



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services

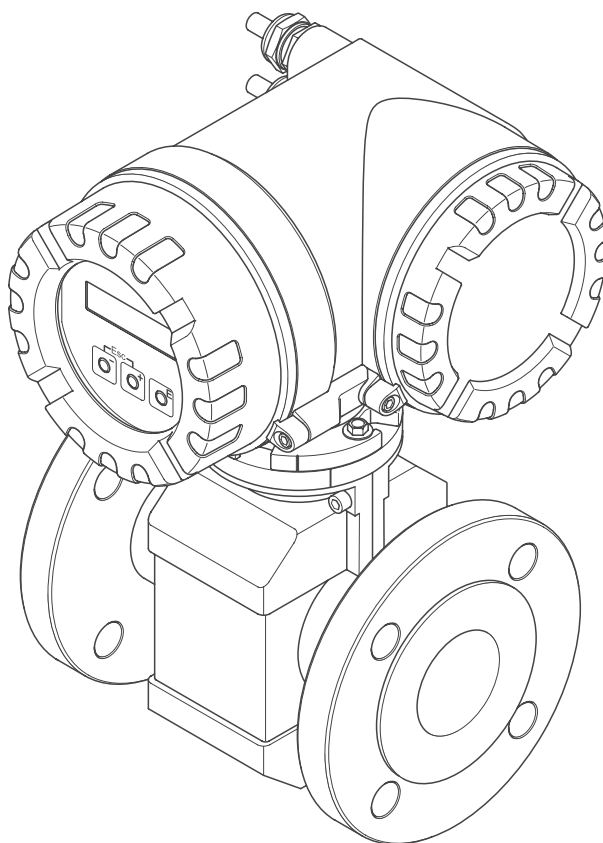


Solutions

## Operating Instructions

# Proline Promag 50 PROFIBUS DP/PA

## Electromagnetic Flow Measuring System



## Brief operating instructions

These brief operating instructions are intended to help you commission the measuring device quickly and easily:

<b>Safety instructions</b>	Page 7 ff.
First familiarize yourself with the safety instructions to be able to perform the following steps quickly and easily. Information provided in this section includes that on the designated use of the measuring device, the operational safety and the safety conventions and icons used in the document.	
▼	
<b>Installation</b>	Page 13 ff.
The “Installation” section provides you with all the important information from incoming acceptance and installation conditions to be taken into consideration (orientation, mounting location, vibrations, etc.) to the actual installation of the device incl. information on seals, grounding and the tightening torques to be observed.	
▼	
<b>Wiring</b>	Page 39 ff.
The electrical connection of the device and the connection of the remote version connecting cable are described in the “Wiring” section. Other topics discussed in this section include: <ul style="list-style-type: none"> <li>■ The specifications of the coil/signal cable and the fieldbus cable</li> <li>■ The terminal assignment</li> <li>■ The potential matching and the degree of protection</li> </ul>	
▼	
<b>Display and operating elements</b>	Page 59 ff.
This section describes the display and operating elements of the local display available and explains how to work with the function matrix.	
▼	
<b>Configuration programs</b>	Page 64 ff.
In addition to the local display, the measuring device can also be configured and operated using configuration programs from other manufacturers.	
▼	
<b>Hardware settings</b>	
Information on how to configure the HW write protection, device address, etc. for: <ul style="list-style-type: none"> <li>■ PROFIBUS DP → Page 67 ff.</li> <li>■ PROFIBUS PA → Page 70 ff.</li> </ul>	
▼	
<b>Basic configuration (device parameters, automation functions)</b>	Page 73
Device-specific parameters and functions can be configured quickly and easily by means of the “Commissioning” Quick Setup. These include the display language, measured variables, units, type of signal, etc.	
▼	
<b>PROFIBUS interface</b>	Page 75 ff.
Commissioning the PROFIBUS interface.	
▼	
<b>System integration and cyclic data transfer</b>	
Using the device master files (GSD files) → Page 77 ff. Cyclic data transfer → Page 80 ff.	
▼	
<b>Application-specific commissioning</b>	Page 88 ff.
Empty-pipe/full-pipe adjustment for detecting partially filled or empty pipes (empty pipe detection).	



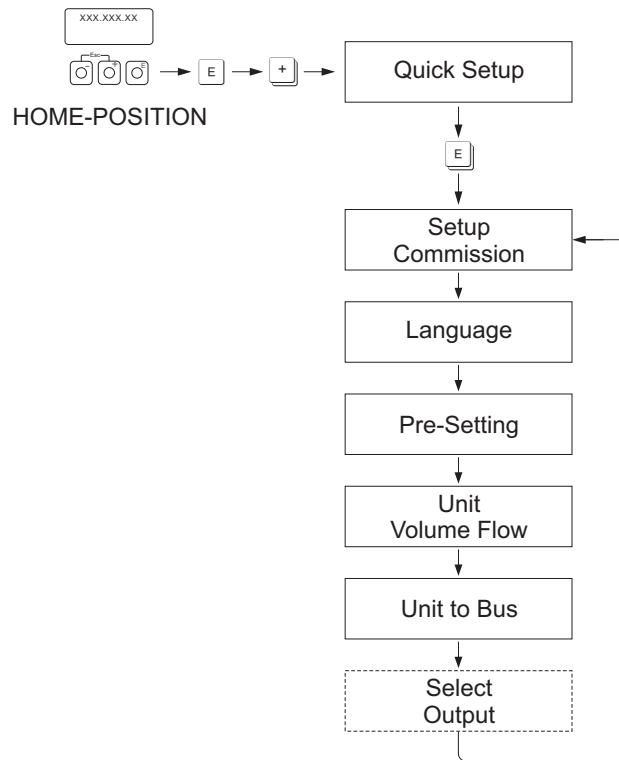
### Note!

Always start troubleshooting with the checklist on see Page 92 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 for rapid commissioning

If the measuring device is equipped with a local display, all the important device parameters for standard operation can be configured quickly and easily by means of the “Commissioning” Quick Setup menu.

In the case of measuring devices without a local display, the individual parameters and functions must be configured via a configuration program, (ToF Tool – Fieldtool Package, FieldCare).



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Fig. 1: Quick Setup “Commissioning”

For Quick Setup “Commissioning”, only settings have to be made in the functions shown in the graphic above.



**Note!**

When you run through the Quick Setup another function or option is displayed (“Select Output” option) but this should not be taken into account. Settings in this function are not processed further by the measuring system.



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# 1 Safety instructions

## 1.1 Designated use

The measuring device described in these Operating Instructions is to be used only for measuring the flow rate of conductive liquids in closed pipes. A minimum conductivity of 20  $\mu\text{S}/\text{cm}$  is required for measuring demineralized water. Most liquids can be metered, provided they have a minimum conductivity of 50  $\mu\text{S}/\text{cm}$ , 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 measuring 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 these Operating Instructions and must follow the instructions they contain.
- The measuring device must be operated by persons authorized and trained by the facility's owner-operator. Strict compliance with the instructions in these Operating Instructions is mandatory.
- Endress+Hauser will be happy to assist in clarifying the chemical resistance properties of parts wetted by special fluids, including fluids used for cleaning. However the user is responsible for the choice of fluid wetted materials as regards to their in-process resistance to corrosion. The manufacturer refuses to accept liability.
- If carrying out welding work on the piping, the welding unit may not be grounded by means of the measuring device.
- 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 isolated.
- 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 these Operating Instructions. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory. The symbol on the front of the Ex documentation indicates the approval and the certification body ( Europe,  USA,  Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/AI (IEC 1326) and NAMUR Recommendations NE 21, NE 43 and NE 53.
- 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 Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.

## 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 measuring device.



**Note!**

You will find a preprinted “Declaration of contamination” form at the back of these Operating Instructions.

- 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.



**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”.

The devices can, however, be a source of danger if used incorrectly or for anything other than the designated use. Consequently, always pay particular attention to the safety instructions indicated in these Operating Instructions 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 measuring 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 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

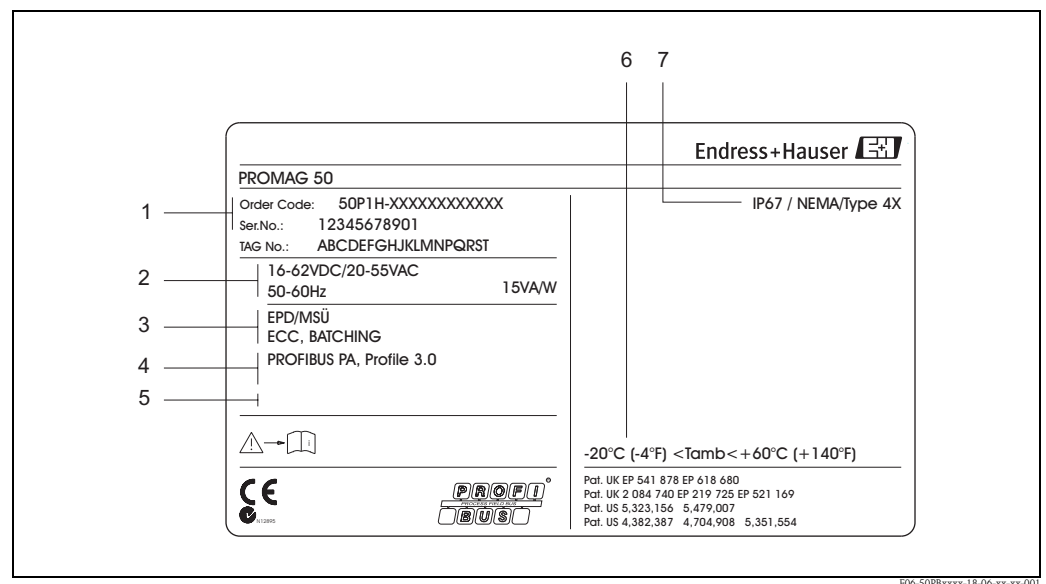


Fig. 2: Nameplate specifications for the “Promag 50” transmitter (example)

- 1 Order 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
- 4 Available inputs/outputs
- 5 Reserved for information on special products
- 6 Ambient temperature range
- 7 Degree of protection

## 2.1.2 Nameplate of the sensor

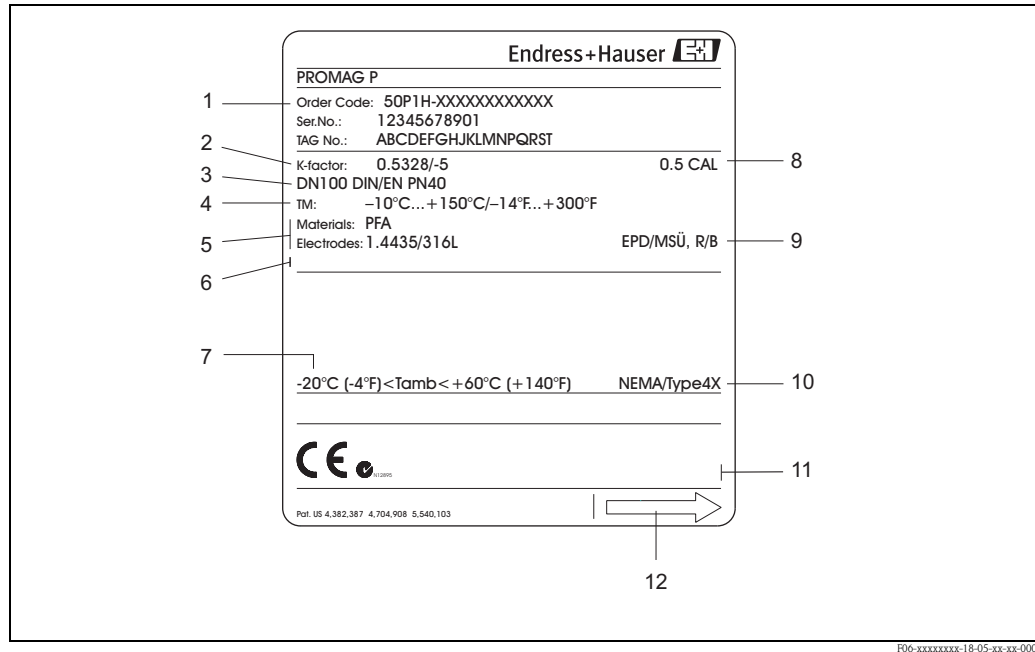


Fig. 3: Nameplate specifications for the "Promag" sensor (example)

- 1 Order code / Serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits
- 2 Calibration factor with zero point
- 3 Nominal diameter/Nominal pressure
- 4 Fluid temperature range
- 5 Materials: lining/measuring electrodes
- 6 Reserved for additional information for special products
- 7 Ambient temperature range
- 8 Calibration tolerance
- 9 Additional information (examples):
  - EPD/MSÜ: with empty pipe detection electrode
  - R/B: with reference electrode
- 10 Degree of protection
- 11 Reserved for additional information on device version (approvals, certificates)
- 12 Flow direction

### 2.1.3 Nameplate, connections

See operating manual  
Betriebsanleitung beachten  
Observer manuel d'instruction

A: active  
P: passive  
NO: normally open contact  
NC: normally closed contact

1 Ser.No.: 12345678912

4 Supply /  
Versorgung /  
Tension d'alimentation

5

6 SW-Version ex-works

7 Device SW: 3.01.00

8 Communication: PROFIBUS PA

9 Drivers: ID 1525 (HEX)

Date: 01. Oct. 05

10

11

20(+)/21(-)  
22(+)/23(-)  
24(+)/25(-)  
26(+)/27(-)

26 = PA +  
27 = PA -

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Fig. 4: Nameplate specifications for transmitter (example)

- 1 Serial number
- 2 Possible configuration of a current output (not available)
- 3 Possible configuration of a relay contact (not available)
- 4 Terminal assignment, 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
- 5 Signals present at inputs and outputs, possible configuration and terminal assignment → Page 48
- 6 Version of device software currently installed
- 7 Installed communication type
- 8 PROFIBUS ID No.
- 9 Date of installation
- 10 Language group
- 11 Current updates to data specified in points 6 to 9

## 2.2 Certificates and approvals

The devices are designed in accordance with good engineering practice 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” and with the EMC requirements of EN 61326/A1 (IEC 1326) and NAMUR Recommendations NE 21, NE 43 and NE 53.

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

The measuring system complies with the EMC requirements of the Australian Communications Authority (ACA).

The flow measuring system has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organization).

The device thus meets all the requirements of the following specifications:

- Certified to PROFIBUS Specification, Profile Version 3.0  
Device certification number: available on request
- The measuring device can also be operated with certified devices of other manufacturers (interoperability)

## 2.3 Registered trademarks

KALREZ® and VITON®

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

TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, D

HistoROM™, S-DAT™, ToF Tool – Fieldtool® Package, Fieldcheck®, Applicator®

Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

## 3 Installation

### 3.1 Incoming acceptance, transport and storage

#### 3.1.1 Incoming acceptance

On receipt of the goods, check the following points:

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

#### 3.1.2 Transport

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

- Transport the devices in the containers in which they are delivered.
- 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 ( $DN \leq 300$ )

Use webbing slings slung round the two process connections.

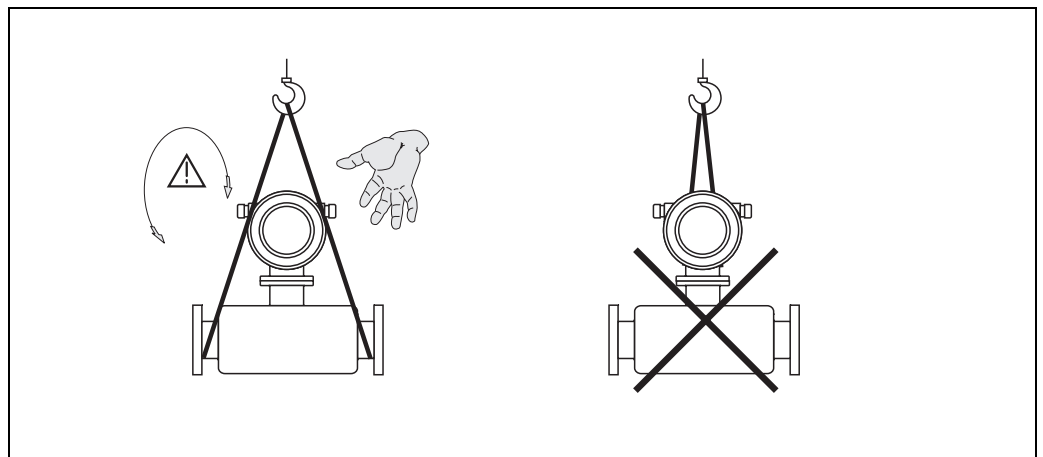
Do not use chains, as they could damage the housing.



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 measuring device does not unexpectedly turn around its axis or slip.



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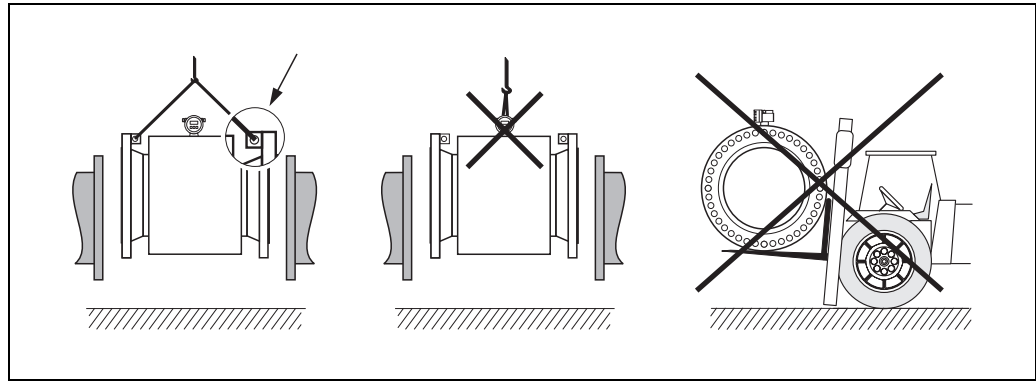
Fig. 5: Transporting transmitters with  $DN \leq 300$

*Transporting flanged devices ( $DN \geq 350$ )*

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.



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Fig. 6: Transporting sensors with  $DN \geq 350$

### 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 permitted storage temperature corresponds to the ambient temperature range of the transmitter and the sensors → Page 113.
- 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.
- 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.

## 3.2 Installation conditions

### 3.2.1 Dimensions

The dimensions and lengths of the sensor and transmitter are provided in the “Technical Information” document on the measuring device in question which you can download as a PDF file from [www.endress.com](http://www.endress.com). A list of the “Technical Information” documents available is provided in the “Documentation” section on Page 123.

### 3.2.2 Mounting location

Accumulated air or gas bubbles in the measuring tube can result in an increase in measuring errors.

**Avoid** the following locations:

- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream of a free pipe outlet in a vertical pipeline.

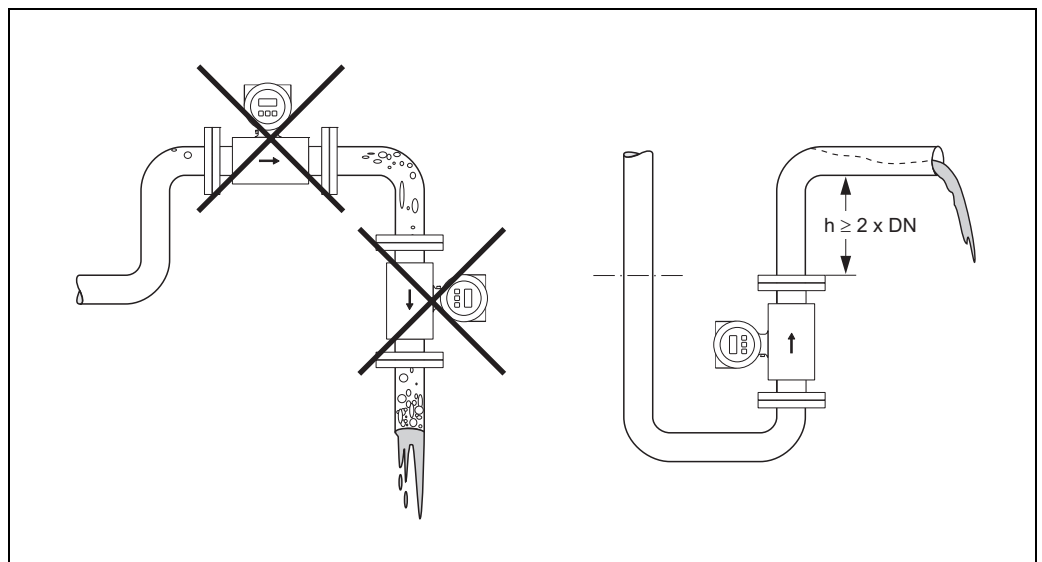


Fig. 7: Mounting location

### 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 115.

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 113.

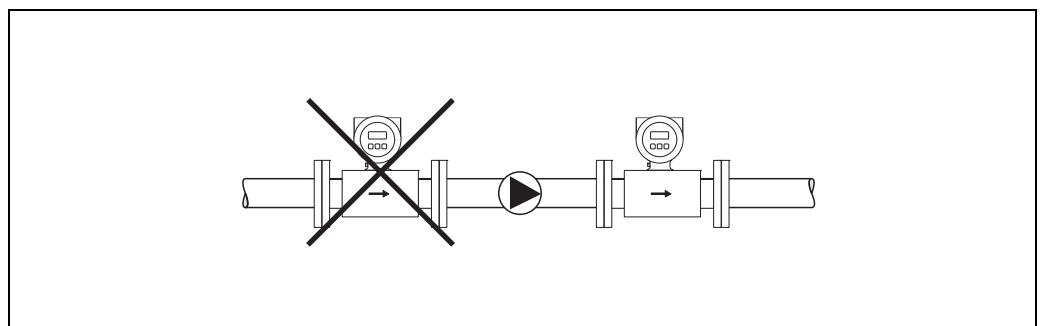


Fig. 8: Installation of pumps

### Partially filled pipes

Partially filled pipes with gradients necessitate a drain-type configuration.

The empty pipe detection function (EPD → Page 88) offers additional security in 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.

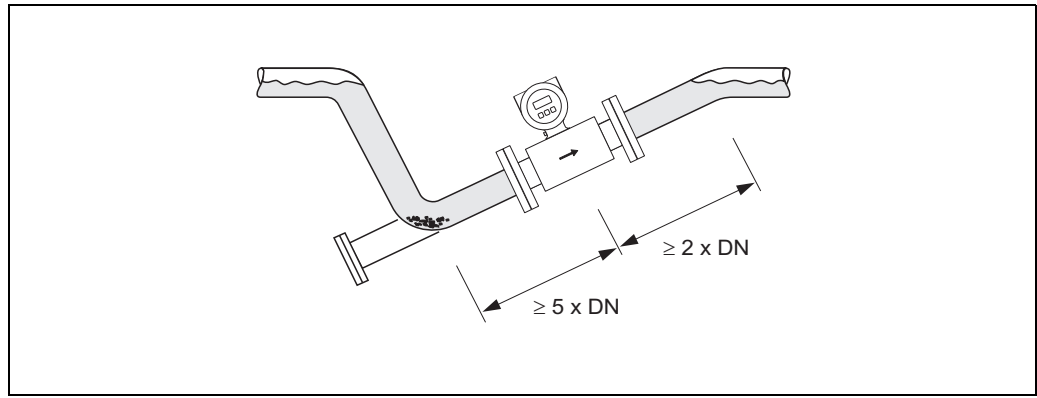


Fig. 9: Installation in partially filled pipe

### 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. This measure also prevents the system losing prime, which could cause air inclusions.

Information on the lining's resistance to partial vacuum can be found on Page 115.

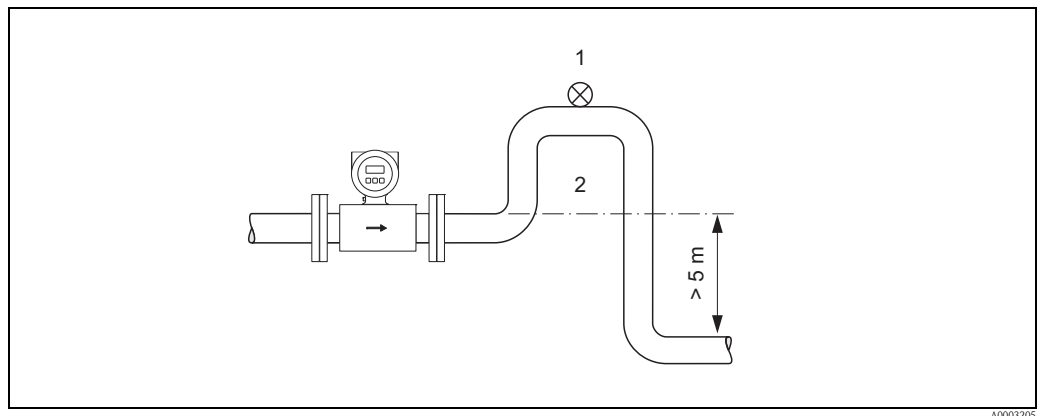


Fig. 10: Installation measures for down pipes

- 1 Vent valve
- 2 Pipe siphon



### 3.2.3 Orientation

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube. The measuring device, 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 pressures → Page 88
- Exchangeable measuring electrodes for abrasive fluids (only Promag W) → Page 106

#### Vertical orientation

This is the ideal orientation for self-emptying piping systems and for use in conjunction with empty pipe detection (EPD).

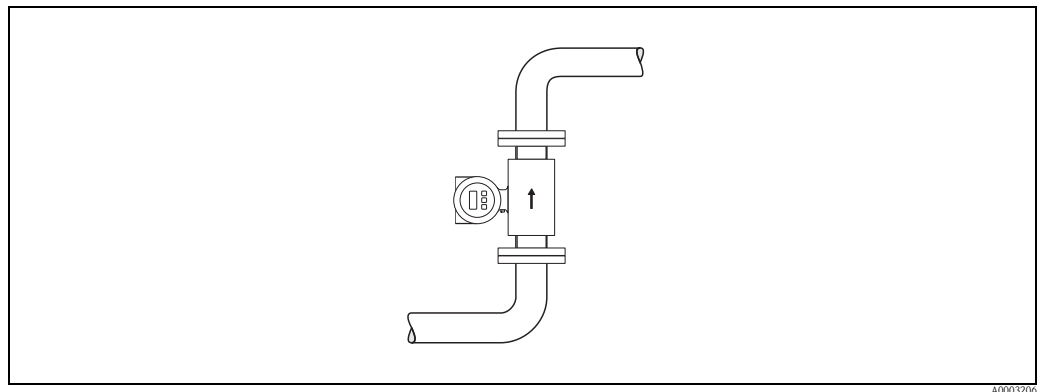


Fig. 11: Vertical orientation

#### 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 with the measuring device installed horizontally only when the transmitter housing is facing upward (→ Fig. 11). Otherwise there is no guarantee that empty pipe detection will respond if the measuring tube is only partially filled or empty.

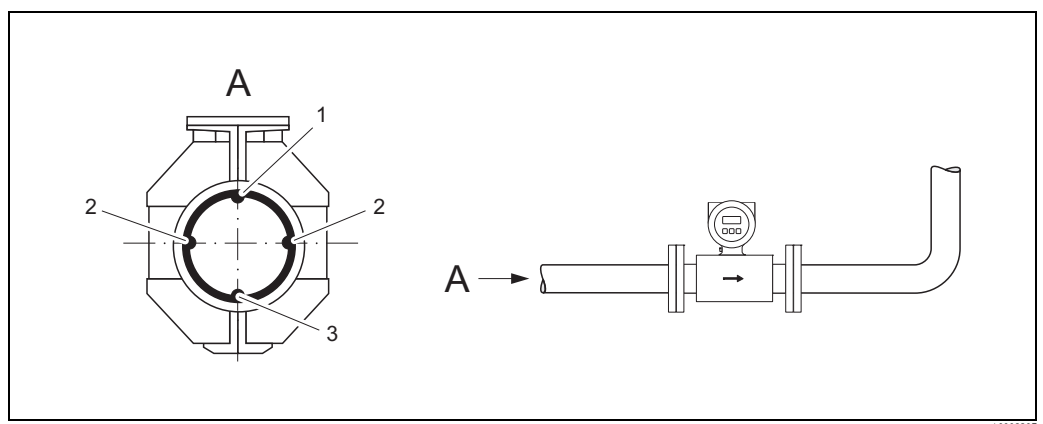


Fig. 12: Horizontal orientation

- 1 EPD electrode for the detection of empty pipes (not with Promag H, DN 2...4)
- 2 Measuring electrodes for the signal acquisition
- 3 Reference electrode for potential matching (not for Promag H)

### Inlet and outlet run

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:  $\geq 5 \times \text{DN}$
- Outlet run:  $\geq 2 \times \text{DN}$

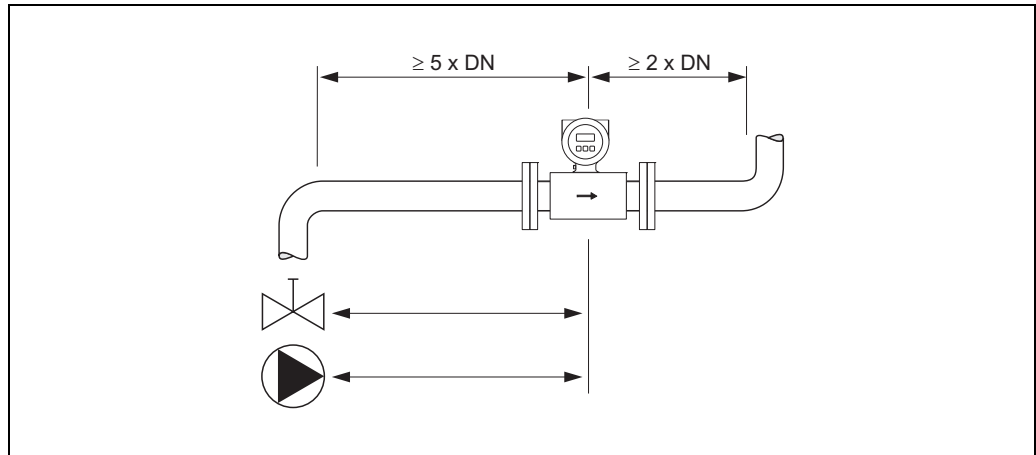


Fig. 13: Inlet and outlet run

### 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 113.

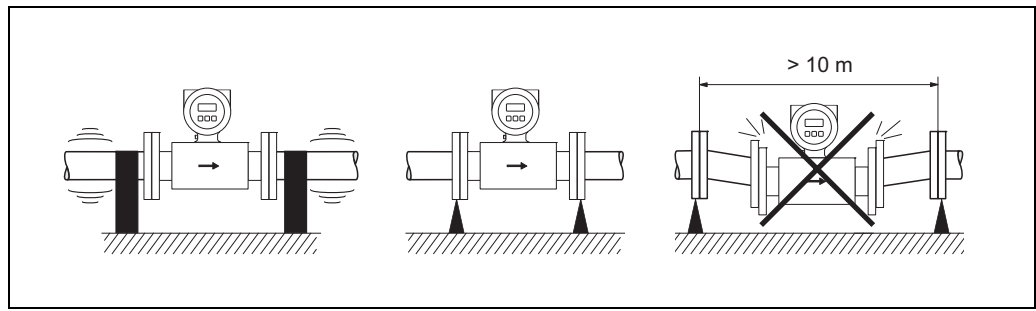


Fig. 14: Measures to prevent vibration of the measuring device

### 3.2.5 Foundations, supports

If the nominal diameter is  $DN \geq 350$ , 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.

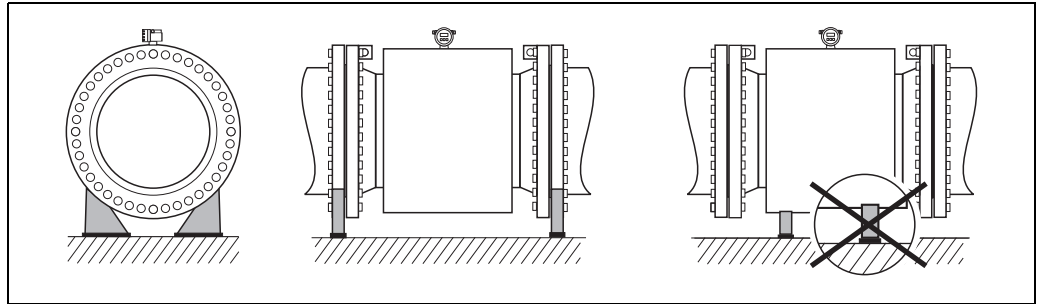


Fig. 15: Correct support for large nominal diameters ( $DN \geq 350$ )

### 3.2.6 Adapters

Suitable adapters to 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 liquids 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.

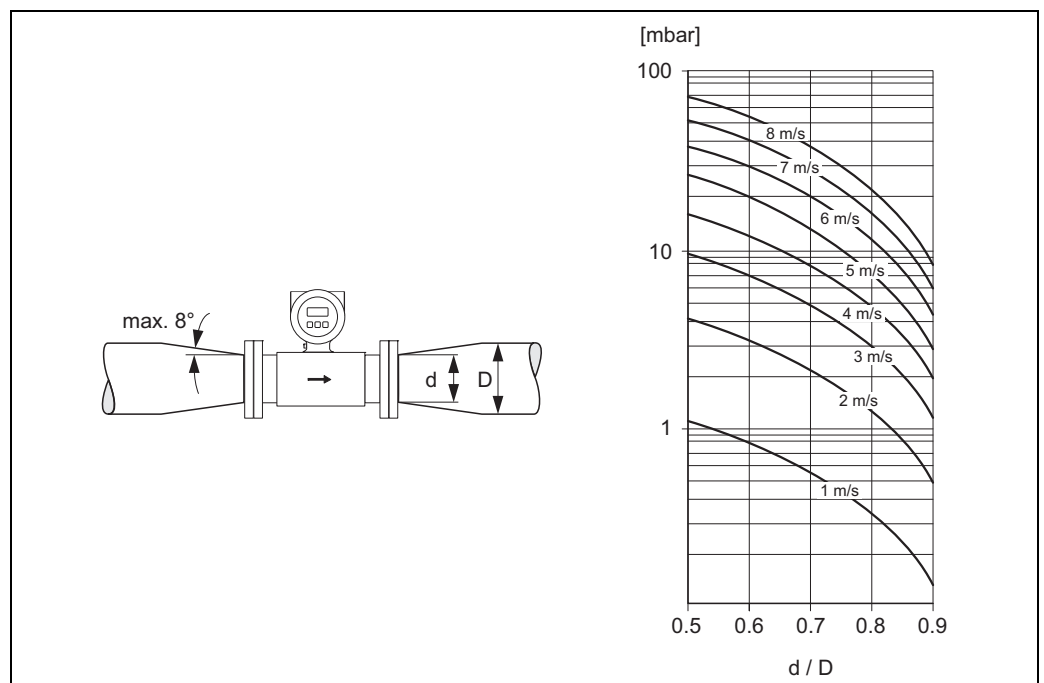


Fig. 16: Pressure loss due to adapters

### 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 buildup such as wastewater sludge, etc.



Note!

