

Technical Information

Proline Promag W 800

Electromagnetic flowmeter



Battery powered flowmeter with EN ISO 12944 corrosion protection & intelligent energy efficient mode

Application

- The electromagnetic measuring principle is unaffected by pressure, temperature and flow profile
- Certified sensor for the most demanding water and wastewater applications

Device properties

- International drinking water approvals
- Degree of protection IP68 (Type 6P enclosure)
- Approved for custody transfer to MI-001/OIML R49
- Transmitter housing made of durable polycarbonate
- All in 1 housing incl. batteries & wireless modem
- Measuring intervals can be adapted individually

Your benefits

- For direct underground installation or permanent underwater use
- Secure, reliable long-term operation – robust and completely welded sensor
- Energy-saving flow measurement – no pressure loss due to cross-section constriction
- Maintenance-free – no moving parts
- No power grid required – battery lifetime of up to 15 years
- Worldwide transmission of measured data and events via email and SMS – integrated GSM/GPRS modem
- Reliable data storage – integrated SD card






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Document information

Symbols used


Electrical symbols

Symbol	Meaning
 <small>A0011197</small>	Direct current A terminal at which DC voltage is present or through which direct current flows.
 <small>A0011198</small>	Alternating current A terminal at which alternating voltage (sinusoidal) is present or through which alternating current flows.
 <small>A0011200</small>	Ground connection A grounded terminal which, from the viewpoint of the user, is grounded via a grounding system.
 <small>A0011199</small>	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.
 <small>A0011201</small>	Equipotential connection A connection that must be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

Symbols for types of information

Symbol	Meaning
 <small>A0011182</small>	Permitted Indicates procedures, processes or actions that are permitted.
 <small>A0011183</small>	Preferred Indicates procedures, processes or actions that are preferred.
 <small>A0011200</small>	Forbidden Indicates procedures, processes or actions that are forbidden.
 <small>A0011193</small>	Tip Indicates additional information.
 <small>A0011194</small>	Reference to documentation Refers to the corresponding device documentation.
 <small>A0011195</small>	Reference to page Refers to the corresponding page number.
 <small>A0011196</small>	Reference to graphic Refers to the corresponding graphic number and page number.

Symbols in graphics

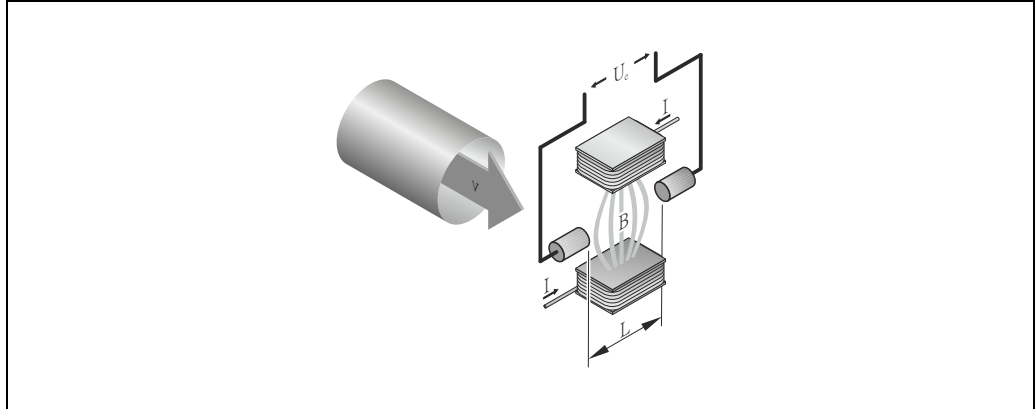
Symbol	Meaning
1, 2, 3 ...	Item numbers
A, B, C etc.	Views
A-A, B-B, C-C etc.	Sections
 <small>A0013441</small>	Flow direction

Function and system design

Measuring principle

Following *Faraday's law of magnetic induction*, a voltage is induced in a conductor moving through a magnetic field.

In the electromagnetic measuring principle, the flowing medium is the moving conductor. The voltage induced is proportional to the flow velocity and is supplied to the amplifier via two measuring electrodes. The flow volume is calculated via the pipe cross-sectional area. The DC magnetic field is created through a switched direct current of alternating polarity.



$$U_e = B \cdot L \cdot v ; Q = A \cdot v$$

U_e	Induced voltage
B	Magnetic induction (magnetic field)
L	Electrode spacing
v	Flow velocity
Q	Volume flow
A	Pipe cross-section
I	Current strength

Measuring system

The device consists of a transmitter and a sensor.

Two device versions are available:

- Compact version – the transmitter and sensor form a mechanical unit.
- Remote version – the transmitter and sensor are mounted separately from one another.

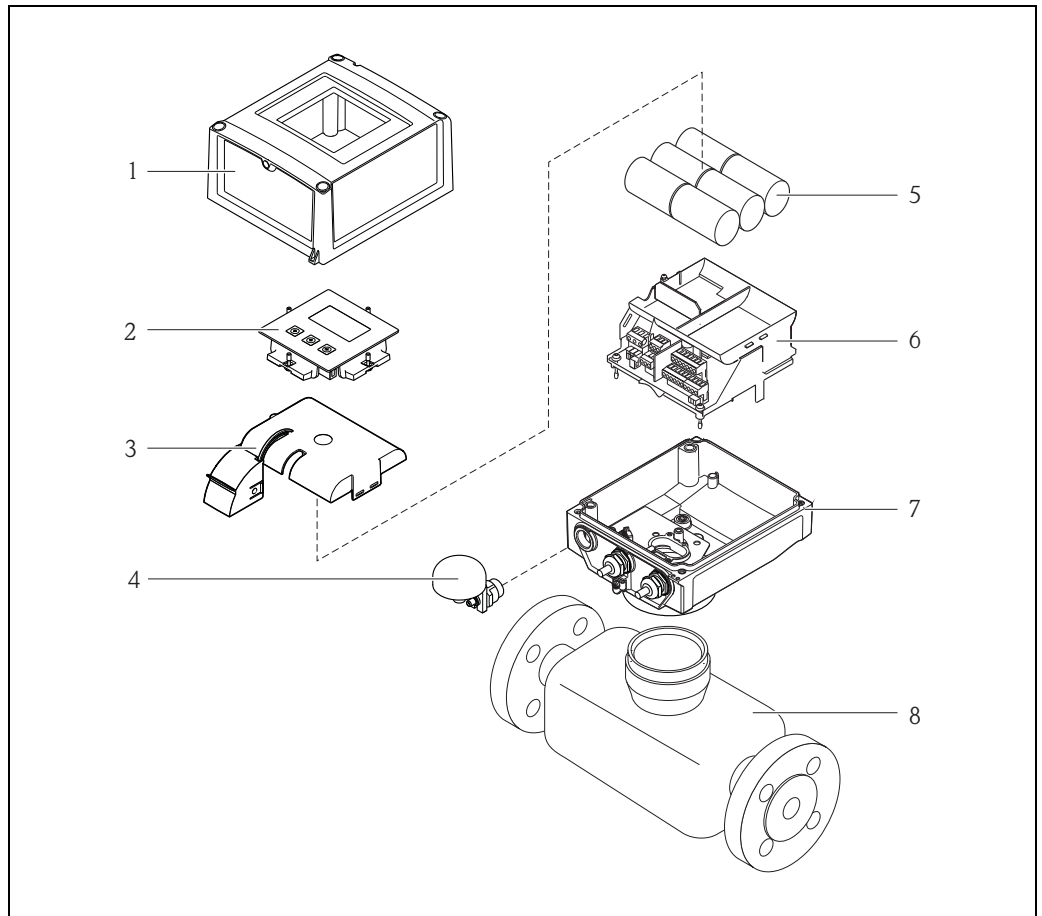
Transmitter

<p>Promag 800</p> <p style="text-align: right; font-size: small;">A0017117</p>	<p>Device versions and materials:</p> <ul style="list-style-type: none"> ▪ Compact housing: polycarbonate plastic ▪ Wall-mount housing: polycarbonate plastic <p>Configuration</p> <ul style="list-style-type: none"> ▪ Local operation, key-based operation, eight-line ▪ Config5800 software operating tool <p>Separate GSM/GPRS antenna optionally available.</p>
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Sensor

<p>Promag W</p> <p style="text-align: right; font-size: small;">A0022673</p>	<p>Nominal diameters: DN 25 to 300 (1 to 12")</p> <p>Materials:</p> <ul style="list-style-type: none"> ▪ Sensor: fully welded with protective varnish ▪ Measuring tube: stainless steel 1.4301/304, 1.4306/304L ▪ Liner: polyurethane, hard rubber ▪ Electrodes: 1.4435, Alloy C-22 ▪ Connection housing, remote version: polycarbonate plastic (IP68)
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Device design



A0016254

Primary components of the measuring device

- 1 Cover for transmitter housing
- 2 Display and operating module
- 3 Cover for battery compartment
- 4 GSM antenna (optional: only supplied with delivery if the "GSM/GPRS" option is ordered)
- 5 Batteries (number depends on the order, battery concept → 8)
- 6 Bracket for electronics board incl. battery compartment
- 7 Transmitter housing
- 8 Sensor

GSM/GPRS communication

Wireless GSM/GPRS transmission of information

Data can be transmitted to and from the measuring device via wireless communication. Ideal for applications in which the measuring point is installed in a remote location, making tasks like reading counters very time-consuming activities.

As it is possible to configure limit value monitoring with alarms signaled by e-mail or SMS, operators can respond specifically to local changes:

- SMS: receive alarms, query totalizer counter readings, change the device configuration etc.
- E-mail: The data saved by the data logger are sent by e-mail in a defined period of time (e.g. once a day). A CSV-file is attached to the e-mail.



To send e-mails, the measuring device must be able to access an SMTP server. The measuring device does not support encrypted login (e.g. SSL/TSL using TCP Port 465), as the processing power and, consequently, power consumption would be too high. For configuration information, see "Operating Instructions" document



It is important to ensure that the signal of the mobile communications network is strong enough to enable the system to dial into the GPRS/GSM network.

Mobile communications network (GSM: Global System for Mobile Communications)

Data can be transmitted via a mobile communications network with the GSM/GPRS modem. The modem can be configured as a point-to-point connection or as a modem that can be openly accessed via the Internet/intranet.

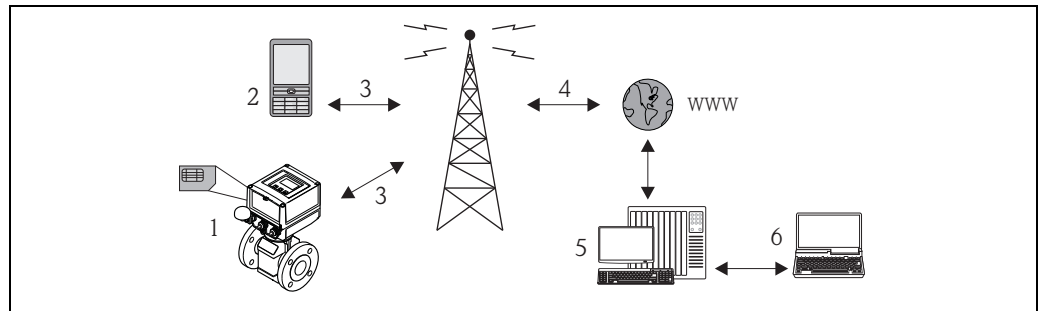
A SIM card from a mobile communications provider is required for the GSM/GPRS mode.

The communication is established via the data channel of the SIM card.

Additional activation might be required for this card depending on the GSM/GPRS provider.



The SIM card must be activated for GPRS operation.



Operation of the measuring device in the mobile communications network

- 1 Measuring device with SIM card
- 2 Cellular phone
- 3 GSM network
- 4 GPRS network
- 5 Web server (provider)
- 6 Laptop (customer)

GPRS support

GPRS (General Packet Radio Services) is a mobile communications technology that takes advantage of the benefits afforded by package-oriented data transmission and channel bundling.

In contrast to normal connections, an entire channel is not reserved for the duration of the connection between the mobile device and the base station when transmitting data via GPRS. Instead, the data are grouped into data packets which can be transmitted depending on the requirements and capacity.

Higher transmission rates are possible with packet-based data transmission. This allows the measuring system to connect periodically to the Internet, an intranet or a mailbox. Data are then only transmitted if required, such as if a new e-mail is sent or received.

Therefore communication via GPRS-based operation of the measuring system provides the simplest and most cost-effective way of connecting a measuring point periodically to the Internet or an intranet.



Note!

If the device is in service subject to legal metrological control, the wireless transmission of billing-specific data via GSM/GPRS is for information purposes only and is not legally binding.

Custody transfer (optional)



Note!

As an option, Promag W 800 is tested in accordance with OIML R49 and has an EC type-examination certificate as per Measuring Instruments Directive 2004/22/EC (MID) for service subject to legal metrological control ("custody transfer") for cold water (Annex MI-001).

The permitted fluid temperature in these applications is 0 to +50 °C (+32 to +122 °F).

It is used with a legally controlled totalizer on the local display.

Measuring devices subject to legal metrological control totalize in both directions, i.e. all the outputs consider flow components in the positive (forward) and negative (reverse) flow direction.

Generally a measuring device subject to legal metrological control is secured against tampering by lead seals on the transmitter or sensor.

These lead seals may normally only be opened by a representative of the competent authority for legal metrology controls.



Note!

After putting the device into circulation or after sealing the device, operation via the onsite display, via the Config 5800 software operating tool or via GSM/GPRS is only possible to a limited extent.



Detailed ordering information is available from your local Endress+Hauser sales center for national approvals as cold water meters based on OIML R49.

Input

Measured variable

Direct measured variables

Volume flow (proportional to induced voltage)

Calculated measured variables

Mass flow



Note!

In custody transfer: only volume flow.

Measuring range

Typically $v = 0.01$ to 10 m/s (0.03 to 33 ft/s) with the specified accuracy



To calculate the measuring range, use the *Applicator* sizing tool (→ 44)

Recommended measuring range

"Limiting flow" section

Operable flow range

Over 1000 : 1

Im eichpflichtigen Verkehr:
160 : 1

Näheres regelt die jeweils gültige Zulassung.

Input signal

Status input (auxiliary input)

- $U = 3$ to 40 V DC
- $R = 5$ k Ω
- Galvanically isolated
- Can be configured for:
totalizer reset, positive zero return, error message reset.

