<br>[mm] | **G**<br>[inch] | **L**<br>[mm] | **S**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|---|
|  | 2…8 | R 3/8" | 10 | 3/8" | 40 | 10.1 | 60 x 42 |
| | 15 | R 1/2" | 16 | 1/2" | 40 | 13.2 | 60 x 42 |
| | 25 (1" ANSI) | R 1" | 25 | 1" | 40 | 16.5 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | | |

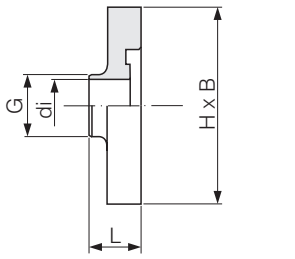
| **Internal pipe thread ISO 228 / DIN 2999, 1.4404 / 316L**<br>5*H**-L********** | **Sensor**<br>DN [mm] | **Fits to**<br>External thread [inch] | **di**<br>[mm] | **G**<br>[inch] | **D**<br>[mm] | **L**<br>[mm] | **S**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | Rp 3/8" | 8.9 | 3/8" | 22 | 45 | 13 | 60 x 42 |
| | 15 | Rp 1/2" | 16.0 | 1/2" | 27 | 45 | 14 | 60 x 42 |
| | 25 (1" ANSI) | Rp 1" | 27.2 | 1" | 40 | 49 | 17 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | | | |

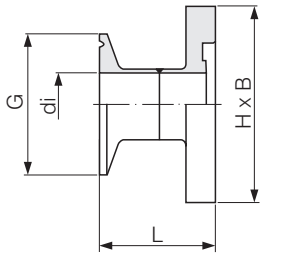
| **Hose connection 1.4404 / 316L**<br>5*H**-M/N/P********** | **Sensor**<br>DN [mm] | **Fits to**<br>Inside diameter [mm] | **di**<br>[mm] | **LW**<br>[mm] | **L**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|
|  | 2…8 | 13 | 10.0 | 13 | 49 | 60 x 42 |
| | 15 | 16 | 12.6 | 16 | 49 | 60 x 42 |
| | 15 | 19 | 16.0 | 19 | 49 | 60 x 42 |
| | Fitting length = (2 x L) + 86 mm | | | | | |

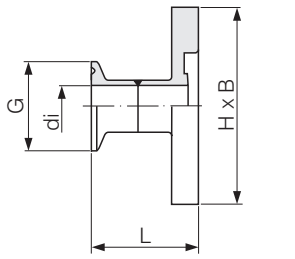
| **Adhesive fitting PVC**<br>5*H**-R/S********** | **Sensor**<br>DN [mm] | **Fits to**<br>Pipe | **di**<br>[mm] | **G**<br>[mm] | **L**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|
|  | 2…8 | 1/2" [inch] | 21.5 | 27.3 | 38.5 | 60 x 42 |
| | 2...8 | 20 x 2 [mm] (DIN 8062) | 20.2 | 27.0 | 38.5 | 60 x 42 |
| | 15 | 20 x 2 [mm] (DIN 8062) | 20.2 | 27.0 | 28.0 | 60 x 42 |
| | – Fitting length = (2 x L) + 86 mm<br>– The requisite ground rings can be ordered as accessories (Order No. DK5HR-****) | | | | | |

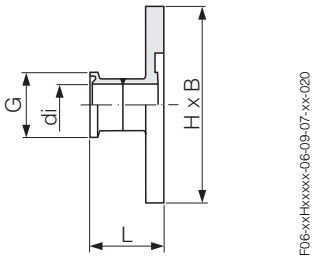
### Process connections with aseptic gasket seal (DN 2…25 )

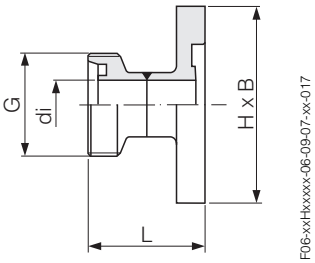
| **Weld nipple for DIN 1.4404 / 316L** 5*H**-U********** | **Sensor** DN [mm] | **Fits to** Piping DIN 11850 | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|
|   | 2…8 | 14 x 2 | 10 | 14 | 23.3 | 60 x 42 |
| | 15 | 20 x 2 | 16 | 20 | 23.3 | 60 x 42 |
| | 25 (DIN) | 30 x 2 | 26 | 30 | 23.3 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