Flow velocity can be increased, if necessary, by reducing the nominal diameter of the sensor

→ Page 19.

Flow characteristics			Recommended flowrate		Factory settings		
Measuring device nominal diameter			min./max. full scale value (v ~ 0.3 or 10 m/s)		Low flow cutoff (v ~ 0.04 m/s)		
[mm]	[inch]	Promag	SI unit	US unit	SI unit	US unit	
2	1/12"	H	0.06...1.8 dm <sup>3</sup> /min	0.015...0.5 gal/min	0.01 dm <sup>3</sup> /min	0.002 gal/min	
4	5/32"	H	0.25...7 dm <sup>3</sup> /min	0.07...2 gal/min	0.05 dm <sup>3</sup> /min	0.008 gal/min	
8	5/16"	H	1...30 dm <sup>3</sup> /min	0.25...8 gal/min	0.1 dm <sup>3</sup> /min	0.025 gal/min	
15	1/2"	P, H	4...100 dm <sup>3</sup> /min	1.0...27 gal/min	0.5 dm <sup>3</sup> /min	0.10 gal/min	
25	1"	W, P, H	9...300 dm <sup>3</sup> /min	2.5...80 gal/min	1.0 dm <sup>3</sup> /min	0.25 gal/min	
32	1 1/4"	W, P	15...500 dm <sup>3</sup> /min	4...130 gal/min	2.0 dm <sup>3</sup> /min	0.50 gal/min	
40	1 1/2"	W, P, H	25...700 dm <sup>3</sup> /min	7...190 gal/min	3.0 dm <sup>3</sup> /min	0.75 gal/min	
50	2"	W, P, H	35...1100 dm <sup>3</sup> /min	10...300 gal/min	5.0 dm <sup>3</sup> /min	1.25 gal/min	
65	2 1/2"	W, P, H	60...2000 dm <sup>3</sup> /min	16...500 gal/min	8.0 dm <sup>3</sup> /min	2.0 gal/min	
80	3"	W, P, H	90...3000 dm <sup>3</sup> /min	24...800 gal/min	12.0 dm <sup>3</sup> /min	2.5 gal/min	
100	4"	W, P, H	145...4700 dm <sup>3</sup> /min	40...1250 gal/min	20.0 dm <sup>3</sup> /min	4.0 gal/min	
125	5"	W, P	220...7500 dm <sup>3</sup> /min	60...1950 gal/min	30.0 dm <sup>3</sup> /min	7.0 gal/min	
150	6"	W, P	20...600 m <sup>3</sup> /h	90...2650 gal/min	2.5 m <sup>3</sup> /h	12 gal/min	
200	8"	W, P	35...1100 m <sup>3</sup> /h	155...4850 gal/min	5.0 m <sup>3</sup> /h	15 gal/min	
250	10"	W, P	55...1700 m <sup>3</sup> /h	250...7500 gal/min	7.5 m <sup>3</sup> /h	30 gal/min	
300	12"	W, P	80...2400 m <sup>3</sup> /h	350...10600 gal/min	10 m <sup>3</sup> /h	45 gal/min	
350	14"	W, P	110...3300 m <sup>3</sup> /h	500...15000 gal/min	15 m <sup>3</sup> /h	60 gal/min	
400	16"	W, P	140...4200 m <sup>3</sup> /h	600...19000 gal/min	20 m <sup>3</sup> /h	60 gal/min	
450	18"	W, P	180...5400 m <sup>3</sup> /h	800...24000 gal/min	25 m <sup>3</sup> /h	90 gal/min	
500	20"	W, P	220...6600 m <sup>3</sup> /h	1000...30000 gal/min	30 m <sup>3</sup> /h	120 gal/min	
600	24"	W, P	310...9600 m <sup>3</sup> /h	1400...44000 gal/min	40 m <sup>3</sup> /h	180 gal/min	
700	28"	W	420...13500 m <sup>3</sup> /h	1900...60000 gal/min	50 m <sup>3</sup> /h	210 gal/min	
–	30"	W	480...15000 m <sup>3</sup> /h	2150...67000 gal/min	60 m <sup>3</sup> /h	270 gal/min	
800	32"	W	550...18000 m <sup>3</sup> /h	2450...80000 gal/min	75 m <sup>3</sup> /h	300 gal/min	
900	36"	W	690...22500 m <sup>3</sup> /h	3100...100000 gal/min	100 m <sup>3</sup> /h	360 gal/min	
1000	40"	W	850...28000 m <sup>3</sup> /h	3800...125000 gal/min	125 m <sup>3</sup> /h	480 gal/min	
–	42"	W	950...30000 m <sup>3</sup> /h	4200...135000 gal/min	125 m <sup>3</sup> /h	600 gal/min	
1200	48"	W	1250...40000 m <sup>3</sup> /h	5500...175000 gal/min	150 m <sup>3</sup> /h	600 gal/min	
–	54"	W	1550...50000 m <sup>3</sup> /h	9...300 Mgal/d	200 m <sup>3</sup> /h	1.3 Mgal/d	
1400	–	W	1700...55000 m <sup>3</sup> /h	10...340 Mgal/d	225 m <sup>3</sup> /h	1.3 Mgal/d	
–	60"	W	1950...60000 m <sup>3</sup> /h	12...380 Mgal/d	250 m <sup>3</sup> /h	1.3 Mgal/d	
1600	–	W	2200...70000 m <sup>3</sup> /h	13...450 Mgal/d	300 m <sup>3</sup> /h	1.7 Mgal/d	
–	66"	W	2500...80000 m <sup>3</sup> /h	14...500 Mgal/d	325 m <sup>3</sup> /h	2.2 Mgal/d	
1800	72"	W	2800...90000 m <sup>3</sup> /h	16...570 Mgal/d	350 m <sup>3</sup> /h	2.6 Mgal/d	
–	78"	W	3300...100000 m <sup>3</sup> /h	18...650 Mgal/d	450 m <sup>3</sup> /h	3.0 Mgal/d	
2000	–	W	3400...110000 m <sup>3</sup> /h	20...700 Mgal/d	450 m <sup>3</sup> /h	3.0 Mgal/d	

### 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 matching between sensor and transmitter, if necessary.
- The permitted length of connecting cable  $L_{\max}$  depends on the fluid conductivity ( $\rightarrow$  Fig. 17). A minimum conductivity of  $20 \mu\text{S}/\text{cm}$  is required for measuring demineralized water.

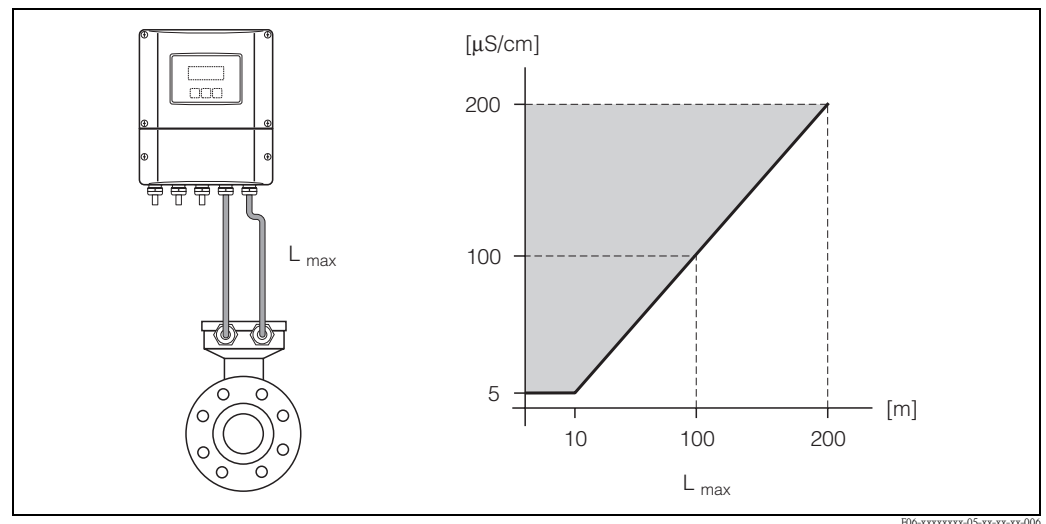


Fig. 17: Permissible cable lengths for the remote version

Area shaded gray = permitted range

$L_{\max}$  = Length of connecting cable in [m]

Medium conductivity in  $[\mu\text{S}/\text{cm}]$

### 3.3 Installation instructions

#### 3.3.1 Installing the Promag W sensor

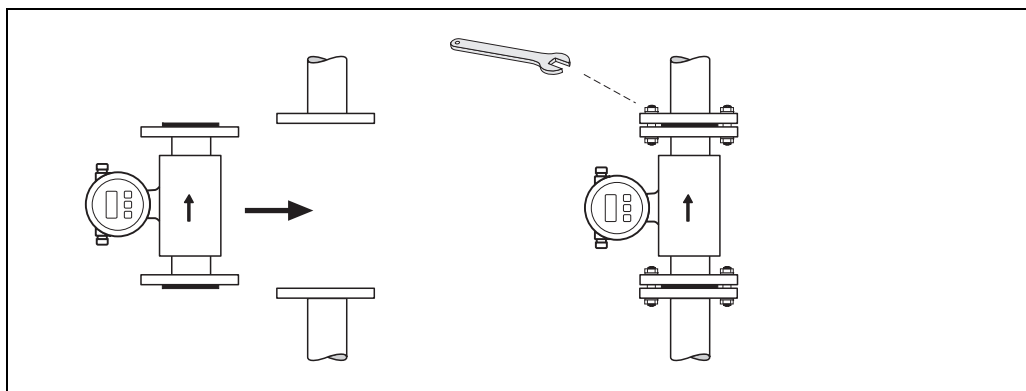


Note!

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 23 ff.
- The mounting of additional ground disks is described on Page 23.



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Fig. 18: 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 acc. to DIN EN 1514-1.
- 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 (25...2000)

- If necessary, special ground cables for potential matching can be ordered as an accessory → Page 90.
- Information on potential matching and detailed installation instructions for the use of ground cables can be found on Page 53 ff.

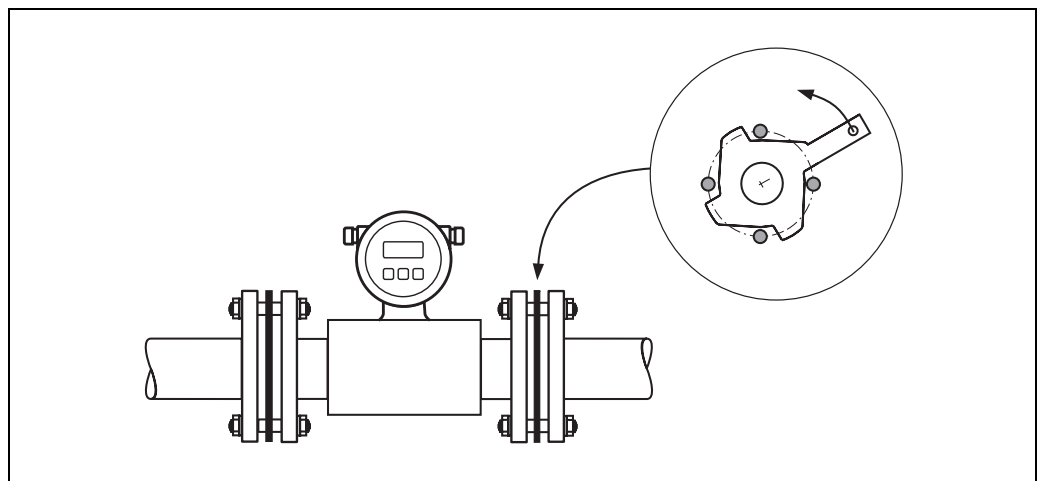
### Assembly with ground disks (DN 25...300)

Depending on the application, e.g. with lined or ungrounded pipes (see Page 53 ff.), it may be necessary to mount ground disks between the sensor and the pipe flange for potential matching. Ground disks can be ordered separately as an accessory from Endress+Hauser (see Page 90).



#### Caution!

- In this case, when using ground disks (including seals) the total fitting length increases! Information on the dimensions can be found in the associated Technical Information for Promag 50 W (TI046D/06/en).
  - 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. 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 the graphic until the handle strikes the bolts. This will center the ground disk automatically.
  4. Tighten the bolts to the required torque → Page 23
  5. Connect the ground disk to ground potential → Page 54



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Fig. 19: 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 screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Tightening torques for:

- EN (DIN) → Page 24
- ANSI → Page 25
- JIS → Page 25
- AWWA → Page 26
- AS 2129 → Page 26
- AS 4087 → Page 27

*Promag W tightening torques for EN (DIN)*

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Screws	Max. tightening torque [Nm]	
			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
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



Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Screws	Max. tightening torque [Nm]	
			Hard rubber	Polyurethane
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 tightening torques for ANSI*

Nominal diameter		ANSI Pressure rating [lbs]	Screws	Max. tightening torque [Nm]	
[mm]	[inch]			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 tightening torques for JIS*

Nominal diameter [mm]	JIS Pressure rating	Screws	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

Nominal diameter [mm]	JIS Pressure rating	Screws	Max. tightening torque [Nm]	
			Hard rubber	Polyurethane
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

*Promag W tightening torques for AWWA*

Nominal diameter		AWWA Pressure rating	Screws	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 tightening torques for AS 2129*

Nominal diameter [mm]	AS 2129 Pressure rating	Screws	Max. tightening torque[Nm] Hard rubber
80	Table E	4 x M 16	49
100	Table E	8 x M 16	38
150	Table E	8 x M 20	64
200	Table E	8 x M 20	96
250	Table E	12 x M 20	98
300	Table E	12 x M 24	123
350	Table E	12 x M 24	203
400	Table E	12 x M 24	226
500	Table E	16 x M 24	271
600	Table E	16 x M 30	439

*Promag W tightening torques for AS 4087*

Nominal diameter [mm]	AS 4087 Pressure rating	Screws	Max. tightening torque [Nm] Hard rubber
80	Cl.14	4 x M 16	49
100*	Cl.14	8 x M 16	38
150	Cl.14	8 x M 20	52
200	Cl.14	8 x M 20	77
250	Cl.14	8 x M 20	147
300	Cl.14	12 x M 24	103
350	Cl.14	12 x M 24	203
400	Cl.14	12 x M 24	226
500	Cl.14	16 x M 24	271
600	Cl.14	16 x M 30	393

\* Designed acc. to AS 2129 (not to AS 4087)

**3.3.2 Installing the Promag P sensor****Caution!**

- The protective covers mounted on the two sensor flanges guard the PTFE 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 29 ff.
- The mounting of additional ground disks is described on Page 28.

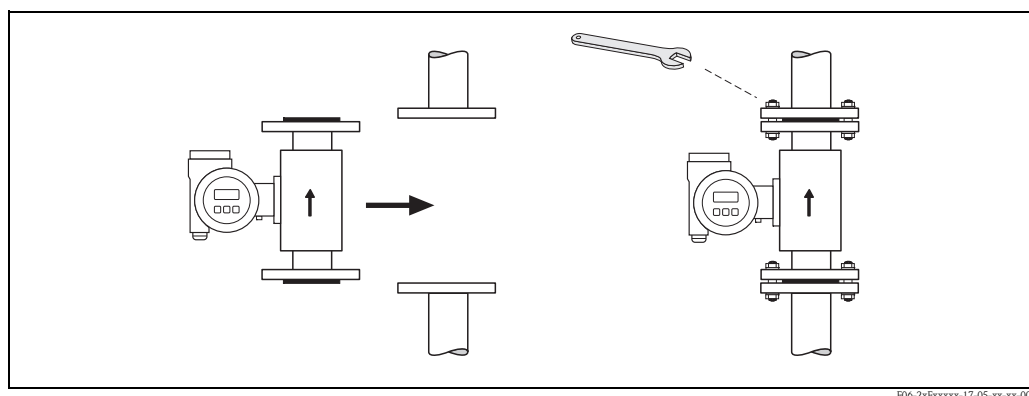


Fig. 20: Installing the Promag P sensor

**Seals**

Comply with the following instructions when installing seals:

- PFA or PTFE measuring tube linings → **No** seals are required.
- For DIN flanges, use only seals acc. to DIN EN 1514-1.
- 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, special ground cables for potential matching can be ordered as an accessory → Page 90.
- Information on potential matching and detailed installation instructions for the use of ground cables can be found on Page 53 ff.

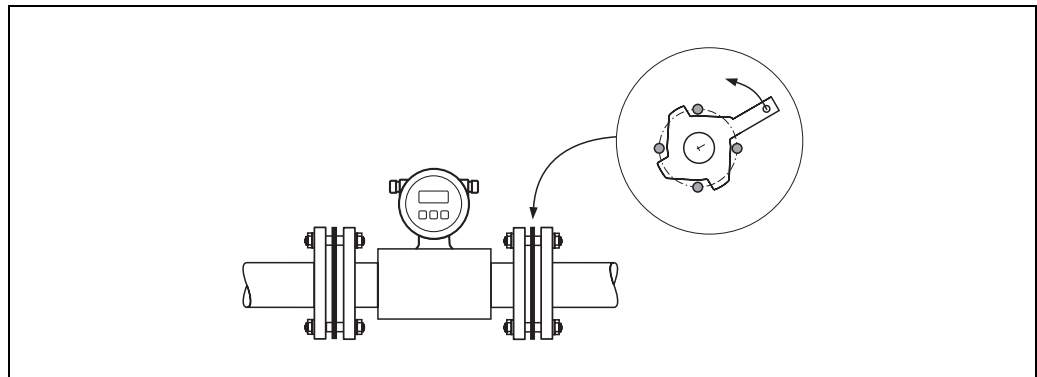
### Assembly with ground disks (DN 15...300)

Depending on the application, e.g. with lined or ungrounded pipes (see Page 53 ff.), it may be necessary to mount ground disks between the sensor and the pipe flange for potential matching. Ground disks can be ordered separately as an accessory from Endress+Hauser (see Page 90).



#### Caution!

- In this case, when using ground disks (including seals) the total fitting length increases! Information on the dimensions can be found in the associated Technical Information for Promag 50 P (TI047D/06/en).
  - PTFE and PFA 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 (see Fig. 20).
  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 the graphic until the handle strikes the bolts. This will center the ground disk automatically.
  4. Tighten the bolts to the required torque → Page 29
  5. Connect the ground disk to ground potential → Page 54.



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Fig. 21: 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!

Information on permissible temperature ranges → Page 113.

### Insulation

Pipes generally have to be insulated if they carry very hot or cryogenic 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 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 half-shells.

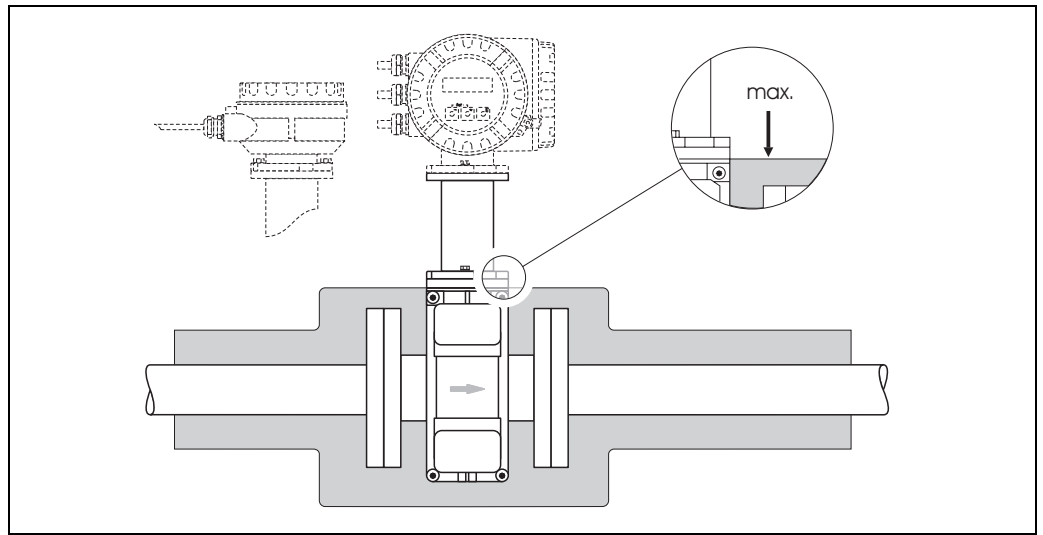


Fig. 22: Promag P (high-temperature version): insulating the pipe)

### Tightening torques for screws (Promag)

Note the following points:

- The tightening torques listed below are for lubricated threads only.
- Always tighten screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Tightening torques for:

- EN (DIN) → Page 30
- AS 2129 → Page 30
- AS 4087 → Page 30
- ANSI → Page 31
- JIS → Page 31

*Promag P tightening torques for EN (DIN)*

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Screws	Max. tightening torque [Nm]	
			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	–
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 tightening torques for AS 2129*

Nominal diameter [mm]	AS 2129 Pressure rating	Screws	Max. tightening torque [Nm] PTFE
25	Table E	4 x M 12	21
50	Table E	4 x M 16	42

*Promag P tightening torques for AS 4087*

Nominal diameter [mm]	AS 4087 Pressure rating	Screws	Max. tightening torque [Nm] PTFE
50	Cl.14	4 x M 16	42

*Promag P tightening torques for ANSI*

Nominal diameter		ANSI Pressure rating [lbs]	Screws	Max. tightening torque [Nm]	
[mm]	[inch]			PTFE	PFA
15	½"	Class 150	4 x ½"	6	–
15	½"	Class 300	4 x ½"	6	–
25	1"	Class 150	4 x ½"	11	10
25	1"	Class 300	4 x ⅝"	14	12
40	1 ½"	Class 150	4 x ½"	24	21
40	1 ½"	Class 300	4 x ¾"	34	31
50	2"	Class 150	4 x ⅝"	47	44
50	2"	Class 300	8 x ⅝"	23	22
80	3"	Class 150	4 x ⅝"	79	67
80	3"	Class 300	8 x ¾"	47	42
100	4"	Class 150	8 x ⅝"	56	50
100	4"	Class 300	8 x ¾"	67	59
150	6"	Class 150	8 x ¾"	106	86
150	6"	Class 300	12 x ¾"	73	67
200	8"	Class 150	8 x ¾"	143	109
250	10"	Class 150	12 x ⅞"	135	–
300	12"	Class 150	12 x ⅞"	178	–
350	14"	Class 150	12 x 1"	260	–
400	16"	Class 150	16 x 1"	246	–
450	18"	Class 150	16 x 1 ⅛"	371	–
500	20"	Class 150	20 x 1 ⅛"	341	–
600	24"	Class 150	20 x 1 ¼"	477	–

*Promag P tightening torques for JIS*

Nominal diameter		JIS Pressure ratings	Screws	Max. tightening torque [Nm]	
[mm]				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 sensor is supplied to order, with or without pre-installed process connections. Pre-installed process connections are secured to the sensor with 4 hex-head bolts.



Caution!

The sensor might require support or additional attachments, depending on the application and the length of the piping run. When plastic process connections are used, the sensor must be additionally supported mechanically. A wall-mounting kit can be ordered separately from Endress+Hauser as an accessory (→ Page 90).

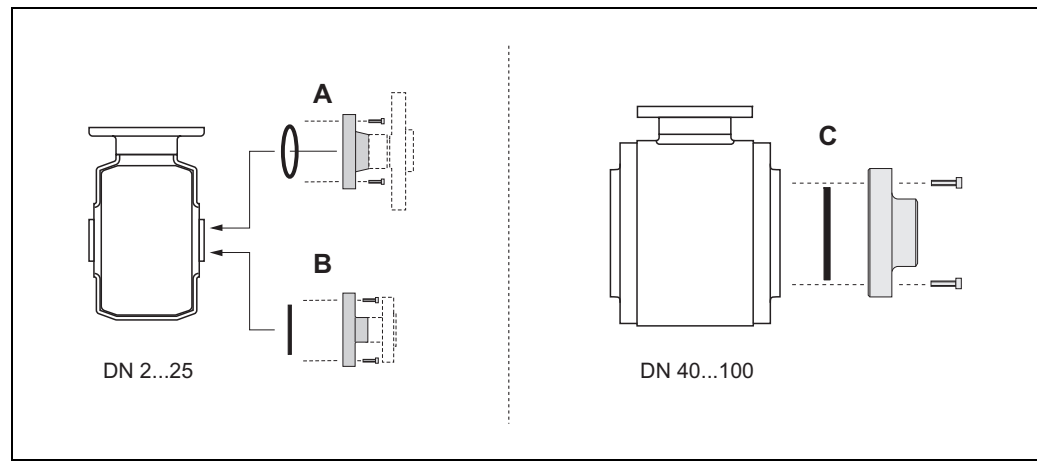


Fig. 23: Promag H process connections (DN 2...25 / DN 40...100)

**A = DN 2...25 / process connections with O-ring**

- Weld nipple (DIN EN ISO 1127, ODT / SMS),
- Flanges (EN (DIN), ANSI, JIS), flange made of PVDF (EN (DIN), ANSI, JIS)
- External thread, internal thread, hose connection, PVC adhesive coupling

**B = DN 2...25 / process connections with aseptic molded seal**

- Weld nipple (DIN 11850, ODT/SMS)
- Clamp (ISO 2852, DIN 32676, L14 AM7)
- Threaded joint (DIN 11851, DIN 11864-1, SMS 1145)
- Flange DIN 11864-2

**C = DN 40...100 / process connections with aseptic molded seal**

- Weld nipple (DIN 11850, ODT/SMS)
- Clamp (ISO 2852, DIN 32676, L14 AM7)
- Threaded joint (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 lubricated threads (7 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 molded 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 90.



### 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 equalized 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 matching 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 Endress+Hauser as accessories (→ Page 90). 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 119.
- Ground rings, including the seals, are mounted within the process connections. Therefore, the fitting length is not affected

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 lubricated threads (7 Nm).

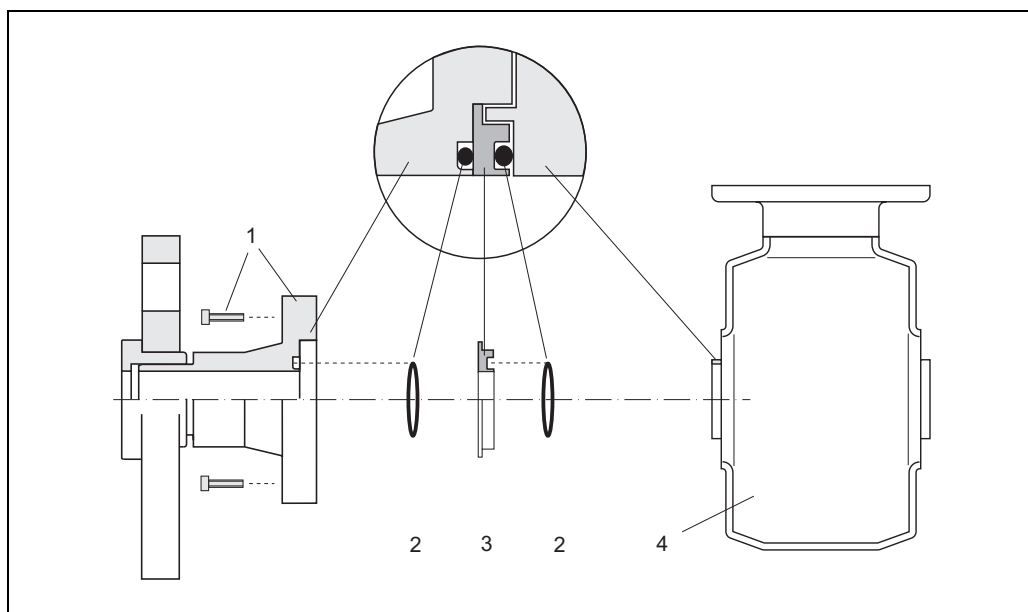


Fig. 24: Installing ground rings with a Promag H (DN 2...25)

- 1 = Process connection hexagonal-headed bolts  
 2 = O-ring seals  
 3 = Grounding ring or plastic disk (spacers)  
 4 = Sensor

### Welding the transmitter 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 sensor into the pipe. A suitable welding jig can be ordered separately as an accessory → Page 90.
2. Loosen the screws on the process connection flange and remove the sensor incl. the 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. All the dimensions and lengths of the sensor and transmitter are provided in the separate documentation "Technical Information" → Page 123

## 3.3.4 Turning the transmitter housing

### Turning the aluminum field housing



#### Caution!

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. Rotate the transmitter housing to the desired position (max. 280° clockwise or max. 20° counter-clockwise).
5. Lower the housing into position and reengage the bayonet catch.
6. Retighten the two securing screws.

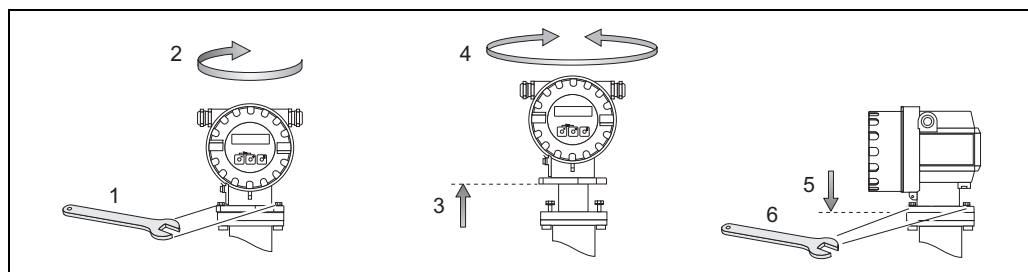


Fig. 25: Turning the transmitter housing (aluminum field housing)

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**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. Rotate the transmitter housing to the desired position (max. 280° clockwise or max. 20° counter-clockwise).
4. Lower the housing into position.
5. Retighten the two securing screws.

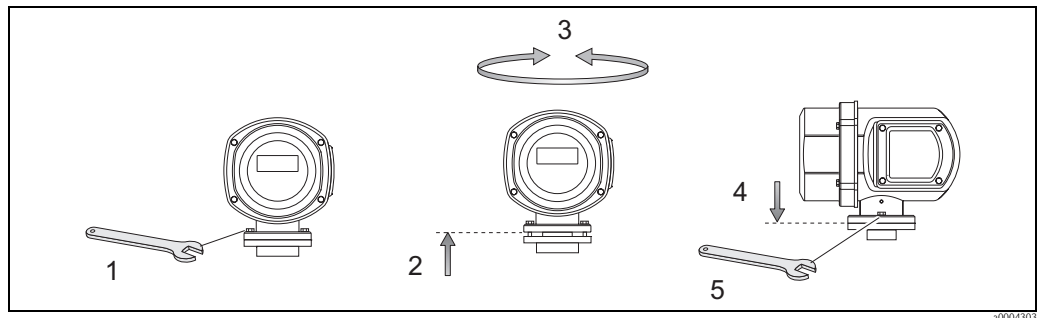


Fig. 26: Turning the transmitter housing (stainless-steel field housing)

**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.

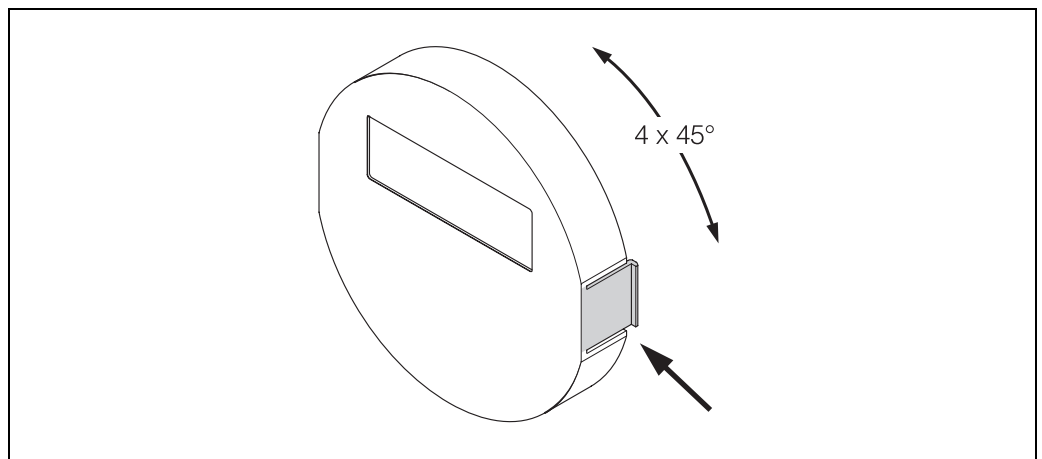


Fig. 27: Turning the local display (field housing)

### 3.3.6 Installing the wall-mount housing

There are various ways of installing the wall-mount transmitter housing:

- Mounted directly on the wall
- Panel mounting (separate mounting set, accessories → Page 90)
- Pipe mounting (separate mounting set, accessories → Page 90)

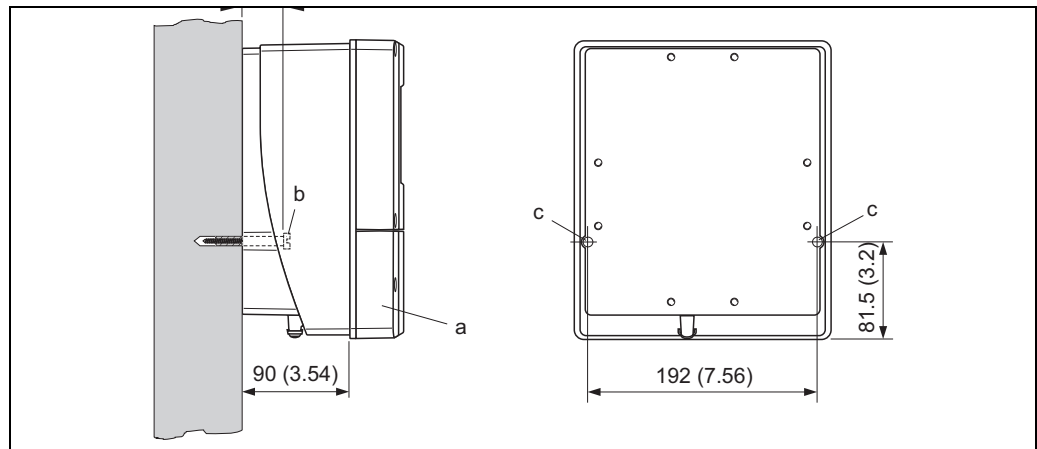


Caution!