Output

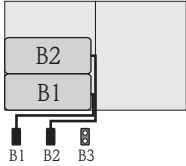

Output signal	Status/pulse output <ul style="list-style-type: none"> ▪ Passive ▪ Opto-MOS (opto-isolated output) ▪ Max. switching voltage: 40 V DC / 28 V AC ▪ Max. switching current: 100 mA ▪ Max. R_{on}: 70 Ω ▪ Max. switching frequency ($R_L = 240 \Omega$, $V_{OUT} = 24 \text{ V DC}$): 50 Hz ▪ Isolated from other secondary circuits: 500 V DC
GSM/GPRS	GSM/GPRS modem <ul style="list-style-type: none"> ▪ For data transmission via a GSM network (TDMA/FMDA) ▪ Integrated on the electronics board ▪ Quad-band: 850, 900, 1800, 1900 MHz ▪ Mail and messaging (SMS) functions <ul style="list-style-type: none"> – Measuring device configuration – Measuring device diagnostics – Flow protocol data (automatic transmission) – Totalizer: positive/negative/net values (balance) (automatic transmission) – Alarms (at the time of the event)
Signal on alarm	Status/pulse output <p>“Not conductive” in the event of fault or power supply failure</p>
Low flow cutoff	Switch points can be selected for low flow cutoff between 0 and 25 % of the full scale value.
Galvanic isolation	All circuits for inputs, outputs and power supply are galvanically isolated from each other.
Data logger (SD card)	<ul style="list-style-type: none"> ▪ The integrated data logger can log the following data: <ul style="list-style-type: none"> – Reference data: time, date, consecutive numbers in list etc. – Totalizer counter readings: positive, negative, net (balance) – Flow: in volume unit (e.g. m³/h) or in % – Measuring cycles per hour, state of charge of the individual battery packs (B1, B2, B3), temperature of the electronics board ▪ Configurable save cycle: 15 seconds to 24 hours. ▪ The data of the data logger are not lost if the battery is replaced. <p>The data logger gives users the option of second, parallel data recording in a higher resolution within a specific period of time.</p> <p>The data are saved daily in a new file on the micro SD card (storage capacity 2 GB). Via the FXA291 service interface, the files can be saved for evaluation on a PC or laptop with the Config5800 operating software. It is also possible to transmit the files by e-mail via the GSM/GPRS modem, which is available as an option.</p>

Power supply

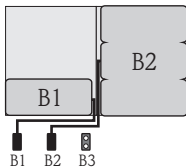
Battery concept	Battery arrangement options <p>Three battery terminals are available in the measuring device. These terminals are assigned different uses depending on the number and arrangement of the batteries. B1 and B2 are the terminals for power supply to the measuring device, B3 is the terminal for the GSM/GPRS modem.</p> <p>The measuring device is initially powered by the batteries in terminal B2. If the voltage supplied by these batteries becomes too low, the measuring device issues a message and switches automatically to the battery in terminal B1.</p> <p>If power is supplied to the measuring device externally and the power supply fails, the battery in terminal B1 acts as a backup power supply.</p> <p>The GSM/GPRS modem is always powered by the battery in terminal B3.</p>
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This is also the case if the measuring device uses an external power supply.

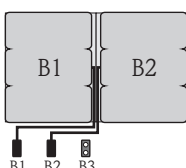
Configuration 1

Configuration of batteries	Connectors	Number of batteries	Battery usage
 <p style="text-align: right; font-size: small;">A0017127</p>	B 1	1	Backup power supply for the measuring device
	B 2	1	Power supply for the measuring device
	B 3	–	Power supply for the GSM/GPRS modem
	"Power supply" order feature for this configuration: 5W8B**_*** FO *****  Note! Not permitted in custody transfer!		

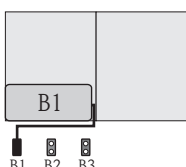
Configuration 2

Configuration of batteries	Connectors	Number of batteries	Battery usage
 <p style="text-align: right; font-size: small;">A0017128</p>	B 1	1	Backup power supply for the measuring device
	B 2	3	Power supply for the measuring device
	B 3	–	Power supply for the GSM/GPRS modem
	"Power supply" order feature for this configuration: 5W8B**_*** GO *****		

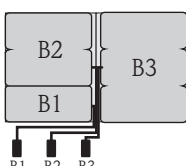
Configuration 3

Configuration of batteries	Connectors	Number of batteries	Battery usage
 <p style="text-align: right; font-size: small;">A0017129</p>	B 1	3	Backup power supply for the measuring device
	B 2	3	Power supply for the measuring device
	B 3	–	Power supply for the GSM/GPRS modem
	"Power supply" order feature for this configuration: 5W8B**_*** HO *****		

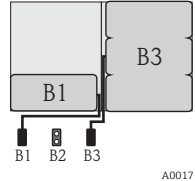
Configuration 4

Configuration of batteries	Connectors	Number of batteries	Battery usage	
 <p style="text-align: right; font-size: small;">A0017130</p>	B 1	1	Backup power supply for the measuring device	
	B 2	–	Power supply for the measuring device	
	B 3	–	Power supply for the GSM/GPRS modem	
	Powered via external power supply			Power supply for the measuring device
	"Power supply" order feature for this configuration: 5W8B**_*** JO *****			

Configuration 5

Configuration of batteries	Connectors	Number of batteries	Battery usage
 <p style="text-align: right; font-size: small;">A0017131</p>	B 1	1	Backup power supply for the measuring device
	B 2	2	Power supply for the measuring device
	B 3	3	Power supply for the GSM/GPRS modem
	"Power supply" order feature for this configuration: 5W8B**_*** HP *****		

Configuration 6

Configuration of batteries	Connectors	Number of batteries	Battery usage
	B 1	1	Backup power supply for the measuring device
	B 2	-	Power supply for the measuring device
	B 3	3	Power supply for the GSM/GPRS modem
	Powered via external power supply		Power supply for the measuring device
	"Power supply" order feature for this configuration: 5W8B**_***KP*****		

Battery specifications

- Lithium-thionyl chloride high-power batteries (size D)
- 3.6 V DC
- Not rechargeable
- 19 Ah nominal capacity at 20 °C (per battery)
- Battery lasts for up to 15 years (→ Battery life)
- Required battery quantity and possible battery arrangement → 8



Lithium-thionyl chloride high-power batteries are categorized as Class 9:

"Miscellaneous Hazardous Materials".

Comply strictly with the hazardous material regulations described in the safety data sheet.

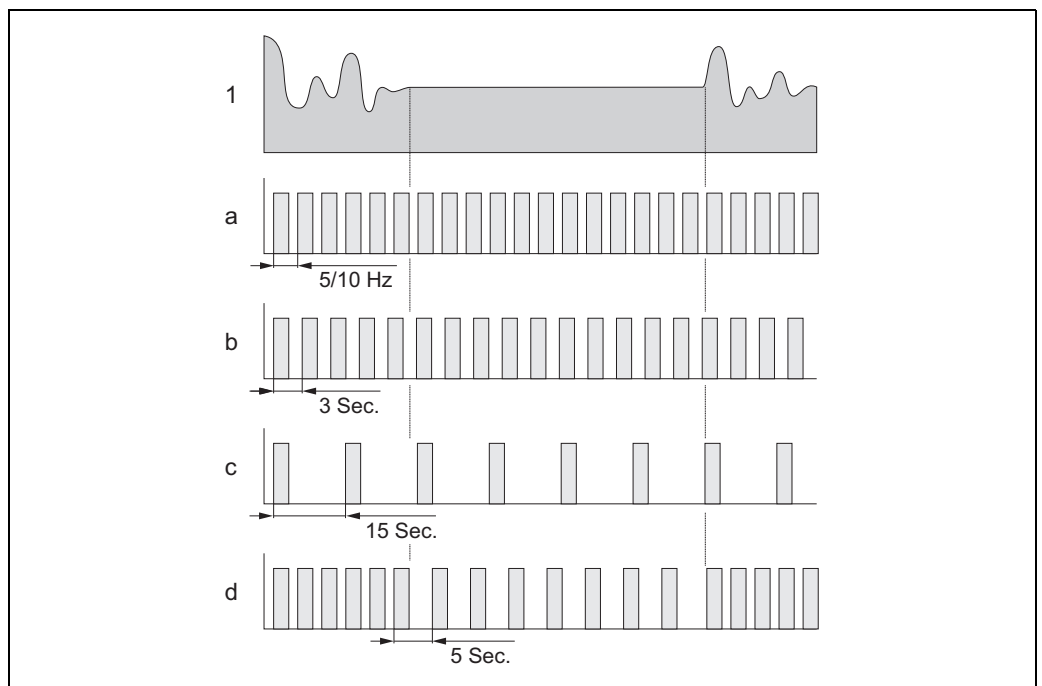
You can request the safety data sheet from your Endress+Hauser Sales Center.

Battery life

The battery has a maximum battery life of 15 years.

The battery life, and thereby the availability of the measuring device if powered by batteries, depends on a number of factors, including:

- The number of batteries
- The ambient conditions
- The frequency of data transmission via the GSM/GPRS modem
- The size of the files transmitted
- The interface activities (use of local operation, GSM/GPRS modem etc.)
- The selected measured value acquisition method:
 - "MAX. LIVE" (max. battery life): measured value acquired every 15 seconds.
 - "SMART" (dynamic control of measurement data acquisition): measured value acquisition depends on the flow profile. The measuring device records the measured value every 5 seconds. The frequency of the measured value acquisition cycle is increased if the measuring device detects a change in the flow profile. The measuring device is supplied with the "SMART" measuring mode as standard.
 - "AVERAGE": measured value acquisition every 3 seconds.
 - "CONTINUOUS": continuous measured value acquisition.



Operating principle of the different measured value acquisition methods

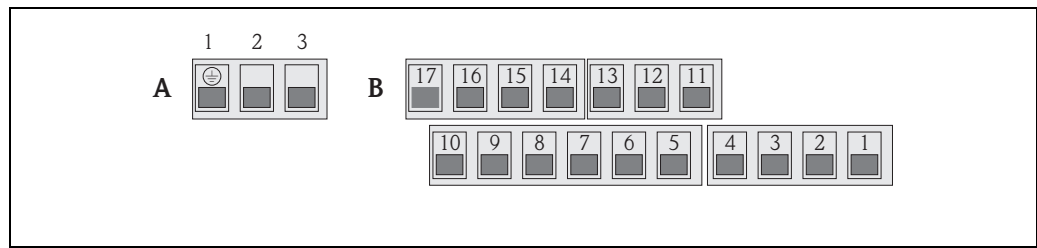
- 1 Flow profile
- a CONT.PWR
- b AVERAGE
- c MAX. LIFE
- d SMART



Contact your Endress+Hauser Sales Center to calculate the battery life for your specific operating conditions.

Terminal assignment

Transmitter



A0017259

Transmitter terminal assignment

- A Terminals: connection of external power supply (optional)
 B Terminals: signal transmission via inputs and outputs, connection of remote version

Terminals (A): connection of external power supply (optional)

External power supply	
Terminal	Connection
1	Protective ground
2	N -
3	L +

Terminals (B): signal transmission via inputs and outputs, connection of remote version

Inputs	
Terminal	Connection
5	Input 1 (+)
6	Input 1 (-)

Outputs	
Terminal	Connection
14	Shield, output 1 and 2
15	Output 1 (+)
16	Output 2 (+)
17	Output 1 and 2 (-)

Remote version connection	
Terminal	Connection
1	Electrode E1 (brown)
2	Electrode E2 (white)
3	Shield, electrode E1 (brown)
4	Shield, electrode E2 (white)
11	Reference electrode (green)
12	Coil current cable B2 (black)
13	Coil current cable B1 (black)

Power supply

Power from batteries

- 3.6 V DC
- 19 Ah nominal capacity at 20 °C (per battery)
- Max. power: 200 mW



Battery life → 11

Supply voltage via external power supply (optional)

- 100 to 240 V AC / 12 to 60 V DC
- 44 to 66 Hz
- Max. power: 3 W
- A battery to act as a back up if the power supply fails



Caution!

The values specified for the supply voltage may not be exceeded.

Power consumption

Switch-on current:

- Max. 30 A at 240 V AC
- Max. 6 A at 24 V DC

Power supply failure

Lasting min. ½ cycle frequency:

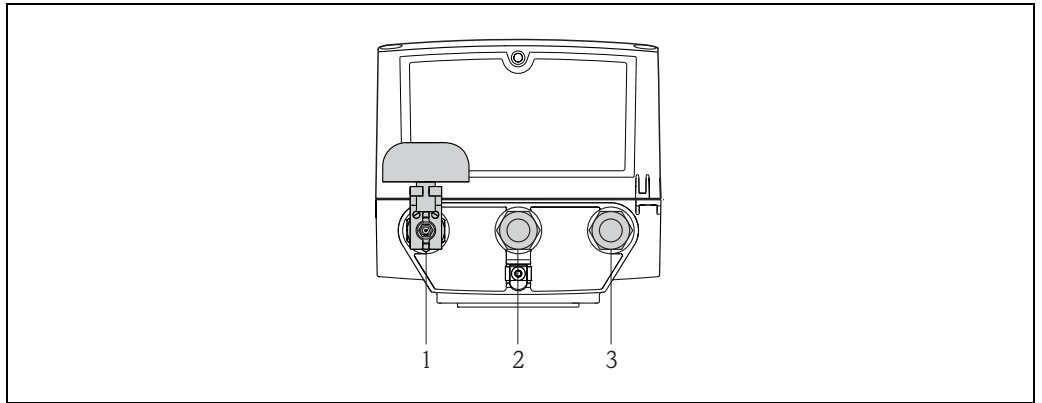


The battery in terminal B1 acts as a power backup if power is supplied to the measuring device externally and the power supply fails.