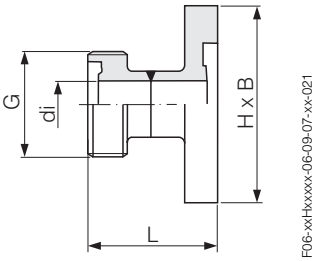
| **Weld nipples for ODT/SMS 1.4404 / 316L** 5*H**-V********** | **Sensor** DN [mm] | **Fits to** Piping OD / SMS | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|
|   | 2…8 | 12.7 x 1.65 | 9.4 | 12.7 | 16.1 | 60 x 42 |
| | 15 | 19.1 x 1.65 | 15.8 | 19.1 | 16.1 | 60 x 42 |
| | 25 (1" ANSI) | 24.5 x 1.65 | 22.1 | 25.4 | 16.1 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

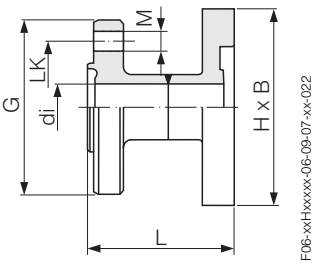
| **Clamp ISO 2852, Fig. 2 1.4404 / 316L** 5*H**-W********** | **Sensor** DN [inch] | **Fits to** Piping ISO 2037 / BS 4825-1 | **ISO 2852** Diameter [mm] | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|---|
|   | 25 (1" ANSI) | Tube 25.4 x 1.65 | 25 | 22.6 | 50.5 | 44.5 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | | |

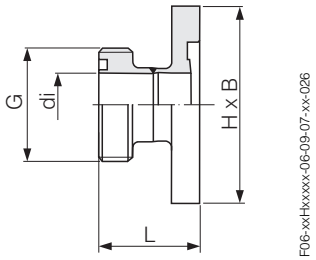
| **Clamp DIN 32676 1.4404 / 316L** 5*H**-0********** | **Sensor** DN [mm] | **Fits to** Piping DIN 11850 | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|
|   | 2…8 | Tube 14 x 2 (DN 10) | 10 | 34.0 | 41.0 | 60 x 42 |
| | 15 | Tube 20 x 2 (DN 15) | 16 | 34.0 | 41.0 | 60 x 42 |
| | 25 (DIN) | Tube 30 x 2 (DN 25) | 26 | 50.5 | 44.5 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

| **Tri-clamp L14 AM7**<br>**1.4404 / 316L**<br>5*H**-1********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping OD | **di**<br>[mm] | **G**<br>[mm] | **L**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|
|  | 2…8 | Tube 12.7 x 1.65 (ODT 1/2") | 9.4 | 25.0 | 28.5 | 60 x 42 |
| | 15 | Tube 19.1 x 1.65 (ODT 3/4") | 15.8 | 25.0 | 28.5 | 60 x 42 |
| | 25 (1" ANSI) | Tube 25.5 x 1.65 (ODT 1") | 22.1 | 50.4 | 28.5 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

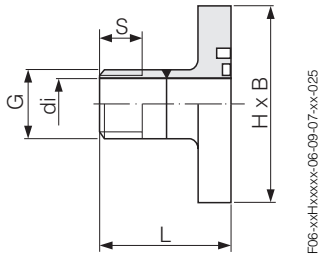
| **Coupling:**<br>**Threaded adapter SC DIN 11851**<br>**1.4404 / 316L**<br>5*H**-2********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping DIN 11850 | **di**<br>[mm] | **G**<br>[mm] | **L**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|
|  | 2…8 | Tube 12 x 1 (DN 10) | 10 | Rd 28 x 1/8" | 44 | 60 x 42 |
| | 15 | Tube 18 x 1 or 1.5 (DN 15) | 16 | Rd 34 x 1/8" | 44 | 60 x 42 |
| | 25 (DIN) | Tube 28 x 1 or 1.5 (DN 25) | 26 | Rd 52 x 1/6" | 52 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