- Make sure that the permitted ambient temperature range (see Page 113) is not exceeded at the mounting location. 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. 28.
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.

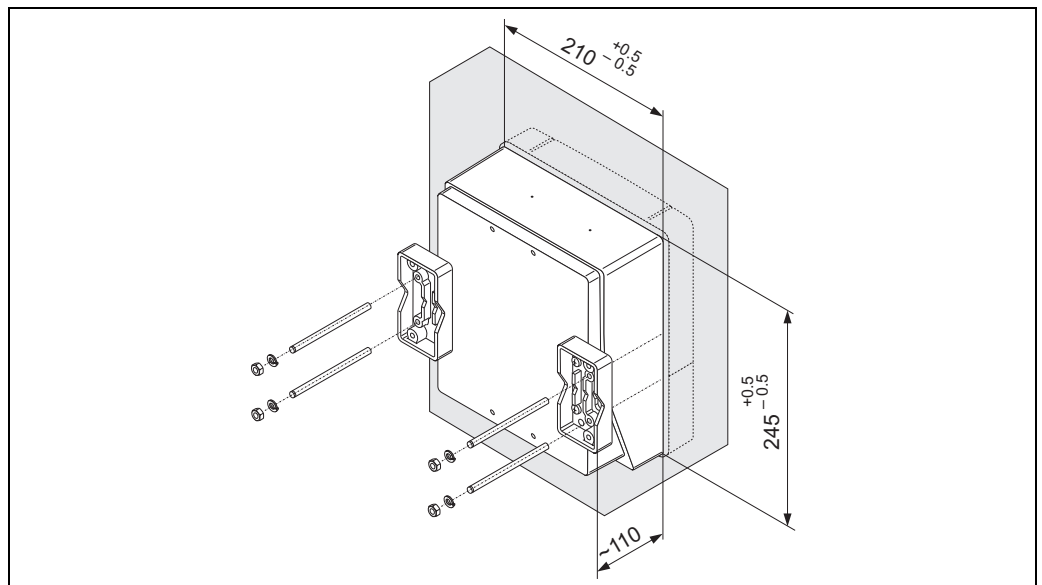


a0001130

Fig. 28: Direct wall mounting

### Panel mounting

1. Prepare the opening in the panel (Fig. 29).
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.



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Fig. 29: Panel mounting (wall-mount housing)

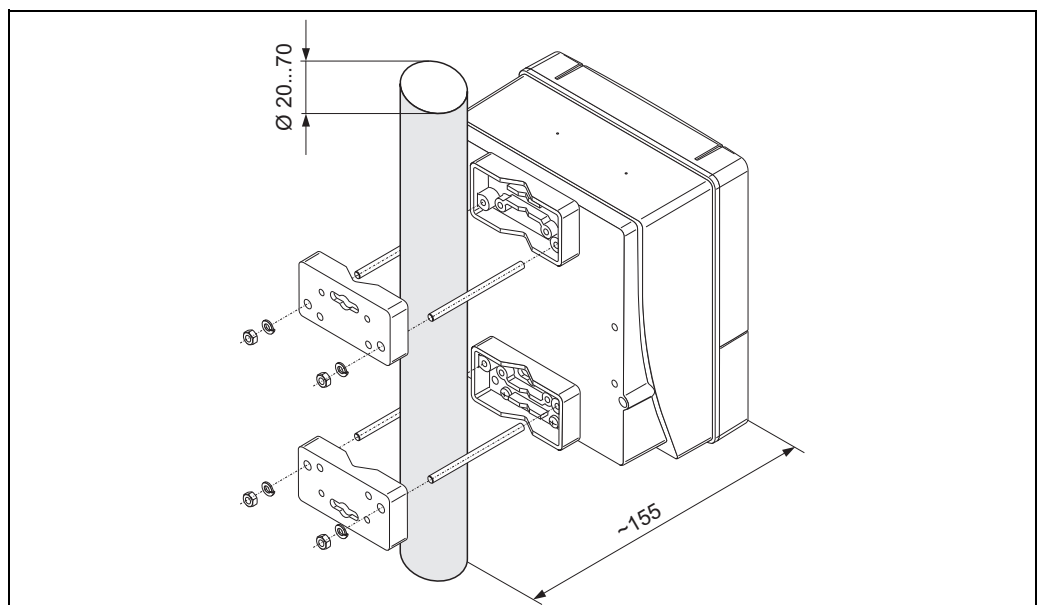
### Pipe mounting

The assembly should be performed by following the instructions in Fig. 30.



#### Caution!

If the device is mounted to a warm pipe, make certain that the housing temperature does not exceed  $+60\text{ }^{\circ}\text{C}$ , which is the maximum permissible temperature.



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Fig. 30: Pipe mounting (wall-mount housing)

### 3.4 Post-installation check

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

Device condition and specifications	Notes
Is the device damaged (visual inspection)?	-
Does the device correspond to specifications at the measuring point, including process temperature and pressure, ambient temperature, minimum fluid conductivity, measuring range, etc.?	→ Page 113 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 plane of the empty pipe detection electrode correct?	→ Page 17
Were all screws tightened to the specified torques when the sensor was installed?	Promag W → Page 23 Promag P → Page 29
Were the correct seals installed (type, material, installation)?	Promag W → Page 22 Promag P → Page 27 Promag H → Page 32
Are the measuring point number and labeling correct (visual inspection)?	-
Process environment/process conditions	Notes
Are the inlet and outlet runs respected?	Inlet run $\geq 5 \times \text{DN}$ Outlet run $\geq 2 \times \text{DN}$
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 600 68-2-8

## 4 Wiring



Warning!

- When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to these Operating Instructions.  
Please do not hesitate to contact your Endress+Hauser sales office 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 PROFIBUS cable specifications

#### 4.1.1 PROFIBUS DP cable specifications

Two versions of the bus line are specified in IEC 61158. Cable type A can be used for all transmission rates up to 12 Mbit/s. Please refer to the following table for the cable parameters:

Cable type A	
Characteristic impedance	135...165 $\Omega$ at a measuring frequency of 3...20 MHz
Cable capacitance	< 30 pF/m
Core cross-section	> 0.34 mm <sup>2</sup> , corresponds to AWG 22
Cable type	Twisted in pairs, 1 x 2, 2 x 2 or 1 x 4 wire
Loop-resistance	110 $\Omega$ /km
Signal damping	Max. 9 dB over the entire length of the cable section
Shielding	Copper braided shielding or braided shielding and foil shielding

#### Bus structure

Note the following points:

- The maximum line length (segment length) depends on the transmission rate.  
For cable type A, the maximum line length (segment length) is as follows:

For transmission rate [kBit/s]	9.6...93.75	187.5	500	1500	300...12000
Max. line length [m]	1200	1000	400	200	100

- A maximum of 32 users are permitted per segment.
- Each segment is terminated at either end with a terminating resistor.
- The bus length or the number of users can be increased by introducing a repeater.
- The first and last segment can comprise max. 31 devices.  
The segments between the repeaters can comprise max. 30 stations.
- The maximum distance between two bus users can be calculated as follows:  
(NO\_REP + 1) x segment length



Note!

NO\_REP = maximum number of repeaters that may be switched in series depending on the repeater in question.

#### Example

In accordance with manufacturer specifications, 9 repeaters can be switched in series when using a standard line.

The maximum distance between two bus users at a transmission rate of 1.5 MBit/s can be calculated as follows: (9 + 1) x 200 m = 2000 m

## Spurs

Note the following points:

- Length of spurs < 6.6 m (at max. 1.5 MBit/s)
- No spurs should be used for transmission rates > 1.5 MBit/s. The line between the connector and the bus driver is described as a spur. Experience has shown that you should proceed with caution when configuring spurs. For this reason, you cannot presume that the sum of all spurs at 1.5 MBit/s may be 6.6 m. This is affected greatly by the arrangement of the field devices. Therefore, we recommend you do not use any spurs, if possible, at transmission rates > 1.5 MBit/s.
- If you cannot avoid using spurs, then they may not include any bus terminators.

## Bus termination

It is important to terminate the RS485 line correctly at the start and end of the bus segment since impedance mismatch results in reflections on the line which can cause faulty data transfer (see Page 69).

## Further information

General information and further notes regarding the wiring can be found in BA034S/04: "Guidelines for planning and commissioning, PROFIBUS DP/PA, field communication".

## 4.1.2 PROFIBUS PA cable specifications

### Cable type

Twin-core cables are recommended for connecting the device to the fieldbus. Following IEC 61158-2 (MBP), four different cable types (A, B, C, D) can be used with the fieldbus, only two of which (cable types A and B) are shielded.

- Cable types A or B are particularly preferable for new installations. Only these types have cable shielding that guarantees adequate protection from electromagnetic interference and thus the most reliable data transfer. In the case of type B multi-pair cables, it is permissible to operate multiple fieldbuses with the same degree of protection on one cable. No other circuits are permissible in the same cable.
- Practical experience has shown that cable types C and D should not be used due to the lack of shielding, since the freedom from interference generally does not meet the requirements described in the standard.

The electrical data of the fieldbus cable have not been specified but determine important characteristics of the design of the fieldbus, such as distances bridged, number of users, electromagnetic compatibility, etc.

	Type A	Type B
Cable structure	Twisted pair, shielded	One or more twisted pairs, fully shielded
Core cross-section	0.8 mm <sup>2</sup> (AWG 18)	0.32 mm <sup>2</sup> (AWG 22)
Loop-resistance (DC)	44 Ω/km	112 Ω/km
Characteristic impedance at 31.25 kHz	100 Ω ± 20%	100 Ω ± 30%
Attenuation constant at 39 kHz	3 dB/km	5 dB/km
Capacitive asymmetry	2 nF/km	2 nF/km
Envelope delay distortion (7.9...39 kHz)	1.7 μs/km	*
Shield coverage	90%	*
Max. cable length (incl. spurs > 1 m)	1900 m	1200 m
* Not specified		



Suitable fieldbus cables from various manufacturers for non-hazardous areas are listed below:

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

### Maximum overall cable length

The maximum network expansion depends on the type of protection and the cable specifications. The overall cable length combines the length of the main cable and the length of all spurs (>1 m).

Note the following points:

- The maximum permissible total cable length depends on the cable type used:

<b>Type A</b>	1900 m
<b>Type B</b>	1200 m

- If repeaters are used, the maximum permissible cable length is doubled.  
A maximum of three repeaters are permitted between user and master.

### Maximum spur length

The line between the distribution box and field device is described as a spur.

In the case of non-Ex applications, the max. length of a spur depends on the number of spurs (>1 m):

<b>Number of spurs</b>	<b>1...12</b>	<b>13...14</b>	<b>15...18</b>	<b>19...24</b>	<b>25...32</b>
<b>Max. length per spur</b>	120 m	90 m	60 m	30 m	1 m

### Number of field devices

In systems that meet FISCO with EEx ia type of protection, the line length is limited to max. 1000 m. A maximum of 32 users per segment in non-Ex areas or a maximum of 10 users in an Ex-area (EEx ia IIC) is possible. The actual number of users must be determined during configuration.

### Bus termination

The start and end of each fieldbus segment are always to be terminated with a bus terminator. With various junction boxes (non-Ex), the bus termination can be activated via a switch. If this is not the case, a separate bus terminator must be installed.

Note the following points:

- In the case of a branched bus segment, the device furthest from the segment coupler represents the end of the bus.
- If the fieldbus is extended with a repeater then the extension must also be terminated at both ends.

### Further information

General information and further notes regarding the wiring can be found in BA034S/04: "Guidelines for planning and commissioning, PROFIBUS DP/PA, field communication".

### 4.1.3 Shielding and grounding

When planning the shielding and grounding for a fieldbus system, there are three important points to consider:

- Electromagnetic compatibility (EMC)
- Explosion protection
- Safety of the personnel

To ensure the optimum electromagnetic compatibility of systems, it is important that the system components and above all the cables, which connect the components, are shielded and that no portion of the system is unshielded. Ideally, the cable shields are connected to the normally metal housings of the connected field devices. Since these are generally connected to the protective ground, the shield of the bus cable is grounded many times.

Keep the stripped and twisted lengths of cable shield to the terminals as short as possible.

This approach, which provides the best electromagnetic compatibility and personnel safety, can be used without restriction in systems with good potential matching.

In the case of systems without potential matching, a power supply frequency (50 Hz) equalizing current can flow between two grounding points which, in unfavorable cases, e.g. when it exceeds the permissible shield current, may destroy the cable.

To suppress the low frequency equalizing currents, it is therefore recommended to either install additional potential matching or connect the cable shield directly to the building ground (or protective ground) at one end only and to use capacitive coupling to connect all other grounding points.



Caution!

The statutory EMC requirements are **only** met if the cable shield is grounded at both ends!

## 4.2 Connecting the remote version



Warning!

- When connecting Ex-certified devices (Fig. 31, d), see the notes and diagrams in the Ex-specific supplement to these Operating Instructions. Please do not hesitate to contact your Endress+Hauser sales office 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.

### 4.2.1 Connecting Promag W/P/H



Warning!

Risk of electric shock!

Failure to comply with this precaution can result in irreparable damage to the electronics.

- Switch off the power supply before opening the device.
- Do **not** install or wire the device while it is connected to the power supply.
- Connect the protective ground to the ground terminal on the housing before the power supply is applied.

Procedure for wall-mount housing (see Fig. 31):

1. Transmitter (wall-mount housing → Fig. 31, c):
  - Loosen the screws of the connection compartment cover (c<sub>1</sub>).
  - Remove the cover from the connection compartment.
2. Sensor (Promag W, P or H; Fig. 31 e or f, g):
  - Remove the cover from the connection housing.
3. Feed the signal cable (a) and coil current cable (b) through the appropriate cable entries:
  - Promag W, P → see “Cable termination” → Page 45
  - Promag H → see “Cable termination” → Page 46



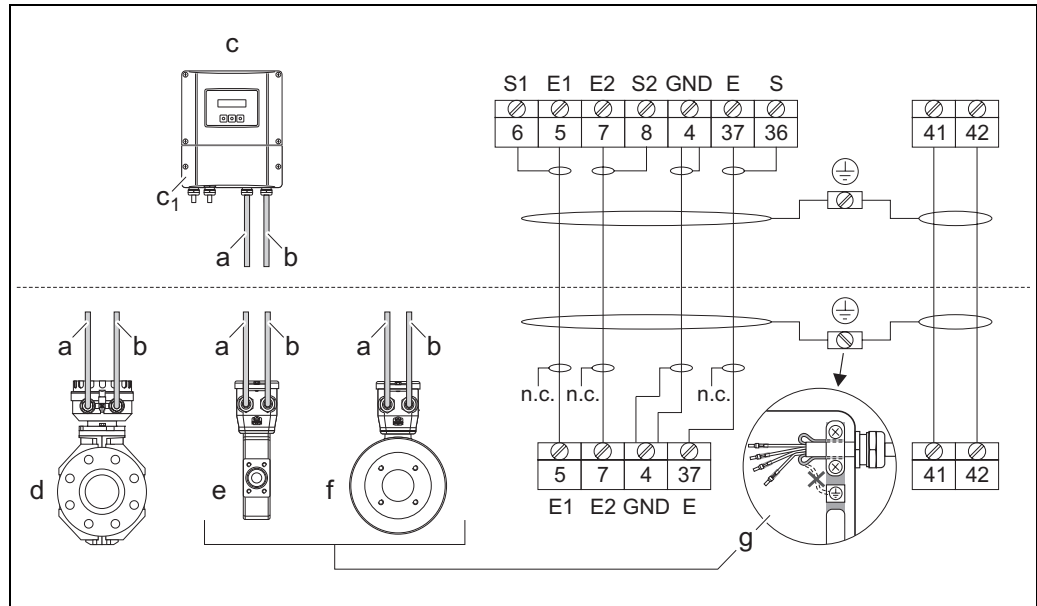
Caution!

- Make sure the connecting cables are secured!
  - The notes in the “Length of connecting cable” section also apply Page 21.
  - Risk of damaging the coil driver. The coil cable may only be connected or released once you have switched off the power supply.
4. Preterminate the signal cable and coil current cable:
    - Promag W, P → see “Cable termination” → Page 45
    - Promag H → see “Cable termination” → Page 46
  5. Establish the connections between sensor and transmitter in accordance with:
    - The electrical wiring diagram → Fig. 31, Page 44
    - The wiring diagram in the screw cap of the device



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.
  - The cable shields are grounded in the Promag H sensor by means of the strain relief terminals. Please pay attention to the notes on cable termination on Page 46.
6. Transmitter:
    - Mount the cover for the connection compartment (c<sub>1</sub>).
    - Retighten the screws of the cover.
  7. Sensor:
    - Mount the cover on the connection housing.



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Fig. 31: Connecting the remote version of Promag W/P/H

- a Signal cable
- b Coil current cable
- c Wall-mount housing (for non-Ex area and ATEX II3G or Zone 2)
- c<sub>1</sub> = Cover of connection compartment
- d Connection housing of remote version, Promag W and P
- e Connection housing of remote version, Promag H, DN 2...25
- f Connection housing of remote version, Promag H, DN 40...100
- g Section only applies to Promag H!  
The cable shields are grounded in the Promag H sensor by means of the strain relief terminals.  
Please pay attention to the notes on cable termination on Page 46.
- n.c. Not connected, insulated cable shields  
Insulate the shields of cables that are not connected to eliminate the risk of short-circuits with neighboring cable shields inside the connection housing!

**Terminal assignment:**

- Electrode circuit → terminal: 4 = GND/pipe, 5/6/7/8 = Measuring signal, 36/37 = EPD
- Coil circuit → terminal: 41 = 1, 42 = 2

Cable colors → terminal: 4 = green, 5/6 = brown, 7/8 = white, 36/37 = yellow

**Cable termination:**

- Promag W, P → Page 45
- Promag H → Page 46

**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).

The fine-wire cores must be provided with ferrules (detail B: m = red ferrules,  $\varnothing$  1.0 mm; n = white ferrules,  $\varnothing$  0.5 mm).



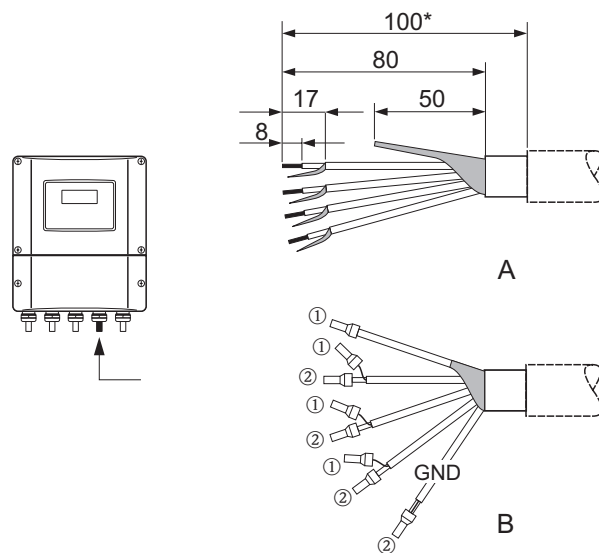
Caution!

When fitting the connectors, pay attention to the following points:

- *Signal cable* → Make sure that the wire end ferrules do not touch the wire shields 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.

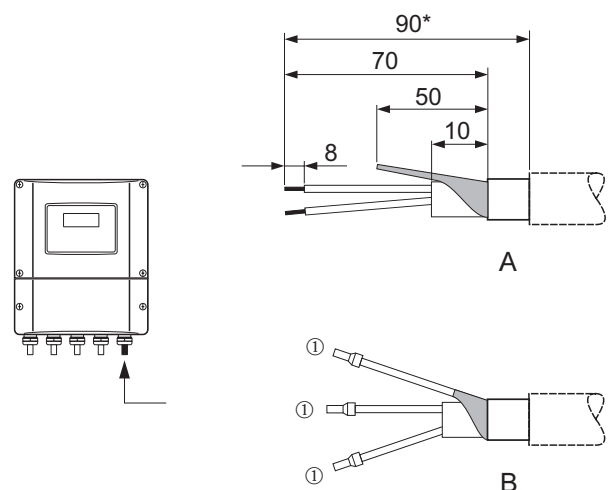
**TRANSMITTER**

Signal cable



A0002643

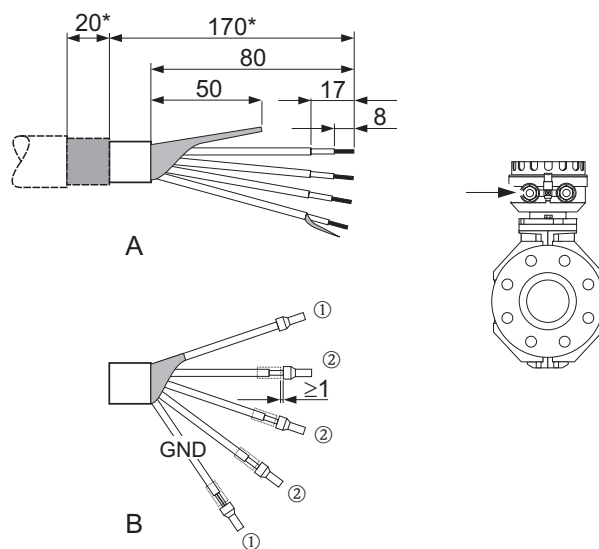
Coil current cable



A0002644

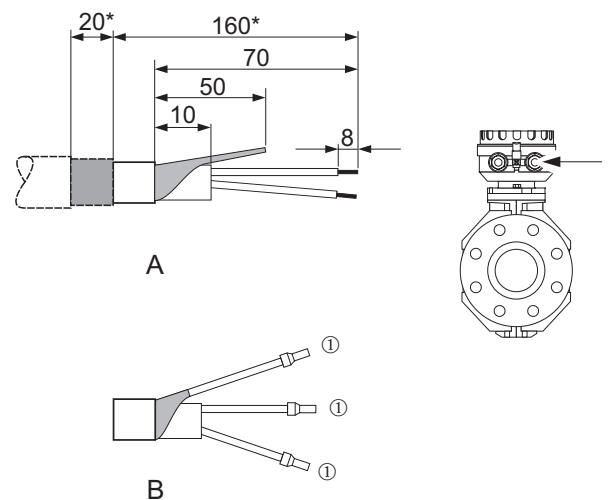
**SENSOR**

Signal cable



A0002646

Coil current cable



A0002645

- ① = Red cable sleeves,  $\varnothing$  1.0 mm
- ② = White cable sleeves,  $\varnothing$  0.5 mm
- \* = Stripping for armoured cables only

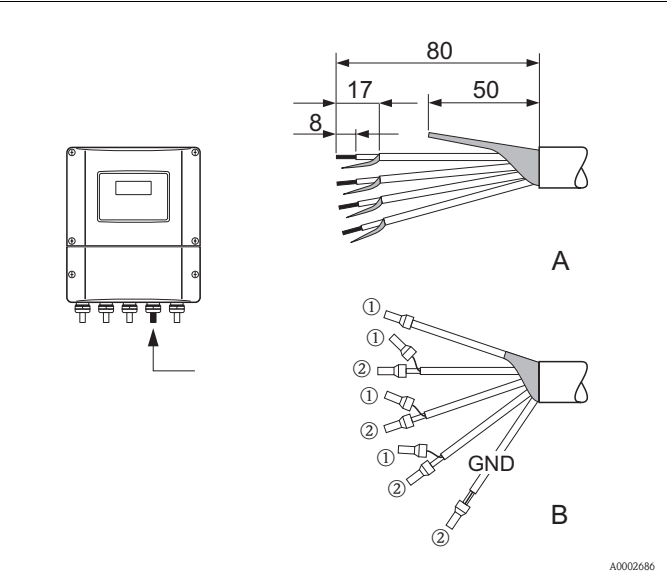
Cable termination for the remote version  
Promag H

Terminate the signal and coil current cables as shown in the figure below (Detail A).  
The fine-wire cores must be provided with ferrules (detail B: ① = red ferrules, Ø 1.0 mm; ② = white ferrules, Ø 0.5 mm).

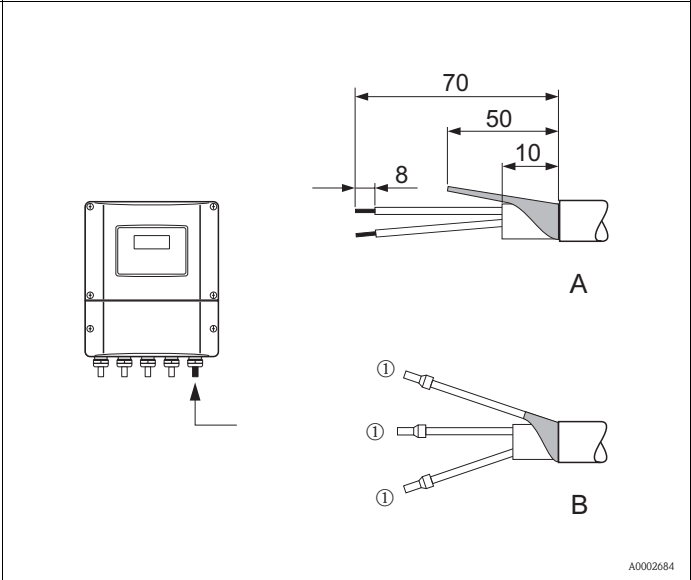
- ⚠ Caution!
- When fitting the connectors, pay attention to the following points:
- Signal cable → Make sure that the wire end ferrules do not touch the wire shields on the sensor side.  
Minimum distance = 1 mm (exception “GND” = green cable).
  - Coil current cable → Insulate one core of the three-core 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

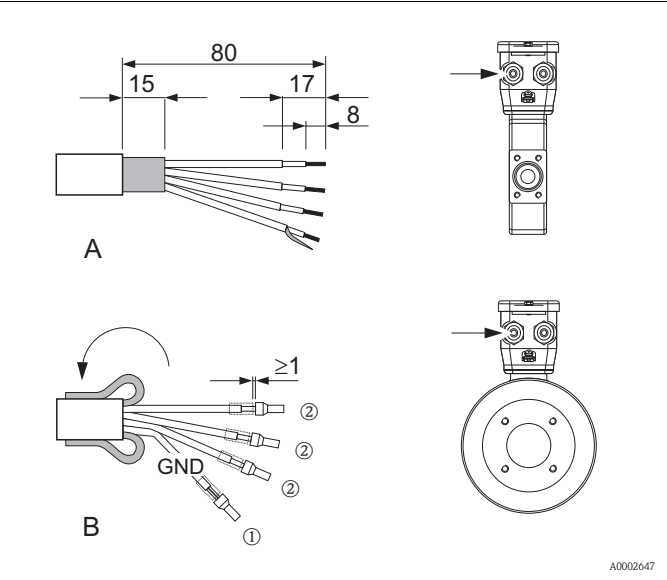


Coil current cable

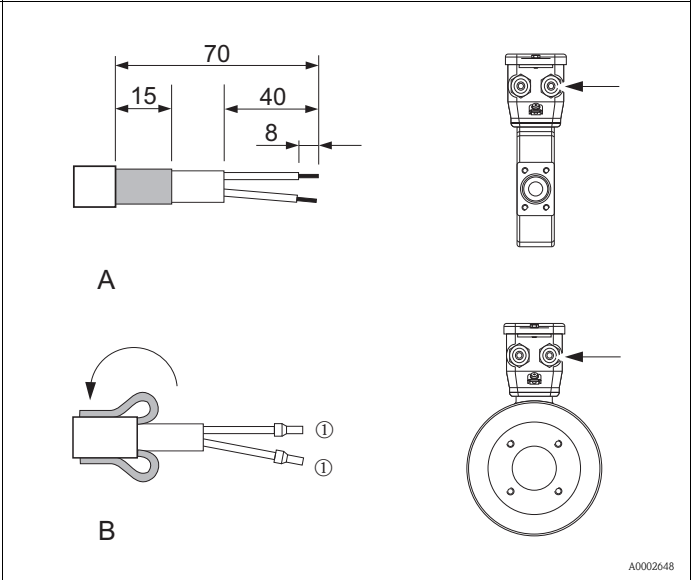


SENSOR

Signal cable



Coil current cable



① = Red cable sleeves, Ø 1.0 mm  
② = White cable sleeves, Ø 0.5 mm  
\* = Stripping for armoured cables only

### 4.2.2 Cable specifications

#### Signal cable

- 3 x 0.38 mm<sup>2</sup> PVC cable with common, braided copper shield (Ø ~ 7 mm) and individually shielded cores
- With empty pipe detection (EPD): 4 x 0.38 mm<sup>2</sup> PVC cable with common, braided copper shield (Ø ~ 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<sup>2</sup>

#### Coil cable

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

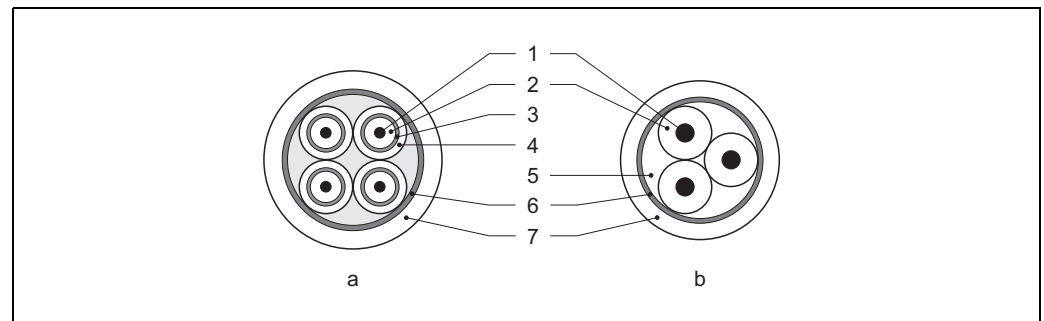


Fig. 32: Cable cross-section

- |   |                    |
|---|--------------------|
| a | Signal cable       |
| b | Coil current cable |
| 1 | Core               |
| 2 | Core insulation    |
| 3 | Core shield        |
| 4 | Core sheath        |
| 5 | Core reinforcement |
| 6 | Cable shield       |
| 7 | Outer jacket       |

As an option, Endress+Hauser 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 strong electrical interference

The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/AI (IEC 1326) and NAMUR Recommendations NE 21, NE 43 and NE 53.



#### 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.

## 4.3 Connecting the measuring unit

### 4.3.1 Terminal assignment



Note!

The electrical characteristic quantities can be found in the “Technical data” section → Page 110 ff.

#### PROFIBUS DP

Order version	Terminal No.			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 = B (RxD/TxD-P) 27 = A (RxD/TxD-N)
50***_*****J	-	-	+5V (ext. termination)	PROFIBUS DP

#### PROFIBUS PA

Order version	Terminal No.			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 = PA + <sup>1)</sup> 27 = PA - <sup>1)</sup>
50***_*****H	-	-	-	PROFIBUS PA
<sup>1)</sup> With integrated reverse polarity protection				

### 4.3.2 Transmitter connection

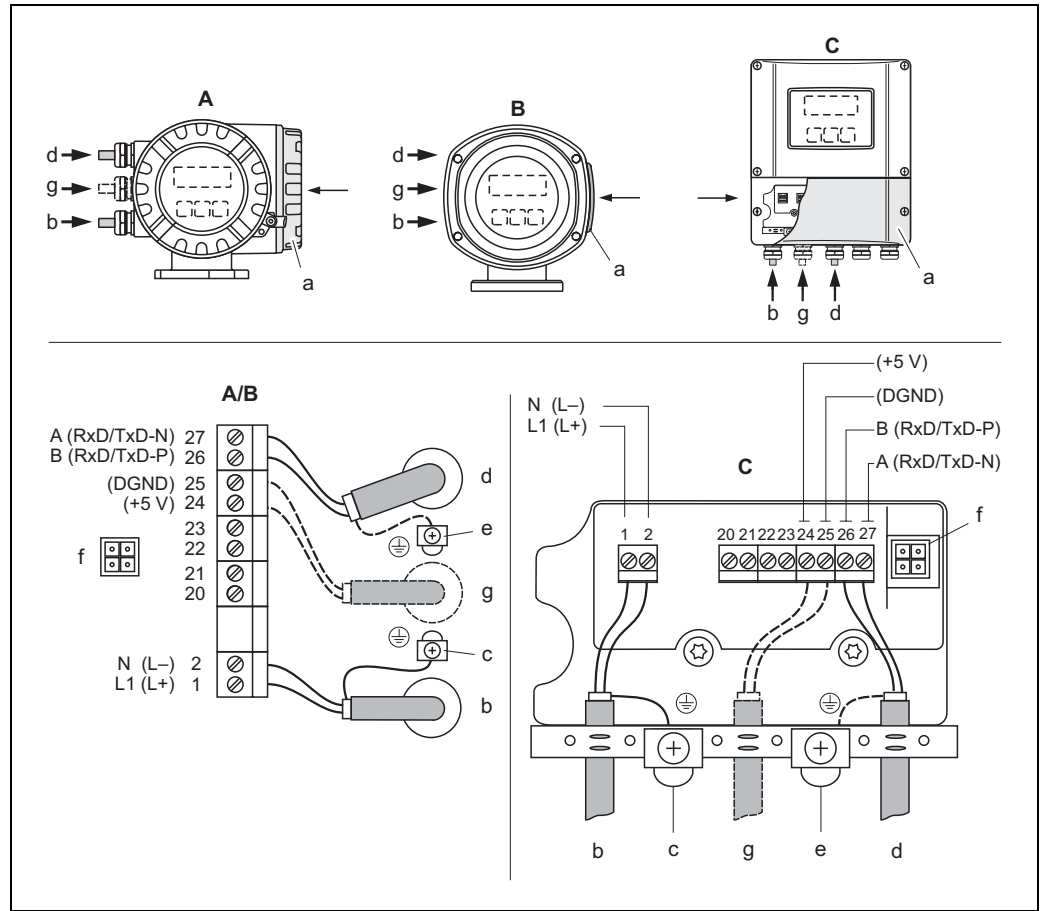


Warning!