Electrical connection

Connecting the transmitter

Cable entries for the compact version

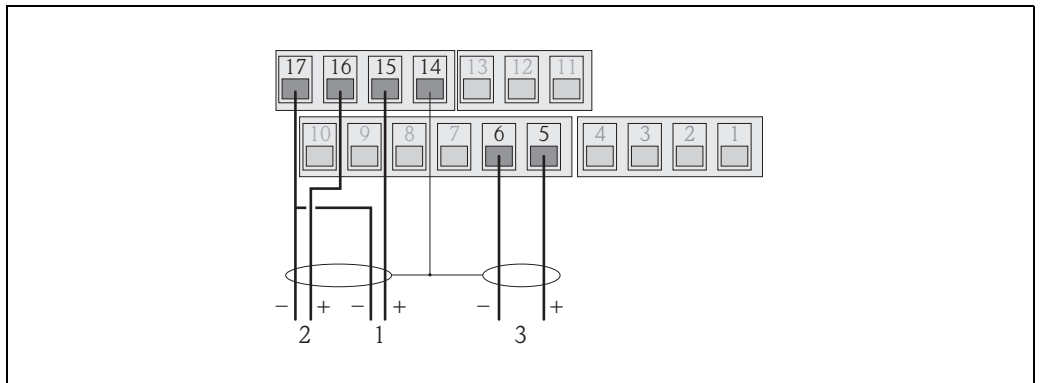


A0016457

Cable entries for the compact version

- 1 Connection terminal for GSM antenna (optional)
- 2 External power supply (optional)
- 3 Inputs/outputs

Connecting the inputs and outputs



A0017026

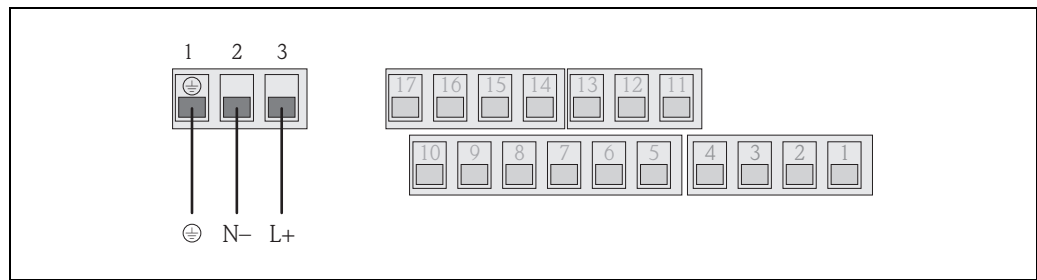
Connecting the outputs

- 1 Output 1
- 2 Output 2
- 3 Input 1

Inputs	
Terminal	Connection
5	Input 1 (+)
6	Input 1 (-)

Outputs	
Terminal	Connection
14	Shield, output 1 and 2
15	Output 1 (+)
16	Output 2 (+)
17	Output 1 and 2 (-)

Connecting the external power supply (optional)



A0017028

Connecting the external power supply (optional)

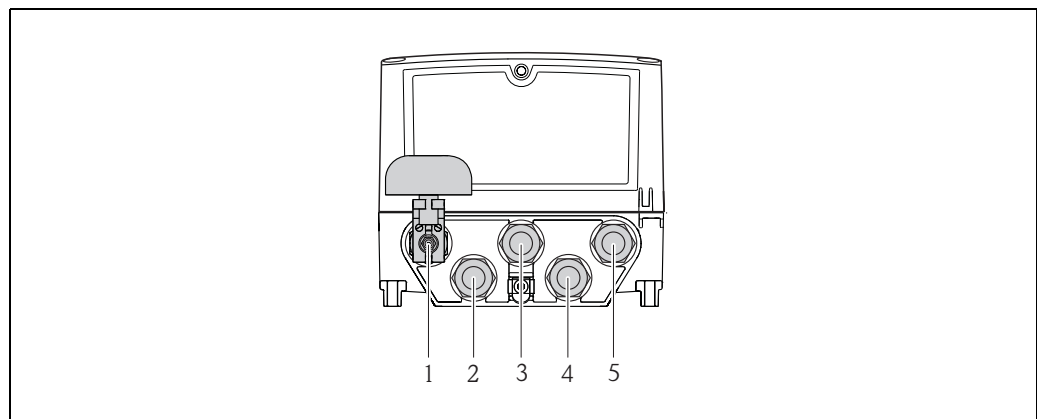
External power supply	
Terminal	Connection
1	Protective ground
2	N -
3	L +

Orderable combinations:

Ordered feature "Power supply"	Power supply	Number of batteries
5W8B**_***J*****	100 to 240 V AC 12 to 60 V DC	1 back-up battery
5W8B**_***K*****	100 to 240 V AC 12 to 60 V DC	1 back-up battery 3 batteries for GSM/GPRS module

Connecting the remote version

Cable entries for the remote version

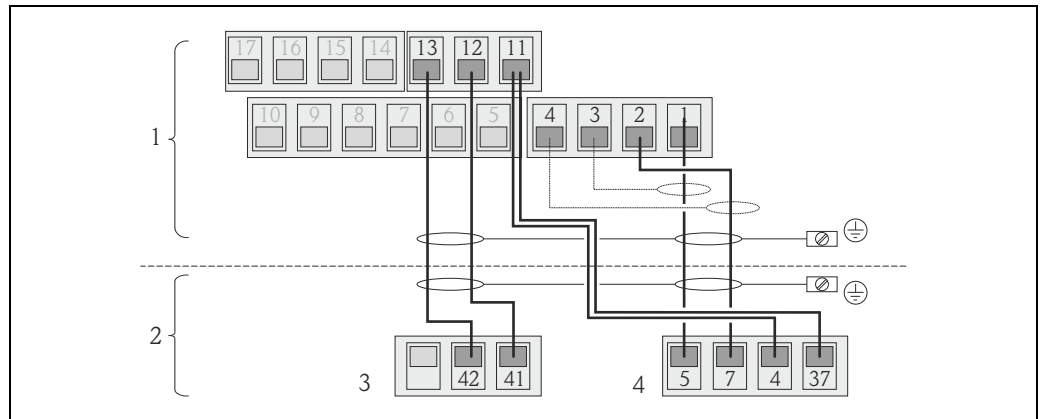


A0016458

Cable entries for the remote version

- 1 Connection terminal for GSM antenna (optional)
- 2 External power supply (optional)
- 3 Inputs/outputs
- 4 Coil current cable
- 5 Electrode cable

Connecting the remote version



A0017027

Connecting the remote version

- 1 Transmitter terminals
- 2 Sensor terminals
- 3 Coil current cable
- 4 Electrode cable

Sensor	
Terminal	Connection
5	Electrode E1 (brown)
7	Electrode E2 (white)
4	Reference electrode,
37	Terminals bridged (green)
41	Coil current cable B2 (black)
42	Coil current cable B1 (black)

Transmitter	
Terminal	Connection
1	Electrode E1 (brown)
2	Electrode E2 (white)
3	Shield, electrode E1 (brown)
4	Shield, electrode E2 (white)
11	Reference electrode (green)
12	Coil current cable B2 (black)
13	Coil current cable B1 (black)

Potential equalization

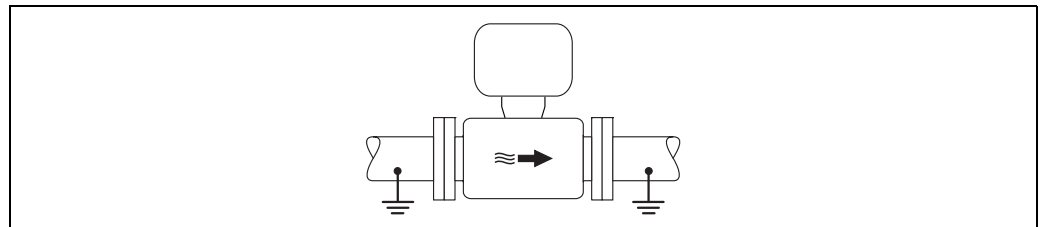
Requirements

Please consider the following to ensure correct measurement:

- The fluid and sensor have the same electrical potential
- Company-internal grounding concepts
- Material and grounding of the pipes

Connection example in standard situations

Metal, grounded pipe



A0016315

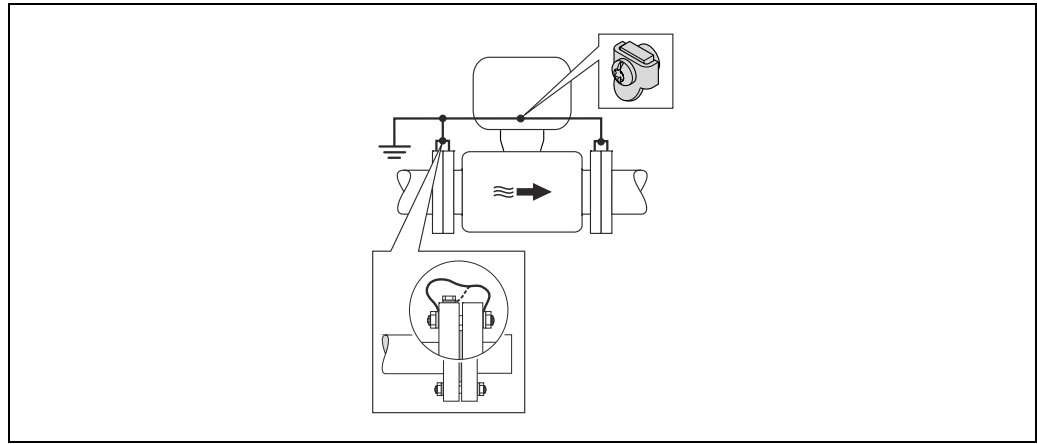
Potential equalization via Measuring tube

Connection example in special situations

Metal, ungrounded pipe without liner

This connection method is also to be used when:

- Potential equalization is not customary
- Equalizing currents are present



Potential equalization via ground terminal and pipe flanges

For mounting consider the following:

- Connect both sensor flanges to the particular pipe flange via a ground cable and ground them. Ground cable = copper wire, at least 6 mm² (0.0093 in²).
- Connect the transmitter or sensor connection housing, as applicable, to ground potential by means of the ground terminal provided for the purpose. For mounting the ground cable: Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.



For remote version: The ground terminal in the example refers to the sensor and **not** to the transmitter.

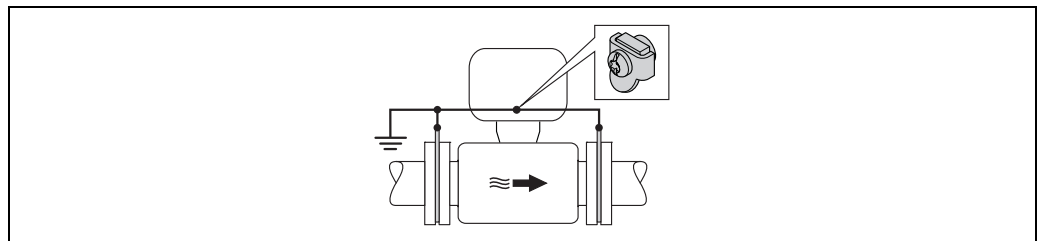


The required ground cable can be ordered from Endress+Hauser → 44.

Plastic pipe or pipe with insulating lining

This connection method is also to be used when:

- Potential equalization is not customary
- Equalizing currents are present




Potential equalization via ground terminal and ground disk

For mounting consider the following:

The ground disks have to be connected to the ground terminal via a ground cable and to the ground potential. Ground cable = copper wire, at least 6 mm² (0.0093 in²).



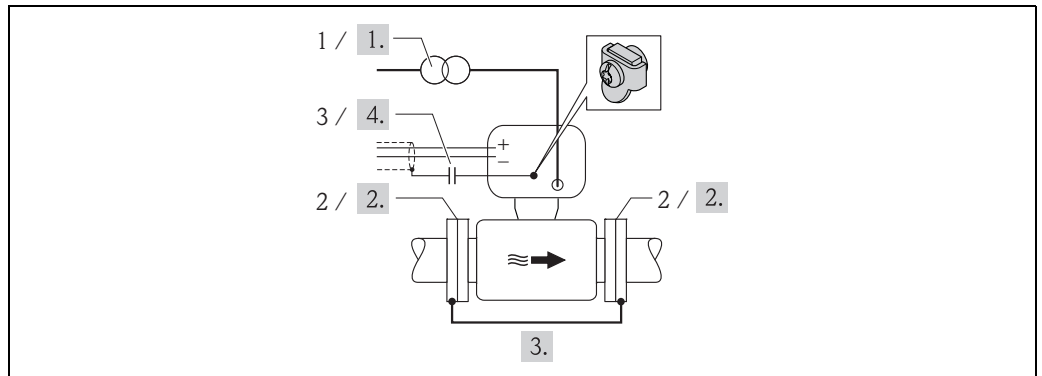
For remote version: The ground terminal in the example refers to the sensor and **not** to the transmitter.

 The required ground cable can be ordered from Endress+Hauser → [44](#).

Pipe with cathodic protection

This connection method only take place, if both of the following requirements are fulfilled:


- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the operator protection




Potential equalization and cathodic protection

- 1 Isolating transformer power supply
- 2 Electrically isolated to pipe
- 3 Capacitor

1. Connect the measuring device potential-free compared to protective earth to the power supply.
2. Install the measuring device electrically isolated in the pipe.
3. Connect the two flanges of the pipe with a ground cable.
Ground cable = copper wire, at least 6 mm² (0.0093 in²).
4. By connecting the shielding of the signal cables a capacitor has to be used.

 For remote version: The ground terminal in the example refers to the sensor and **not** to the transmitter.

 The required ground cable can be ordered from Endress+Hauser → [44](#).


Terminals

Plug-in terminals for core cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entry

Power supply cable, signal cable (inputs/outputs) and connecting cable for remote version

- Cable entry
 - Standard: M20 × 1.5 (8 to 12 mm / 0.31 to 0.47 in)
 - For reinforced cables: M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63 in)
- Thread: ½" NPT, G ½"

 If using metal cable entries, the optional ground plate for cable entries must be used.