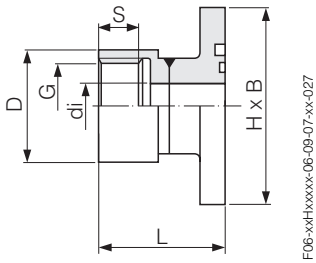
| **Coupling DIN 11864-1:**<br>**Aseptic threaded adapter, Form A**<br>**1.4404 / 316L**<br>5*H**-3********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping DIN 11850 | **di**<br>[mm] | **G**<br>[mm] | **L**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|
|  | 2…8 | Tube 13 x 1.5 (DN 10) | 10 | Rd 28 x 1/8" | 42 | 60 x 42 |
| | 15 | Tune 19 x 1.5 (DN 15) | 16 | Rd 34 x 1/8" | 42 | 60 x 42 |
| | 25 (DIN) | Tube 29 x 1.5 (DN 25) | 26 | Rd 52 x 1/6" | 49 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

| **Flange DIN 11864-2**<br>**Aseptic grooved flange, Form A**<br>**1.4404 / 316L**<br>5*H**-4********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping DIN 11850 | **di**<br>[mm] | **G**<br>[mm] | **L**<br>[mm] | **LK**<br>[mm] | **M**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | Tube 13 x 1.5 (DN 10) | 10 | 54 | 48.5 | 37 | 9 | 60 x 42 |
| | 15 | Tube 19 x 1.5 (DN 15) | 16 | 59 | 48.5 | 42 | 9 | 60 x 42 |
| | 25 (DIN) | Tube 29 x 1.5 (DN 25) | 26 | 70 | 48.5 | 53 | 9 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | | | |

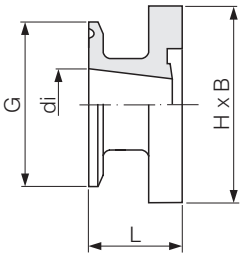
| **Coupling:**<br>**Threaded adapter SMS 1145**<br>**1.4404 / 316L**<br>5*H**-5********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping OD | **SMS 1145**<br>Diameter [mm] | **di**<br>[mm] | **G**<br>[mm] | **L**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|---|
|  | 25 (1" ANSI) | 1" | 25 | 22.5 | Rd 40 x 1/6" | 30.8 | 70 x 52 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | | |

### Process connections orderable only as accessories (with O-ring seal, DN 2…25)

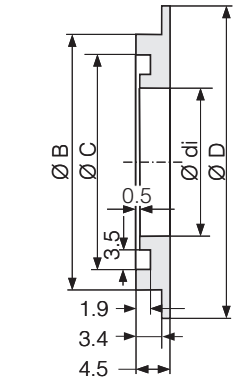
| **External pipe thread**<br>**1.4404 / 316L**<br>DKH**-GD** | **Sensor**<br>DN [mm] | **Fits to**<br>NP internal thread | **di**<br>[mm] | **G**<br>[inch] | **L**<br>[mm] | **S**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|---|
|  | 2…8 | NPT 3/8" | 10 | 3/8" | 50 | 15.5 | 60 x 42 |
| | 15 | NPT 1/2" | 16 | 1/2" | 50 | 20.0 | 60 x 42 |
| | 25 (1" ANSI) | NPT 1" | 25 | 1" | 57 | 25.0 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | | |

| **Internal pipe thread**<br>**1.4404 / 316L**<br>DKH**-GC** | **Sensor**<br>DN [mm] | **Fits to**<br>NP external thread | **di**<br>[mm] | **G**<br>[inch] | **D**<br>[mm] | **L**<br>[mm] | **S**<br>[mm] | **H x B**<br>[mm] |
|---|---|---|---|---|---|---|---|---|
|  | 2…8 | NPT 3/8" | 8.9 | 3/8" | 22 | 45 | 13 | 60 x 42 |
| | 15 | NPT 1/2" | 16.0 | 1/2" | 27 | 45 | 14 | 60 x 42 |
| | 25 (1" ANSI) | NPT 1" | 27.2 | 1" | 40 | 49 | 17 | 70 x 52 |
| | Fitting length = (2 x L) + 86 mm | | | | | | | |

### Process connections orderable only as accessories (with aseptic gasket seal)

| **Tri-Clamp L14 AM7 1.4404 / 316L** DKH**-HF*** | **Sensor** DN [mm] | **Fits to** Piping OD | **di** [mm] | **G** [mm] | **L** [mm] | **H x B** [mm] |
|---|---|---|---|---|---|---|
|  | 15 | Tube 25.4 x 1.5 (ODT; 1") | 22.1 | 50.4 | 28.5 | 60 x 42 |
| | – Fitting length = (2 x L) + 86 mm<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 133) and process connection (di) into account. | | | | | |