- 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 ground to the ground terminal on the housing before the power supply is applied (not required for galvanically isolated power supply).
  - Compare the specifications on the nameplate with the local supply voltage and frequency. The national regulations governing the installation of electrical equipment also apply.
1. Unscrew the connection compartment cover (a) from the transmitter housing.
  2. Feed the power supply cable (b), the signal cable (d) and the fieldbus cable (e) through the appropriate cable entries.
  3. Perform wiring:
    - Wiring diagram (aluminum housing)
    - Wiring diagram (stainless steel housing)\*
    - Wiring diagram (wall-mount housing)\*
    - Terminal assignment
- Caution!**
- Risk of damaging the fieldbus cable!  
Observe the information on shielding and grounding the fieldbus cable → Page 42.
  - We recommend that the fieldbus cable not be looped using conventional cable glands. If you later replace even just one measuring device, the bus communication will have to be interrupted.
4. Screw the cover of the connection compartment (a) back onto the transmitter housing.



### 4.3.3 PROFIBUS DP connection diagram



F06-50PBxxxx-04-xx-xx-xx-000

Fig. 33: Connecting the transmitter, cable cross-section max. 2.5 mm<sup>2</sup>

- A View A (field housing)  
 B View B (stainless steel field housing)  
 C View C (wall-mount housing)

- a Connection compartment cover  
 b 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

- c Ground terminal for protective ground  
 d Fieldbus cable:

- Terminal No. 26: B (Rx/D/TxD-P)  
 Terminal No. 27: A (Rx/D/TxD-N)

- e Fieldbus cable shield ground terminal

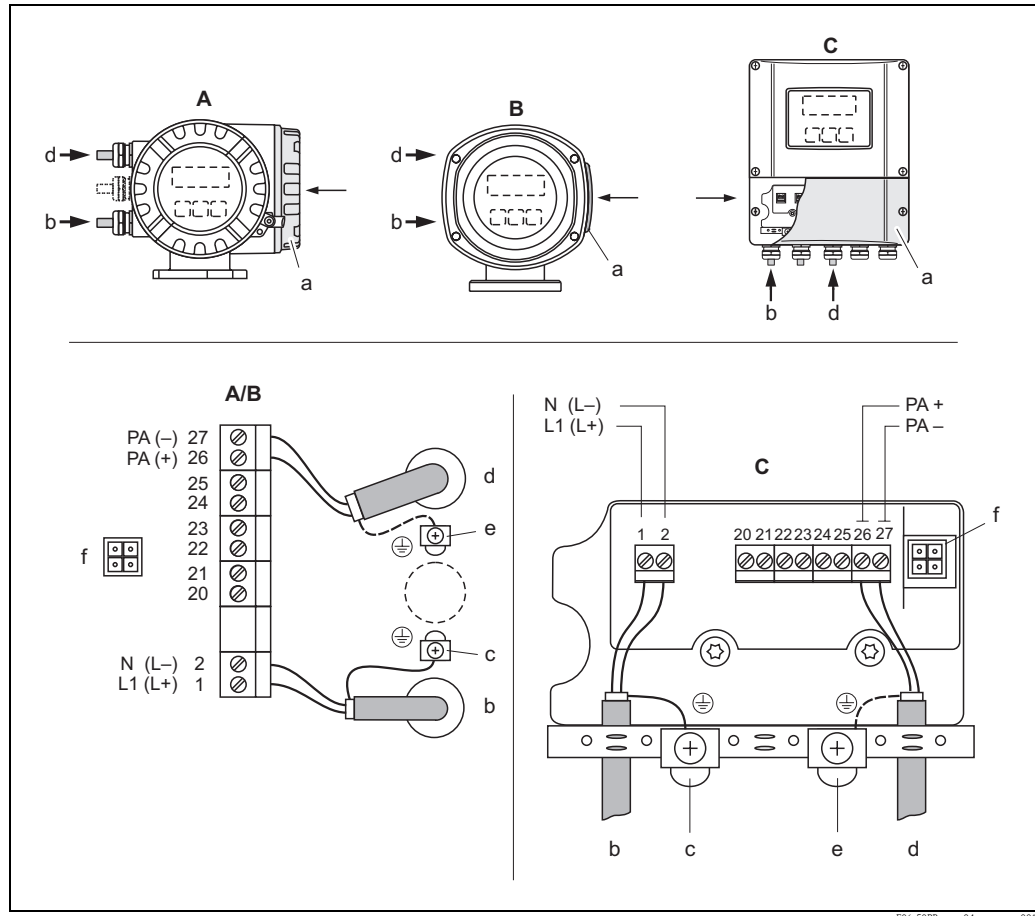
Please note the following:

– The shield and grounding of the fieldbus cable → Page 42

– Make sure that the stripped and twisted lengths of cable shield to the ground terminal are kept as short as possible  
 Service adapter for connecting service interface FXA 193 (Fieldcheck, ToF Tool – Fieldtool Package)

- g Cable for external termination:  
 Terminal No. 24: +5 V  
 Terminal No. 25: DGND

#### 4.3.4 PROFIBUS PA connection diagram



F06-50PBxxxx-04-xx-xx-xx-001

Fig. 34: Connecting the transmitter, cable cross-section max. 2.5 mm<sup>2</sup>

A View A (field housing)

B View B (stainless steel field housing)

C View C (wall-mount housing)

a Connection compartment cover

b 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

c Ground terminal for protective ground

d Fieldbus cable:

Terminal No. 26: PA +, with reverse polarity protection

Terminal No. 27: PA -, with reverse polarity protection

e Fieldbus cable shield ground terminal

Please note the following:

– The shield and grounding of the fieldbus cable → Page 42

– Make sure that the stripped and twisted lengths of cable shield to the ground terminal are kept as short as possible

f Service adapter for connecting service interface FXA 193 (Fieldcheck, ToF Tool - Fieldtool Package)

## Fieldbus connector



### Note!

The connector can only be used for PROFIBUS PA devices.

The connection technology of PROFIBUS PA allows measuring devices to be connected to the fieldbus via uniform mechanical connections such as T-boxes, distribution modules etc.

This connection technology using prefabricated distribution modules and plug-in connectors offers substantial advantages over conventional wiring:

- Field devices can be removed, replaced or added at any time during normal operation. Data transmission is not interrupted.
- Installation and maintenance are significantly easier.
- Existing cable infrastructures can be used and expanded instantly, e.g. when constructing new star distributors using 4-channel or 8-channel distribution modules.

The measuring device can therefore be supplied with the option of a ready-mounted fieldbus connector. Fieldbus connectors for retrofitting can be ordered from Endress+Hauser as a spare part → Page 90.

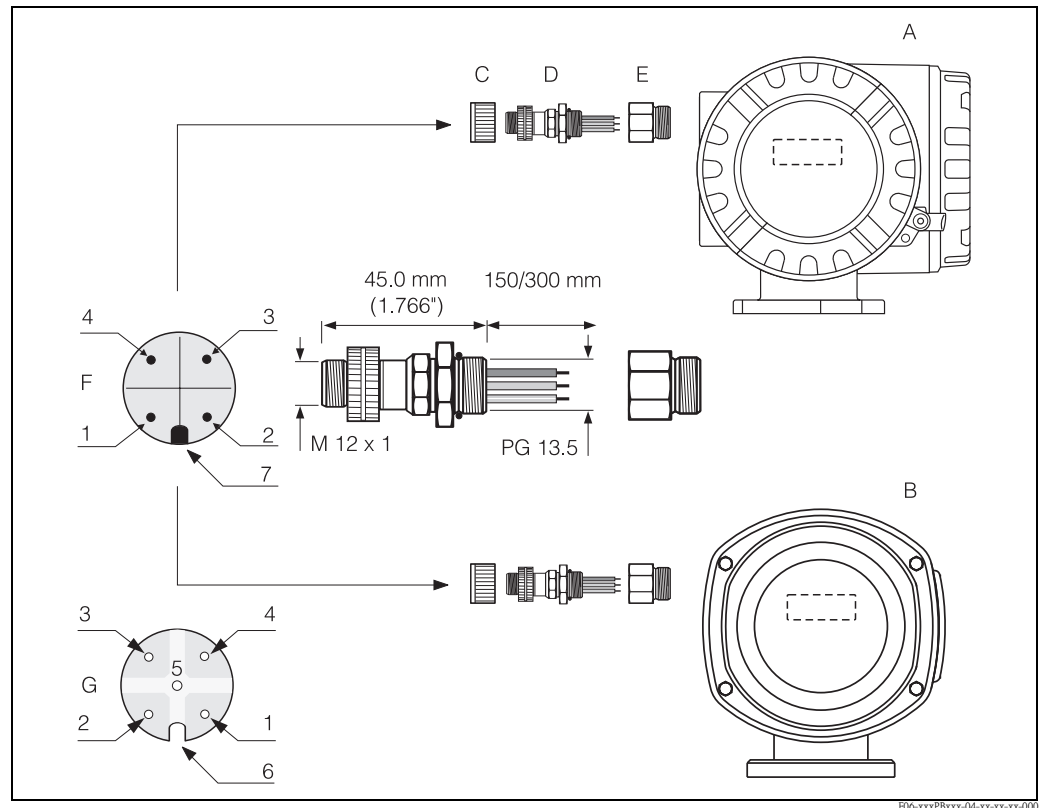


Fig. 35: Connectors for connecting to the PROFIBUS PA

- A Aluminum field housing
- B Stainless steel field housing
- C Protection cap for connector
- D Fieldbus connector
- E Adapter PG 13.5 / M 20.5
- F Connector at housing (male)
- G Female connector

### Pin assignment / color codes:

- 1 Brown wire: PA + (terminal 26)
- 2 Not connected
- 3 Blue wire: PA – (terminal 27)
- 4 Black wire: ground (instructions for connection → Seite 49 ff.)
- 5 Middle female connector not assigned
- 6 Positioning groove
- 7 Positioning key

**Technical data (fieldbus connector):**

Connection cross section	0.75 mm <sup>2</sup>
Connector thread	PG 13.5
Degree of protection	IP 67 in accordance with DIN 40 050 IEC 529
Contact surface	CuZnAu
Housing material	Cu Zn, surface Ni
Flammability	V - 2 in accordance with UL - 94
Operating temperature	-40...+85 °C
Ambient temperature range	-40...+150 °C
Nominal current per contact	3 A
Nominal voltage	125...150 V DC in accordance with the VDE Standard 01 10/ISO Group 10
Resistance to tracking	KC 600
Volume resistance	≤ 8 mΩ in accordance with IEC 512 Part 2
Insulation resistance	≤ 10 <sup>12</sup> Ω in accordance with IEC 512 Part 2

**Supply line/T-box shielding**

Use cable glands with good EMC properties, if possible with all-round contact of the cable shielding (Iris spring). This requires small differences in potential, poss. potential matching.

- The shielding of the PA cable must be intact.
- Always keep the shielding connection as short as possible.

Ideally, cable glands with Iris springs should be used for the shielding connection. The shielding is connected to the T-box housing by means of the Iris spring located inside the gland. The shielding braid is located beneath the Iris spring. When the armored thread is tightened, the Iris spring is pressed against the shielding, thereby creating a conductive connection between the shielding and the metal housing.

A connection box or a plug-in connection is seen as part of the shielding (Faraday shield). This applies, in particular, to remote boxes if these are connected to a PROFIBUS PA measuring device by means of a pluggable cable. In such instances, use a metallic connector where the cable shielding is connected to the connector housing (e.g. pre-terminated cables).

## 4.4 Potential equalization



Warning!

The measuring system must be included in the potential matching system.

### 4.4.1 Standard

Perfect measurement is only ensured when the medium and the sensor have the same electrical potential. Most sensors have a reference electrode installed as standard 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 equalized (→ Page 33). Ground rings can be ordered with the main product structure or as accessories (→ Page 90).



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.

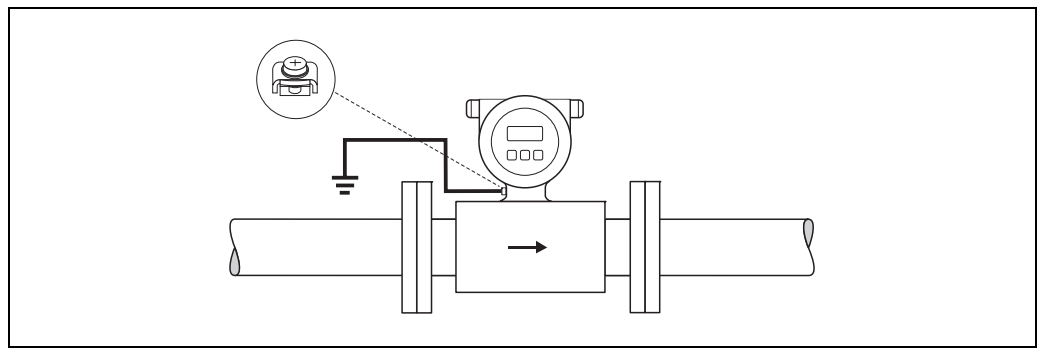


Fig. 36: Potential matching by means of the transmitter's ground terminal



Caution!

For sensors without reference electrodes or without metal process terminals, carry out potential matching 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.

## 4.4.2 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 (see the graphic below).



Caution!

Also, observe company-internal grounding guidelines.



Note!

The ground cable for flange-to-flange connections can be ordered separately as an accessory from Endress+Hauser → Page 90:

- $DN \leq 300$ : The ground cable is in direct connection with the conductive flange coating and is secured by the flange screws.
- $DN \geq 350$ : The ground cable connects directly to the metal transport bracket.

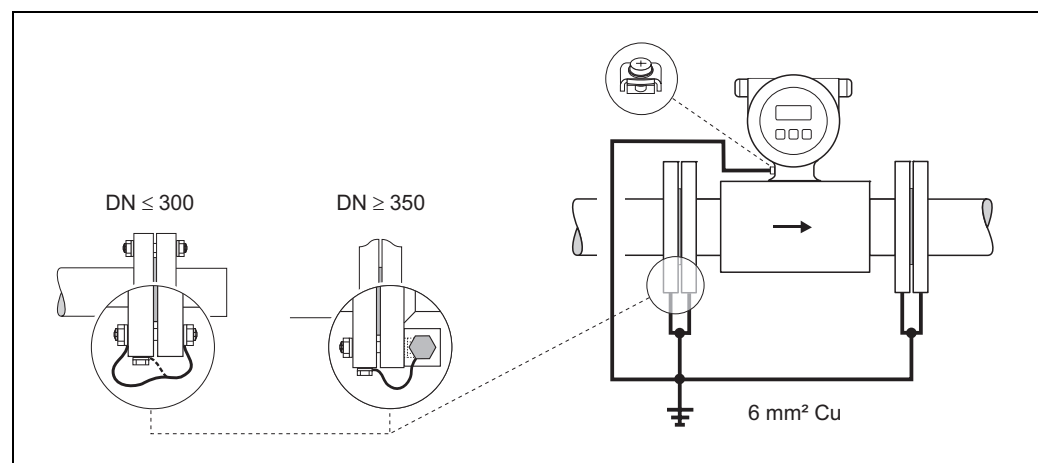


Fig. 37: Potential matching with equalizing currents in metallic, non-grounded piping systems

### 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 currents 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 fiberglass or PVC piping, it is recommended that you use additional ground disks for potential matching.



Note!

Assembly with ground disks → Page 23 (Promag W), → Page 28 (Promag P)



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.

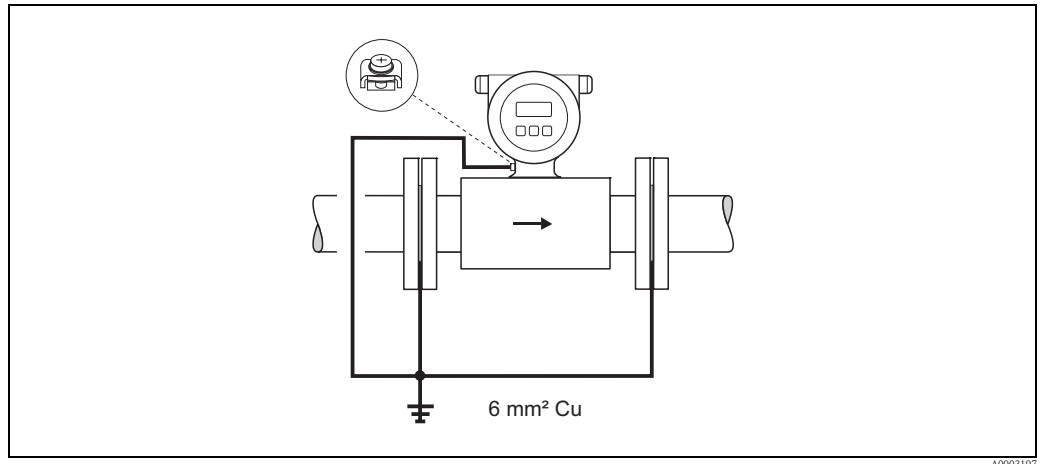


Fig. 38: Potential matching/ground disks with plastic pipes or lined pipes

### 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<sup>2</sup>).
- 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 screws are tightened.
- Also comply with the regulations applicable to potential-free installation.

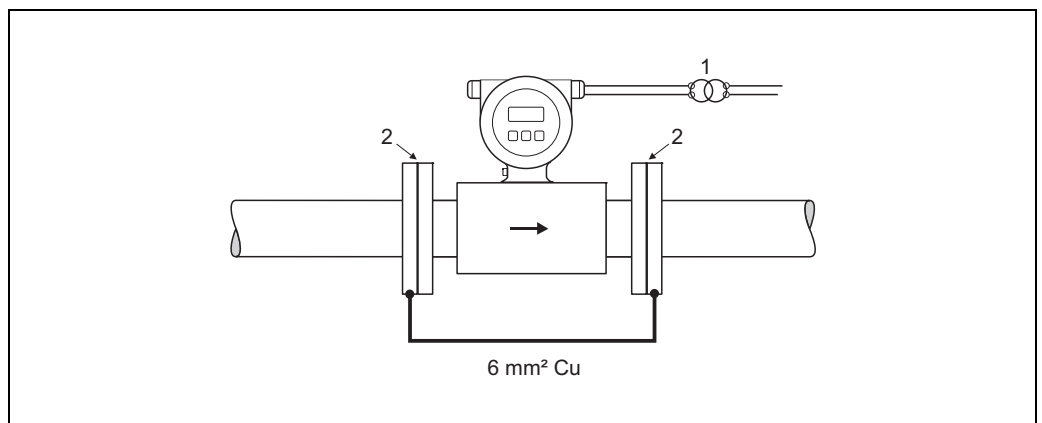


Fig. 39: Potential matching and cathodic protection

- 1 Isolation transformer power supply  
2 Electrically isolated

## 4.5 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 screws and screw covers must be firmly tightened.
- The cables used for connection must be of the specified outside diameter → Page 47.
- Firmly tighten the cable entries.
- The cables must loop down before they enter the cable entries ("water trap").  
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.

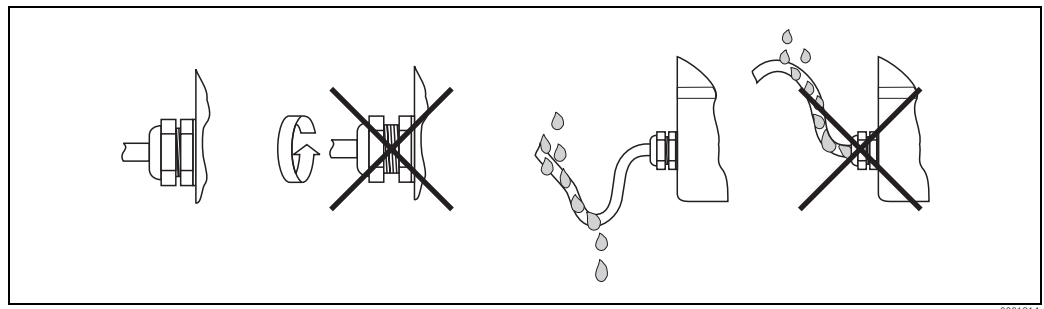


Fig. 40: Installation instructions, cable entries



### Caution!

Do not loosen the screws of the 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.



## 4.6 Post-connection check

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

Device condition and specifications	Notes
Are cables or the device damaged (visual inspection)?	-
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	85...250 V AC (50...60 Hz) 20...28 V AC (50...60 Hz) 11...40 V DC
Do the cables comply with the specifications?	PROFIBUS DP → Page 39 PROFIBUS PA → Page 40 Sensor cable → Page 47
Do the cables have adequate strain relief?	-
Cables correctly segregated by type? 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 matching been correctly implemented?	→ Page 53 ff.
Are all cable entries installed, firmly tightened and correctly sealed? Cables looped as "water traps"?	→ Page 56
Are all housing covers installed and firmly tightened?	-
Electrical connection, PROFIBUS	Notes
Are all the connecting components (T-boxes, junction boxes, connectors, etc.) connected with each other correctly?	-
Has each fieldbus segment been terminated at both ends with a bus terminator?	PROFIBUS DP → Page 69
Has the max. length of the fieldbus cable been observed in accordance with the PROFIBUS specifications?	PROFIBUS DP → Page 39 PROFIBUS PA → Page 40
Has the max. length of the spurs been observed in accordance with the PROFIBUS specifications?	PROFIBUS DP → Page 39 PROFIBUS PA → Page 40
Is the fieldbus cable fully shielded and correctly grounded?	→ Page 42

## 5 Operation

### 5.1 Quick operation guide

The user has a number of options for configuring and commissioning the device:

1. **Local display (option)** → Page 59  
The local display enables you to read all important variables directly at the measuring point, configure device-specific parameters in the field and perform commissioning.
2. **Configuration programs** → Page 64  
The configuration of profile and device-specific parameters is primarily done via the PROFIBUS interface. You can obtain special configuration and operating programs from various manufacturers for these purposes.
3. **Jumpers/miniature switches for hardware settings**
  - PROFIBUS DP → Page 67
  - PROFIBUS PA → Page 70

You can make the following hardware settings using a jumper or miniature switches on the I/O board:

  - Address mode configuration (select software or hardware addressing)
  - Device bus address configuration (for hardware addressing)
  - Hardware write protection enabling/disabling

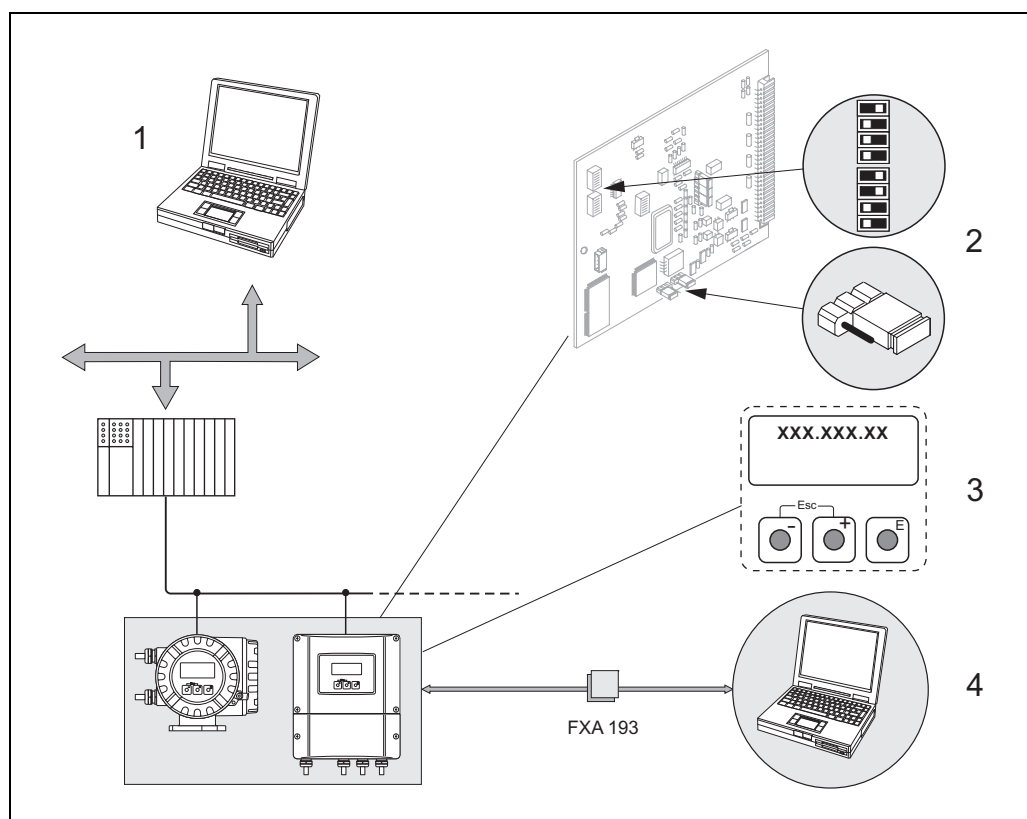


Fig. 41: Methods of operating PROFIBUS DP/PA

- 1 Configuration/operating program (e.g. FieldCare) for operation via PROFIBUS DP/PA
- 2 Jumper/miniature switches for hardware settings (write protection, device address, address mode)
- 3 Local display for device operation in the field (option)
- 4 Configuration/operating program for operating by means of the FXA 193 service interface (e.g. ToF Tool - Fieldtool Package)

## 5.2 Local display

### 5.2.1 Display and operating elements

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

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 different variables to suit your needs and preferences (→ see the “Description of Device Functions” manual).

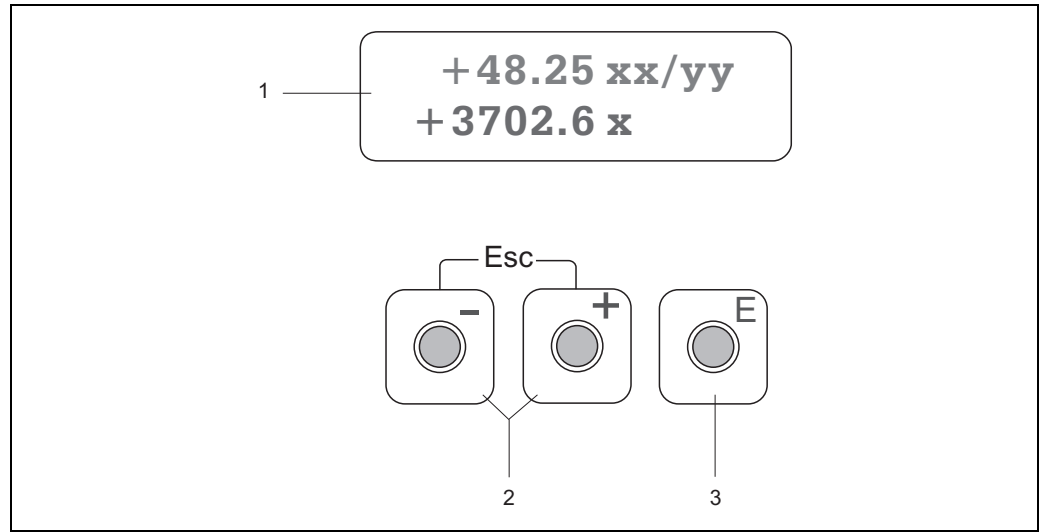


Fig. 42: Display and operating elements

**1** Liquid crystal display

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

- Top line shows primary measured values, e.g. volume flow [e.g. in ml/min]
- Bottom line shows the totalizer status [e.g. in m³]
- Bar graph display, tag name

**2** Plus/minus keys

- 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

**3** Enter key

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

### 5.2.2 Icons

The icons which appear in the field on the left make it easier to read and recognize measured variables, device status, and error messages.

Icons	Meaning
S	System error
!	Notice message
P	Process error
⚡	Fault message
  (alternating display)	Cyclic communication via PROFIBUS active, e.g. via PLC (Master Class 1)
 <small>a0001206</small>	Acyclic communication via PROFIBUS active, e.g. via FieldCare

### 5.3 Brief operating instructions on the function matrix



Note!

- See the general notes on → Page 62.
  - Function descriptions → see the “Description of Device Functions” manual
1. HOME position → **E** → Entry into the function matrix
  2. Select a function group (e.g. OPERATION)
  3. Select a function (e.g. LANGUAGE)  
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

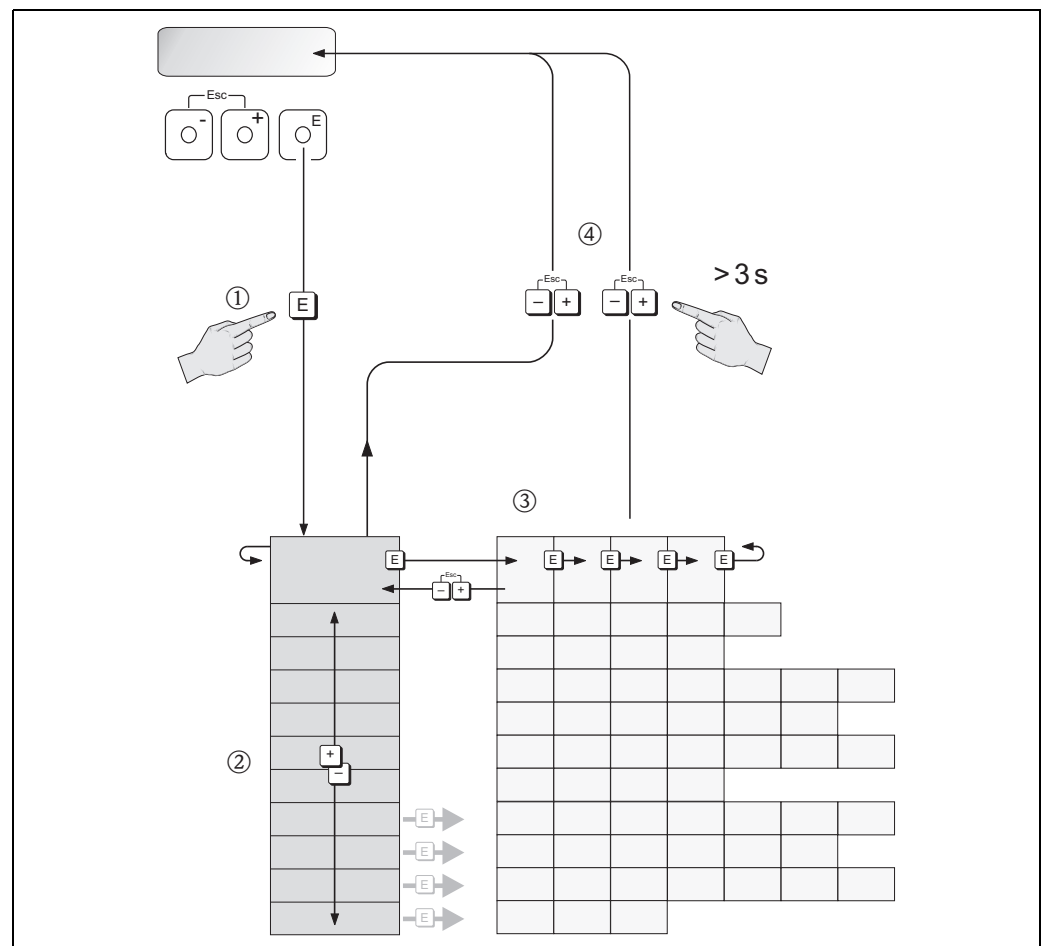




Fig. 43: Selecting functions and configuring parameters (function matrix)

F06-x0xxxxxx-19-xx-xx-xx-000

### 5.3.1 General notes

The “Commissioning” brief operating instructions (→ Page 72) are 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 61.
- 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  to confirm. This saves your setting or starts a function, as applicable.
- Return to the HOME position is automatic if no operating 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 configured values remain safely stored in the EEPROM.



Caution!


All functions are described in detail, as is the function matrix itself, in the “**Description of Device Functions**” manual which is a separate part of these Operating Instructions.

### 5.3.2 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  operating elements are pressed in any function, a prompt for the code automatically appears on the display.
- If “0” is specified as the customer's code, programming is always enabled!
- The Endress+Hauser service organization 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 Endress+Hauser service organization. Please contact Endress+Hauser if you have any questions.

### 5.3.3 Disabling the programming mode

Programming mode 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).

## 5.4 Error messages

### 5.4.1 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 error → Page 93 ff.  
This group comprises all device errors, e.g. communication errors, hardware errors, etc.
- Process error → Page 98  
This group comprises all application errors, e.g. fluid not homogeneous, etc.

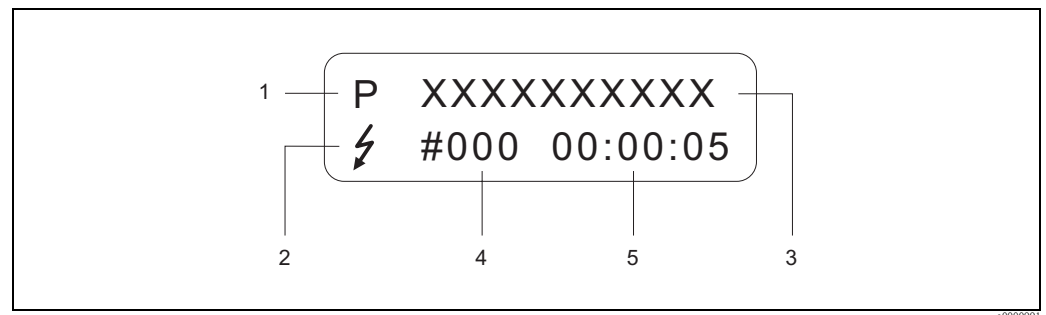


Fig 44: Error messages on the display (example)

- 1 Error type: P = process error, S = system error
- 2 Error message type: ⚡ = 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

### 5.4.2 Error message type

The measuring system permanently assigns system and process errors to two types of error message (**Fault message** or **Notice message**), thereby giving them different weighting → Page 94 ff. Critical system errors, e.g. electronic module defects, are always detected by the measuring device as “fault messages” and displayed as such.

#### Notice message (!)

- The error in question has no effect on the current operation
- Displayed as → Exclamation mark (!), error type (S: system error, P: process error)
- PROFIBUS device status display, fault display → Page 94

#### Fault message (⚡)

- The error in question interrupts or stops the current operation
- Displayed as → Lightning flash (⚡), error type (S: system error, P: process error)
- PROFIBUS device status display, fault display → Page 94

## 5.5 Operating options

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

### 5.5.1 FieldCare

FieldCare is Endress+Hauser's FDT-based plant Asset Management Tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple but effective tool for monitoring devices.

### 5.5.2 Operating program "ToF Tool - Fieldtool Package"

Modular software package consisting of the service program "ToF Tool" for configuration and diagnosis of ToF level measuring devices (time-of-flight measurement) and evolution of pressure measuring instruments as well as the "Fieldtool" service program for the configuration and diagnosis of Proline flow measuring devices. The Proline flow measuring devices are accessed via a service interface or via the service interface FXA 193.