Cable specification

- Permitted temperature range: -40 to 80 °C (-40 to 176 °F),
Minimum ambient temperature: + 20 K
- A shielded cable is recommended.
- Stripped length: 6 mm
- Strand (flexible): 2.5 mm²
- Cable diameter
 - With cable glands supplied: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
 - Plug-in screw terminals: core cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

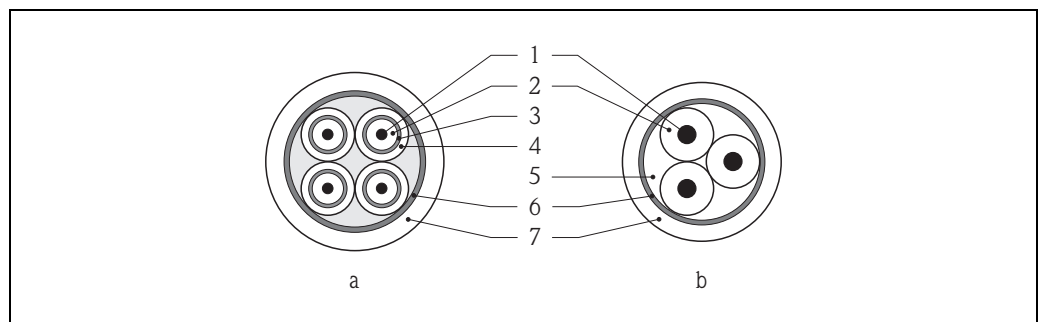
Remote version cable specifications

Electrode cable

- $3 \times 0.38 \text{ mm}^2$ PVC cable with common, braided copper shield ($\varnothing \sim 7 \text{ mm}$) and individually shielded cores
- Conductor resistance: $\leq 50 \text{ } \Omega/\text{km}$
- Capacitance: core/shield: $\leq 420 \text{ pF/m}$
- Operating temperature: -20 to $+80 \text{ } ^\circ\text{C}$ (-4 to $176 \text{ } ^\circ\text{F}$)
- Cable cross-section: max. 2.5 mm^2

Coil current cable

- $2 \times 0.75 \text{ mm}^2$ PVC cable with common, braided copper shield ($\varnothing \sim 7 \text{ mm}$)
- Conductor resistance: $\leq 37 \text{ } \Omega/\text{km}$
- Capacitance: core/core, shield grounded: $\leq 120 \text{ pF/m}$
- Operating temperature: -20 to $+80 \text{ } ^\circ\text{C}$ (-4 to $176 \text{ } ^\circ\text{F}$)
- Cable cross-section: max. 2.5 mm^2
- Test voltage for cable insulation: $\geq 1433 \text{ V AC r.m.s } 50/60 \text{ Hz}$ or $\geq 2026 \text{ V DC}$



A0003194

Cable cross-section

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

Reinforced connecting cables

As an option, Endress+Hauser can also deliver reinforced connecting cables with an additional, reinforcing metal braid.

Use a reinforced connecting cable in the following situations:

- When laying the cable directly in the ground
- Where there is a risk of damage from rodents
- If using the device below IP68 degree of protection

Operation in zones of severe electrical interference

The measuring device complies with the general safety requirements in accordance with EN 61010-1 and the EMC requirements of IEC/EN 61326.



Caution!

Grounding is by means of the ground terminals provided for the purpose inside the connection housing. Ensure that the stripped and twisted lengths of cable shield to the ground terminal are as short as possible.

Performance characteristics

Reference operating conditions

To DIN EN 29104

- Fluid temperature: $(+28 \pm 2) \text{ }^\circ\text{C} / (+82 \pm 4) \text{ }^\circ\text{F}$
- Ambient temperature range: $(+22 \pm 2) \text{ }^\circ\text{C} / (+72 \pm 4) \text{ }^\circ\text{F}$
- Warm-up period: 30 minutes

Installation conditions

- Inlet run $> 10 \times \text{DN}$
- Outlet run $> 5 \times \text{DN}$
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.



The minimum conductivity information refers to measured value acquisition with the "CONT.PWR" profile (continuous operation, the device records the maximum number of measured values, parameter Prof., MPROF). Values can deviate if another profile is selected for measured value acquisition.



No special requirements must be observed at the inlet and outlet runs to keep within the in-service maximum permissible errors for custody transfer.

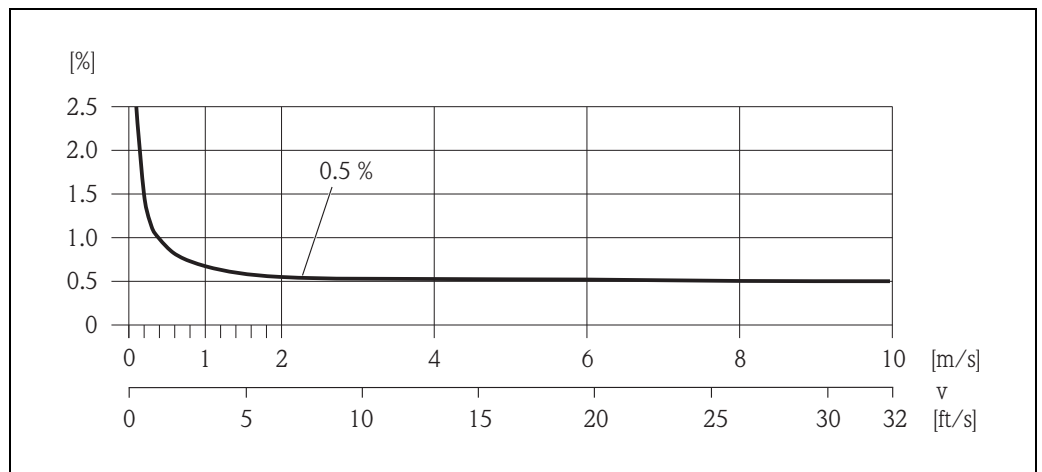
Maximum measured error

Pulse output

$\pm 0.5\%$ o.r. $\pm 2 \text{ mm/s}$ ($\pm 0.5\%$ o.r. $\pm 0.08 \text{ in/s}$)

o.r. = of reading

Fluctuations in the power supply do not have any effect within the specified range.



Max. measured error in % of reading

A0003200

Repeatability

Max. $\pm 0.2\%$ o.r. $\pm 2.0 \text{ mm/s}$ ($\pm 0.2\%$ o.r. $\pm 0.08 \text{ in/s}$)

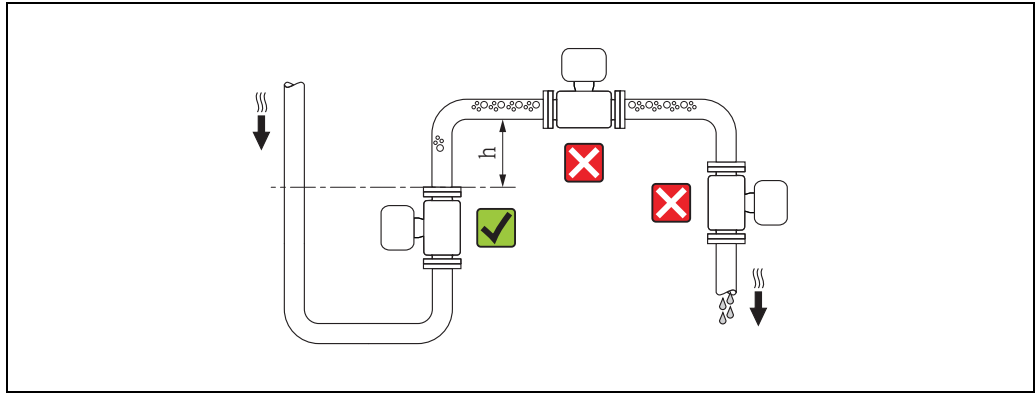
o.r. = of reading

Installation

No special measures such as supports are necessary.
External forces are absorbed by the construction of the device.

Mounting location

Preferably install the sensor in an ascending pipe,
and ensure a sufficient distance ($\geq 2 \times \text{DN}$) to the next pipe elbow.



Selecting the mounting location

To prevent measuring errors from gas bubbles accumulating in the measuring tube, avoid the following mounting locations in the pipe:

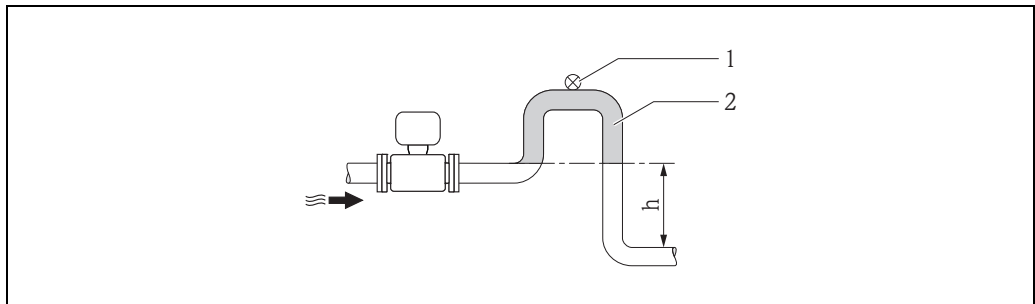
- Highest point of a pipeline
- Directly upstream of a free pipe outlet in a down pipe

Installation in down pipes

Install a siphon or a vent valve downstream of the sensor in down pipes whose length $h \geq 5 \text{ m}$ (16.4 ft). 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 pockets.



Information on the lining's resistance to partial vacuum can be found in the "Pressure tightness" section (\rightarrow 28)



Installation in a down pipe

- 1 Vent valve
2 Pipe siphon
h Length of down pipe, $h \geq 5 \text{ m}$ (16.4 ft)

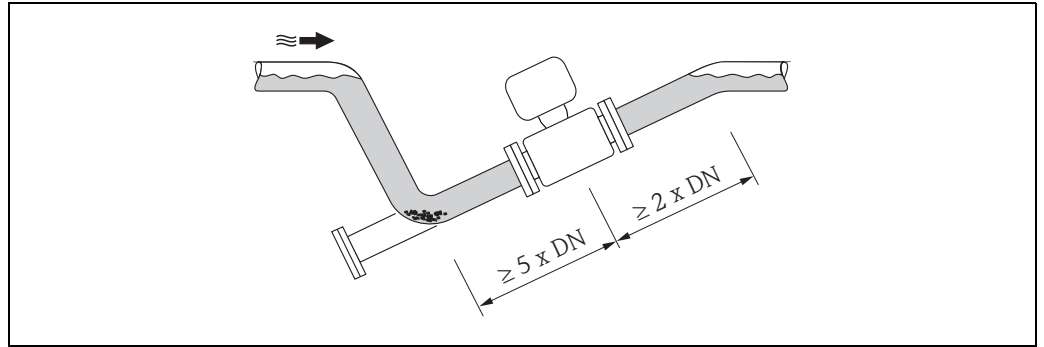
Installation in partially filled pipes with a gradient

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



Risk of solids accumulating.

- Do not install the sensor at the lowest point in the drain.
- It is advisable to install a cleaning valve.



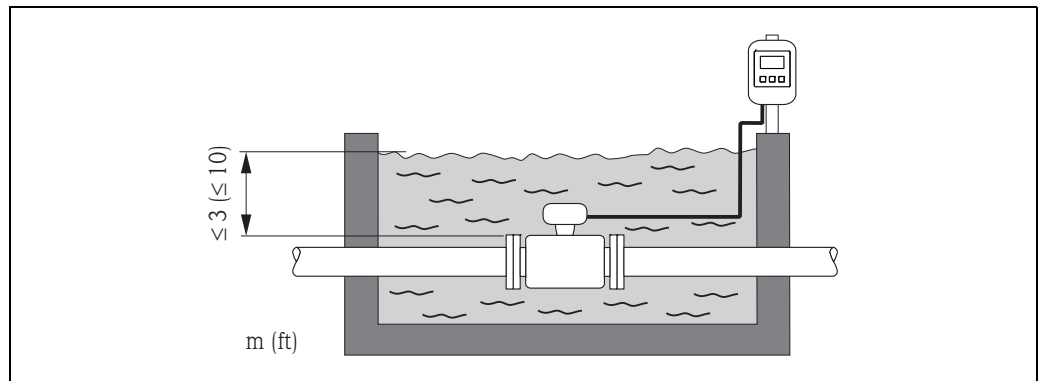
Installation in a partially filled pipe

For permanent immersion in water

The fully welded remote version of the measuring device can be immersed permanently in water to a depth of ≤ 3 m (10 ft) or 48 h at ≤ 10 m (30 ft). The measuring device satisfies diverse corrosion protection categories in accordance with EN ISO 12944. The fully welded design along with the connection compartment sealing system ensure that moisture cannot enter the measuring device.

The connecting cables of the remote version can be ordered:

- With pre-terminated cables that are already connected to the sensor.
- **Optionally:** With pre-terminated cables, where the cables are connected by the customer onsite (incl. tools for sealing the connection compartment).



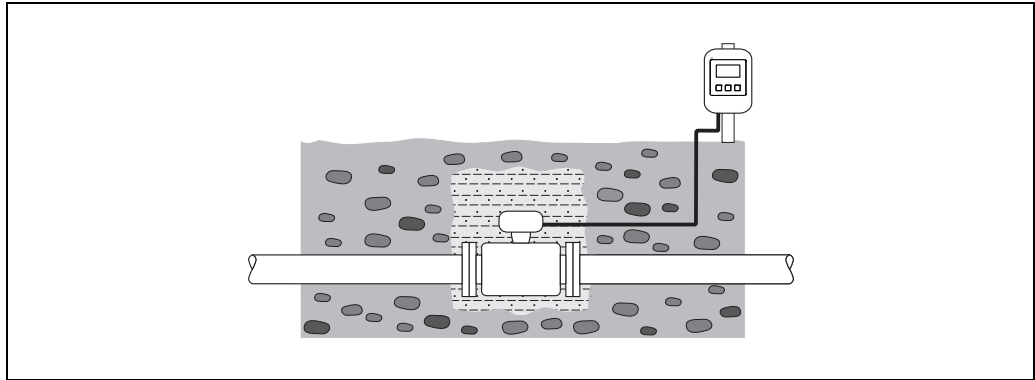
Installation for permanent immersion in water

For buried applications

The fully welded remote version of the measuring device can be used for buried applications. The measuring device satisfies the certified corrosion protection Im3 in accordance with EN ISO 12944. It can be used directly underground without the need for additional protective measures. The device is installed in accordance with the usual regional installation regulations (e.g. EN DIN 1610).

The connecting cables of the remote version can be ordered:

- With pre-terminated cables that are already connected to the sensor.
- **Optionally:** With pre-terminated cables, where the cables are connected by the customer onsite (incl. tools for sealing the connection compartment).