### Ground rings (accessories for PVDF flanges / PVC adhesive fitting)

| **Ground ring 1.4435/316L, Alloy C-22, tantalum** DK5HR – **** | **Sensor** DN [mm] | **di** [mm] | **D** [mm] | **B** [mm] | **C** [mm] |
|---|---|---|---|---|---|
|  | 2…8 | 9.0 | 33.9 | 22.0 | 17.6 |
| | 15 | 16.0 | 33.9 | 29.0 | 24.6 |
| | 25 (1" ANSI) | 22.6 | 43.9 | 36.5 | 31.2 |
| | 25 (DIN) | 26.0 | 43.9 | 39.0 | 34.6 |

## 10.9 Process connections Promag H (DN 40...100)

**Front view Promag H / DN 40...100 (without process connection)**

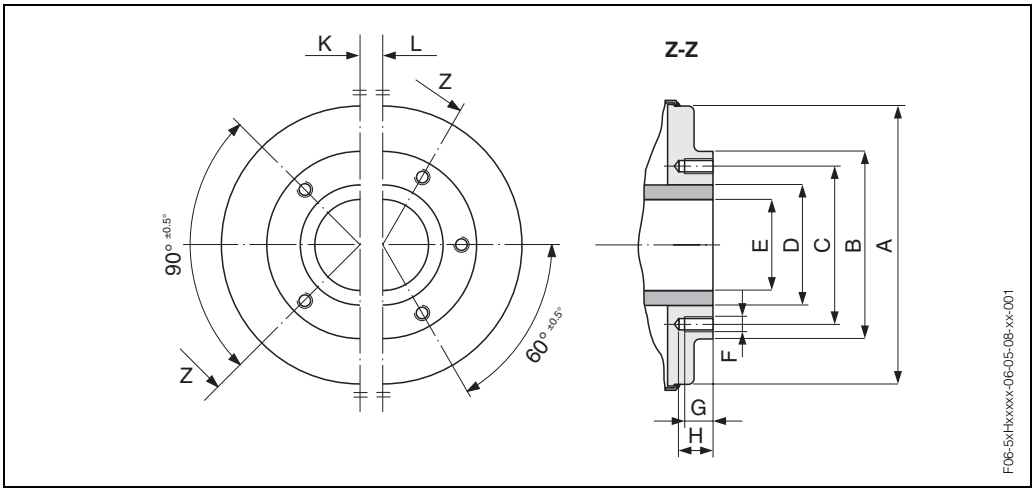
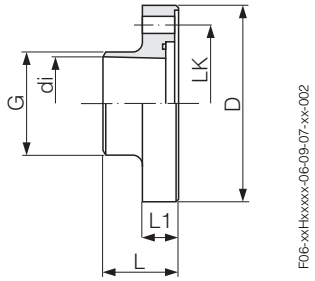
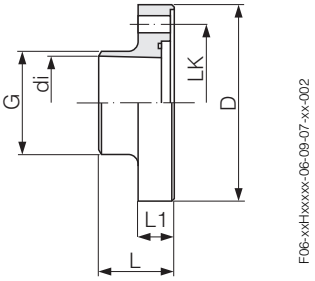


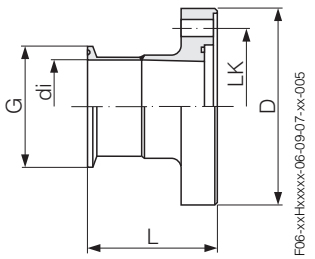

*Fig. 75: Dimensions front view of sensor DN 40…100*

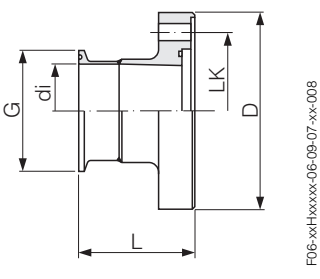
| DN | A | B | C | D | E | F | G | H | L | K |
|---|---|---|---|---|---|---|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | Threaded holes | |
| 40 | 122.0 | 86 | 71.0 | 51.0 | 35.3 | M 8 | 15 | 18 | – | 4 |
| 50 | 147.0 | 99 | 83.5 | 63.5 | 48.1 | M 8 | 15 | 18 | – | 4 |
| 65 | 147.0 | 115 | 100.0 | 76.1 | 59.9 | M 8 | 15 | 18 | 6 | – |
| 80 | 197.0 | 141 | 121.0 | 88.9 | 72.6 | M 12 | 15 | 20 | – | 4 |
| 100 | 197.0 | 162 | 141.5 | 114.3 | 97.5 | M 12 | 15 | 20 | 6 | – |