Contents of the "ToF Tool - Fieldtool Package":

- Commissioning, maintenance analysis
- Configuring flowmeters
- Service functions
- Visualization of process data
- Troubleshooting
- Controlling the "Fieldcheck" tester/simulator

### 5.5.3 Operating program "SIMATIC PDM" (Siemens)


SIMATIC PDM is a standardized, manufacturer-independent tool for the operation, configuration, maintenance and diagnosis of intelligent field devices.



### 5.5.4 Device drivers for operating programs

The following section illustrates the suitable device drivers for the operating tool in question and then indicates where these can be obtained.

#### PROFIBUS DP

<b>Valid for device software:</b>	3.01.XX	→ Function “DEVICE SOFTWARE”
<b>PROFIBUS DP device data</b>		
Profile Version:	3.0	→ Function “PROFILE VERSION”
Promag 50 ID No.:	1546hex	→ Function “DEVICE ID”
Profile ID No.:	9740hex	
<b>GSD file information:</b>		
Promag 50 GSD file:	Extended format (recommended): Standard format:	eh3x1546.gsd eh3_1546.gsd
	 <b>Note!</b> When planning and configuring the PROFIBUS network, please observe the information on using GSD files → Page 77	
Bitmaps:	EH_1546_d.bmp/.dib EH_1546_n.bmp/.dib EH_1546_s.bmp/.dib	
Profile GSD file:	PA039740.gsd	
Software release:	10.2005	
Operating program/device driver:	Sources for obtaining device descriptions/program updates:	
Promag 50 GSD file	<ul style="list-style-type: none"> <li>■ www.endress.com (→ Download → Software → Device Drivers)</li> <li>■ www.profibus.com</li> <li>■ CD-ROM (Endress+Hauser order number: 56003894)</li> </ul>	
FieldCare/DTM	<ul style="list-style-type: none"> <li>■ www.endress.com (→ Download → Software → Device Drivers)</li> <li>■ CD-ROM (Endress+Hauser order number: 56004088)</li> </ul>	
SIMATIC PDM	<ul style="list-style-type: none"> <li>■ www.endress.com (→ Download → Software → Device Drivers)</li> <li>■ www.feldgeraete.de</li> </ul>	
ToF Tool - Fieldtool Package (operation via service protocol)	<ul style="list-style-type: none"> <li>■ www.tof-fieldtool.endress.com</li> <li>■ Update CD-ROM (Endress+Hauser order number: 50099820)</li> </ul>	


Tester/simulator:	
Measuring device:	How to acquire:
Fieldcheck	<ul style="list-style-type: none"> <li>■ Update by means of ToF Tool - Fieldtool Package via Fieldflash</li> </ul>



**Note!**

The Fieldcheck tester/simulator is used for testing flowmeters in the field. When used in conjunction with the “ToF Tool - Fieldtool Package” software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.

**PROFIBUS PA**

<b>Valid for device software:</b>	2.03.XX	→ Function "DEVICE SOFTWARE"
<b>PROFIBUS PA device data</b>		
Profile Version:	3.0	→ Function "PROFILE VERSION"
Promag 50 ID No.:	1525hex	→ Function "DEVICE ID"
Profile ID No.:	9740hex	
<b>GSD file information:</b>		
Promag 50 GSD file:	Extended format (recommended): Standard format:	eh3x1525.gsd eh3_1525.gsd
	 <b>Note!</b> When planning and configuring the PROFIBUS network, please observe the information on using GSD files → Page 77	
Bitmaps:	EH_1525_d.bmp/.dib EH_1525_n.bmp/.dib EH_1525_s.bmp/.dib	
Profile GSD file:	PA139740.gsd	
Software release:	10.2003	
Operating program/device driver:	Sources for obtaining device descriptions/program updates:	
Promag 50 GSD file	<ul style="list-style-type: none"> <li>■ www.endress.com (→ Download → Software → Device Drivers)</li> <li>■ www.profibusb.com</li> <li>■ CD-ROM (Endress+Hauser order number: 56003894)</li> </ul>	
FieldCare/DTM	<ul style="list-style-type: none"> <li>■ www.endress.com (→ Download → Software → Device Drivers)</li> <li>■ CD-ROM (Endress+Hauser order number: 56004088)</li> </ul>	
SIMATIC PDM	<ul style="list-style-type: none"> <li>■ www.endress.com (→ Download → Software → Device Drivers)</li> <li>■ www.feldgeraete.de</li> </ul>	
ToF Tool - Fieldtool Package (operation via service protocol)	<ul style="list-style-type: none"> <li>■ www.tof-fieldtool.endress.com</li> <li>■ Update CD-ROM (Endress+Hauser order number: 50099820)</li> </ul>	

<b>Tester/simulator:</b>	
<b>Measuring device:</b>	<b>How to acquire:</b>
Fieldcheck	<ul style="list-style-type: none"> <li>■ Update by means of ToF Tool - Fieldtool Package via Fieldflash</li> </ul>

**Note!**

The Fieldcheck tester/simulator is used for testing flowmeters in the field. When used in conjunction with the "ToF Tool - Fieldtool Package" software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.

## 5.6 PROFIBUS DP hardware settings

### 5.6.1 Configuring the write protection

A jumper on the I/O board provides the means of switching hardware write protection on or off. When the hardware write protection is switched on, it is **not** possible to write to the device parameters via PROFIBUS (acyclic data transfer, e.g. via FieldCare).



**Warning!**

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

1. Switch off power supply.
2. Remove the I/O board.
3. Configure the hardware write protection accordingly with the aid of the jumpers (see Figure).
4. Installation is the reverse of the removal procedure.

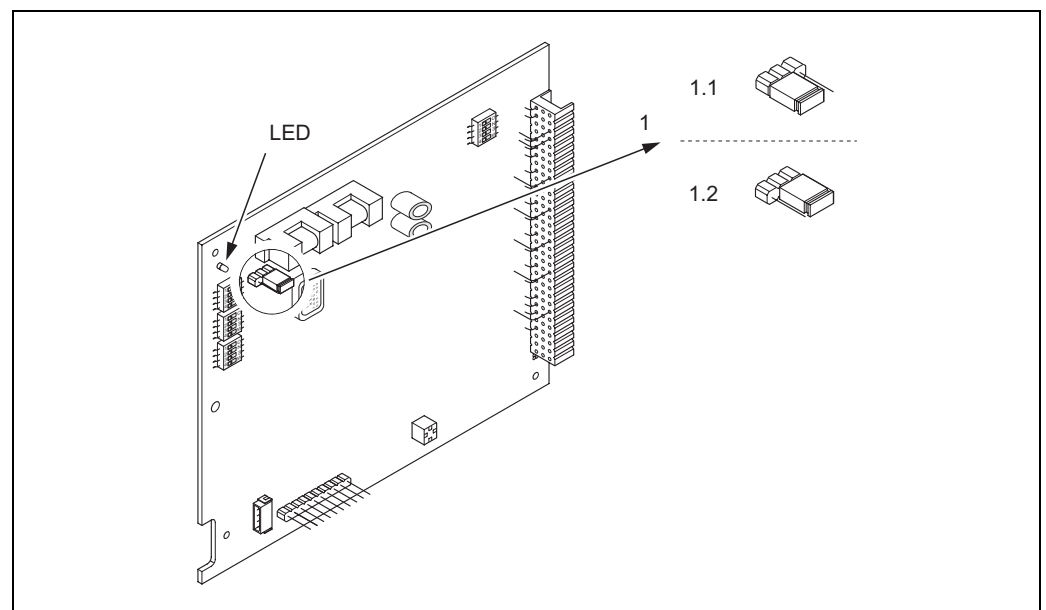


Fig. 45: Switching write protection on and off with the aid of a jumper on the I/O board

- 1 Jumper for switching write protection on and off
- 1.1 Write protection switched off (factory setting) = it is possible to write to the device parameters via PROFIBUS (acyclic data transfer, e.g. via FieldCare)
- 1.2 Write protection switched on = it is **not** possible to write to the device parameters via PROFIBUS (acyclic data transfer, e.g. via FieldCare)

LED Overview of LED status:

- Lit continuously → Ready for operation
- Not lit → Not ready for operation
- Flashing → System or process error present → Page 92

### 5.6.2 Configuring the device address

The address must always be configured for a PROFIBUS DP/PA measuring device. The valid device addresses are in the range from 0...126. In a PROFIBUS DP/PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master. All measuring devices are delivered from the factory with the address 126 and software addressing.

#### Addressing via local operation

Addressing takes place in the FIELDBUS ADDRESS function → see “Description of Device Functions” manual.

#### Addressing via miniature switches



##### Warning!

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

1. Loosen Allen screw (3 mm) of the securing clamp.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Remove the local display (if present) by loosening the set screws of the display module.
4. Set the position of the miniature switches on the I/O board using a sharp pointed object.
5. Installation is the reverse of the removal procedure.

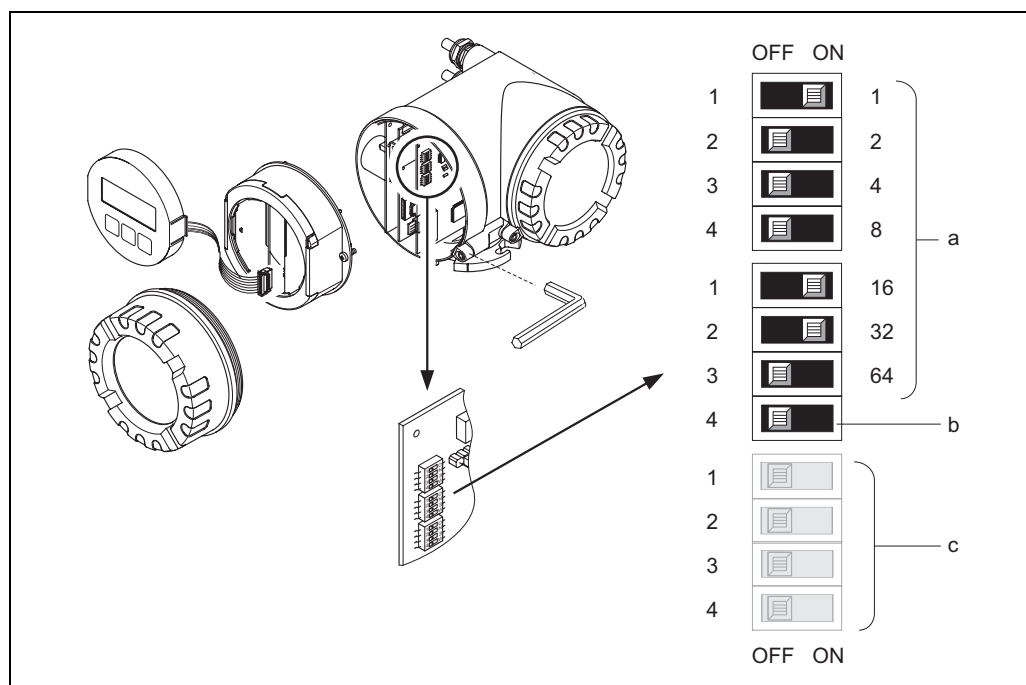


Fig. 46: Addressing with the aid of miniature switches on the I/O board

- a Miniature switches for setting the device address (illustrated:  $1 + 16 + 32 = \text{device address } 49$ )
- b Miniature switches for the address mode (method of addressing):  
 OFF = software addressing via local operation (factory setting)  
 ON = hardware addressing via miniature switches
- c Miniature switches not assigned

### 5.6.3 Configuring the terminating resistors



#### Note!

It is important to terminate the RS485 line correctly at the start and end of the bus segment since impedance mismatch results in reflections on the line which can cause faulty data transfer.



#### 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.

- For baudrates up to 1.5 MBaud, the termination is set via the terminating switch SW 1 for the last transmitter on the bus: ON – ON – ON – ON.
- The measuring device is operated with a baudrate >1.5 MBaud:  
Due to the capacitive load of the user and the line reflection generated as a result, make sure that external termination is used.

The miniature switch for termination is located on the I/O board (see Figure):

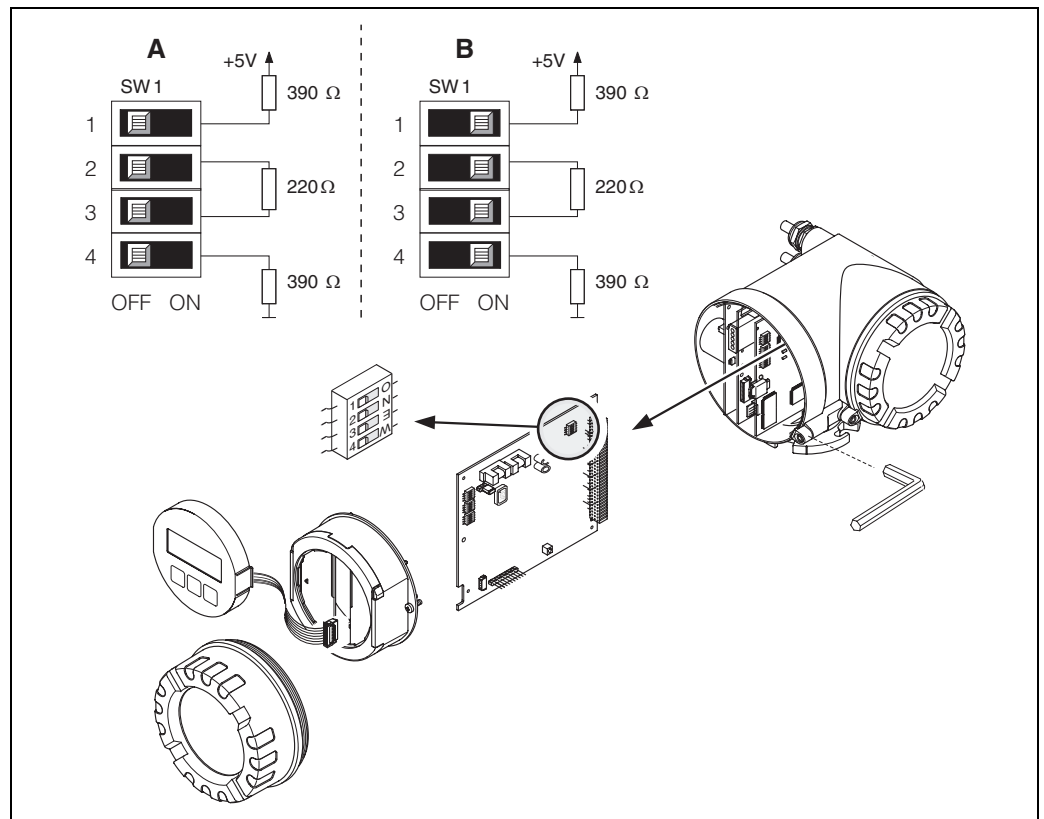


Fig. 47: Set terminating resistors (for baudrates < 1.5 MBaud)

A = Factory setting

B = Setting at the last transmitter



#### Note!

It is generally recommended to use external termination since if a device that is terminated internally is defect, this can result in the failure of the entire segment.

## 5.7 PROFIBUS PA hardware settings

### 5.7.1 Configuring the write protection

A jumper on the I/O board provides the means of switching hardware write protection on or off. When the hardware write protection is switched on, it is **not** possible to write to the device parameters via PROFIBUS (acyclic data transfer, e.g. via FieldCare).



#### Warning!

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

1. Switch off power supply.
2. Remove the I/O board.
3. Configure the hardware write protection accordingly with the aid of the jumpers (see Figure).
4. Installation is the reverse of the removal procedure.

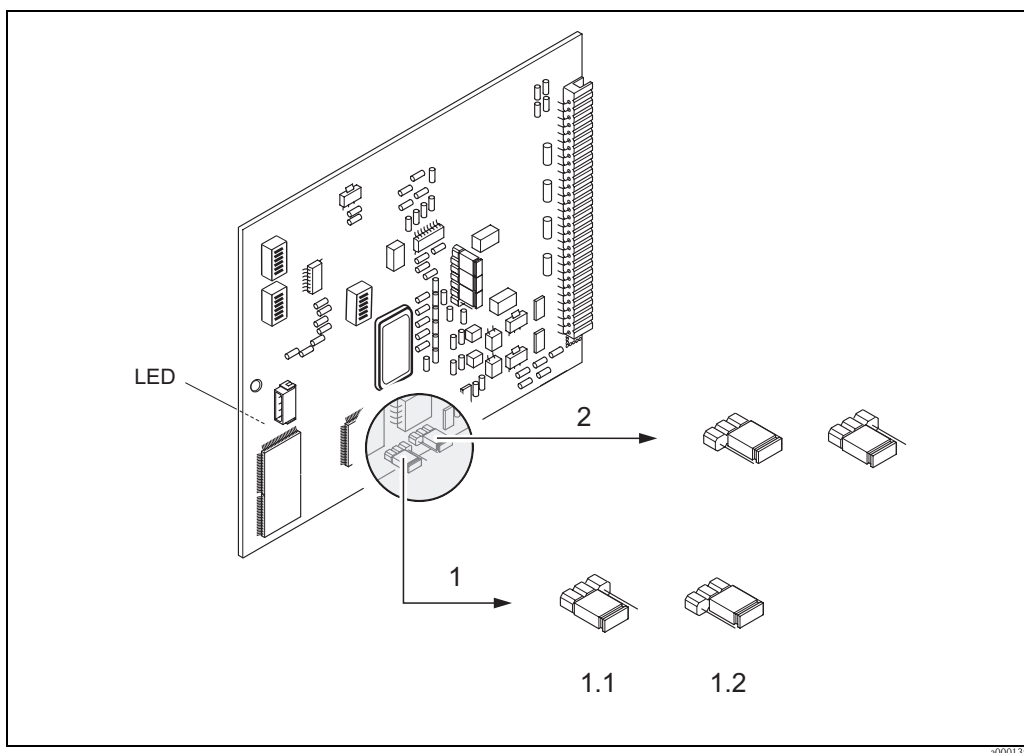


Fig. 48: Switching write protection on and off with the aid of a jumper on the I/O board

- 1 Jumper for switching write protection on and off
  - 1.1 Write protection switched off (factory setting) = it is possible to write to the device parameters via PROFIBUS (acyclic data transfer, e.g. via FieldCare)
  - 1.2 Write protection switched on = it is **not** possible to write to the device parameters via PROFIBUS (acyclic data transfer, e.g. via FieldCare)
- 2 Jumper without function

LED (light emitting diode is located on the rear of the board):

- Lit continuously → Ready for operation
- Not lit → Not ready for operation
- Flashing → System or process error present → Page 92

### 5.7.2 Configuring the device address

The address must always be configured for a PROFIBUS DP/PA device.

The valid device addresses are in the range from 0...126. In a PROFIBUS DP/PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master. All measuring devices are delivered from the factory with the address 126 and software addressing.

#### Addressing via local operation

Addressing takes place in the FIELDBUS ADDRESS function → see “Description of Device Functions” manual.

#### Addressing via miniature switches



**Warning!**

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

1. Loosen Allen screw (3 mm) of the securing clamp.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Remove the local display (if present) by loosening the set screw of the display module.
4. Set the position of the miniature switches on the I/O board using a sharp pointed object.
5. Installation is the reverse of the removal procedure.

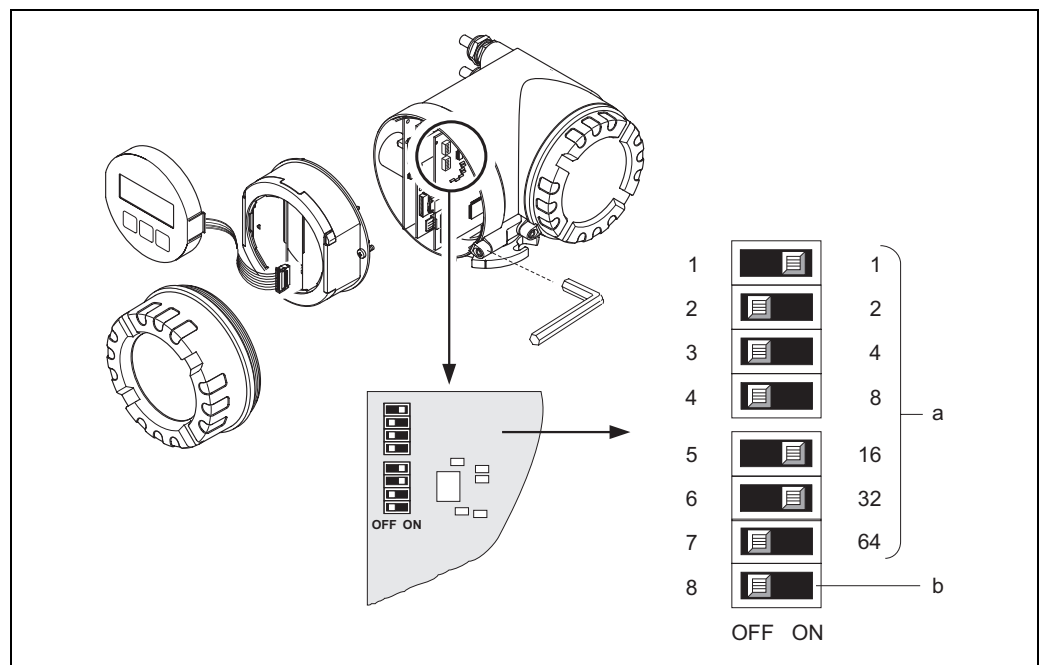


Fig. 49: Addressing with the aid of miniature switches on the I/O board

a Miniature switches for setting the device address (illustrated:  $1 + 16 + 32 = \text{device address } 49$ )

b Miniature switches for the address mode (method of addressing):

OFF = software addressing via local operation (factory setting)

ON = hardware addressing via miniature switches

## 6 Commissioning

### 6.1 Function check

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

- Checklist for “Post-installation check” → Page 38
- Checklist for “Post-connection check” → Page 57



Note!

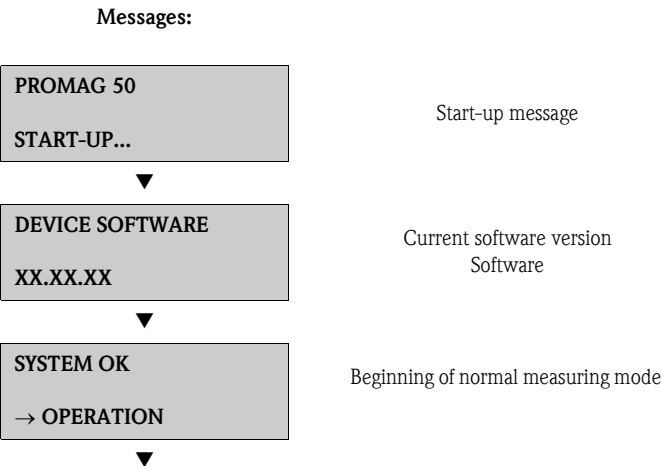
When using PROFIBUS PA, please note the following:

- The PROFIBUS interface's technical data must be maintained in accordance with IEC 61158-2 (MBP).
- A normal multimeter can be used to check the bus voltage of 9...32 V and the current consumption of 11 mA at the device.

#### 6.1.1 Switching on the measuring device

Once the post-connection checks have been successfully completed, it is time to switch on the supply voltage. The measuring 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:



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



Note!

If startup fails, an error message indicating the cause is displayed.



## 6.2 Quick Setup

A Quick Setup guides you through the local display to the functions of the measuring device that have to be configured for the task in question. The following Quick Setups are available for rapid measuring device commissioning and to establish the cyclic data transfer between the PROFIBUS master and the measuring device (slave):

- Quick Setup “Commissioning” → Page 73 (next section)
- Quick Setup “Communication” → Page 74

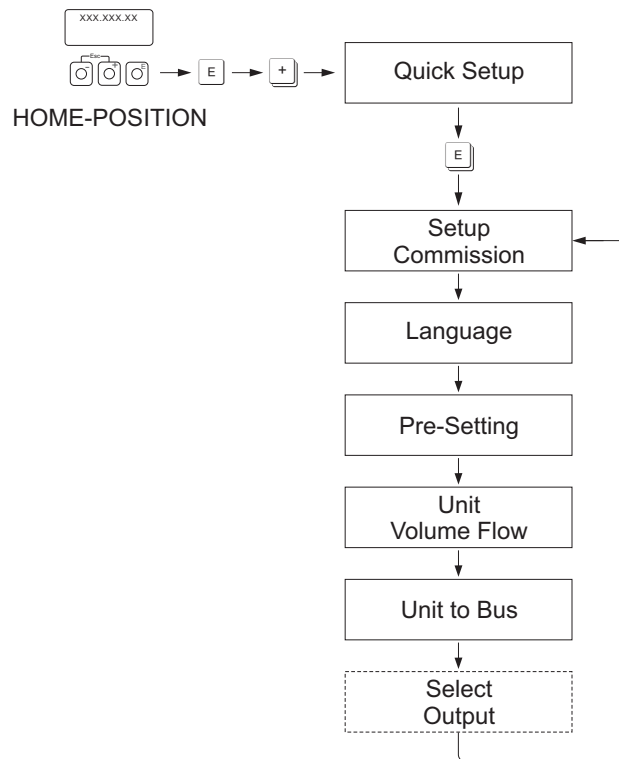


Note!

In the case of measuring devices without a local display, the individual parameters and functions must be configured via a configuration program, (ToF Tool – Fieldtool Package, FieldCare).

### 6.2.1 Quick-Setup “Commissioning”

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.



F06-50PBxxxx-19-xx-xx-en-000

For the Quick Setup “Commissioning”, only settings have to be made in the functions shown in the graphic above.

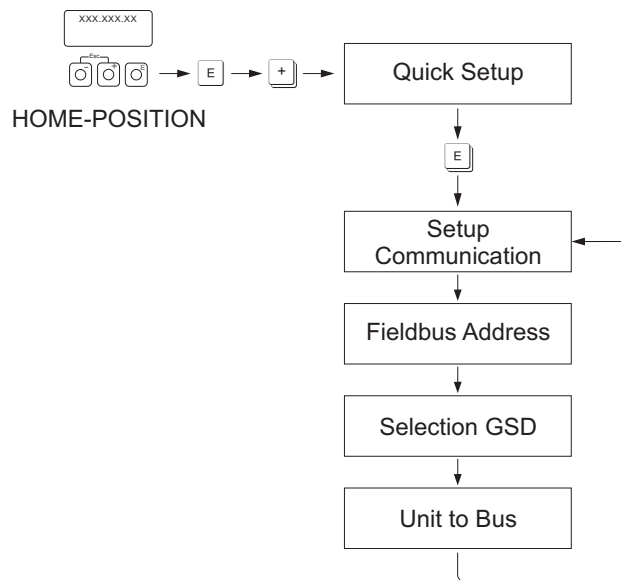


Note!

When you run through the Quick Setup another function or option is displayed (“Select Output” option) but this should not be taken into account. Settings in this function are not processed further by the measuring system.

### 6.2.2 Quick Setup “Communication”

To establish cyclic data transfer, various arrangements between the PROFIBUS master and the measuring device (slave) are required which have to be taken into consideration when configuring various functions. These functions can be configured quickly and easily by means of the “Communication” Quick Setup.



F06-50PBxxxx-19-xx-xx-en-001

Fig. 50: Communication Quick Setup.

The table explains the function configuration options in more detail.

SETUP COMMUNICATION	After  (YES) is pressed by way of confirmation, the following functions are called up in succession.
FIELDBUS ADDRESS	Enter the device address (permitted address range: 1...126)  Factory setting: 126
SELECTION GSD	Select the operating mode (GSD file) which should be used for cyclic data transfer with the PROFIBUS master.  Options <ul style="list-style-type: none"> <li>■ MANUFACT. SPEC. → The measuring device is operated with complete device functionality.</li> <li>■ MANUFACT V2.0 → The measuring device is used as the replacement for the previous Promag 33 model (compatibility mode).</li> <li>■ PROFILE-GSD → The measuring device is operated in the PROFIBUS Profile mode.</li> </ul> Factory setting: MANUFACT. SPEC.  <b>Note!</b> For PROFIBUS network configuration, make sure that the right device master file (GSD file) of the measuring device is used for the selected operating mode → Page 77.
UNIT TO BUS	If this function is executed, the volume flow (AI module) transmitted cyclically is transmitted to the PROFIBUS master (Class 1) with the system unit configured in the measuring device.  Options: OFF SET UNITS (transmission is started by pressing the  key)  <b>Caution!</b> Activating this function can cause the volume flow (AI module) transmitted to the PROFIBUS master (Class 1) to change suddenly; this, in turn, can affect subsequent control routines.

## 6.3 Commissioning the PROFIBUS interface



Note!

- All functions required for commissioning are described in detail in the “Description of Device Functions” manual which is a separate part of these Operating Instructions.
- A code (factory setting: 50) must be entered to change device functions, numerical values or factory settings.

### 6.3.1 PROFIBUS DP/PA commissioning

The following steps must be carried out in the sequence specified:

1. **Check the hardware write protection:**

The WRITE PROTECTION parameter indicates whether write access to the device is possible via PROFIBUS communication (e.g. via FieldCare).



Note!

This check is not needed if operating via the local display.

COMMUNICATION → WRITE PROTECT...

... → OFF display (factory setting): write access via PROFIBUS possible

... → ON display: write access via PROFIBUS **not** possible

Deactivate the write protection if necessary:

– PROFIBUS DP → Page 67

– PROFIBUS PA → Page 70

2. **Enter the tag name (optional):**

COMMUNICATION → TAG NAME

3. **Configure the bus address:**

Configure the bus address:

– Software addressing via the local display:

COMMUNICATION → FIELDBUS ADDRESS

– Hardware addressing via miniature switches:

PROFIBUS DP → Page 68; PROFIBUS PA → Page 71

4. **Select the system units:**

- By means of the system units group:

SYSTEM UNITS → UNIT VOL.FLOW → UNIT VOLUME → UNIT...

- Execute the SET UNITS function in the UNIT TO BUS parameter to transmit the volume flow transmitted cyclically to the PROFIBUS master (Class 1) with the system unit configured in the measuring device.

COMMUNICATION → UNIT TO BUS



Note!

– The configuration of the engineering units for the totalizers is described separately  
→ see Point 6.

– If the system unit is changed by means of the local operation, this initially does not have any effect on the unit which is used to transmit the volume flow to the automation system.

The altered system unit of the measured value is not transmitted to the automation system until the UNIT TO BUS function is activated in the COMMUNICATION block.

5. **Set the measuring mode:**

SYSTEM PARAMETER → MEASURING MODE

Select the flow components that should be recorded by the measuring device:

- UNIDIRECTIONAL (factory setting) = only the positive flow components
- BIDIRECTIONAL = the positive and negative flow components

## 6. Configuration of the totalizer:

The measuring device has one totalizer.

- You can assign a measured variable to the totalizer by means of the “CHANNEL” parameter:  
TOTALIZER → CHANNEL ...  
... → VOLUME FLOW option (CHANNEL = 273), factory setting: the volume flow is totalized as the measured variable  
... → OFF option (CHANNEL = 0): no totalizing, the value 0 is displayed as the totalizer value

### Note!

If the TOTAL module or function was integrated in PROFIBUS network configuration, the measured variable selected in the “CHANNEL” parameter is transmitted cyclically to the PROFIBUS master (Class 1) (for further information, see Page 80).

- Enter the desired totalizer units:  
TOTALIZER → UNIT TOTALIZER (factory setting: m<sup>3</sup>)
- Configure totalizer status, e.g. totalize:  
TOTALIZER → SET TOTALIZER...  
... → Options: TOTALIZE
- Set the totalizer mode:  
TOTALIZER → TOTALIZER MODE...  
... → BALANCE option (factory setting): counts the positive and negative flow components  
... → POSITIVE option: only counts the positive flow components  
... → NEGATIVE option: only counts the negative flow components  
... → HOLD VALUE option: totalizer stays at the last value

### Note!

The BIDIRECTIONAL option has to be active in the SYSTEM PARAMETER → MEASURING MODE function for the counting of the positive and negative flow components (BALANCE) or of only the negative flow components (NEGATIVE) to be executed correctly.

## 7. Select the operating mode:

Select the operating mode (GSD file) which should be used for cyclic data transfer to the PROFIBUS master.

COMMUNICATION → SELECTION GSD...

- ... → MANUFACTURER SPEC. option (factory setting): the complete device functionality is available
- ... → MANUFACT V2.0 option: the measuring device is used as the replacement for the previous model (Promag 33) (compatibility mode)
- ... → PROFILE-GSD option: the measuring device is operated in the PROFIBUS Profile mode.

### Note!

For PROFIBUS network configuration, make sure that the right device master file (GSD file) of the measuring device is used for the selected operating mode → Page 77.

## 8. Configuration of cyclic data transfer in the PROFIBUS master:

A detailed description of the system integration can be found on → Page 77.

## 6.4 PROFIBUS DP/PA system integration

### 6.4.1 Device master file (GSD file)

For PROFIBUS network configuration, the device master file (GSD file) is needed for every bus user (PROFIBUS slave). The GSD file contains a description of the properties of a PROFIBUS device, such as supported data transmission rate and number of input and output data. Before configuration takes place, a decision should be made as to which GSD file should be used to operate the measuring device in the PROFIBUS DP master system.

The measuring device supports the following GSD files:

- Promag 50 GSD file (complete device functionality)
- PROFIBUS Profile GSD file
- Promag 33 GSD file (compatibility with previous Promag 33 model)

The following section contains detailed information on the GSD files supported:

#### Promag 50 GSD file (complete device functionality)

Use this GSD file to access the complete functionality of the measuring device. In this way, device-specific measured variables and functionalities are thus completely available in the PROFIBUS master system. An overview of the modules available (input and output data) can be found on Page 80 ff.

#### *GSD file with standard or extended format*

The GSD file with either the standard or the extended format must be used depending on the configuration software used. When installing the GSD file, the GSD file with the extended format (EH3x15xx.gsd) should always be used first.

However, if the installation or the configuration of the device fails with this format, then use the standard GSD (EH3\_15xx.gsd). This differentiation is the result of different implementation of the GSD formats in the master systems. Note the specifications of the configuration software.

#### *Name of the Promag 50 GSD file*

	ID No.	Promag 50 GSD file	Type file	Bitmaps
PROFIBUS DP	1546 (Hex)	Extended format (recommended): EH3x1546.gsd Standard format: EH3_1546.gsd	EH_1546.200	EH_1546_d.bmp/.dib EH_1546_n.bmp/.dib EH_1546_s.bmp/.dib
PROFIBUS PA	1525 (Hex)	Extended format (recommended): EH3x1525.gsd Standard format: EH3_1525.gsd	EH_1525.200	EH_1525_d.bmp/.dib EH_1525_n.bmp/.dib EH_1525_s.bmp/.dib

#### *How to acquire:*

- Internet (Endress+Hauser) → [www.endress.com](http://www.endress.com) ( → Download → Software → Device Drivers)
- CD-ROM with all GSD files for Endress+Hauser devices → Order No.: 56003894

#### *Contents of the download file from the internet and CD-ROM:*

- all Endress+Hauser GSD files (standard and extended format)
- Endress+Hauser type and bitmap files
- Useful information about the devices

#### PROFIBUS Profile GSD file

The function scope of the profile GSD file is defined by the PROFIBUS Profile Specification 3.0. The function scope is restricted compared to the Promag 50 GSD file (complete device functionality). However, similar devices from different manufacturers can be interchanged with the profile GSD file without the need to reconfigure (interchangeability).