Installation for buried applications

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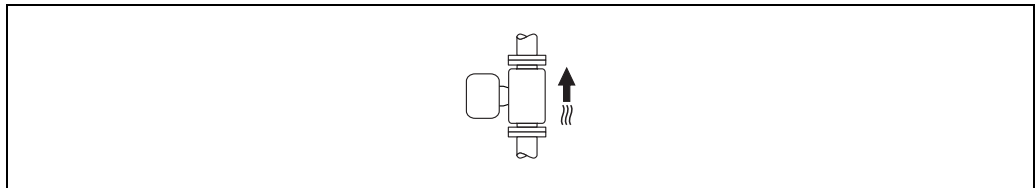
Orientation

The direction of the arrow on the sensor nameplate helps to match the sensor with the direction of flow (direction of fluid flow through the pipe).
An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube.

Vertical orientation

Vertical orientation is optimal in the following scenarios:

- For self-emptying piping systems.
- For sludge containing sand or stones where the solids tend to settle at the bottom.

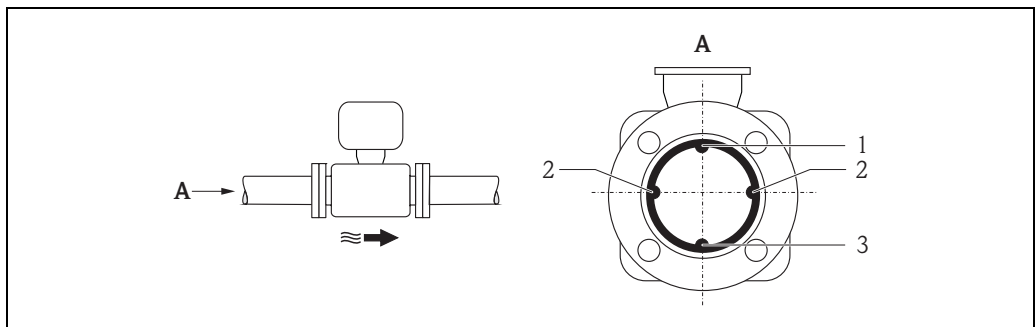


Vertical orientation

A0015591

Horizontal orientation

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



Horizontal orientation

A0016260

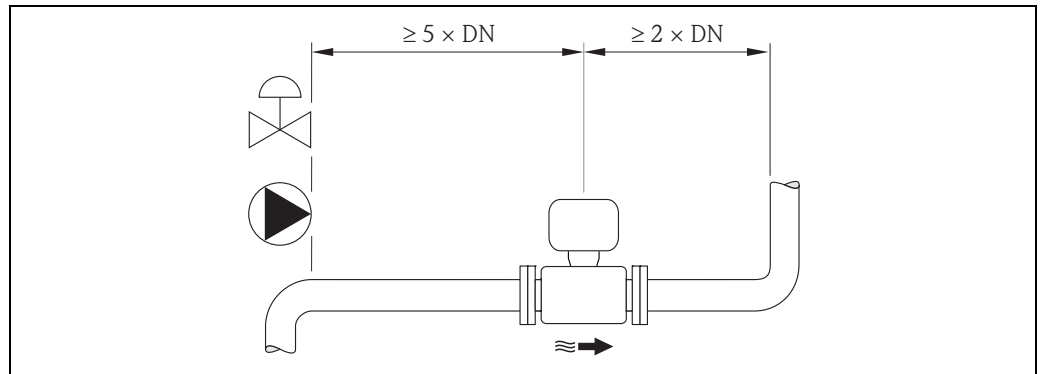
- 1 EPD electrode for the detection of empty pipes (not supported by the transmitter)
- 2 Measuring electrodes used for measuring signal pick up and empty pipe detection (EPD). An EPD alarm is triggered if there is no fluid between electrodes.
- 3 Reference electrode for potential equalization

Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces, elbows, etc.

Observe the following inlet and outlet runs to comply with accuracy specifications:

- Inlet run $\geq 5 \times DN$
- Outlet run $\geq 2 \times DN$



Inlet and outlet runs



No special requirements must be observed at the inlet and outlet runs to keep within the in-service maximum permissible errors for custody transfer.

Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes.

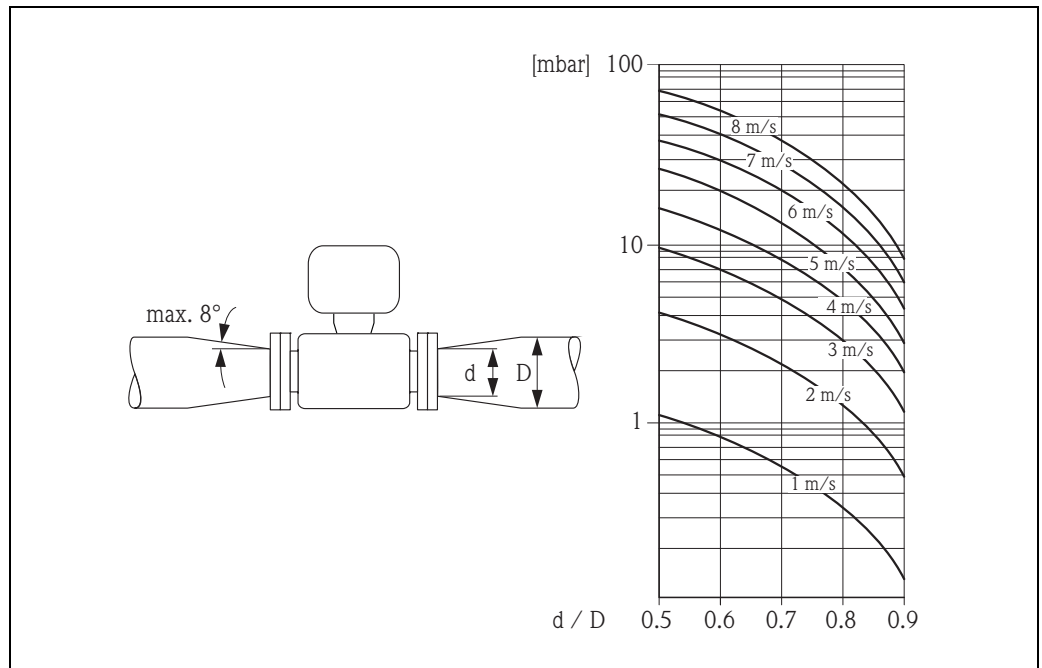
The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.



The nomogram only applies to liquids of viscosity similar to water.

Determining the pressure loss:

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.



Pressure loss due to adapters

Length of connecting cable

The maximum connecting cable length is 20 m (35.6 ft).



When mounting the remote version, please note the following to achieve correct measuring results:

- Fix the cable run or route it in an armored conduit. Cable movements can falsify the measuring signal especially in the case of low fluid conductivities.
 - Route the cable well clear of electrical machines and switching elements.
 - Ensure potential equalization between sensor and transmitter, if necessary.
-

Special installation**Display protection**

To ensure that the optional display protection can be easily opened, maintain the following minimum head clearance: 350 mm (13.8 in)

Environment

Ambient temperature range	<p>Transmitter</p> <p>–20 to +60 °C (–4 to +140 °F)</p> <p>Sensor</p> <ul style="list-style-type: none"> ▪ Flange material carbon steel: –10 to +60 °C (14 to +140 °F) <p> The permitted temperature range of the measuring tube lining may not be undershot or overshot, "Medium temperature range" section.</p> <p>Note the following points:</p> <ul style="list-style-type: none"> ▪ Install the measuring device in a shady location. <ul style="list-style-type: none"> – Avoid direct sunlight, particularly in warm climatic regions. – Avoid direct exposure to weather conditions. If necessary use a protective cover or weather protector. ▪ The transmitter must be mounted separate from the sensor if both the ambient and fluid temperatures are high. ▪ If the measuring device is to be operated with the AVERAGE, SMART or MAX.LIFE profile at low ambient temperatures, regular housing heating should be provided if necessary.
Storage temperature	<p>The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.</p> <p>Note the following points:</p> <ul style="list-style-type: none"> ▪ The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures. ▪ A storage location must be selected where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner. ▪ Never remove any protection caps or protective covers mounted before installing the measuring device. ▪ Also be mindful of the following when storing the batteries: <ul style="list-style-type: none"> – Avoid any short-circuiting of the battery poles. – The storage temperature should preferably be ≤ 21 °C (70 °F). – Store in a dry, dust-free atmosphere that is not subject to large fluctuations in temperature. – Protect from sunlight. – Do not store near heaters.
Altitude	<p>–200 to +4000 m (–656 to +13124 ft)</p>
Atmosphere	<p>If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing.</p> <p> If you are unsure, please contact your Endress+Hauser Sales Center for clarification.</p>
Degree of protection	<p>Transmitter</p> <ul style="list-style-type: none"> ▪ Standard: IP66/67, Type 4X enclosure ▪ When housing is open: IP20, Type 1 enclosure <p>Sensor</p> <ul style="list-style-type: none"> ▪ IP66/67, Type 4X enclosure; fully welded, with protective varnish EN ISO 12944 C5-M. Suitable for use in corrosive atmospheres. ▪ IP68, Type 6P enclosure; fully welded, with protective varnish EN ISO 12944 C5-M. Suitable for permanent immersion in water ≤ 3 m (10 ft). <ul style="list-style-type: none"> ≤ 10 m (30 ft) for 48 hours. ▪ IP68, Type 6P enclosure; fully welded, with protective varnish EN ISO 12944 Im2/Im3. Suitable for permanent immersion in saline water ≤ 3 m (10 ft) or underground. <ul style="list-style-type: none"> ≤ 10 m (30 ft) for 48 hours.

Shock and vibration resistance

- Vibration sinusoidal, 1 g peak, following IEC 60068-2-6
- Vibration broadband random, 1.54 g rms, following IEC 60068-2-64

Mechanical load**Transmitter housing**

- The transmitter housing must be protected against mechanical effects, such as shock, impact etc. It is sometimes preferable to use the remote device version.
- The transmitter housing must never be used as a ladder or climbing aid!

Electromagnetic compatibility (EMC)

In accordance with IEC/EN 61326

GSM/GPRS signal strength

It is important to ensure that the signal of the mobile communications network is strong enough to enable the system to dial into the GPRS/GSM network.

Process

Medium temperature range**Sensor**

The permissible temperature depends on the lining of the measuring tube.

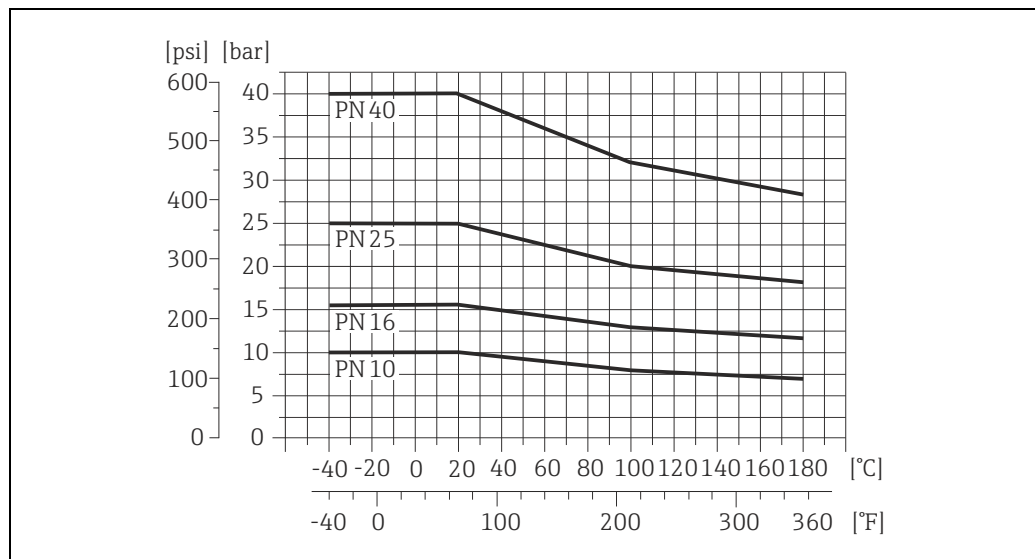
- -20 to +50 °C (-4 to +122 °F) for polyurethane
- 0 to +80 °C (+32 to +176 °F) for hard rubber, DN 50 to 300 (2 to 12")

Conductivity

The minimum conductivity is 50 µS/cm.

Pressure-temperature ratings

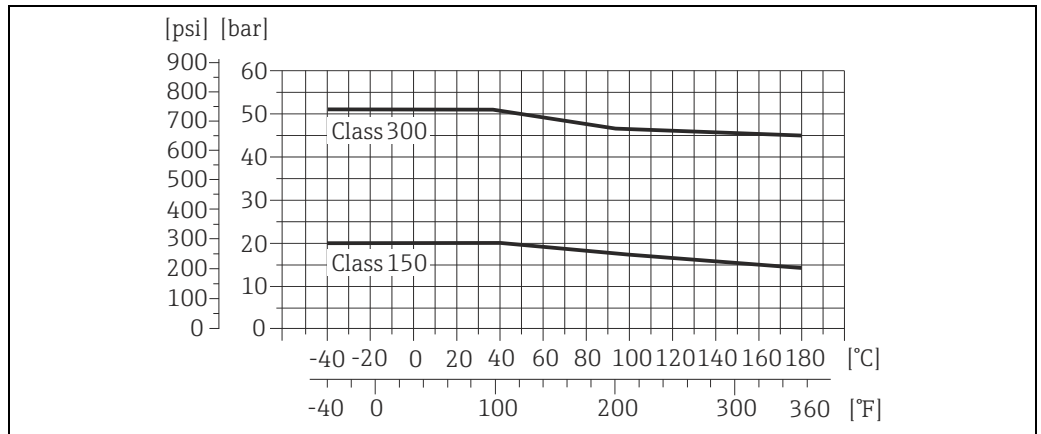
The following material load diagrams refer to the entire device and not just the process connection.