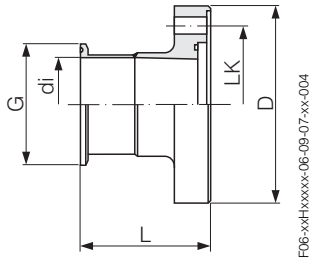
## Process connections with gasket seal (DN 40…100)

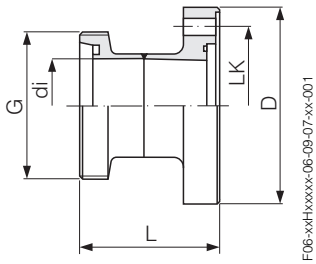
| **Weld nipples for DIN 1.4404 / 316L** 5*H**-U********** | **Sensor** DN [mm] | **Fits to** Piping DIN 11850 | **di** [mm] | **G** [mm] | **D** [mm] | **L** [mm] | **L1** [mm] | **LK** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 40 | 42 x 2 | 38.0 | 43 | 92 | 42 | 19 | 71.0 |
| | 50 | 54 x 2 | 50.0 | 55 | 105 | 42 | 19 | 83.5 |
| | 65 | 70 x 2 | 66.0 | 72 | 121 | 42 | 21 | 100.0 |
| | 80 | 85 x 2 | 81.0 | 87 | 147 | 42 | 24 | 121.0 |
| | 100 | 104 x 2 | 100.0 | 106 | 168 | 42 | 24 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

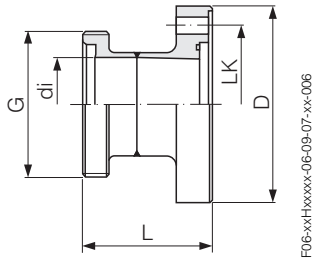
| **Weld nipples for ODT 1.4404 / 316L** 5*H**-V********** | **Sensor** DN [mm] | **Fits to** Piping OD | **di** [mm] | **G** [mm] | **D** [mm] | **L** [mm] | **L1** [mm] | **LK** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 40 | 38.1 x 1.65 | 35.3 | 40 | 92 | 42 | 19 | 71.0 |
| | 50 | 50.8 x 1.65 | 48.1 | 55 | 105 | 42 | 19 | 83.5 |
| | 65 | 63.5 x 1.65 | 59.9 | 66 | 121 | 42 | 21 | 100.0 |
| | 80 | 76.2 x 1.65 | 72.6 | 79 | 147 | 42 | 24 | 121.0 |
| | 100 | 101.6 x 1.65 | 97.5 | 104 | 168 | 42 | 24 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

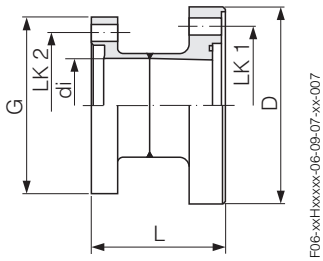
| **Clamp ISO 2852 1.4404 / 316L** 5*H**-W********** | **Sensor** DN [mm] | **Fits to** Piping ISO 2037 / BS 4825-1 | **Clamp ISO 2852** Diameter [mm] | **di** [mm] | **G** [mm] | **D** [mm] | **L** [mm] | **LK** [mm] |
|---|---|---|---|---|---|---|---|---|
|  | 40 | 38.0 x 1.6 | 38.0 | 35.6 | 50.5 | 92 | 68.5 | 71.0 |
| | 50 | 51.0 x 1.6 | 51.0 | 48.6 | 64.0 | 105 | 68.5 | 83.5 |
| | 65 | 63.5 x 1.6 | 63.5 | 60.3 | 77.5 | 121 | 68.5 | 100.0 |
| | 80 | 76.1 x 1.6 | 76.1 | 72.9 | 91.0 | 147 | 68.5 | 121.0 |
| | 100 | 101.6 x 2.0 | 101.6 | 97.6 | 119.0 | 168 | 68.5 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