The following modules are supported with the Profile GSD file:

- “AI FLOW” module → Analog Input function block 1 / Output variable: Volume flow
- “TOTALIZER” module → Totalizer function block 1 / Output variable: Totalized volume flow

*Name of the PROFIBUS Profile GSD file*

	Profile 3.0 ID No.	Profile GSD file
PROFIBUS DP	9740 (Hex)	PA039740.gsd
PROFIBUS PA	9740 (Hex)	PA139740.gsd

*Can be acquired from:*

- Internet (GSD library of the PROFIBUS User Organization) → [www.PROFIBUS.com](http://www.PROFIBUS.com)

### Promag 33 GSD file

Promag 33 with Profile Version 2.0 is the precursor to Promag 50.

If Promag 33 is already being operated in the system and if the device has to be replaced, Promag 50 can be used as a replacement device without having to reconfigure the PROFIBUS DP network.

Further information → Page 79.

## 6.4.2 Selecting the GSD file in the measuring device

Depending on which GSD file is used in the PROFIBUS master system, the corresponding GSD file has to be selected in the device by means of COMMUNICATION → SELECTION GSD.

- Promag 50 GSD file → Select MANUFACT. SPEC. (factory setting)
- Profile GSD file → Select: PROFILE-GSD
- Promag 33 GSD file → Select: MANUFACT V2.0

## 6.4.3 Example for selecting the GSD file

Before configuration takes place, a decision should be made as to which GSD file should be used to configure the measuring device in the PROFIBUS master system. The following example describes the use of the Promag 50 GSD file (complete functionality) for **PROFIBUS PA**:

Select the Promag 50 GSD file in the measuring device by means of the SELECTION GSD function. COMMUNICATION → SELECTION GSD → Select: MANUFACT. SPEC.

1. Before configuring the network, load the Promag 50 GSD file into the configuration system/master system.



**Note!**

When installing the GSD file, always first use the GSD file with the extended format (EH3x1525.gsd). However, if the installation or the configuration of the device fails with this format, then use the standard GSD (EH3\_1525.gsd).

Example for the configuration software Siemens STEP 7 of the Siemens PLC family S7-300/400:

Use the Promag 50 GSD file with the extended format (EH3x1525.gsd).

Copy the file to the subdirectory ... \ siemens \ step7 \ s7data \ gsd.

The bitmap files also belong to the GSD files. These bitmap files are used to display the measuring points in image form. The bitmap files must be saved to the directory ... \ siemens \ step7 \ s7data \ nsbmp.

If you are using configuration software other than that referred to above, ask your PROFIBUS master system manufacturer which directory you should use.

2. Promag 50 is a modular PROFIBUS slave, i.e. the desired module configuration (input and output data) must be performed in the next step for Promag 50. This can be done directly by means of the configuration software.  
A detailed description of the modules supported by the measuring device can be found on Page 80 ff.

#### 6.4.4 Compatibility with previous Promag 33 model (Profile Version 2.0)

The Promag 33 measuring device with Profile Version 2.0 is the PROFIBUS precursor to Promag 50. If Promag 33 is already being operated in the system and if the device has to be replaced, Promag 50 can be used as a replacement device without having to reconfigure the PROFIBUS network.

In the event of a device being replaced, Promag 50 completely supports the compatibility of the cyclic data with the previous Promag 33 model.

The measuring devices can be exchanged as follows:

Existing device:	GSD file used:	→	To be replaced with:
Promag 33 PROFIBUS DP (ID No. 0x1511)	Extended format: EH3x1511.gsd or Standard format: EH3_1511.gsd	→	Promag 50 PROFIBUS DP
Promag 33 PROFIBUS PA (ID No. 0x1505)	Extended format: EH3x1505.gsd or Standard format: EH3_1505.gsd	→	Promag 50 PROFIBUS PA

Promag 50 is accepted as the replacement device if the “MANUFACT V2.0” option is activated in the “SELECTION GSD” parameter.

Promag 50 then realizes that a Promag 33 device was configured in the automation system and makes suitable input and output data and measured value status information available even though the devices differ in name and ID number. You do not have to adjust the configuration of the PROFIBUS network in the automation system.

Procedure after replacing the measuring devices:

1. Set the same (old) device address → FIELDBUS ADDRESS function
2. In the SELECTION GSD function → Select MANUFACT V2.0
3. Restart the measuring device → SYSTEM RESET function



Note!

If necessary, the following settings have to be made after exchanging the devices:

- Configuration of the application-specific parameters
- Configuration of the units for the volume flow and totalizer

#### 6.4.5 Maximum number of writes

If a nonvolatile device parameter is modified via cyclic or acyclic data transfer, the change is saved in the EEPROM of the measuring device.

The number of writes to the EEPROM is technically restricted to a maximum of 1 million.

Attention must be paid to this limit since, if exceeded, it results in data loss and measuring device failure. For this reason, avoid constantly writing nonvolatile parameters via PROFIBUS!

6.5 PROFIBUS DP/PA cyclic data transfer

6.5.1 Block model

The block model shows which input and output data the measuring device provides for cyclic data transfer via PROFIBUS.

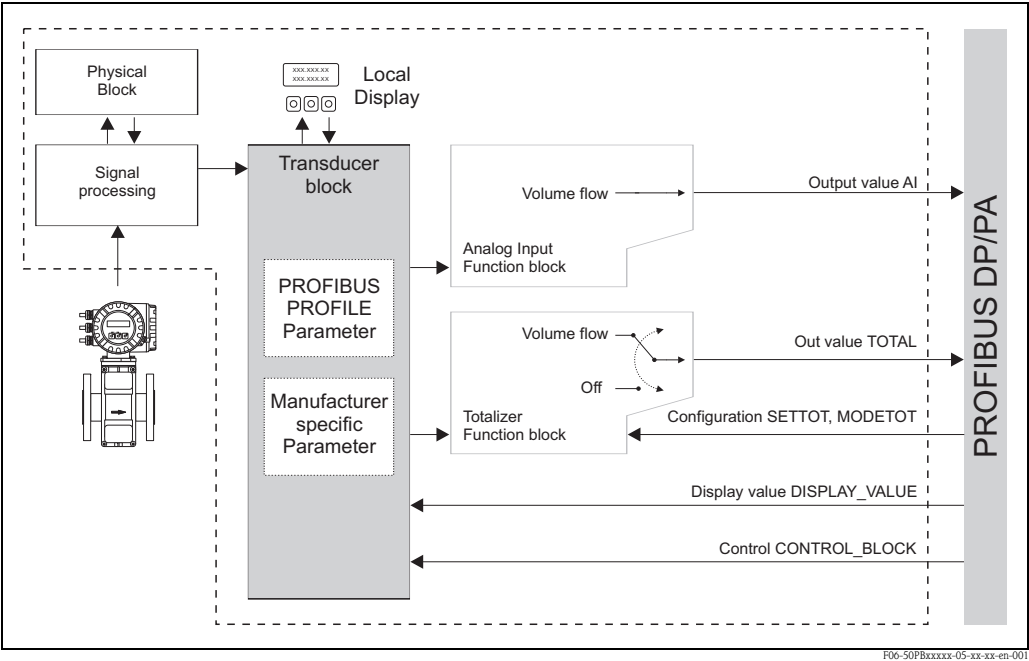


Fig. 51: Block model for Promag 50 PROFIBUS DP/PA Profile 3.0

6.5.2 Modules for cyclic data transfer

The measuring device is a modular PROFIBUS slave. In contrast to a compact slave, the structure of a modular slave is variable - it consists of several individual modules. The following section describes the modules that are available for cyclic data transfer with the Promag 50 GSD file (complete device functionality).



**Note!**  
When integrating the modules, please observe the configuration instructions on Page 84.

AI module (Analog Input)

The volume flow incl. the status is cyclically transmitted to the PROFIBUS master (Class 1) by means of the AI module. The volume flow is portrayed in the first four bytes in the form of a floating point number in accordance with the IEEE 754 standard. The 5th byte contains standardized status information on the measuring device. Further information on the device status is provided on → Page 94.

Input data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Volume flow (IEEE 754 floating-point number)				Status

Factory setting

Module	Output variable	ID for the CHANNEL parameter	Unit factory setting
AI	Volume flow	273	m <sup>3</sup> /h



### TOTAL module

The totalizer value incl. the status is cyclically transmitted to the automation system by means of the TOTAL module. The totalizer value is portrayed in the first four bytes in the form of a floating point number in accordance with the IEEE 754 standard. The 5th byte contains standardized status information on the measuring device. Further information on the device status is provided on → Page 94.

#### Input data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Totalizer value (IEEE 754 floating-point number)				Status

#### Selecting the output variable

The output variable (volume flow or OFF), which is transmitted to the automation system by means of the TOTAL module, is selected in the CHANNEL parameter:

#### Configuration via the local display/operating program:

TOTALIZER → CHANNEL ...

... → VOLUME FLOW option (factory setting, CHANNEL = 273)

... → OFF option (CHANNEL = 0)

#### Factory setting

Module	Output variable	ID for the CHANNEL parameter	Factory setting: Unit
TOTAL	Totalizer value volume flow	273	m <sup>3</sup>

### SETTOT\_TOTAL module

The SETTOT\_TOTAL module combination consists of the SETTOT and TOTAL functions. With this module combination:

- The totalizer can be controlled by means of the automation system (SETTOT)
- The totalizer value is transmitted incl. status (TOTAL)

#### SETTOT function

In the SETTOT function, the totalizer can be controlled by means of control variables. The following control variables are supported:

- 0 = Totalize (factory setting)
- 1 = Reset totalizer (the totalizer value is reset to 0)
- 2 = Accept totalizer presetting



#### Note!

Totalizing continues automatically once the totalizer value has been reset to 0 or set to the preset value. To restart totalizing it is not necessary to change the control variable again to 0. Stopping totalizing is controlled in the SETTOT\_MODETOT\_TOTAL module by means of the MODETOT function (→ Page 82).

*TOTAL function*

Description of the TOTAL function, see TOTAL module → Page 81.

*Data structure of the SETTOT\_TOTAL module combination*

Output data		Input data				
Byte 1		Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
<b>Control</b>		<b>Totalizer value (IEEE 754 floating-point number)</b>				<b>Status</b>
SETTOT		TOTAL				

**SETTOT\_MODETOT\_TOTAL module**

The SETTOT\_MODETOT\_TOTAL module combination consists of the SETTOT, MODETOT and TOTAL functions.

With this module combination:

- The totalizer can be controlled by means of the automation system (SETTOT)
- The totalizer can be configured by means of the automation system (MODETOT)
- The totalizer value is transmitted incl. status (TOTAL)

*SETTOT function*

Description of the SETTOT function, see SETTOT\_TOTAL module → Page 81.

*MODETOT function*

In the MODETOT function, the totalizer can be configured by means of control variables.

The following settings are possible:

- 0 = Balancing (factory setting), counts the positive and negative flow components
- 1 = Counts the positive flow components
- 2 = Counts the negative flow components
- 3 = Totalizing is stopped



Note!

The BIDIRECTIONAL option has to be active in the SYSTEM PARAMETER → MEASURING MODE function for the counting of the positive and negative flow components (control variable 0) or of only the negative flow components (control variable 2) to be executed correctly.

*TOTAL function*

Description of the TOTAL function, see TOTAL module → Page 81.

*Data structure of the SETTOT\_MODETOT\_TOTAL module combination*

Output data		Input data				
Byte 1	Byte 2	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
<b>Control</b>	<b>Configuration</b>	<b>Totalizer value (IEEE 754 floating-point number)</b>				<b>Status</b>
SETTOT	MODETOT	TOTAL				

*Example for using the SETTOT\_MODETOT\_TOTAL module*

If the SETTOT function is set to 1 (= reset the totalizer), the value for the aggregated total is reset to 0.

If the aggregated total of the totalizer should constantly retain the value 0, the value 3 (= stop totalizing) should first be selected in the MODETOT function and then the value 1 (= reset the totalizer) should be selected in the SETTOT function.

### DISPLAY\_VALUE module

Any value (IEEE 754 floating point number) incl. status can be cyclically transmitted directly to the local display via the PROFIBUS master (Class 1) using the DISPLAY\_VALUE module. Display value assignment to line 1 or line 2 can be configured via the local display itself or an operating program (e.g. FieldCare).

#### Output data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Display value (IEEE 754 floating-point number)				Status

#### Status:

The status is not evaluated by the device.

### CONTROL\_BLOCK module

By means of the CONTROL\_BLOCK module, the measuring device is able to process device-specific control variables from the PROFIBUS master (Class 1) in cyclic data transfer (e.g. switching on positive zero return).

#### Supported control variables of the CONTROL\_BLOCK module

The following device-specific control variables can be selected by changing the output byte from 0 → x:

- 0 → 2 = Positive zero return ON
- 0 → 3 = Positive zero return OFF
  
- 0 → 5 = ECC OFF
- 0 → 6 = ECC ON



#### Note!

This functionality is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC).

- 0 → 8 = UNIDIRECTIONAL measuring mode
- 0 → 9 = BIDIRECTIONAL measuring mode
  
- 0 → 24 = Run UNIT TO BUS function



#### Note!

The control (e.g. switching on positive zero return) is executed by cyclic data transfer if the output byte switches from “0” to the bit pattern in question. The output byte must always switch from “0”. A switchback to “0” does not have any effect. Examples → See the next table:

From	→	To	Result
0	→	2	positive zero return is switched on.
2	→	0	this does not have any effect.
0	→	3	positive zero return is switched off.
3	→	2	this does not have any effect.

#### Output data

Byte 1
Control

**EMPTY\_MODULE module**

The measuring device is a modular PROFIBUS slave. In contrast to a compact slave, the structure of a modular slave is variable – it consists of several individual modules. In the GSD file, the individual modules are described with their individual properties.

The modules are permanently assigned to the slots, i.e. the sequence or arrangement of the modules must be observed when configuring the modules. Gaps between configured modules have to be assigned the EMPTY\_MODULE module.

A more detailed description is provided in the next section.

**6.5.3 Configuration information for integrating modules**

The measuring device is a modular PROFIBUS slave. In contrast to a compact slave, the structure of a modular slave is variable – it consists of several individual modules. In the GSD file, the individual modules are described with their individual properties.

The modules are permanently assigned to the slots, i.e. the sequence or arrangement of the modules must be observed when configuring the modules (see following table). Gaps between configured modules have to be assigned the EMPTY\_MODULE module.

To optimize the data throughput rate of the PROFIBUS DP network, it is recommended to only configure modules that are processed in the PROFIBUS master system.

It is essential to adhere to the following sequence/assignment when configuring the modules in the PROFIBUS master system:

Sequence Slot	Module	Description
1	AI	<b>Analog Input function block</b> Output variable → Volume flow
2	TOTAL or SETTOT_TOTAL or SETTOT_MODETOT_TOTAL	<b>Totalizer function block</b> TOTAL → Output variable = volume flow totalizer value SETTOT → Totalizer control MODETOT → Totalizer configuration
3	DISPLAY_VALUE	Value for local display
4	CONTROL_BLOCK	Control of device functions

**Note!**

The device has to be reset once a new configuration has been loaded to the automation system. This can be effected as follows:

- Local display
- By means of an operating program (e.g. FieldCare)
- Switching supply voltage OFF and then ON again.

6.5.4 Configuration examples with Simatic S7 HW-Konfig

Example 1:

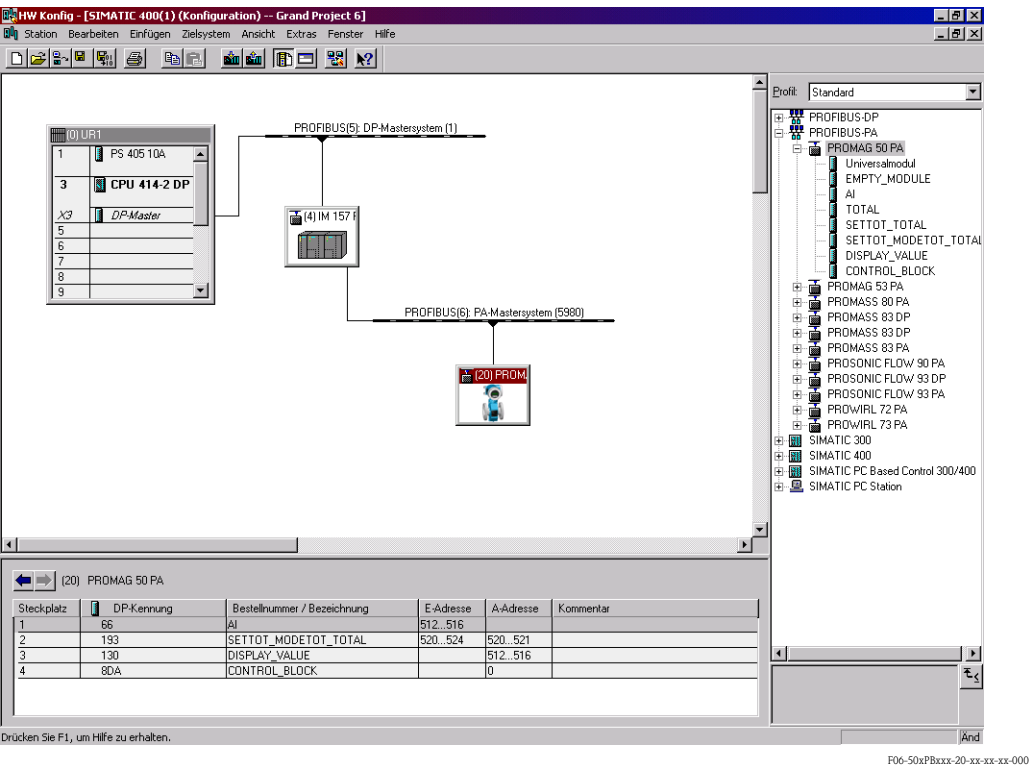


Fig. 52: Full configuration using Promag 50 GSD file (complete device functionality) for PROFIBUS PA.

It is essential to adhere to the following sequence when configuring the modules into the automation system (PROFIBUS Class 1 master):

Slot sequence	Module	Byte length input data	Byte length output data	Description
1	AI	5	–	<b>Analog Input function block</b> Output variable → Volume flow
2	SETTOT_ MODETOT_TOTAL	5	2	<b>Totalizer function block</b> SETTOT totalizer control  MODETOT Totalizer configuration  TOTAL Output variable → volume flow totalizer value
3	DISPLAY_VALUE	–	5	Value for local display
4	CONTROL_BLOCK	–	1	Control of device functions

Example 2:

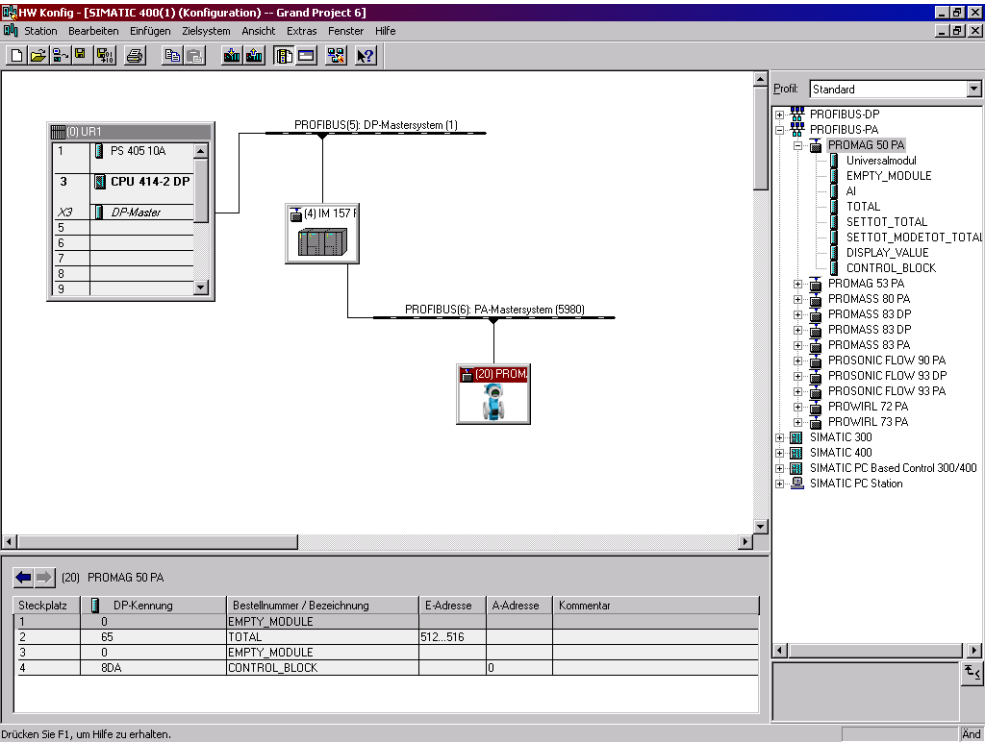


Fig. 53: In this configuration example, modules that are not needed are replaced by the module *EMPTY\_MODULE*. The Promag 50 GSD file (complete device functionality) is used for PROFIBUS PA.

The totalizer (slot 2) and the device-specific control (slot 4) are activated with this configuration. The totalizer is configured “without control”. In this example, it only supplies the totalizer value and cannot be controlled. The totalizer cannot be reset or stopped.

Slot sequence	Module	Byte length input data	Byte length output data	Description
1	EMPTY_MODULE	–	–	Empty
2	TOTAL	5	–	<b>Totalizer function block</b> TOTAL Output variable → volume flow totalizer value
3	EMPTY_MODULE	–	–	Empty
4	CONTROL_BLOCK	–	1	Control of device functions

## 6.6 Acyclic data transfer

Acyclic data transfer is used for transmitting parameters during commissioning, maintenance or for displaying other measured variables that are not included in useful cyclic data traffic. In this way, you can modify parameters for identifying, control or comparison in the various blocks (Physical Block, Transducer Block, function block) while the device is involved in cyclic data transfer with a PLC.

If acyclic data transfer has to be observed, a distinction is generally made between two types:

### 6.6.1 Master Class 2 acyclic (MS2AC)

MS2AC refers to acyclic data transfer between a field device and a Class 2 master (e.g. FieldCare, Siemens PDM, etc. → Page 64). Here, the master opens a communication channel by means of an SAP (Service Access Point) to access the device.

A Class 2 master has to be aware of all the parameters that are to be exchanged with the device by means of PROFIBUS. This assignment takes place either in a DD file (Device Description), a DTM (Device Type Manager) or within a software component in the master by means of slot and index addressing to each individual parameter.

Please note the following for MS2AC communication:

- As already explained, a Class 2 master accesses a device by means of special SAPs. Thus, the number of Class 2 masters that can simultaneously communicate with a device is restricted to the number of SAPs made available for this data transfer.
- The use of a Class 2 master increases the cycle time of the bus system. This should be taken into consideration when programming the PCS/control system used.

### 6.6.2 Master Class 1 acyclic (MS1AC)

In MS1AC, a cyclic master that is already reading the cyclic data from the device or is writing to the device opens the communication channel by means of SAP 0x33 (special Service Access Point for MS1AC) and can then, just like a Class 2 master, acyclically read or write a parameter by means of the slot and index (if supported).

Please note the following for MS1AC communication:

- Currently there are very few PROFIBUS masters on the market that support this data transfer.
- Not all PROFIBUS devices support MS1AC.
- In the user program, please note that the operating life of a device is dramatically reduced by constantly writing parameters (e.g. with every cycle of the program). Parameters written acyclically are stored in memory modules (EEPROM, Flash, etc.) with voltage resistance. These memory modules are only designed for a limited number of writes. This number of writes is not even remotely reached in normal operation without MS1AC (during parameterization). Incorrect programming can mean that this maximum number is quickly reached, thereby dramatically reducing the operating life of a device.

The measuring device supports MS2AC communication with 2 available SAPs.

MS1AC communication is supported by the device.

The memory module is designed for one million writes.

## 6.7 Adjustment

### 6.7.1 Empty-pipe/full-pipe adjustment

Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times with the empty pipe detection function. EPD = empty pipe detection (with the help of an EPD electrode)



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 ADJUSTMENT → Carrying out the adjustment
- EPD → Switching empty pipe detection on and off
- EPD RESPONSE TIME → Enter the response time for EPD



Note!

- The EPD function is not available unless the sensor is fitted with an EPD electrode.
- The devices are calibrated at the factory with water (approx. 500 µS/cm).  
If the liquid conductivity differs from this reference, empty-pipe/full-pipe adjustment has to be performed again on site.
- The default setting for EPD when the devices are delivered is OFF; the function has to be activated if required.

### 6.7.2 Performing empty-pipe and full-pipe adjustment (EPD)

1. Select the appropriate function in the function matrix:  
HOME → → → PROCESS PARAMETER → → → EPD ADJUSTMENT
2. Empty the piping. For EPD empty-pipe adjustment, the measuring pipe wall must still be covered with fluid.
3. Start empty-pipe adjustment: Select “EMPTY PIPE ADJUST” and press to confirm.
4. After empty-pipe adjustment, fill the piping with fluid.
5. Start full-pipe adjustment: Select “FULL PIPE ADJUST” and press to confirm.
6. Having completed the adjustment, select the setting “OFF” and exit the function by pressing .
7. Now switch on empty pipe detection in the EPD function.



Caution!

- The adjustment coefficients must be valid before you can activate the EPD 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 values are out of range.

## 6.8 Data memory (HistoROM)

At Endress+Hauser, the term HistoROM refers to various types of data memory modules on which process and measuring device data are stored.

### 6.8.1 HistoROM/S-DAT (sensor-DAT)

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



## **7 Maintenance**

No special maintenance work is required.

### **7.1 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.

### **7.2 Seals**

The seals of the Promag H sensor must be replaced periodically, particularly in the case of molded 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 90.

## 8 Accessories

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

### 8.1 Device-specific accessories

Accessory	Description	Order code
Promag 50 transmitter	Transmitter for replacement or for stock. Use the order code to define the following specifications: <ul style="list-style-type: none"> <li>■ Approvals</li> <li>■ Degree of protection / version</li> <li>■ Cable type for the remote version</li> <li>■ Cable entries</li> <li>■ Display / power supply / operation</li> <li>■ Software</li> <li>■ Outputs / inputs</li> </ul>	50XXX - XXXXX * * * * *

### 8.2 Measuring principle-specific accessories

Accessory	Description	Order code
Mounting set for transmitter Promag 50 Remote version	Mounting kit for wall-mount housing, suitable for: <ul style="list-style-type: none"> <li>■ Wall mounting</li> <li>■ Pipe mounting</li> <li>■ Panel mounting</li> </ul> Mounting set for aluminum field housing. Suitable for pipe mounting (3/4"...32")	DK5WM - *
Remote version cable	Coil and signal cables, various lengths.	DK5CA - * *
Promag W, P ground cable	A set consists of two ground cables.	DK5GC - * * *
Ground disk Promag W, P	Ground disk for potential matching	DK5GD - * * * *
Mounting kit Promag H	Mounting kit for Promag H, comprising: <ul style="list-style-type: none"> <li>■ 2 process connections</li> <li>■ Screws</li> <li>■ Seals</li> </ul>	DKH * * - * * *
Adapter connection for Promag A, H	Adapter connection for installing a Promag 50 H instead of Promag 30/33 A or Promag 30/33 H, DN 25.	DK5HA - * * * * *
Grounding rings Promag H	If the process connections are made of PVC or PVDF, grounding rings are necessary to ensure that potential is matched. A set of "grounding rings" comprises: 2 grounding rings	DK5HR - * * *
Set of seals Promag H	For regular replacement of the seals of the Promag H sensor	DK5HS - * * *
Wall-mounting kit Promag H	Wall-mounting kit for the Promag H sensor	DK5HM-*
Welding jig Promag H	Weld nipple as process connection: Welding jig for installation in pipelines	DK5HW - * * *




### 8.3 Service-specific accessories

Accessory	Description	Order code
Applicator	<p>Software for selecting and configuring flowmeters.</p> <p>Applicator can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC.</p> <p>Contact your Endress+Hauser representative for more information.</p>	DKA80 - *
ToF Tool – Fieldtool Package	<p>Modular software package consisting of the service program “ToF Tool” for configuration and diagnosis of ToF level measuring devices (time-of-flight measurement) and the “Fieldtool” service program for the configuration and diagnosis of Proline flowmeters. The Proline flow measuring devices are accessed via a service interface or the FXA 193 service interface.</p> <p>Contents of the “ToF Tool – Fieldtool Package”:</p> <ul style="list-style-type: none"> <li>■ Commissioning, maintenance analysis</li> <li>■ Configuring flowmeters</li> <li>■ Service functions</li> <li>■ Visualization of process data</li> <li>■ Troubleshooting</li> <li>■ Controlling the “Fieldcheck” tester/simulator</li> </ul> <p>Contact your Endress+Hauser representative for more information.</p>	DXS10 - * * * * *
Fieldcheck	<p>Tester/simulator for testing flowmeters in the field.</p> <p>When used in conjunction with the “ToF Tool – Fieldtool Package” software package, test results can be imported into a database, printed and used for official certification.</p> <p>Contact your Endress+Hauser representative for more information.</p>	50098801

## 9 Troubleshooting

### 9.1 Troubleshooting instructions

Always start troubleshooting with the following checklist if faults occur after commissioning or during operation. The routine takes you directly to the cause of the problem and the appropriate remedial measures.

Check the display	
No display visible and no output signals present.	<ol style="list-style-type: none"> <li>1. Check the supply voltage * Terminals 1, 2</li> <li>2. Check device fuse → Page 105 85...260 V AC: 0.8 A slow-blow / 250 V 20...55 V AC and 16...62 V DC: 2 A slow-blow / 250 V</li> <li>3. Measuring electronics defective * order spare parts → Page 100</li> </ol>
No display visible, but output signals are present.	<ol style="list-style-type: none"> <li>1. Check whether the ribbon-cable connector of the display module is correctly plugged into the amplifier board → Page 100 ff.</li> <li>2. Display module defective * order spare parts → Page 100</li> <li>3. Measuring electronics defective * order spare parts → Page 100</li> </ol>
Display texts are in a foreign language.	Switch off power supply. Press and hold down both the  keys and switch on the measuring device. The display text will appear in English (default) and is displayed at maximum contrast.
▼	
Error messages on display	
<p>Errors which occur during commissioning or measuring operation are displayed immediately. Error messages consist of a variety of icons. The meanings of these icons are as follows (example):</p> <ul style="list-style-type: none"> <li>– Error type: <b>S</b> = system error, <b>P</b> = process error</li> <li>– Error message type:  = fault message, <b>!</b> = notice message</li> <li>– <b>EMPTY PIPE</b> = error designation (e.g. fluid is not homogeneous)</li> <li>– <b>03:00:05</b> = duration of error occurrence (in hours, minutes and seconds)</li> <li>– <b>#401</b> = error number</li> </ul> <p> Caution!</p> <ul style="list-style-type: none"> <li>■ See the information on → Page 63!</li> <li>■ The measuring system interprets simulations and positive zero return as system errors, but displays them as a notice message only.</li> </ul>	
System error (device error) has occurred → Page 93	
Process error (application error) has occurred → Page 98	
▼	
Faulty connection to control system	
No connection can be made between the control system and the device. Check the following points:	
Supply voltage Transmitter	Check the supply voltage → Terminals 1/2
Device fuse	Check device fuse → Page 105 85...260 V AC: 0.8 A slow-blow / 250 V 20...55 V AC and 16...62 V DC: 2 A slow-blow / 250 V
Fieldbus connection	PROFIBUS PA: check data line Terminal 26 = PA + Terminal 27 = PA –  PROFIBUS DP: check data line Terminal 26 = B (RxD/TxD-P) Terminal 27 = A (RxD/TxD-N)
▼	

Faulty connection to control system (continued)	
Fieldbus connector (only for PROFIBUS PA)	<ul style="list-style-type: none"> <li>Check pin assignment/wiring</li> <li>Check connection between connector/fieldbus port. Is the coupling ring tightened correctly?</li> </ul>
Fieldbus voltage (only for PROFIBUS PA)	Check that a min. bus voltage of 9 V DC is present at terminals 26/27. Permissible range: 9 ... 32 V DC
Network structure	Check permissible fieldbus length and number of spurs.
Basic current (only for PROFIBUS PA)	Is there a basic current of min. 11 mA?
FIELDBUS ADDRESS	Check FIELDBUS ADDRESS: make sure there are no double assignments
Bus terminator	Has the PROFIBUS network been terminated correctly? Each bus segment must always be terminated with a bus terminator at both ends (start and finish). Otherwise there may be interference in data transfer.
Power consumption/ permitted feed current (only for PROFIBUS PA)	Check the current consumption of the bus segment: The current consumption of the bus segment in question (= total of basic currents of all bus users) must not exceed the max. permissible feed current of the bus power supply.
▼	
System or process error messages	
System or process errors which occur during commissioning or operation can also be displayed in the manufacturer-specific device controls using the FieldCare operating program.	
▼	
Other error (without error message)	
Some other error has occurred.	Diagnosis and rectification

## 9.2 System error messages

Serious system errors are **always** recognized by the instrument as “Fault messages”, and are shown as a lightning flash (⚡) on the display! Fault messages immediately affect the 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. Important procedures must be carried out before you return a flowmeter to Endress+Hauser  
→ Page 8.

Always enclose a duly completed “Declaration of contamination” form. You will find a preprinted blank of this form at the back of these Operating Instructions.



### Note!

See the information on Page 63 ff.

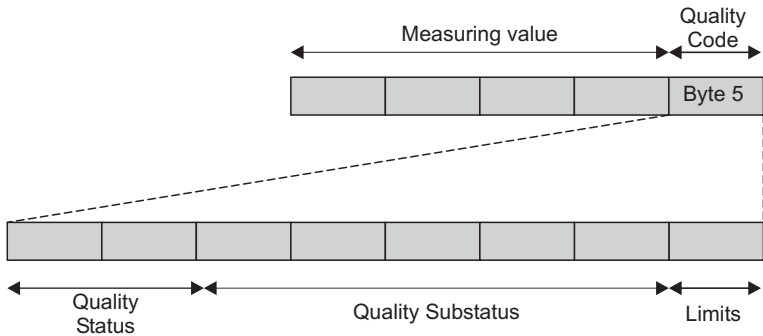
9.2.1     Displaying the device status on PROFIBUS DP/PA

Display in the operating program (acyclic data exchange)

The device status can be queried by means of an operating program (e.g. FieldCare).  
Function group → SUPERVISION → Function ACTUAL SYSTEM CONDITION.