Flange connection according to EN 1092-1 (DIN 2501)

PN 10/16/25/40: materials C22, FE 410 WB and S235JRG2

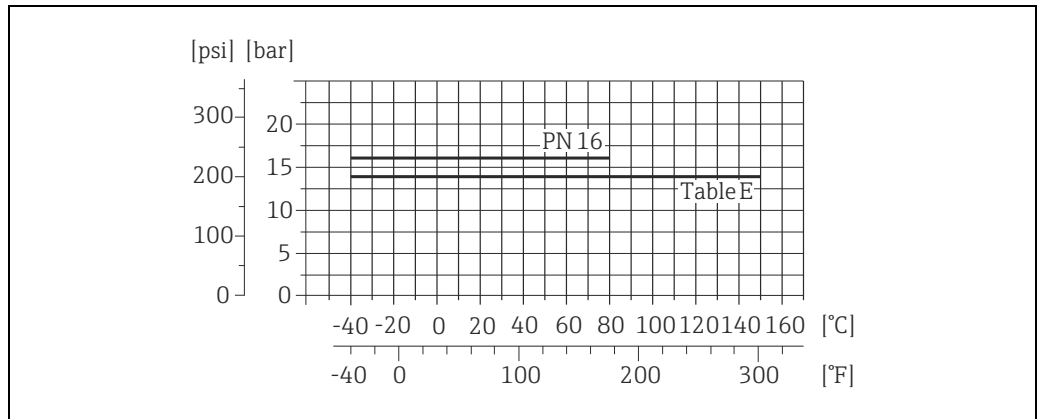
A0022705-EN

Flange connection according to ASME B16.5



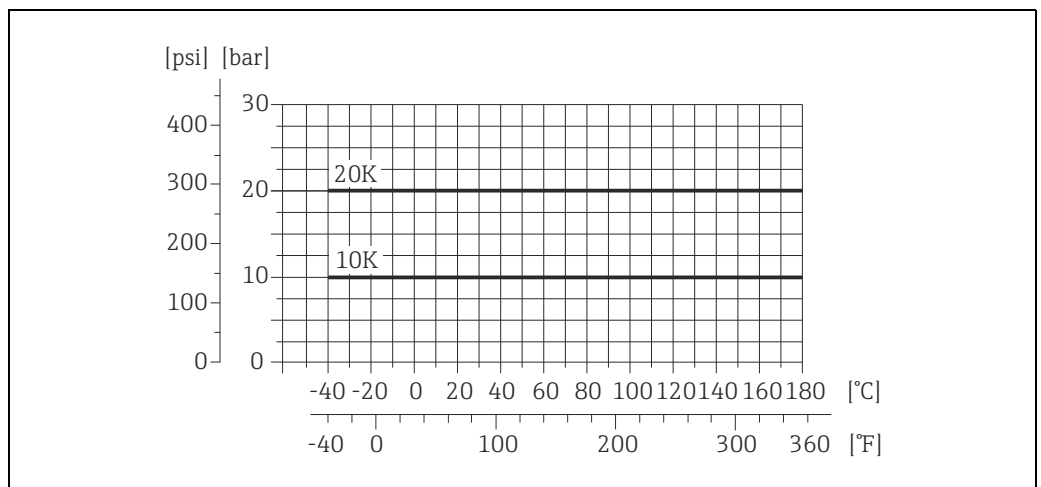
Class 150/300: material A105

Flange connection according to AS 2129 and AS 4087



AS 2129: materials A105, S235JRG2 and S275JR;
AS 4087: materials A105 and S275JR

Flange connection according to JIS B2220



10K/20K: materials 1.0425, HII and S235JRG2

Pressure tightness

Liner: polyurethane, hard rubber

Promag W Nominal diameter		Measuring tube liner	Liner pressure tightness: limit values for absolute pressure at different fluid temperatures		
[mm]	[in]		25 °C (77 °F) [mbar]/[psi]	50 °C (122 °F) [mbar]/[psi]	80 °C (176 °F) [mbar]/[psi]
25 to 300	1 to 12"	Polyurethane	0	0	-
50 to 300	2 to 12"	Hard rubber	0	0	0

Limiting flow

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 and 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:

- $v < 2$ m/s ($v < 6.5$ ft/s): for abrasive fluids (potter's clay, lime milk, ore slurry etc.)
- $v > 2$ m/s ($v > 6.5$ ft/s): for fluids producing buildup (wastewater sludge etc.)

Flow characteristic values in SI units

Nominal diameter [mm]	Recommended flow min./max. full scale value ($v \approx 0.5$ or 10 m/s)	Full scale value ($v \approx 2.5$ m/s)	Factory setting	
			Pulse value approx. 2 pulse/s for ($v \approx 2.5$ m/s)	Low flow cut off ($v \approx 0.04$ m/s)
25	15 to 295 dm ³ /min	75 dm ³ /min	0.03 dm ³	2 dm ³ /min
32	25 to 485 dm ³ /min	125 dm ³ /min	0.05 dm ³	4 dm ³ /min
40	40 to 755 dm ³ /min	200 dm ³ /min	0.08 dm ³	6 dm ³ /min
50	60 to 1180 dm ³ /min	300 dm ³ /min	0.10 dm ³	10 dm ³ /min
65	100 to 2000 dm ³ /min	500 dm ³ /min	0.20 dm ³	15 dm ³ /min
80	150 to 3020 dm ³ /min	750 dm ³ /min	0.30 dm ³	20 dm ³ /min
100	240 to 4750 dm ³ /min	1200 dm ³ /min	0.50 dm ³	40 dm ³ /min
125	370 to 7400 dm ³ /min	1850 dm ³ /min	0.75 dm ³	60 dm ³ /min
150	32 to 640 m ³ /h	150 m ³ /h	0.001 m ³	5 m ³ /h
200	58 to 1135 m ³ /h	300 m ³ /h	0.002 m ³	10 m ³ /h
250	90 to 1800 m ³ /h	500 m ³ /h	0.003 m ³	15 m ³ /h
300	130 to 2500 m ³ /h	750 m ³ /h	0.004 m ³	20 m ³ /h

Flow characteristic values in US units

Nominal diameter [in]	Recommended flow min./max. full scale value ($v \approx 0.5$ or 10 m/s)	Full scale value ($v \approx 2.5$ m/s)	Factory setting	
			Pulse value approx. 2 pulse/s for ($v \approx 2.5$ m/s)	Low flow cut off ($v \approx 0.04$ m/s)
1"	4 to 80 gal/min	20 gal/min	0.008 gal	0.60 gal/min
-	7 to 130 gal/min	30 gal/min	0.015 gal	1.00 gal/min
1 1/2"	10 to 200 gal/min	50 gal/min	0.02 gal	1.50 gal/min
2"	16 to 320 gal/min	80 gal/min	0.03 gal	2.50 gal/min
2 1/2"	28 to 530 gal/min	150 gal/min	0.05 gal	4.00 gal/min
3"	40 to 800 gal/min	200 gal/min	0.08 gal	6.00 gal/min
4"	65 to 1200 gal/min	300 gal/min	0.15 gal	10.0 gal/min
5"	100 to 1900 gal/min	500 gal/min	0.20 gal	15.0 gal/min
6"	142 to 2800 gal/min	700 gal/min	0.30 gal	20.0 gal/min
8"	250 to 4900 gal/min	1200 gal/min	0.50 gal	40.0 gal/min
10"	390 to 7700 gal/min	2000 gal/min	0.80 gal	60.0 gal/min
12"	570 to 11000 gal/min	3000 gal/min	1.15 gal	80.0 gal/min

Pressure loss

- No pressure loss if the sensor is installed in a pipe of the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 (see "Adapters" → 23)

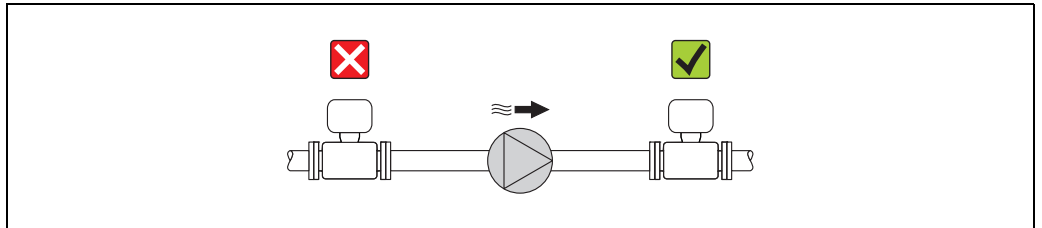
System pressure

Sensors may not be installed on the pump suction side. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube.

i Information on the lining's resistance to partial vacuum can be found in the "Pressure tightness" section → 28.

If reciprocating, diaphragm or peristaltic pumps are used, it might be necessary to install pulse dampers.

i For information on the measuring system's resistance to vibration and shock, see the "Shock resistance" and "Vibration resistance" sections → 26.



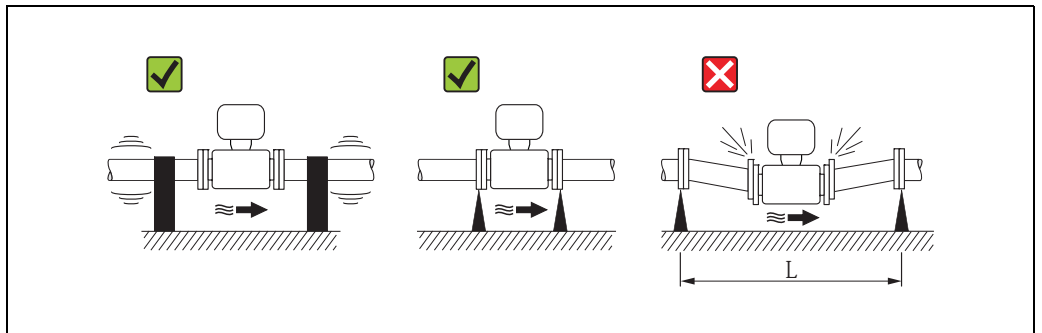
Installation if using pumps

A0015594

Vibrations

In the event of very strong vibrations, the pipe and sensor must be supported and fixed. It is also advisable to mount the sensor and transmitter separately.

i For information on the measuring system's resistance to vibration and shock, see the "Shock resistance" and "Vibration resistance" sections → 26.



Measures to prevent vibration of the device

$L > 10\text{ m (33 ft)}$

A0016266

Corrosive environment

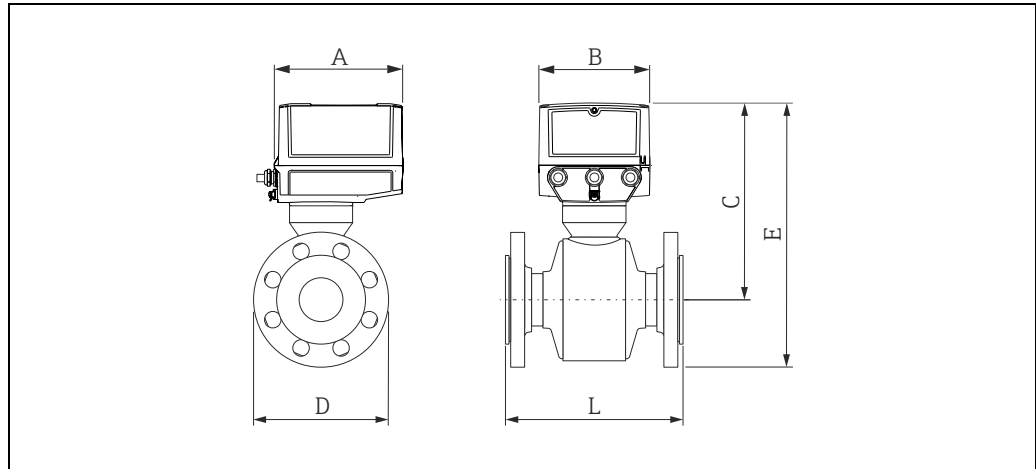
The fully welded remote version of the measuring device can be immersed permanently in in corrosive (saline) environments.

The measuring device satisfies the certified corrosion protection in accordance with EN ISO 12944 C5M. The fully welded design along with the varnish finish ensure that the device can be used in saline environments.

Mechanical construction

Design, dimensions

Compact version, fully welded (IP66/67)



A0022694

Dimensions in SI units

DN ¹⁾ [mm]	L [mm]	A [mm]	B [mm]	C [mm]
25	200	189	165	261
32	200	189	165	261
40	200	189	165	261
50	200	189	165	261
65	200	189	165	273
80	200	189	165	278
100	250	189	165	291
125	250	189	165	304
150	300	189	165	325
200	350	189	165	351
250	450	189	165	384
300	500	189	165	409

¹⁾ EN (DIN), AS, JIS: For flanges according to AS, only nominal diameters DN 80, 100 and 150 to 300 are available.