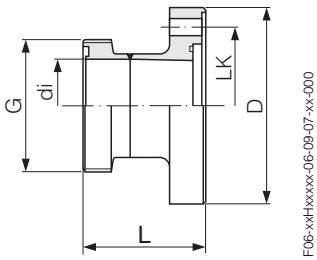
| **Clamp DIN 32676 1.4404 / 316L** 5*H**-0********** | **Sensor** DN [mm] | **Fits to** Piping DIN 11850 | **di** [mm] | **G** [mm] | **D** [mm] | **L** [mm] | **LK** [mm] |
|---|---|---|---|---|---|---|---|
|  | 40 | 42 x 2 | 38 | 50.5 | 92 | 61.5 | 71.0 |
| | 50 | 54 x 2 | 50 | 64.0 | 105 | 61.5 | 83.5 |
| | 65 | 70 x 2 | 66 | 91.0 | 121 | 68.0 | 100.0 |
| | 80 | 85 x 2 | 81 | 106.0 | 147 | 68.0 | 121.0 |
| | 100 | 104 x 2 | 100 | 119.0 | 168 | 68.0 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | |

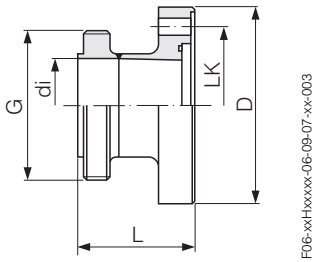
| **Tri-Clamp L14 AM7**<br>**1.4404 / 316L**<br>5*H**-1********** | **Sensor** | | **Fits to** | **di** | **G** | **D** | **L** | **LK** |
|---|---|---|---|---|---|---|---|---|
| | DN [mm] | DN [inch] | Piping OD | [mm] | [mm] | [mm] | [mm] | [mm] |
|  | 40 | 1 1/2" | 38.1 x 1.65 | 34.8 | 50.4 | 92 | 68.6 | 71.0 |
| | 50 | 2" | 50.8 x 1.65 | 47.5 | 63.9 | 105 | 68.6 | 83.5 |
| | 65 | – | 63.5 x 1.65 | 60.2 | 77.4 | 121 | 68.6 | 100.0 |
| | 80 | 3" | 76.2 x 1.65 | 72.9 | 90.9 | 147 | 68.6 | 121.0 |
| | 100 | 4" | 101.6 x 1.65 | 97.4 | 118.9 | 168 | 68.6 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

| **Coupling:**<br>**Threaded adapter SC DIN 11851**<br>**1.4404 / 316L**<br>5*H**-2********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping DIN 11850 | **di**<br>[mm] | **G**<br>[mm] | **D**<br>[mm] | **L**<br>[mm] | **LK**<br>[mm] |
|---|---|---|---|---|---|---|---|
|  | 40 | 42 x 2 | 38 | Rd 65 x 1/6" | 92 | 72 | 71.0 |
| | 50 | 54 x 2 | 50 | Rd 78 x 1/6" | 105 | 74 | 83.5 |
| | 65 | 70 x 2 | 66 | Rd 95 x 1/6" | 121 | 78 | 100.0 |
| | 80 | 85 x 2 | 81 | Rd 110 x 1/4" | 147 | 83 | 121.0 |
| | 100 | 104 x 2 | 100 | Rd 130 x 1/4" | 168 | 92 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | |

| **Coupling: Threaded adapter**<br>**DIN 11864-1, Form A**<br>**1.4404 / 316L**<br>5*H**-3********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping DIN 11850 | **di**<br>[mm] | **G**<br>[mm] | **D**<br>[mm] | **L**<br>[mm] | **LK**<br>[mm] |
|---|---|---|---|---|---|---|---|
|  | 40 | 42 x 2 | 38 | Rd 65 x 1/6" | 92 | 71 | 71.0 |
| | 50 | 54 x 2 | 50 | Rd 78 x 1/6" | 105 | 71 | 83.5 |
| | 65 | 70 x 2 | 66 | Rd 95 x 1/6" | 121 | 76 | 100.0 |
| | 80 | 85 x 2 | 81 | Rd 110 x 1/4" | 147 | 82 | 121.0 |
| | 100 | 104 x 2 | 100 | Rd 130 x 1/4" | 168 | 90 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | |

| **Flange: Aseptic flat flange**<br>**DIN 11864-2, Form A**<br>**1.4404/316L**<br>5*H**-4********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping DIN 11850 | **di**<br>[mm] | **G**<br>[mm] | **D**<br>[mm] | **L**<br>[mm] | **LK1**<br>[mm] | **LK2**<br>[mm] |
|---|---|---|---|---|---|---|---|---|
|  | 40 | 42 x 2 | 38 | 82 | 92 | 64 | 71.0 | 65 |
| | 50 | 54 x 2 | 50 | 94 | 105 | 64 | 83.5 | 77 |
| | 65 | 70 x 2 | 66 | 113 | 121 | 64 | 100.0 | 95 |
| | 80 | 85 x 2 | 81 | 133 | 147 | 98 | 121.0 | 112 |
| | 100 | 104 x 2 | 100 | 159 | 168 | 98 | 141.5 | 137 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

| **Coupling:**<br>**Threaded adapter SMS 1145**<br>**1.4404 / 316L**<br>5*H**-5********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping OD | **SMS 1145**<br>Diameter [mm] | **di**<br>[mm] | **G**<br>[mm] | **D**<br>[mm] | **L**<br>[mm] | **LK**<br>[mm] |
|---|---|---|---|---|---|---|---|---|
|  | 40 | 38.1 x 1.65 | 38.0 | 35.5 | Rd 60 x 1/6" | 92 | 63 | 71.0 |
| | 50 | 50.8 x 1.65 | 51.0 | 48.5 | Rd 70 x 1/6" | 105 | 65 | 83.5 |
| | 65 | 63.5 x 1.65 | 63.5 | 60.5 | Rd 85 x 1/6" | 121 | 70 | 100.0 |
| | 80 | 76.2 x 1.65 | 76.0 | 72.0 | Rd 98 x 1/6" | 147 | 75 | 121.0 |
| | 100 | 101.6 x 1.65 | 101.6 | 97.6 | Rd 132 x 1/6" | 168 | 70 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

| **Coupling:**<br>**Threaded adapter ISO 2853**<br>**1.4404 / 316L**<br>5*H**-6********** | **Sensor**<br>DN [mm] | **Fits to**<br>Piping ISO 2037 / BS 4825-1 | **ISO 2853**<br>Diameter [mm] | **di**<br>[mm] | **G**<br>[mm] | **D**<br>[mm] | **L**<br>[mm] | **LK**<br>[mm] |
|---|---|---|---|---|---|---|---|---|
|  | 40 | 38.0 x 1.6 | 38.0 | 35.6 | 50.6 | 92 | 61.5 | 71.0 |
| | 50 | 51.0 x 1.6 | 51.0 | 48.6 | 64.1 | 105 | 61.5 | 83.5 |
| | 65 | 63.5 x 1.6 | 63.5 | 60.3 | 77.6 | 121 | 61.5 | 100.0 |
| | 80 | 76.1 x 1.6 | 76.1 | 72.9 | 91.1 | 147 | 61.5 | 121.0 |
| | 100 | 101.6 x 2.0 | 101.6 | 97.6 | 118.1 | 168 | 61.5 | 141.5 |
| | – Fitting length = (2 x L) + 140 mm (DN 40…65) / + 200 mm (DN 80…100)<br>– If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 135) and process connection (di) into account. | | | | | | | |

# Index

# Declaration of contamination

Dear customer,
Because of legal determinations and for the safety of our employees and operating equipment we need this "Declaration of contamination" with your signature before your order can be handled. Please put the completely filled in declaration to the instrument and to the shipping documents in any case. Add also safety sheets and/or specific handling instructions if necessary.

type of instrument / sensor: _____ serial number: _____

medium / concentration: _____ temperature: _____ pressure: _____

cleaned with: _____ conductivity: _____ viscosity: _____

**Warning hints for medium used:**


☐ radioactive ☐ explosive ☐ caustic ☐ poisonous ☐ harmful to health ☐ biologically hazardous ☐ inflammable ☐ safe

Please mark the appropriate warning hints.

**Reason for return:**

_____

_____

**Company data:**

company: _____ contact person: _____

_____ _____

_____ department: _____

address: _____ phone number: _____

_____ fax / e-mail: _____

_____ your order no.: _____

I hereby certify that the returned equipment has been cleaned and decontaminated acc. to good industrial practices and is in compliance with all regulations. This equipment poses no health or safety risks due to contamination.

_____ _____

(Date) (company stamp and legally binding signature)

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