Display in the PROFIBUS master system (cyclic data transfer)

If the AI or TOTAL modules are configured for cyclic data transfer, the device status is coded in accordance with PROFIBUS Profile Specification 3.0 and transmitted with the measured value to the PROFIBUS master by means of the quality byte (byte 5). The quality byte is split into the “quality status”, “quality substatus” and “limits” segments.



a0002707-en

Fig. 54:     Structure of the quality byte

The content of the quality byte depends on the configured failsafe mode in the Analog Input function block or Totalizer function block. Depending on the failsafe mode set in the FAILSAFE\_TYPE function, the following stats information is transmitted to the PROFIBUS master by means of the quality byte:

- For FAILSAFE\_TYPE → FSAFE VALUE:

Quality code (HEX)	Quality status	Quality substatus	Limits
0x48 0x49 0x4A	UNCERTAIN	Substitute set	OK Low High

- For FAILSAFE\_TYPE → LAST GOOD VALUE (factory setting):

The following status information is transmitted if a valid output value was available before the failure:

Quality code (HEX)	Quality status	Quality substatus	Limits
0x44 0x45 0x46	UNCERTAIN	Last usable value	OK Low High

The following status information is transmitted if no valid output value was available before the failure:


Quality code (HEX)	Quality status	Quality substatus	Limits
0x4C 0x4D 0x4E	UNCERTAIN	Initial Value	OK Low High

- For FAILSAFE\_TYPE → WRONG VALUE:

For status information, see the table in the following section.

## 9.2.2 List of system error messages

No.	Device status message (local display)	PROFIBUS measured value status				Advanced diagnostics message in PROFIBUS master	Cause/remedy
		Quality code (HEX) Measured value status	Quality status	Quality substatus	Limits		
<p>S = System error</p> <p>“Fault message” error message type:</p> <ul style="list-style-type: none"><li>■ If this message occurs, operation is immediately interrupted or stopped!</li><li>■ Local display → A lightning symbol (⚡) flashes on the display</li></ul> <p>“Notice message” error message type:</p> <ul style="list-style-type: none"><li>■ Normal operation continues despite this message!</li><li>■ Local display → An exclamation mark (!) flashes on the display.</li></ul> <p>Error messages on the local display → see Table</p>							
<b>No. # 0xx → Hardware error</b>							
001	S CRITICAL FAILURE ⚡ # 001	0x0F	BAD	Device Failure	Constant	ROM / RAM failure	Serious device error.  Replace the amplifier board → Page 100
011	S AMP HW EEPROM ⚡ # 011	0x0F	BAD	Device Failure	Constant	Amplifier EEPROM failure	Amplifier with faulty EEPROM  Replace the amplifier board → Page 100
012	S AMP SW EEPROM ⚡ # 012	0x0F	BAD	Device Failure	Constant	Amp. EEPROM data inconsistent	Error when accessing data of the measuring amplifier EEPROM In the “FAULT ELIMINATION” function, the data blocks of the EEPROM displayed are those in which an error has occurred. The errors in question must be confirmed with the Enter-key; faulty parameters are then replaced by predefined default values.
031	S SENSOR HW DAT ⚡ # 031	0x10 0x11 0x12	BAD	Sensor Failure	O.K. Low High	S-DAT failure / not inserted	1. S-DAT is defective Replace S-DAT, spare parts → Page 100 Check the spare part set number to ensure that the new, replacement DAT is compatible with the measuring electronics.  2. S-DAT is not plugged into the amplifier board (missing). Plug the S-DAT into the amplifier board
032	S SENSOR SW DAT ⚡ # 032	0x10 0x11 0x12	BAD	Sensor Failure	O.K. Low High	S-DAT data inconsistent	Error accessing the calibration values stored in the S-DAT.  1. Check whether the S-DAT is correctly plugged into the amplifier board → Page 101, Page 103  2. Replace the S-DAT if it is defective. Spare parts → Page 100. Before replacing the DAT, check that the new, replacement DAT is compatible with the measuring electronics. Check the: – Spare part set number – Hardware revision code  3. Replace measuring electronics boards if necessary. Spare parts → Page 100

No.	Device status message (local display)	Quality code (HEX) Measured value status	PROFIBUS measured value status			Advanced diagnostics message in PROFIBUS master	Cause/remedy
			Quality status	Quality substatus	Limits		
No. # 1xx → Software error							
101	S: GAIN ERROR AMP. ⚡ # 101	0x0F	BAD	Device Failure	Constant	Gain Error Amplifier	Gain deviation compared to reference gain is greater than 2%.  Replace measuring electronics boards. Spare parts → Page 100
121	S: A / C COMPATIB. ⚡ # 121	0x0F	BAD	Device Failure	Constant	Amp.-I/O soft only part. comp.	Cause: Due to different software versions, I/O board and amplifier board are only partially compatible (possibly restricted functionality).   Note! ■ This message is only listed in the error history. ■ Nothing is displayed on the display.  Remedy: Module with lower software version has either to be actualized by ToF Tool Fieldtool Package with the required software version or the module has to be replaced. Spare parts → Page 100
No. # 2xx → Error in DAT / no communication							
261	S COMMUNICAT. I/O ⚡ # 261	0x18 0x19 0x1A	BAD	No Communicati on	O.K. Low High	Communication failure	No data reception between amplifier and I/O board or faulty internal data transfer.  Check the bus contacts.
No. # 3xx → System limits exceeded							
321	S TOL. COIL CURR. ⚡: # 321	0x0F	BAD	Device Failure	Constant	Coil current out of tol.	The coil current of the sensor is outside the tolerance.  1. Remote version: Switch off the power supply before connecting or disconnecting the cable of the coil (terminals 41/42).  2. Remote version: Switch off power supply and check wiring of terminals 41/42.  3. Switch off the power supply and check the connectors of the coil cable  4. Replace measuring electronics board if necessary. Spare parts → Page 90



No.	Device status message (local display)	Quality code (HEX) Measured value status	PROFIBUS measured value status			Advanced diagnostics message in PROFIBUS master	Cause/remedy
			Quality status	Quality substatus	Limits		
No. # 5xx → Application error							
501	S SW. UPDATE ACT. ! # 501	0x48 0x49 0x4A	UNCERTAIN	Substitute set (Substitute set of failsafe status)	O.K. Low High	Software update active	New amplifier or communication software version is loaded. Currently no other functions are possible.  Wait until process is finished. The device will restart automatically.
502	S UP-/DOWNLO. ACT. ! # 502	0x48 0x49 0x4A	UNCERTAIN	Substitute set (Substitute set of failsafe status)	O.K. Low High	Upload/download active	Up- or downloading the device data via configuration program. Currently no other functions are possible.  Wait until process is finished. The device will restart automatically.
No. # 6xx → Simulation mode active							
601	S POSITIVE ZERO RETURN ! # 601	0x53	UNCERTAIN	Sensor conversion not accurate (measured value from sensor not accurate)	Constant	Positive zero return active	Positive zero return is active.  Switch off positive zero return.
691	S SIM. FAILSAFE ! # 691	0x48 0x49 0x4A	UNCERTAIN	Substitute set (Substitute set of failsafe status)	O.K. Low High	Simulation failsafe active	Simulation of response to error is active.  Switch off simulation.
692	S SIM. MEASURAND ! # 692	0x60 0x61 0x62	UNCERTAIN	Simulated Value (manually specified value)	O.K. Low High	Simulation volume flow	Simulation of volume flow is active.  Switch off simulation.
698	S DEV. TEST AKT. ! # 698	0x60 0x61 0x62	UNCERTAIN	Simulated Value (manually specified value)	O.K. Low High	Dev. test via Fieldcheck act.	The measuring device is being checked on site via the test and simulation device.

## 9.3 Process error messages



Note!

Also observe the information on Page 63 and Page 99.

### 9.3.1 Displaying the device status on PROFIBUS DP/PA

Further information see Page 94 ff.

### 9.3.2 List of process error messages

No.	Device status message (local display)	PROFIBUS measured value status				Adv. diagnostics message in PROFIBUS master	Cause/remedy
		Quality code (HEX) Measured value status	Quality status	Quality substatus	Limits		
<p>P = Process error</p> <p>“Fault message” error message type:</p> <ul style="list-style-type: none"><li>■ If this message occurs, operation is immediately interrupted or stopped!</li><li>■ Local display → A lightning symbol (⚡) flashes on the display</li></ul> <p>“Notice message” error message type:</p> <ul style="list-style-type: none"><li>■ Normal operation continues despite this message!</li><li>■ Local display → An exclamation mark (!) flashes on the display.</li></ul> <p>Error messages on the local display → See Table</p>							
401	P EMPTY PIPE ! # 401	0x50	UNCERT AIN	sensor convention not accurate (measured value from sensor inaccurate)	no limits	Empty pipe detected	<p>Cause: Alarm from empty pipe detection (EPD). The measuring tube is only partially filled or empty.</p> <p>Remedy: 1. Check the process conditions of the plant. 2. Fill the measuring tube.</p>
461	P EPD ADJ. N. OK ! # 461	0x40	UNCERT AIN	non-specific (uncertain status)	no limits	EPD adj. not possible	<p>Cause: EPD adjustment not possible because the fluid's conductivity is either too low or too high.</p> <p>Remedy: The EPD function cannot be used with fluids of this nature.</p>
463	P FULL = EMPTY ⚡ # 463	0x40	UNCERT AIN	non-specific (uncertain status) .	no limits	EPD adj. wrong	<p>Cause: The EPD adjustment values for an empty pipe and full pipe are identical, therefore incorrect.</p> <p>Remedy: Repeat EPD adjustment, observing procedure closely → Page 101 ff.</p>

## 9.4 Process error without error message

Symptoms	Rectification
<p>Comment: You may have to change or correct settings in certain parameters in order to rectify faults. The parameters outlined below are described in detail in the "Description of Device Functions" manual.</p>	
Flow values are negative, even though the fluid is flowing forwards through the pipe.	<ol style="list-style-type: none"> <li>Remote version: <ul style="list-style-type: none"> <li>Switch off the power supply and check the wiring → Page 39</li> <li>If necessary, reverse the connections at terminals 41 and 42</li> </ul> </li> <li>Change the setting in the "INSTALLATION DIRECTION SENSOR" function accordingly</li> </ol>
Measured value reading fluctuates even though flow is steady.	<ol style="list-style-type: none"> <li>Check grounding and potential matching → Page 53</li> <li>Check the fluid for presence of gas bubbles.</li> <li>In the "SYSTEM DAMPING" function → Increase the value</li> <li>In the "DISPLAY DAMPING" function → increase the value</li> </ol>
Measured-value reading or measured-value output pulsates or fluctuates, e.g. because of reciprocating pump, peristaltic pump, diaphragm pump or pump with similar delivery characteristic.	<p>Increase the value for system damping: In the "SYSTEM DAMPING" function → Increase the value</p> <p>If the problem persists despite these measures, a pulsation damper will have to be installed between pump and measuring device.</p>
Measured value reading shown on display, even though the fluid is at a standstill and the measuring tube is full.	<ol style="list-style-type: none"> <li>Check grounding and potential matching → Page 53</li> <li>Check the fluid for presence of gas bubbles.</li> <li>Activate the "LOW FLOW CUTOFF" function, i.e. enter or increase the value for the switching point.</li> </ol>
Measured-value reading on display, even though measuring tube is empty.	<ol style="list-style-type: none"> <li>Perform empty-pipe/full-pipe adjustment and then switch on empty pipe detection → Page 88</li> <li>Remote version: check the terminals of the EPD cable → Page 43</li> <li>Fill the measuring tube.</li> </ol>
<p>The fault cannot be rectified or some other fault not described above has arisen.</p> <p>In these instances, please contact your Endress+Hauser service organization.</p>	<p>The following options are available for tackling problems of this nature:</p> <p><b>Request the services of an Endress+Hauser service technician</b> If you contact our service organization to have a service technician sent out, please be ready to quote the following information:</p> <ul style="list-style-type: none"> <li>Brief description of the fault</li> <li>Nameplate specifications: order code and serial number → Page 9</li> </ul> <p><b>Returning devices to Endress+Hauser</b> You can return a measuring device to Endress+Hauser for repair or calibration. Always enclose the duly completed "Declaration of contamination" form with the flowmeter. You will find a preprinted blank of this form at the back of these Operating Instructions.</p> <p><b>Replace transmitter electronics</b> Parts of the measuring electronics defective → Order spare parts → Page 100 ff.</p>

## 9.5 Spare parts

The previous sections contain a detailed troubleshooting guide → Page 92 ff.

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.

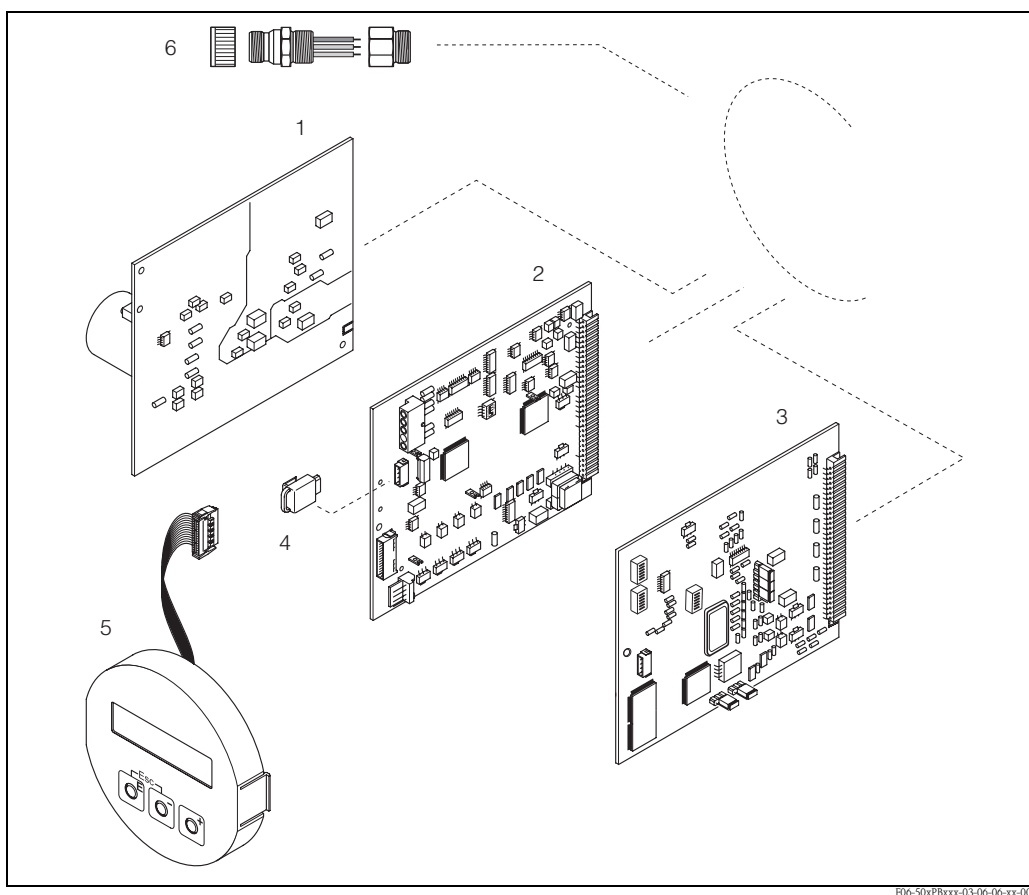


**Note!**

You can order spare parts directly from your Endress+Hauser service organization by providing the serial number printed on the transmitter's nameplate (see Page 9).

Spare parts are shipped as sets comprising the following parts:

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



F06-50xPBxxx-03-06-06-xx-000

*Fig. 55: Spare parts for transmitter Promag 50 PROFIBUS DP/PA (field and wall-mount housings)*

- 1 Power unit board (85...260 V AC, 20...55 V AC, 16...62 V DC)
- 2 Amplifier board
- 3 I/O board (COM module), PROFIBUS DP or PROFIBUS PA
- 4 HistoROM S-DAT (sensor data memory)
- 5 Display module
- 6 Fieldbus connector consisting of protection cap, connector, adapter PG 13.5/M20.5 (only for PROFIBUS PA, Order No. 50098037)

## 9.5.1 Removing and installing printed circuit boards

### Field housing



#### Warning!

- Risk of electric shock.  
Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection).  
Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface purposely built for electrostatically sensitive devices!
- 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.
- When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to these Operating Instructions.

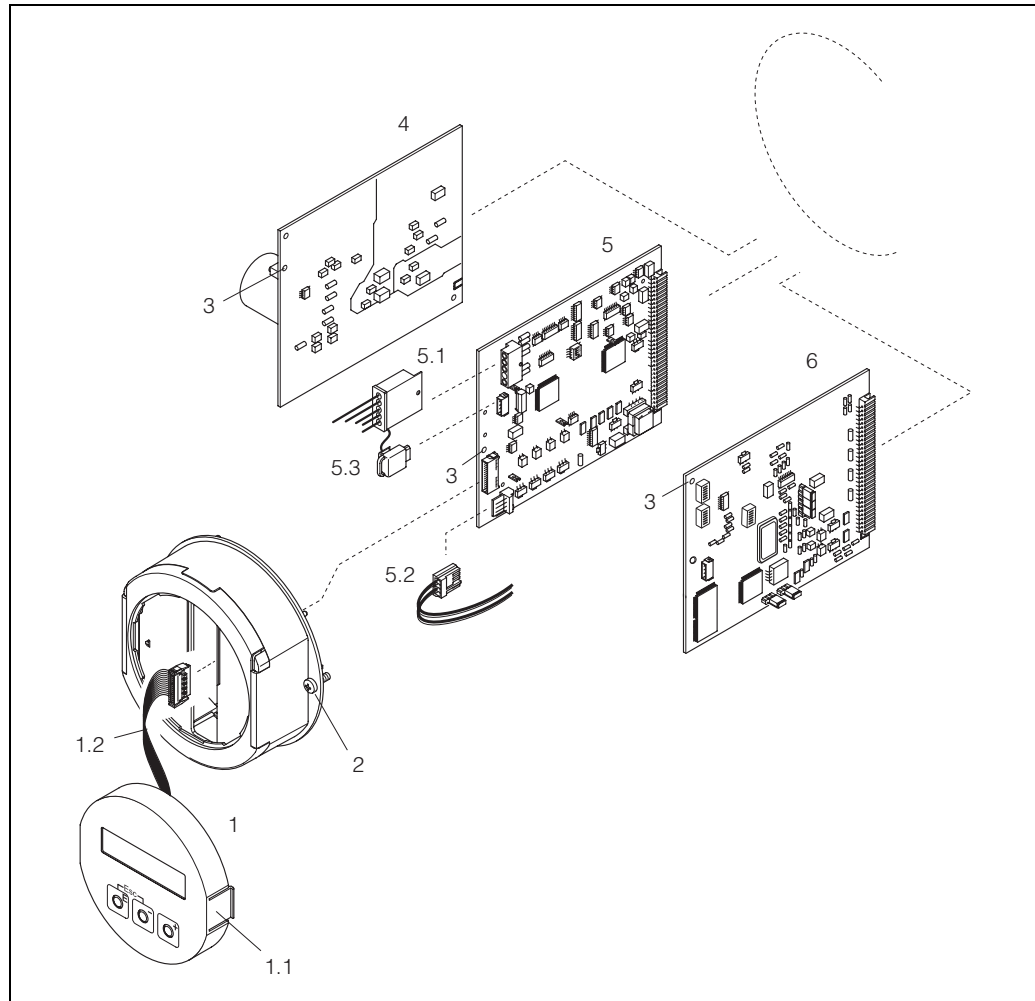


#### Caution!

Use only original Endress+Hauser parts.

Fig. 56, installation and removal:

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 unit board (4) and I/O board (6): Insert a thin pin into the hole (3) provided for the purpose and pull the board clear of its holder.
5. Remove amplifier board (5):
  - Disconnect the plug of the 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.



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Fig. 56: 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 installing/removing boards
- 4 Power unit board
- 5 Amplifier board
- 5.1 Electrode signal cable (sensor)
- 5.2 Coil current cable (sensor)
- 5.3 HistoROM S-DAT (sensor data memory)
- 6 I/O board PROFIBUS DP or PROFIBUS PA

### Wall-mount housing



#### Warning!

- Risk of electric shock.  
Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.
- Risk of damaging electronic components (ESD protection).  
Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface purposely built for electrostatically sensitive devices!
- 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.
- When connecting Ex-certified devices, see the notes and diagrams in the Ex-specific supplement to these Operating Instructions.

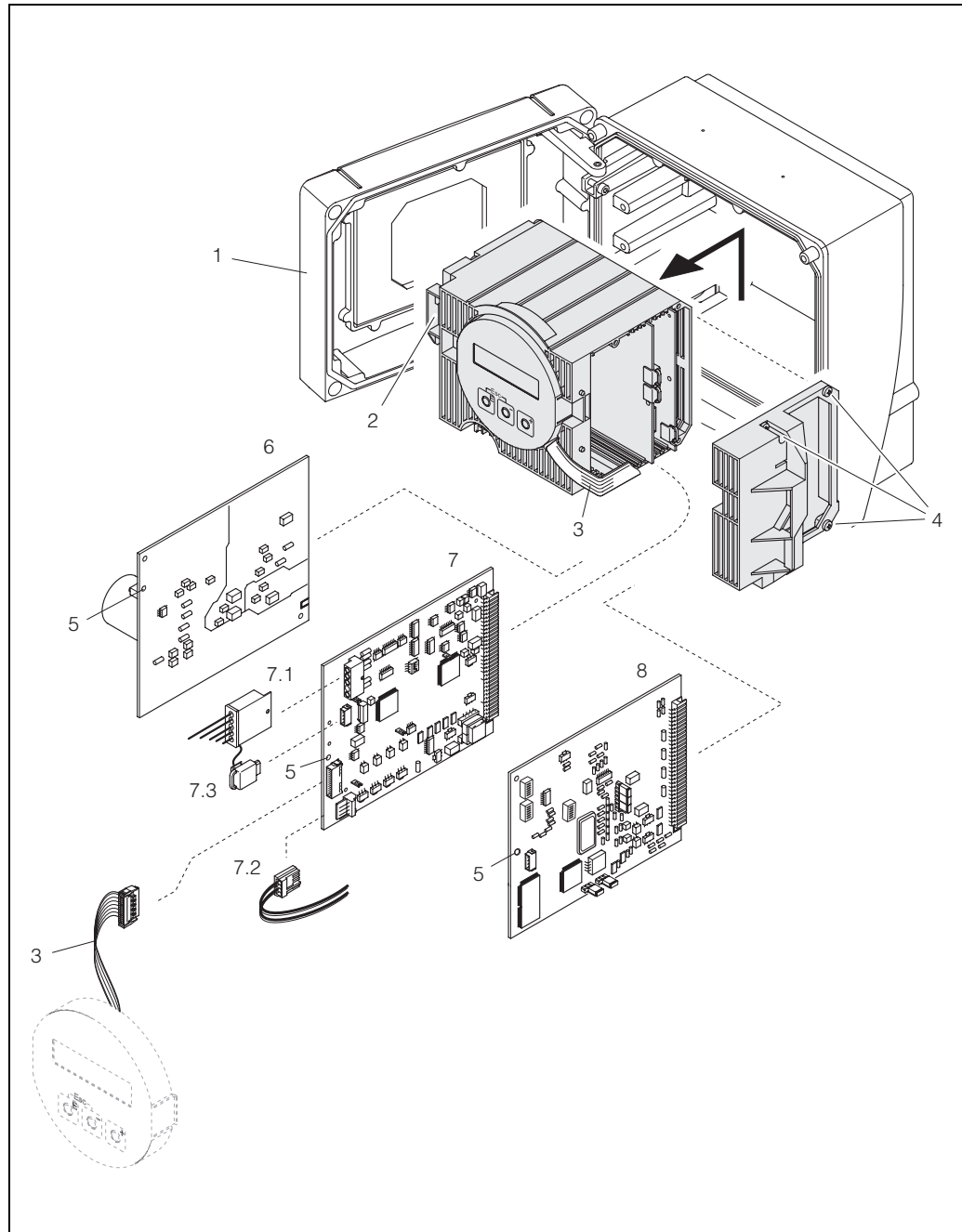


#### Caution!

Use only original Endress+Hauser parts.

Fig. 57, installation and removal:

1. Remove the screws and open the hinged cover (1) of the housing.
2. Remove the screws securing 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 cover (4) from the electronics compartment by loosening the screws.
5. Remove the boards (6, 7, 8): Insert a thin pin 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.



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Fig. 57: Wall-mount housing: removing and installing printed circuit boards

- 1 Housing cover
- 2 Electronics module
- 3 Ribbon cable (display module)
- 4 Screws of electronics compartment cover
- 5 Aperture for installing/removing boards
- 6 Power unit board
- 7 Amplifier board
- 7.1 Electrode signal cable (sensor)
- 7.2 Coil current cable (sensor)
- 7.3 HistoROM S-DAT (sensor data memory)
- 8 I/O board PROFIBUS DP or PROFIBUS PA



### 9.5.2 Replacing the device fuse



**Warning!**

Risk of electric shock.

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

The main fuse is on the power unit board (see Fig. 58).

The procedure for replacing the fuse is as follows:

1. Switch off power supply.
2. Remove the power unit board (→ Page 101 ff.).
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. Installation is the reverse of the removal procedure.



**Caution!**

Use only original Endress+Hauser parts.

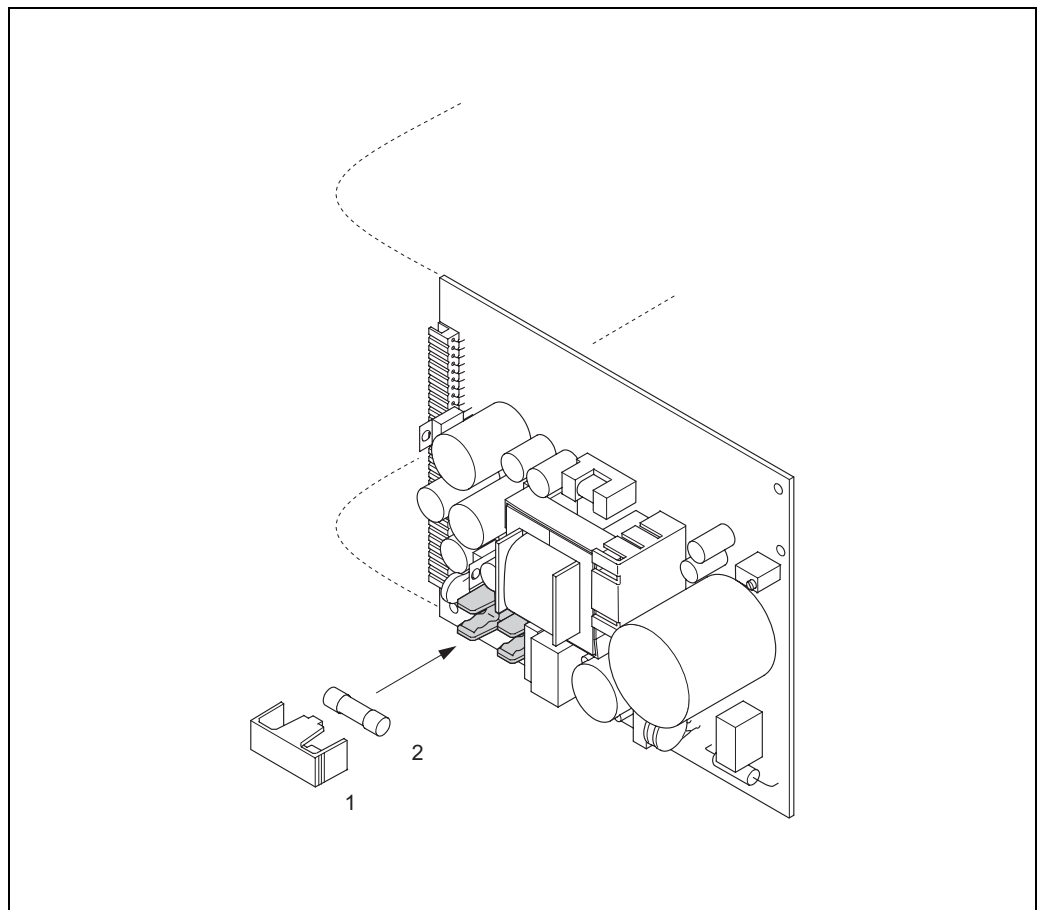


Fig. 58: Replacing the device fuse on the power unit board

- 1 Protective cap  
2 Device fuse

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## 9.6 Replacing the exchangeable electrode

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 107).

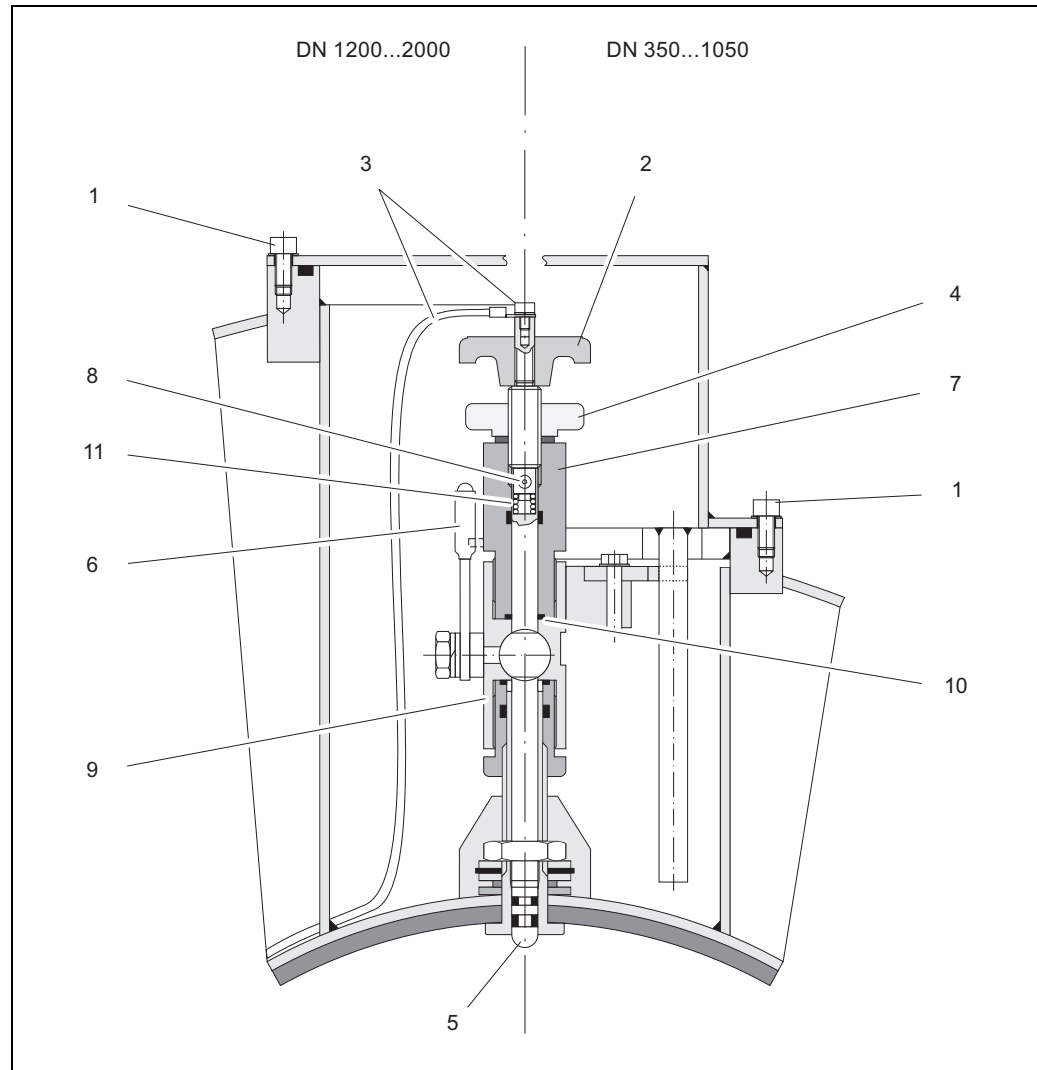







Fig. 59: Replacement unit for the exchangeable measuring electrodes

- 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.  <b>Caution!</b> Make sure that coil spring (k) is inserted. This is essential to ensure correct electrical contact and correct measuring signals.
3 Loosen knurled nut (d) by hand. This knurled nut acts as a locknut.	3 Pull the electrode back until the tip of the electrode no longer protrudes from retaining cylinder (g).
4 Remove electrode (e) by turning handle (b). The electrode can now be pulled out of retaining cylinder (g) as far as a defined stop.  <b>Warning!</b> 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.	4 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.  <b>Note!</b> Make sure that the rubber hoses on retaining cylinder (g) and stop cock (f) are of the same color (red or blue).
5 Close stop cock (f) after pulling out the electrode as far as it will go.  <b>Warning!</b> Do not subsequently open the stop cock, in order to prevent fluid escaping.	5 Open stop cock (f) and turn handle (b) to screw the electrode all the way into the retaining cylinder.
6 Remove the electrode complete with retaining cylinder (g).	6 Screw knurled nut (d) onto the retaining cylinder. This firmly locates the electrode in position.
7 Remove handle (b) from electrode (e) by pressing out locking pin (h). Take care not to lose coil spring (k).	7 Use the Allen screw to secure electrode cable (c) to handle (b).  <b>Caution!</b> 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.
8 Remove the old electrode and insert the new electrode. Replacement electrodes can be ordered separately from Endress+Hauser.	8 Reinstall the cover and tighten (a) Allen screw.

## 9.7 Return

Information on returning products: Page 8

## 9.8 Disposal


Observe the regulations applicable in your country!