Dimension D										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Cl. 150 [mm]	Cl. 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	-	-	-	140	140	140	140	-	140	140
32	-	-	-	140	-	-	-	-	140	140
40	-	-	-	150	140	155	-	-	140	140
50	-	-	-	165	153	165	150	150	155	155
65	-	185	-	185	-	-	-	-	175	175
80	-	200	-	200	191	210	185	185	185	200
100	-	220	-	325	229	254	215	215	210	225
125	-	250	-	270	-	-	-	-	250	270
150	-	285	-	300	280	318	280	280	280	305
200	340	340	360	-	343	-	335	335	330	350
250	395	405	425	-	407	-	405	405	400	430
300	445	460	485	-	483	-	455	455	445	480

Dimension E										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Cl. 150 [mm]	Cl. 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	-	-	-	258	258	258	258	-	258	258
32	-	-	-	258	-	-	-	-	258	258
40	-	-	-	262	258	265	-	-	258	258
50	-	-	-	270	263	270	262	262	265	265
65	-	293	-	293	-	-	-	-	288	288
80	-	305	-	305	300	309	298	298	298	305
100	-	328	-	380	331	344	325	325	323	330
125	-	355	-	365	-	-	-	-	355	365
150	-	394	-	402	391	410	393	393	393	404
200	448	448	458	-	448	-	445	445	443	452
250	508	513	523	-	514	-	513	513	511	526
300	558	566	578	-	578	-	563	563	558	576

Dimensions in US units

DN ¹⁾ [in]	L [in]	A [in]	B [in]	C [in]
1"	7.87	7.44	6.50	10.3
2"	7.87	7.44	6.50	10.3
3"	7.87	7.44	6.50	10.9
4"	9.84	7.44	6.50	11.5
6"	11.8	7.44	6.50	12.8
8"	13.8	7.44	6.50	13.8
10"	17.7	7.44	6.50	15.1
12"	19.7	7.44	6.50	16.1

¹⁾ ASME

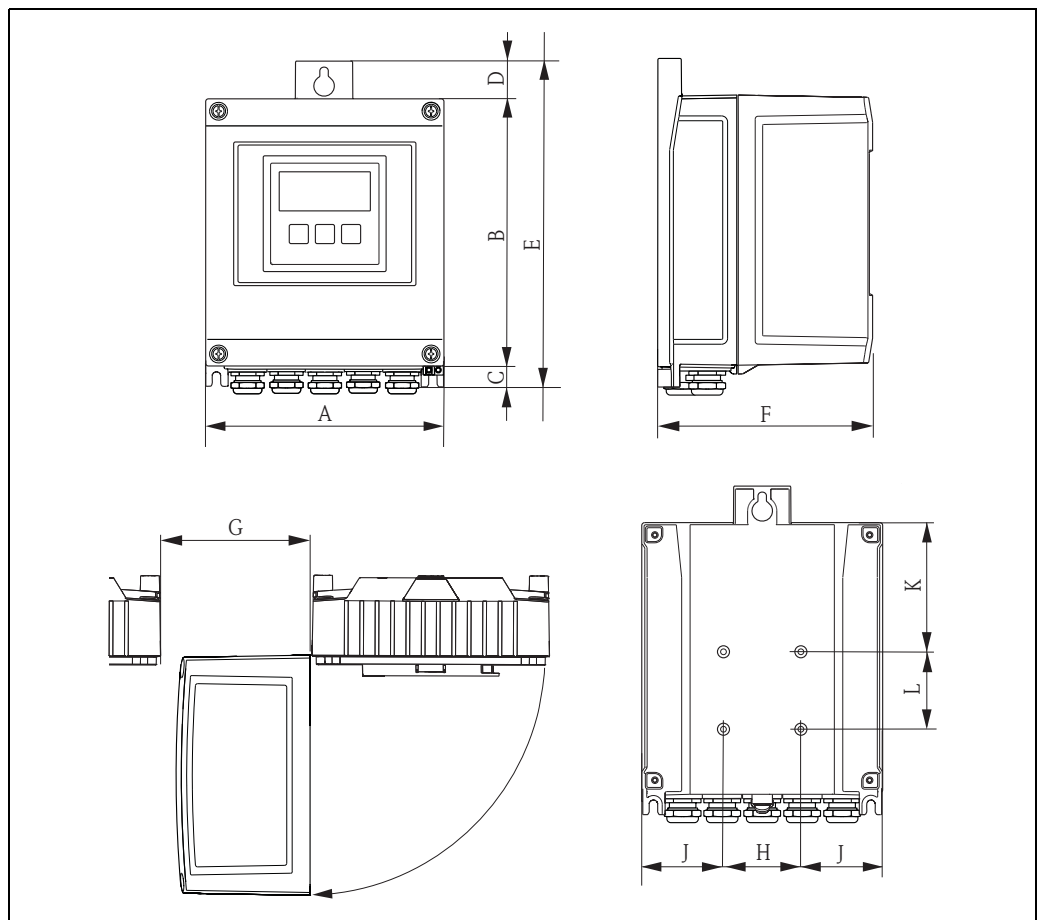
Dimension D										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Cl. 150 [in]	Cl. 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1	-	-	-	5.51	5.51	5.51	5.51	-	5.51	5.51
2	-	-	-	6.50	6.02	6.50	5.91	5.91	6.10	6.10
3	-	7.87	-	7.87	7.52	8.72	7.28	7.28	7.28	7.87
4	-	8.66	-	12.8	9.02	10.0	8.46	8.46	8.27	8.86
6	-	11.2	-	11.8	11.0	12.5	11.0	11.0	11.0	12.0
8	13.4	13.4	14.2	-	17.1	-	13.2	13.2	13.0	13.8
10	15.6	15.9	16.7	-	16.0	-	15.9	15.9	15.8	16.9
12	17.5	18.1	19.1	-	19.0	-	17.9	17.9	17.5	18.9

Dimension E										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Cl. 150 [in]	Cl. 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1	-	-	-	10.2	10.2	10.2	10.2	-	10.2	10.2
2	-	-	-	10.6	10.4	10.6	10.3	10.3	10.4	10.4
3	-	12.0	-	12.0	11.8	12.2	11.7	11.7	11.7	12.0
4	-	12.9	-	15.0	13.0	13.5	12.8	12.8	12.7	13.0

Dimension E										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Cl. 150 [in]	Cl. 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
6	-	15.5	-	15.8	15.4	16.1	15.5	15.5	15.5	15.9
8	17.6	17.6	18.0	-	17.6	-	17.5	17.5	17.4	17.8
10	20.0	20.2	20.6	-	20.2	-	20.2	20.2	20.1	20.7
12	22.0	22.3	22.8	-	22.8	-	22.2	22.2	22.0	22.7

Transmitter remote version, wall-mount housing

"Housing" order feature, option N: remote, polycarbonate



A0017347

Dimensions in SI units

A	B	C	D	E	F	G	H	J	K	L
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
165	185	15	25	225	151.5	50	53	56	88.5	53

Dimensions in US units

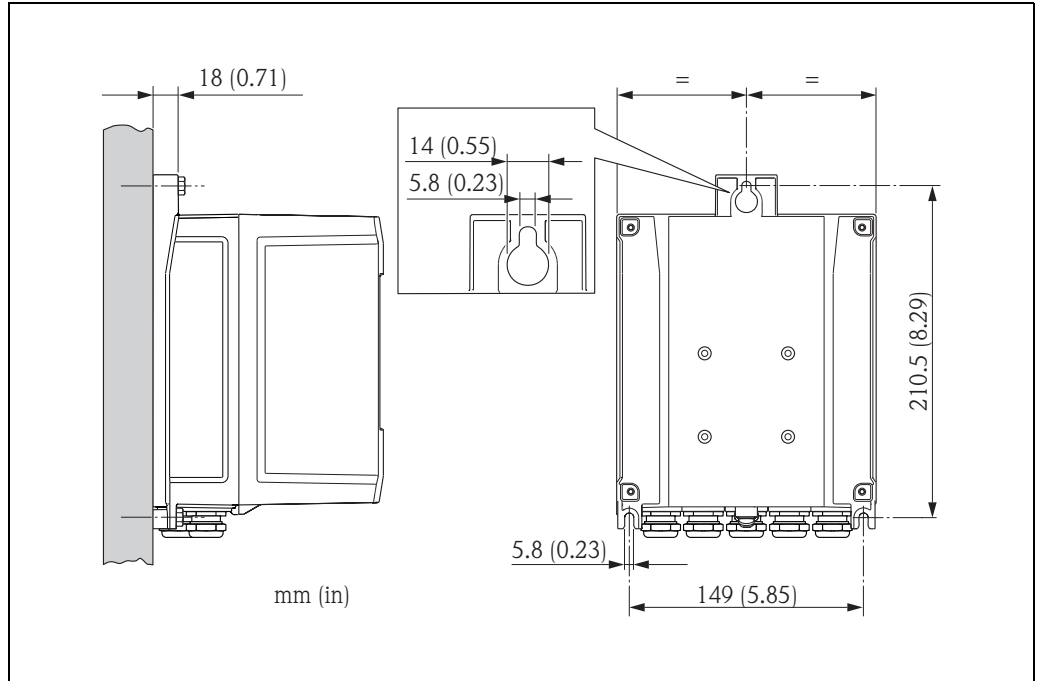
A	B	C	D	E	F	G	H	J	K	L
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
6.50	7.28	0.59	0.98	8.86	5.96	1.97	2.09	2.20	3.48	2.09

Installing the wall-mount housing

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

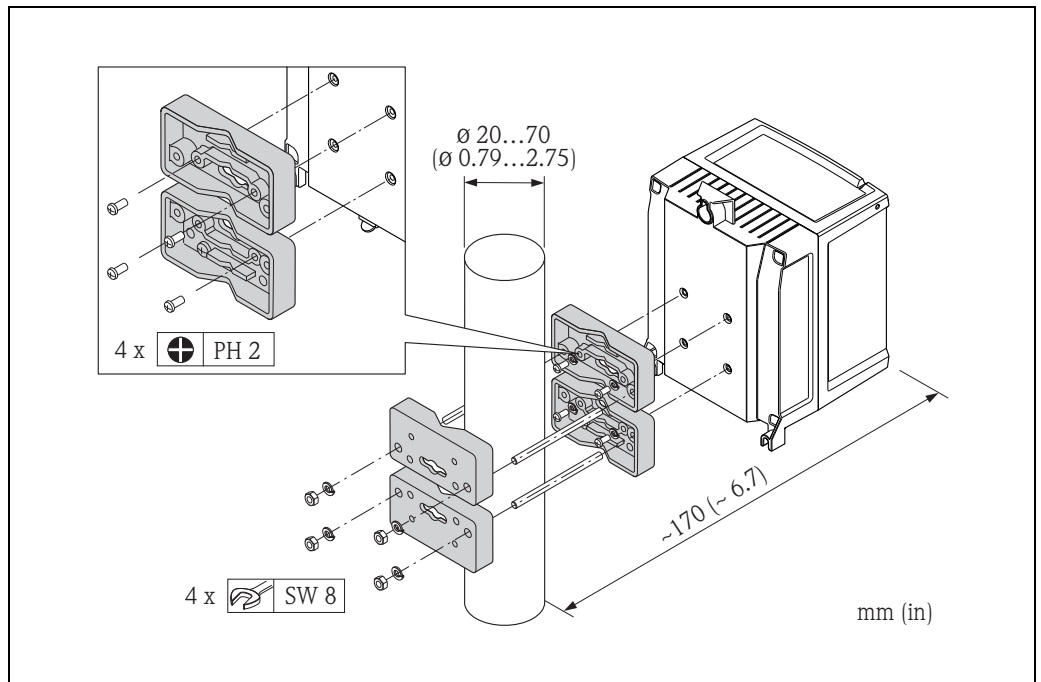
- Direct wall mounting
- Pipe mounting (with separate mounting kit, accessories → 44)

Direct wall mounting



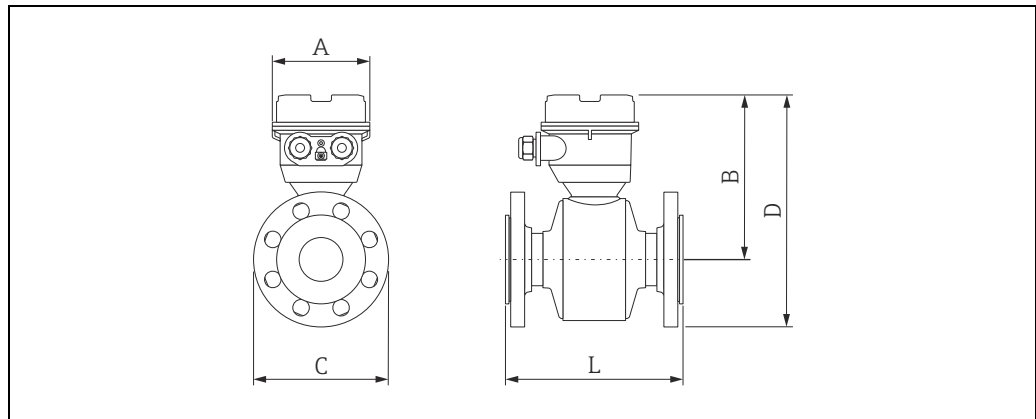
A0016411

Pipe mounting



A0016412

Remote version sensor, fully welded (IP68)



A0020399

Dimensions in SI units

DN [mm]	L [mm]	A [mm]	B [mm]
25	200	112	189
32	200	112	189
40	200	112	189
50	200	112	189
65	200	112	189
80	200	112	189
100	250	112	189
125	250	112	202
150	300	112	207
200	350	112	219
250	450	112	232
300	500	112	254

Dimension C										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Cl. 150 [mm]	Cl. 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	-	-	-	140	140	140	140	-	140	140
32	-	-	-	140	-	-	-	-	140	140
40	-	-	-	150	140	155	-	-	140	140
50	-	-	-	165	152	165	150	150	155	155
65	-	185	-	185	-	-	-	-	175	175
80	-	200	-	200	191	210	185	185	185	200
100	-	220	-	325	229	254	215	215	210	225
125	-	250	-	270	-	-	-	-	250	270
150	-	285	-	300	279	318	280	280	280	305
200	340	340	360	-	343	-	335	335	330	350
250	395	405	425	-	406	-	405	405	400	430
300	445	460	485	-	483	-	455	455	445	480

Dimension D										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Cl. 150 [mm]	Cl. 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	-	-	-	260	260	260	260	-	260	260
32	-	-	-	260	-	-	-	-	260	260
40	-	-	-	264	260	267	-	-	260	260
50	-	-	-	272	265	272	264	264	267	267
65	-	295	-	295	-	-	-	-	290	290
80	-	307	-	307	302	311	300	300	300	307
100	-	330	-	382	333	346	327	327	325	332
125	-	357	-	367	-	-	-	-	357	367
150	-	396	-	404	393	412	395	395	395	406
200	450	450	460	-	450	-	447	447	445	454
250	510	515	525	-	516	-	515	515	513	528
300	560	568	580	-	580	-	565	565	560	578

Dimensions in US units

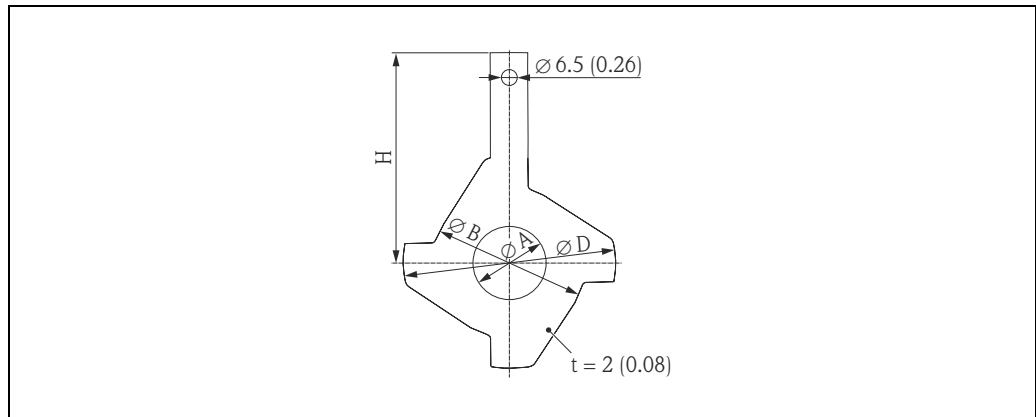
DN [mm]	L [mm]	A [mm]	B [mm]
1"	7,87	4,41	7,44
2"	7,87	4,41	7,44
3"	7,87	4,41	8,15
4"	9,84	4,41	8,62
6"	11,8	4,41	10,0
8"	13,8	4,41	11,0
10"	17,7	4,41	12,3
12"	19,7	4,41	13,3