## 9.9 Software history

### 9.9.1 PROFIBUS DP

Date	Software version	Changes to software	Operating Instructions
10.2005	3.01.XX	Introduction of new PROFIBUS DP I/O module	50099244/10.05

### 9.9.2 PROFIBUS PA

Date	Software version	Changes to software	Operating Instructions
10.2005	2.03.XX	–	50099244/10.05
03.2005	2.03.XX	Software expansion: – New / revised functionalities  New functionalities: – DEVICE SOFTWARE → Device software displayed (NAMUR Recommendation 53) – Unit US Kgal	50099244/10.03
10.2003	Amplifier: 1.06.XX Communication module: 2.03.XX	Software expansion: – Language group – New error messages – SIL 2 – The totalizer values are also updated without integration in cyclic data transfer  New functionalities: – Operation hours counter – Adjustable backlight (display) – Counter for access code – Upload/download via ToF Tool - Fieldtool Package  Compatible with service protocol: – ToF-Tool FieldTool Package (the latest SW version can be downloaded under: <a href="http://www.tof-fieldtool.endress.com">www.tof-fieldtool.endress.com</a> )  PROFIBUS operation via: – Commuwin II version 2.08-1 (update C) and higher	50099244/10.03
12.2002	Communication module: 2.02.XX	Software adjustment	
09.2002	Amplifier: 1.04.XX Communication module: 2.01.XX	Software expansion: – Data length of advanced diagnosis adjusted in cyclic data transfer   <b>Note!</b> As of this software version, a new device master file (GSD) must be used when replacing the device	
03.2002	Amplifier: 1.03.XX Communication module: 2.00.01	Software expansion: – Possible to update the communication software via the service protocol – For suitability for custody transfer measurement, Promag 50/51	
07.2001	Com. module: 1.01.00	Software adjustment	
06.2001	Amplifier: 1.02.00	Software adjustment	

Date	Software version	Changes to software	Operating Instructions
04.2001	Com. module: 1.00.00	Original software	50099244/04.01
09.2000	Amplifier: 1.01.01	Software adjustment	
08.2000	Amplifier: 1.01.00	SW extension (functional adjustments)	
04.2000	Amplifier: 1.00.00	Original software	

## 10 Technical data

### 10.1 Technical data at a glance

#### 10.1.1 Application

- Measuring the flow rate of liquids in closed piping systems.
- A minimum conductivity of  $\geq 5 \mu\text{S}/\text{cm}$  is required for measuring; the minimum conductivity required in the case of demineralized water is  $\geq 20 \mu\text{S}/\text{cm}$ .
- Applications measurement and control technology.

Lining-specific applications

- Promag W (DN 25...2000)
  - Polyurethane lining for applications with cold water and for slightly abrasive fluids.
  - Hard rubber lining for all applications with water (especially for drinking water)
- Promag P (DN 15...600)
  - PTFE lining for standard applications in chemical and process industries.
  - PFA lining for all applications in chemical and process industries.  
especially for high process temperatures and severe temperature shocks
- Promag H (DN 2...100)
  - PFA lining for all applications in chemical, process and food industries; especially for high process temperatures, for applications with severe 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.
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Measuring system	<p>The measuring system consists of a transmitter and a sensor.</p> <p>Two versions are available:</p> <ul style="list-style-type: none"> <li>■ Compact version: Transmitter and sensor form a single mechanical unit.</li> <li>■ Remote version: Transmitter and sensor are installed separately.</li> </ul>
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*Transmitter*

- Promag 50

*Sensor*

- Promag W (DN 25...2000)
- Promag P (DN 15...600)
- Promag H (DN 2...100)

#### 10.1.3 Input

Measured variable	Flow rate (proportional to induced voltage)
Measuring range	Typically $v = 0.01 \dots 10 \text{ m/s}$ with the specified measuring accuracy
Operable flow range	Over 1000 : 1

### 10.1.4 Output

Output signal	<p><i>PROFIBUS DP interface</i></p> <ul style="list-style-type: none"> <li>■ PROFIBUS DP in accordance with IEC 61158, galvanically isolated</li> <li>■ Profile Version 3.0</li> <li>■ Data transmission rate: 9.6 kBaud...12 MBaud</li> <li>■ Automatic identification of data transmission rate</li> <li>■ Signal coding: NRZ code</li> <li>■ Bus adress can be configured via miniature switches or via the local display (optional)</li> </ul> <p><i>PROFIBUS PA interface</i></p> <ul style="list-style-type: none"> <li>■ PROFIBUS PA in accordance with IEC 61158 (MBP), galvanically isolated</li> <li>■ Profile Version 3.0</li> <li>■ Data transmission rate: 31.25 kBaud</li> <li>■ Current consumption: 11 mA</li> <li>■ Permitted supply voltage: 9...32 V</li> <li>■ Bus connection with integrated reverse polarity protection</li> <li>■ Error current FDE (Fault Disconnection Electronic): 0 mA</li> <li>■ Signal coding: Manchester II</li> <li>■ Bus adress can be configured via miniature switches or via the local display (optional)</li> </ul>
Signal on alarm	Status and alarms in accordance with PROFIBUS Profile Version 3.0.
Low flow cut off	Switch points for low flow cutoff are selectable
Galvanic isolation	All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

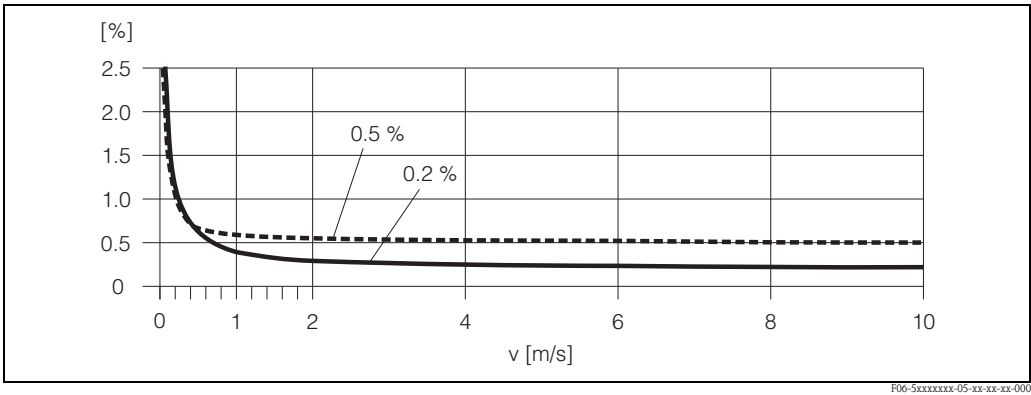
### 10.1.5 Power supply

Electrical connections	See Page 39 ff.
Cable entry	<p>Power supply and signal cables (inputs/outputs):</p> <ul style="list-style-type: none"> <li>■ Cable entry M20 x 1.5 (8...12 mm)</li> <li>■ Sensor cable entry for armored cables M20 x 1.5 (9.5...16 mm)</li> <li>■ Threads for cable entries, PG 13.5 (5...15 mm), ½" NPT, G ½"</li> </ul> <p>Connecting cable for remote version:</p> <ul style="list-style-type: none"> <li>■ Cable entry M 20 x 1.5 (8...12 mm)</li> <li>■ Sensor cable entry for armored cables M20 x 1.5 (9.5...16 mm)</li> <li>■ Threads for cable entries, PG 13.5 (5...15 mm), ½" NPT, G ½"</li> </ul>
Cable specifications	See Page 47 ff.
Supply voltage (power supply)	<p>85...260 V AC, 45...65 Hz</p> <p>20...55 V AC, 45...65 Hz</p> <p>16...62 V DC</p>
Power consumption	<p>AC: &lt;15 VA (including sensor)</p> <p>DC: &lt;15 W (including sensor)</p> <p>Switch-on current</p> <ul style="list-style-type: none"> <li>■ max. 13.5 A (&lt; 50 ms) at 24 V DC</li> <li>■ max. 3 A (&lt; 5 ms) at 260 V AC</li> </ul>

Power supply failure	Lasting min. 1 power cycle: <ul style="list-style-type: none"><li>■ EEPROM saves measuring system data if power supply fails</li><li>■ HistoROM S-DAT: exchangeable data memory which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point, etc.)</li></ul>
Potential equalization	See Page 53 ff.

10.1.6 Performance characteristics

Reference operating conditions	To DIN EN 29104 and VDI/VDE 2641: <ul style="list-style-type: none"><li>■ Fluid temperature: +28 °C ± 2 K</li><li>■ Ambient temperature: +22 °C ± 2 K</li><li>■ Warm-up time: 30 minutes</li></ul> Installation: <ul style="list-style-type: none"><li>■ Inlet run &gt;10 x DN</li><li>■ Outlet run &gt; 5 x DN</li><li>■ Sensor and transmitter grounded.</li><li>■ Sensor centered relative to the pipe.</li></ul>
Maximum measured error	<ul style="list-style-type: none"><li>■ ± 0.5% o.r. ± 1 mm/s (o.r. = of reading)</li><li>■ Optional: ± 0.2% o.r. ± 2 mm/s</li></ul> Supply-voltage fluctuations have no effect within the specified range.





Repeatability	Max. ± 0.1% o.r. ± 0.5 mm/s (o.r. = of reading)
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10.1.7 Operating conditions: Installation

Installation instructions	Any orientation (vertical, horizontal) Restrictions and additional installation instructions → Page 15 ff.
Inlet and outlet run	<ul style="list-style-type: none"><li>■ Inlet run: typically ≥ 5 x DN</li><li>■ Outlet run: typically ≥ 2 x DN</li></ul>
Length of connecting cable	For the remote version the permissible cable length $L_{max}$ depends on the conductivity of the medium (→ Page 21, Fig. 17). A minimum conductivity of 20 µS/cm is required for measuring demineralized water.



### 10.1.8 Operating conditions: Environment

Ambient temperature range	<p><i>Transmitter</i></p> <ul style="list-style-type: none"> <li>■ Standard: <math>-20...+60\text{ °C}</math></li> <li>■ Optional: <math>-40...+60\text{ °C}</math></li> </ul> <p> Note! At ambient temperatures below <math>-20\text{ °C}</math> the readability of the display may be impaired.</p> <p><i>Sensor</i></p> <ul style="list-style-type: none"> <li>■ Flange material carbon steel: <math>-10...+60\text{ °C}</math></li> <li>■ Flange material stainless steel: <math>-40...+60\text{ °C}</math></li> </ul> <p> Caution! It is not allowed to use the device beyond the min. and max. lining specified temperature values (→ “Medium temperature range”).</p> <p>Note the following points:</p> <ul style="list-style-type: none"> <li>■ Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.</li> <li>■ If both fluid and ambient temperatures are high, install the transmitter at a remote location from the sensor (→ “Medium temperature range”).</li> </ul>
Storage temperature	The storage temperature corresponds to the ambient temperature range of the transmitter and the sensors.
Degree of protection	<ul style="list-style-type: none"> <li>■ Standard: IP 67 (ENEMA 4X) for transmitter and sensor</li> <li>■ Optional: IP 68 (ENEMA 6P) for remote version of Promag W and P sensor</li> </ul>
Shock and vibration resistance	Acceleration up to 2 g by analogy with IEC 60068-2-6 (high-temperature version: no data available)
CIP cleaning	Promag W: not possible Promag P: possible (note max. temperature) Promag H: possible (note max. temperature)
SIP cleaning	Promag W: not possible Promag P: possible with PFA (note max. temperature) Promag H: possible (note max. temperature)
Electromagnetic compatibility (EMC)	To EN 61326/A1 (IEC 1326) and NAMUR Recommendation NE 21

### 10.1.9 Operating conditions: Process

Medium temperature range	<p>The permissible temperature depends on the lining of the measuring tube</p> <p><i>Promag W</i></p> <ul style="list-style-type: none"> <li>■ <math>0...+80\text{ °C}</math> for hard rubber (DN 65...2000)</li> <li>■ <math>-20...+50\text{ °C}</math> for polyurethane (DN 25...1000)</li> </ul> <p><i>Promag P</i></p> <ul style="list-style-type: none"> <li>■ <math>-40...+130\text{ °C}</math> for PTFE (DN 15...600), restrictions → see the following diagrams</li> <li>■ <math>-20...+180\text{ °C}</math> for PFA (DN 25...200), restrictions → see the following diagrams</li> </ul>
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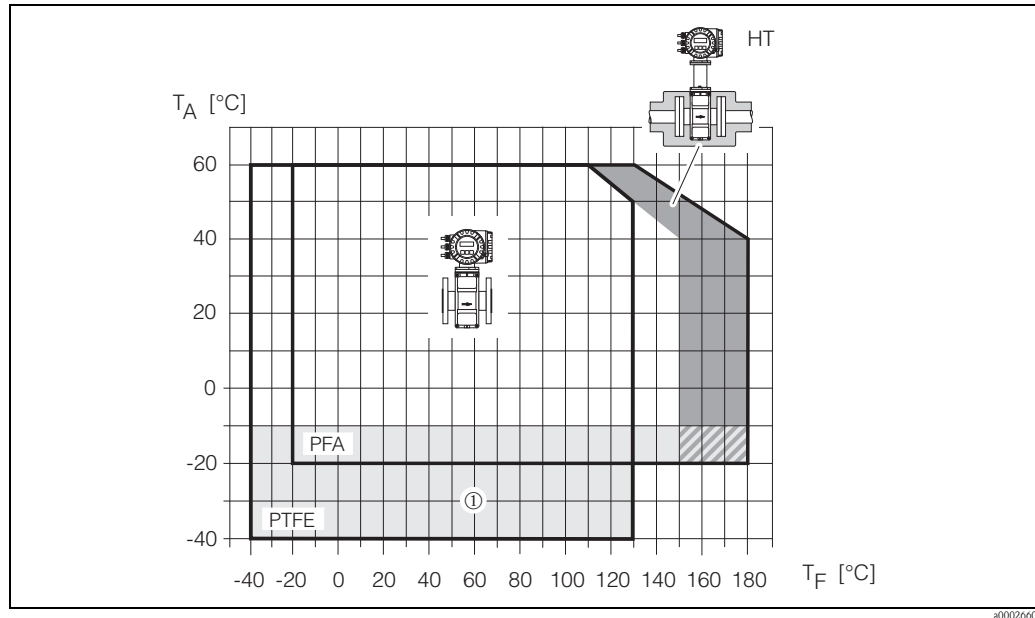


Fig. 61: Compact version Promag P (with PFA or PTFE lining)  
 TA = ambient temperature, TF = fluid temperature, HT = high-temperature version with insulation  
 ① = Temperature range from -10 °C to -40 °C is valid for stainless steel flanges only

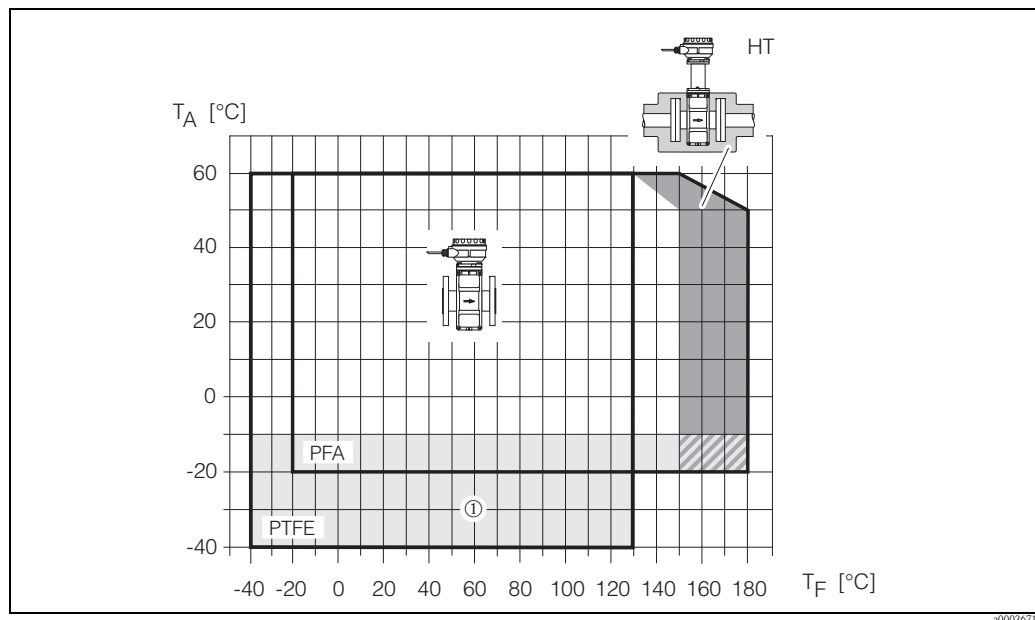


Fig. 62: Remote version Promag P (with PFA or PTFE lining)  
 TA = ambient temperature, TF = fluid temperature, HT = high-temperature version, with insulation  
 ① = Temperature range from -10 °C to -40 °C is valid for stainless steel flanges only

### Promag H

#### Sensor:

- DN 2...25: -20...+150 °C
- DN 40...100: -20...+150 °C

#### Seals:

- EPDM: -20...+130 °C
- Silicone: -20...+150 °C
- Viton: -20...+150 °C
- Kalrez: -20...+150 °C

Medium conductivity	<p>Minimum conductivity:</p> <ul style="list-style-type: none"> <li>■ <math>\geq 5 \mu\text{S}/\text{cm}</math> for liquids generally</li> <li>■ <math>\geq 20 \mu\text{S}/\text{cm}</math> for demineralized water</li> </ul> <p>Note that in the case of the remote version, the requisite fluid conductivity is also influenced by the length of the connecting cable (see Page 21).</p>
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Medium pressure range	<p><i>Promag W</i></p> <ul style="list-style-type: none"> <li>■ EN 1092-1 (DIN 2501): <ul style="list-style-type: none"> <li>– PN 6 (DN 1200...2000)</li> <li>– PN 10 (DN 200...2000)</li> <li>– PN 16 (DN 65...2000)</li> <li>– PN 25 (DN 200...1000)</li> <li>– PN 40 (DN 25...150)</li> </ul> </li> <li>■ ANSI B 16.5: <ul style="list-style-type: none"> <li>– Class 150 (1...24")</li> <li>– Class 300 (1...6")</li> </ul> </li> <li>■ AWWA: Class D (28...78")</li> <li>■ JIS B2238 <ul style="list-style-type: none"> <li>– 10 K (DN 50...300)</li> <li>– 20 K (DN 25...300)</li> </ul> </li> <li>■ AS 2129: Table E (DN 80, 100, 150...400, 500, 600)</li> <li>■ AS 4087: Cl. 14 (DN 80, 100, 150...400, 500, 600)</li> </ul>
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*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 B 16.5:
  - Class 150 (½...24")
  - Class 300 (½...6")
- JIS B2238:
  - 10 K (DN 50...300)
  - 20 K (DN 15...300)
- AS 2129: Table E (DN 25, 50)
- AS 4087: Cl. 14 (DN 50)

*Promag H*

The permissible nominal pressure depends on the process connection and the seal:

- 40 bar: flange, weld nipple (with O-ring seal)
- 16 bar: all other process connections

Pressure tightness	<i>Promag W pressure tightness</i>
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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]	Material	25 °C	50 °C	80 °C	100 °C	130 °C	150 °C	180 °C
25...1000	1...40"	Polyurethane	0	0	–	–	–	–	–
65...2000	3...78"	Hard rubber	0	0	0	–	–	–	–

*Promag P pressure tightness*

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]	Material	25 °C	80 °C	100 °C	130 °C	150 °C	180 °C
15	½"	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 ½"	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 pressure tightness*

Nominal diameter		Measuring tube lining	Resistance of measuring tube lining to partial vacuum					
[mm]	[inch]		Limit values for abs. pressure [mbar] at various fluid temperatures					
		Material	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 DIN EN 545 → Page 19.

**10.1.10 Mechanical construction**

Design / dimensions

The dimensions and lengths of the sensor and transmitter are provided in the “Technical Information” document on the measuring device in question which you can download as a PDF file from [www.endress.com](http://www.endress.com). A list of the “Technical Information” documents available is provided in the “Documentation” section on Page 123.

## Weight

## Promag W weight

Weight data in kg														
Nominal diameter		Compact version					Remote version (without cable)							
		[mm]	[inch]	EN (DIN) / AS*	JIS	ANSI / AWWA	EN (DIN) / AS*	Sensor		JIS	ANSI / AWWA	Wall housing		
25	1"	PN 40	7.3	10K	7.3	PN 40	5.3	10K	5.3	Class 150	5.3	6.0		
32	1 ¼"		8.0		7.3		–		6.0		5.3	–	6.0	
40	1 ½"		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 ½"	PN 16	12.0	10K	11.1	PN 16	10.0	10K	9.1	Class 150	–	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"	PN 10	25.5	10K	24.5	PN 10	23.5	10K	22.5	Class 150	23.5	6.0		
200	8"		45		41.9		45		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"	PN 10	115	10K	Class 150	175	PN 10	10K	Class 150	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"	PN 10	235	10K	Class 150	405	PN 10	10K	Class 150	403	6.0			
700	28"		355			400				353	398	6.0		
–	30"		–			460				–	458	6.0		
800	32"		435			550				433	548	6.0		
900	36"	PN 10	575	10K	Class 150	800	PN 10	10K	Class 150	798	6.0			
1000	40"		700			900				698	898	6.0		
–	42"		–			1100				–	1098	6.0		
1200	48"		850			1400				848	1398	6.0		
–	54"	PN 6	–	10K	Class D	2200	PN 6	10K	Class D	2198	6.0			
1400	–		1300			–				1298	–	6.0		
–	60"		–			2700				–	2698	6.0		
1600	–		1700			–				1698	–	6.0		
–	66"	PN 6	–	10K	Class D	3700	PN 6	10K	Class D	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)

\* Flanges according to AS are only available for nominal diameters DN 80, 100, 150...400, 500 and 600

*Promag P weight*

Weight data in kg												
Nominal diameter		Compact version					Remote version (without cable)					
[mm]	[inch]	EN (DIN) / AS*		JIS		ANSI / AWWA	EN (DIN) / AS*		Sensor		ANSI / AWWA	Wall housing
15	½"	PN 40	6.5	10K	6.5	Class 150	PN 40	4.5	10K	4.5	Class 150	6.0
25	1"		7.3		7.3			5.3		5.3		6.0
32	1 ¼"		8.0		7.3			6.0		5.3		6.0
40	1 ½"		9.4		8.3			7.4		6.3		6.0
50	2"		10.6		9.3			8.6		7.3		6.0
65	2 ½"	PN 16	12.0	10K	11.1	Class 150	PN 16	10.0	10K	9.1	Class 150	6.0
80	3"		14.0		12.5			12.0		10.5		6.0
100	4"		16.0		14.7			14.0		12.7		6.0
125	5"		21.5		21.0			19.5		19.0		6.0
150	6"		25.5		24.5			23.5		22.5		6.0
200	8"	PN 10	45	10K	41.9	Class 150	PN 10	43	10K	39.9	Class 150	6.0
250	10"		65		69.4			63		67.4		6.0
300	12"		70		72.3			68		70.3		6.0
350	14"		115					113				6.0
400	16"		135					133				6.0
450	18"	PN 10	175	10K		Class 150	PN 10	173	10K		Class 150	6.0
500	20"		175					173				6.0
600	24"		235					233				6.0
Transmitter Promag (compact version): 3.4 kg (Weight data valid for standard pressure ratings and without packaging material) * Flanges according to AS are only available for nominal diameters DN 80, 100, 150...400, 500 and 600												

*Promag H weight*

Weight data in kg				
Nominal diameter		Compact version	Remote version (without cable)	
[mm]	[inch]	DIN	Sensor	Transmitter
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	½"	5.4	2.6	6.0
25	1"	5.5	2.8	6.0
40	1 ½"	6.5	4.5	6.0
50	2"	9.0	7.0	6.0
65	2 ½"	9.5	7.5	6.0
80	3"	19.0	17.0	6.0
100	4"	18.5	16.5	6.0
Transmitter Promag (compact version): 3.4 kg (Weight data valid for standard pressure ratings and without packaging material)				

## Material

*Promag W*

Transmitter housing:

- Compact and remote version: powder coated die-cast aluminum

Sensor housing:

- DN 25...300: powder-coated die-cast aluminum
- DN 350...2000: painted steel (Amerlock 400)

Measuring tube

- DN < 350: stainless steel 1.4301/304 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)

Flanges

- EN 1092-1 (DIN2501): 316L / 1.4571; RSt37-2 (S235JRG2) / C22 / FE 410W B  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- ANSI: A105; F316L  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AWWA: 1.0425 (with Amerlock 400 paint)
- JIS: RSt37-2 (S235JRG2) / HII / 1.0425 / 316L  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AS 2129
  - (DN 150, 200, 250, 300, 600) A105 or RSt37-2 (S235JRG2)
  - (DN 80, 100, 350, 400, 500) A105 or St44-2 (S275JR)  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AS 4087: A105 or St44-2 (S275JR)  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)

Ground disks: 1.4435/316L or Alloy C-22

Electrodes: 1.4435/316L, Alloy C-22

Seals: Seals to DIN EN 1514-1

*Promag P*

Transmitter housing:

- Compact and remote version: powder coated die-cast aluminum

Sensor housing:

- DN 15...300: powder-coated die-cast aluminum
- DN 350...600: painted steel (Amerlock 400)

Measuring tube

- DN < 350: stainless steel 1.4301/304 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)

Flanges

- EN 1092-1 (DIN2501): 316L / 1.4571; RSt37-2 (S235JRG2) / C22 / FE 410W B  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- ANSI: A105; F316L  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- JIS: RSt37-2 (S235JRG2) / HII / 1.0425 / 316L  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AS 2129
  - (DN 25) A105 or RSt37-2 (S235JRG2)
  - (DN 50) A105 or St44-2 (S275JR)  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AS 4087: A105 or St44-2 (S275JR)  
(DN < 350: with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)

Ground disks: 1.4435/316L or Alloy C-22  
 Electrodes: 1.4435/316L, Alloy C-22  
 Seals: Seals to DIN EN 1514-1

### *Promag H*

Transmitter housing:

- Compact version: powder coated die-cast aluminum or stainless steel field housing (1.4301/316L)
- Remote version wall-mount housing: powder coated die-cast aluminum

Sensor housing: 1.4301

Wall mounting kit: 1.4301/304

Measuring tube: 1.4301/304 or 1.4306/304L

Flange:

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

Ground rings: 1.4435/316L, optional: 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 molded seal (EPDM, silicone, Viton)
- DN 40...100: molded seal (EPDM, silicone)

### Material load diagrams

The material load diagrams (pressure-temperature diagrams) for the process connections are provided in the "Technical Information" document on the measuring device in question which you can download as a PDF file from [www.endress.com](http://www.endress.com). A list of the "Technical Information" documents available is provided in the "Documentation" section on Page 123.

### 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, platinum/rhodium 80/20
- Optional: measuring electrodes made of platinum/rhodium 80/20

#### *Promag H*





Measuring electrodes and empty pipe detection electrode

- Standard available with 1.4435, Alloy C-22, tantalum, platinum/rhodium 80/20
- DN 2...4: without EPD electrode



Process connections	<p><i>Promag W</i></p> <p>Flange connection: EN 1092-1 (DIN 2501), DN &lt; 350: Form A, DN &gt; 300: Form B (DN 65, PN 16 and DN 600, PN 16 exclusively to EN 1092-1); ANSI; AWWA; JIS and AS</p> <p><i>Promag P</i></p> <p>Flange connection: EN 1092-1 (DIN 2501), DN &lt; 350: Form A, DN &gt; 300: Form B (DN 65, PN 16 and DN 600, PN 16 exclusively to EN 1092-1); ANSI; JIS and AS</p> <p><i>Promag H</i></p> <ul style="list-style-type: none"> <li>■ With O-ring: weld nipples (DIN EN ISO 1127, ODT/SMS), flanges (EN (DIN), ANSI, JIS), PVDF flanges (EN (DIN), ANSI, JIS), external pipe thread, internal pipe thread, hose connection, PVC adhesive coupling</li> <li>■ With molded seal: weld nipples (DIN 11850, ODT / SMS), clamps (ISO 2852, DIN 32676, L14 AM7), screws (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145), flanges DIN 11864-2</li> </ul>
Surface roughness	<ul style="list-style-type: none"> <li>■ PFA liner: <math>\leq 0.4 \mu\text{m}</math></li> <li>■ Electrodes               <ul style="list-style-type: none"> <li>– 1.4435, Alloy C-22: <math>0.3\ldots 0.5 \mu\text{m}</math></li> <li>– Tantalum, platinum/rhodium: <math>0.3\ldots 0.5 \mu\text{m}</math></li> </ul> </li> <li>■ Process connection Promag H: <math>\leq 0.8 \mu\text{m}</math></li> </ul> <p>All data relate to parts in contact with medium.</p>

### 10.1.11 Human interface

Display elements	<ul style="list-style-type: none"> <li>■ Liquid crystal display: illuminated, two lines with 16 characters per line</li> <li>■ Custom configurations for presenting different measured values and status variables</li> <li>■ Totalizer</li> </ul>
	<p>Note!</p> <p>At ambient temperatures below <math>-20\text{ }^{\circ}\text{C}</math> the readability of the display may be impaired</p>
Operating elements	<ul style="list-style-type: none"> <li>■ Local operation via three keys (, , )</li> <li>■ Quick Setup menus for straightforward commissioning</li> </ul>
Language group	<p>Language groups available for operation in different countries:</p> <ul style="list-style-type: none"> <li>■ Western Europe and America (WEA): English, German, Spanish, Italian, French, Dutch and Portuguese</li> <li>■ Eastern Europe and Scandinavia (EES): English, Russian, Polish, Norwegian, Finnish, Swedish and Czech</li> <li>■ South and east Asia (SEA): English, Japanese, Indonesian</li> </ul> <p>You can change the language group via the operating program “ToF Tool – Fieldtool Package”.</p>
Remote operation	Operation via PROFIBUS DP or PROFIBUS PA

### 10.1.12 Certificates and approvals

Ex approval	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	<p><i>Promag W</i></p> <p>No applicable approvals or certification</p> <p><i>Promag P</i></p> <p>No applicable approvals or certification</p> <p><i>Promag H</i></p> <ul style="list-style-type: none"> <li>■ 3A authorization and EHEDG-tested</li> <li>■ Seals: in conformity with FDA (except Kalrez seals)</li> </ul>
PROFIBUS DP/PA certification	<p>The flowmeter has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organization). The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified to PROFIBUS Profile Version 3.0 (device certification number: available on request)</li> <li>■ The measuring device can also be operated with certified devices of other manufacturers (interoperability)</li> </ul>
Pressure measuring device approval	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. For larger nominal diameters, optional approvals according to Cat. II/III are available when required (depends on fluid and process pressure).
CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the measuring device by affixing to it the CE mark.
C-Tick mark	The measuring system complies with the EMC requirements of the Australian Communications Authority (ACA).
Other standards and guidelines	<ul style="list-style-type: none"> <li>■ EN 60529: Degrees of protection by housing (IP code).</li> <li>■ EN 61010 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</li> <li>■ EN 61326/A1 (IEC 1326) “Emission in accordance with requirements for Class A”. Electromagnetic compatibility (EMC requirements)</li> <li>■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.</li> <li>■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.</li> <li>■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics</li> </ul>

### 10.1.13 Ordering information

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Ordering information	The Endress+Hauser service organization can provide detailed ordering information and information on the order codes on request.
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### 10.1.14 Accessories

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Accessories	<p>Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor → Page 90.</p> <p>The Endress+Hauser service organization can provide detailed information on the order codes of your choice.</p>
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### 10.1.15 Documentation

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Documentation	<ul style="list-style-type: none"> <li>■ System Information Promag (SI028D/06/en)</li> <li>■ Technical Information Promag 50 W (TI046D/06/en)</li> <li>■ Technical Information Promag 50 P (TI047D/06/en)</li> <li>■ Technical Information Promag 50 H (TI048D/06/en)</li> <li>■ Description of Device Functions Promag 50 (BA056D/06/en)</li> <li>■ Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.</li> </ul>
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### 10.1.16 Measuring pipe specifications

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Measuring pipe specifications	<p>Information on the measuring pipe specifications is provided in the following documents:</p> <ul style="list-style-type: none"> <li>■ Technical Information Promag 50 W (TI046D/06/en)</li> <li>■ Technical Information Promag 50 P (TI047D/06/en)</li> <li>■ Technical Information Promag 50 H (TI048D/06/en)</li> </ul> <p>You can also download these documents as PDF files from the Endress+Hauser Internet pages → <a href="http://www.endress.com">www.endress.com</a></p>
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### 10.1.17 Dimensions

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Dimensions	<p>Information on the dimensions is provided in the following documents:</p> <ul style="list-style-type: none"> <li>■ Technical Information Promag 50 W (TI046D/06/en)</li> <li>■ Technical Information Promag 50 P (TI047D/06/en)</li> <li>■ Technical Information Promag 50 H (TI048D/06/en)</li> </ul> <p>You can also download these documents as PDF files from the Endress+Hauser Internet pages → <a href="http://www.endress.com">www.endress.com</a></p>
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# Declaration of Contamination

## Erklärung zur Kontamination

Because of legal regulations and for the safety of our employees and operating equipment, we need the "declaration of contamination", with your signature, before your order can be handled. Please make absolutely sure to include it with the shipping documents, or – even better – attach it to the outside of the packaging.

*Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination", bevor Ihr Auftrag bearbeitet werden kann. Legen Sie diese unbedingt den Versandpapieren bei oder bringen Sie sie idealerweise außen an der Verpackung an.*

### Type of instrument / sensor

Geräte-/Sensortyp \_\_\_\_\_

### Serial number

Seriennummer \_\_\_\_\_

### Process data/ Prozessdaten

Temperature / Temperatur \_\_\_\_\_ [°C] Pressure / Druck \_\_\_\_\_ [Pa]

Conductivity / Leitfähigkeit \_\_\_\_\_ [S] Viscosity / Viskosität \_\_\_\_\_ [mm<sup>2</sup>/s]

### Medium and warnings

Warnhinweise zum Medium



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

\* explosive; oxidising; dangerous for the environment; biological risk; radioactive

\* explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv

Please tick should one of the above be applicable, include security sheet and, if necessary, special handling instructions.

*Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.*

### Reason for return / Grund zur Rücksendung

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Company data / Angaben zum Absender

Company / Firma _____	Contact person / Ansprechpartner _____
_____	Department / Abteilung _____
Address / Adresse _____	Phone number/ Telefon _____
_____	Fax / E-Mail _____
_____	Your order No. / Ihre Auftragsnr. _____

We hereby certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free from any residues in dangerous quantities.

*Hiermit bestätigen wir, dass die zurückgesandten Teile sorgfältig gereinigt wurden, und nach unserem Wissen frei von Rückständen in gefährbringender Menge sind.*

\_\_\_\_\_  
(place, date / Ort, Datum)

\_\_\_\_\_  
(Company stamp and legally binding signature)  
(Firmenstempel und rechtsverbindliche Unterschrift)

[www.endress.com/worldwide](http://www.endress.com/worldwide)

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People for Process Automation