Dimension C										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Cl. 150 [in]	Cl. 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1"	-	-	-	5.51	5.51	5.51	5.51	-	5.51	5.51
2"	-	-	-	6.50	6.00	6.50	5.91	5.91	6.10	6.10
3"	-	7.87	-	7.87	7.50	8.25	7.28	7.28	7.28	7.87
4"	-	8.66	-	12.8	9.00	10.0	8.46	8.46	8.27	8.86
6"	-	11.2	-	11.8	11.0	12.5	11.0	11.0	11.0	12.0
8"	13.4	13.4	14.2	-	13.5	-	13.2	13.2	13.0	13.8
10"	15.6	15.9	16.7	-	16.0	-	15.9	15.9	15.8	16.9
12"	17.5	18.1	19.1	-	19.0	-	17.9	17.9	17.5	18.9

Dimension D										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Cl. 150 [in]	Cl. 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1"	-	-	-	10.2	10.2	10.2	10.2	-	10.2	10.2
2"	-	-	-	10.7	10.4	10.7	10.4	10.4	10.5	10.5
3"	-	12.1	-	12.1	11.9	12.2	11.8	11.8	11.8	12.1
4"	-	13.0	-	15.0	13.1	13.6	12.9	12.9	12.8	13.1
6"	-	15.6	-	15.9	15.5	16.2	15.6	15.6	15.6	16.0
8"	17.7	17.7	18.1	-	17.7	-	17.6	17.6	17.5	17.9
10"	20.1	20.3	20.7	-	20.3	-	20.3	20.3	20.2	20.8
12"	22.0	22.4	22.8	-	22.8	-	22.2	22.2	22.0	22.8

Accessories

Ground disks for flange connections



A0022709

Dimensions in SI units

DN ¹⁾ [mm]	EN (DIN)/JIS/AS ²⁾			
	A [mm]	B [mm]	D [mm]	H [mm]
25	26	62	78	88
32	35	80	88	95
40	41	82	101	103
50	52	101	116	108
65	68	121	132	118
80	80	131	155	135
100	104	156	187	153
125	130	187	207	160
150	158	217	256	184
200	206	267	288	205
250	260	328	359	240
300 ³⁾	312	375	413	273
300 ⁴⁾	310	375	404	268

¹⁾ Ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version.

²⁾ EN (DIN)/AS/JIS; For flanges according to AS, DN 32, 40, 65 and 125 are not available.

³⁾ PN 10/16

⁴⁾ PN 25, JIS 10K/20K

Dimensions in US units

DN ¹⁾ [in]	ASME			
	A [in]	B [in]	D [in]	H [in]
1"	1.02	2.44	3.05	3.44
2"	2.05	3.98	4.55	4.25
3"	3.15	5.16	6.08	5.31
4"	4.09	6.14	7.34	6.02
6"	6.22	8.54	10.1	7.24
8"	8.11	10.5	11.3	8.07
10"	10.2	12.9	14.1	9.45
12"	12.3	14.8	16.3	10.8

¹⁾ Ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version.

Weight

Weight in SI units

Weight data in kg (for standard pressure ratings and excluding packaging material)												
Nominal diameter		Compact version (sensor and transmitter) excluding batteries						Remote version (sensor and connection housing) excluding connecting cable, transmitter and batteries				
		EN (DIN) / AS*		ASME		JIS		EN (DIN) / AS*		ASME		JIS
[mm]	[in]											
25	1"	PN 40	5	5	5	PN 40	6.5	6	6.5	Class 150	10K	PN 10
32	-		6	-	5		8	-	7.5			
40	1 1/2"		8	8	6		8.5	7	7.5			
50	2"		9	9	7		10	9	9			
65	-	PN 16	10	-	9	PN 16	11	-	10	Class 150	10K	PN 10
80	3"		12	12	11		13	13	11			
100	4"		14	14	13		15	17	13			
125	-		20	-	19		20	-	18			
150	6"	24	24	23	25	26	23					
200	8"	43	43	40	36	42	32					
250	10"	63	73	68	49	59	48					
300	12"	68	108	70	58	84	55					
												Transmitter remote version = 1.5 kg
*Flanges according to AS are only available for DN 80, 100, 150 to 300. Weight of battery block: 100 g (1 battery), 190 g (2 batteries), 290 g (3 batteries)												

Weight in US units

Weight data in lbs (excluding packaging material)												
Nominal diameter		Compact version (sensor and transmitter) excluding batteries						Remote version (sensor and connection housing) excluding connecting cable, transmitter and batteries				
		ASME						ASME				
[mm]	[in]											
25	1"	Class 150	11		13		Class 150	13				PN 10
32	-		-		-			-				
40	-		-		-			-				
50	2"		20		20			20				
65	-	-		-		-						
80	3"	27		29		29						
100	4"	31		38		38						
125	-	-		-		-						
150	6"	53		58		58						
200	8"	95		93		93						
250	10"	161		130		130						
300	12"	238		185		185						
												Transmitter remote version = 3.3 lbs
Weight of battery block: 3.53 oz (1 battery), 6.70 oz (2 batteries), 10.2 oz (3 batteries)												

Measuring tube specifications

Nominal diameter		Pressure rating					Measuring tube internal diameter			
		EN (DIN)	ASME	AS		JIS	Hard rubber		Polyurethane	
[mm]	[in]			2129	4087		[mm]	[in]	[mm]	[in]
25	1"	PN 40	Class 150	-	-	20K	-	-	24	0.94
32	-	PN 40	-	-	-	20K	-	-	32	1.26
40	-	PN 40	-	-	-	20K	-	-	38	1.50
50	2"	PN 40	Class 150	Table E	PN 16	10K	50	1.97	50	1.97
65	-	PN 16	-	-	-	10K	66	2.60	66	2.60
80	3"	PN 16	Class 150	Table E	PN 16	10K	79	3.11	79	3.11
100	4"	PN 16	Class 150	Table E	PN 16	10K	102	4.02	102	4.02
125	-	PN 16	-	-	-	10K	127	5.00	127	5.00
150	6"	PN 10	Class 150	Table E	PN 16	10K	156	6.14	156	6.14
200	8"	PN 10	Class 150	Table E	PN 16	10K	204	8.03	204	8.03
250	10"	PN 10	Class 150	Table E	PN 16	10K	258	10.2	258	10.2
300	12"	PN 10	Class 150	Table E	PN 16	10K	309	12.2	309	12.2

Material**Transmitter housing**

- Compact version: polycarbonate plastic
- Remote version (wall-mount housing): polycarbonate plastic

Sensor

Fully welded with protective varnish

Sensor connection housing (remote version)

Polycarbonate plastic

Measuring tubes

Stainless steel 1.4301 or 1.4306/304L

Measuring tube lining

- DN 25 to 300 (1 to 12"): polyurethane
- DN 50 to 300 (2 to 12"): hard rubber

Electrodes

1.4435/304L, Alloy C-22

Process connections with protective varnish

- EN 1092-1 (DIN 2501): C22, FE 410 WB, S235JRG2
- ASME B16.5: A105
- AS 2129: A105, S235JRG2, S275JR
- AS 4087: A105, S275JR
- JIS: 1.0425, HII, S235JRG2

Seals

In accordance with DIN EN 1514-1

Accessories

- Display protection
Stainless steel 1.4301
- Ground disks
1.4435/316L, Alloy C-22

- Fitted electrodes**
- 2 measuring electrodes for signal detection
 - 1 reference electrode for potential equalization
 - 1 EPD electrode for the detection of empty pipes (not supported by the measuring device)
-

- Process connections**
- EN 1092-1 (DIN 2501):
 - PN 10 (DN 200 to 300 / 8 to 12")
 - PN 16 (DN 65 to 300 / 3 to 12")
 - PN 25 (DN 200 to 300 / 8 to 12")
 - PN 40 (DN 25 to 150 / 1 to 6")
 - ASME
 - Class 150 (DN 25 to 300 / 1 to 12")
 - Class 300 (DN 25 to 150 / 1 to 6")
 - AS
 - AS 2129: Table E (DN 80 to 300 / 3 to 12")
 - AS 4087: PN 16 (DN 80 to 300 / 3 to 12")
 - JIS
 - 10K (DN 50 to 300 / 2 to 12")
 - 20K (DN 25 to 300 / 1 to 12")
-

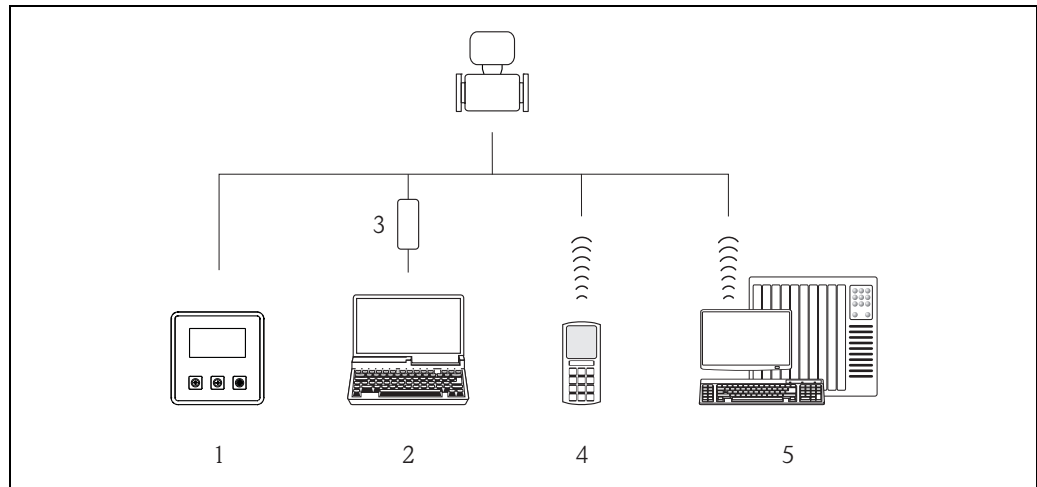
Surface roughness Electrodes: 0.3 to 0.5 μm (12 to 20 μin). The data relate to parts in contact with fluid.

- GSM/GPRS antenna**
- Omnidirectional dipole antenna with 3 m (9.84 ft) connecting cable.
 - Connection socket for GSM antenna: SMA socket (female)
 - For mounting and connecting the GSM antenna, see → [26](#).

Operability

Operating concept

Operating options



Overview of operating options

- 1 Local operation of the measuring device
- 2 Computer with Config 5800 operating tool
- 3 FXA 291 service interface (connected to computer via USB port and to measuring device via service interface)
- 4 Cell phone (wireless via SMS)
- 5 Computer (wireless via mail)

Onsite operation

Display elements

- Liquid crystal display: unlit, 8-line, 16 characters per line
- Custom configurations for presenting different measured-value and status variables
- Totalizer

Operating elements



- Local operation via plastic-coated keypad
- Quick Start menu for quick commissioning

Config 5800 operating tool

Config 5800 is a software operating tool which is used to configure and operate the Promag 800 measuring device. The measuring device does not support any other operating tools.

Function scope

- Access to all the measuring device parameters:
 - Via the user interface integrated in the operating tool
 - Via the parameter menu
- Configuring/establishing measuring device communication via GSM, mail etc.
These parameters are only available via the parameter menu of the operating tool.
- Operation of the measuring device.
- Saving or exporting data records (parameters, events etc.).
- Saving or loading the configuration of the measuring device.
- Saving data or reading out data from the data logger.

 The FXA 291 service interface (USB version) is required to connect the computer to the measuring device. The FXA 291 service interface is not included in the scope of supply (accessory →  44).

Remote operation

- Via Config 5800 operating tool
- Via GSM (Global System for Mobile Communication)/GPRS (General Packet Radio Service)

Languages

English, German, Italian, Spanish, French

Certificates and approvals

CE mark The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Drinking water approval

- WRAS BS 6920
- ACS
- NSF 61
- KTW/W270

Other standards and guidelines

- EN 60529: Degrees of protection provided by enclosures (IP code)
- EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC/EN 61326: Emission in accordance with Class A requirements

GSM approvals

- EN 301 511 V9.0.2
Global System for Mobile communications (GSM); Harmonized EN for mobile stations in the GSM 900 and GSM 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)
- EN 301 489-7 V1.3.1
Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio -telecommunications systems (GMS and DCS)
- EN 61326
Electrical equipment for measurement, control and laboratory use
EMC requirements - Part 1: General requirements
- EN 60950-1:2006 + A11: 2009 + A1:2010 + A12: 2011
Information technology equipment - Safety - Part 1: General requirements
- 47CFR15 (12/2010) Part 15
RADIO FREQUENCY DEVICES, Subpart B - Unintentional Radiators

Declaration of Conformity **CE mark**

The measuring system meets the requirements of EC Directive "Electromagnetic compatibility" (EMC Directive).

- Interference emission: EN 61326: Class A, Industry
- Interference immunity: EN 61326: Industry

A Declaration of Conformity in line with the standards cited above has been submitted and can be viewed at Endress+Hauser.

FCC information (Federal Communications Commission)

This device generates, uses and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the device and receiver
- Connect the device to an outlet on a circuit different from that to which the receiver is connected.

To ensure that the device meets current FCC requirements and safety conditions, which restrict both the maximum radio frequency output rating and human exposure to radio frequency radiation, use an antenna with a maximum antenna gain of 2 dBi. Furthermore, a distance of at least 20 cm must be observed between the device antenna and the user's body and everyone in the vicinity of the antenna. This distance must be observed for all applications and uses.

Modifications

The FCC requires the manufacturer to inform users that all modifications made to this device, which are not expressly approved by Endress+Hauser, can void the authority of the user to operate the device.

FCC statement (Federal Communications Commission)

This device complies with Part 15 of the FCC regulations.

Operation is subject to the following two conditions:

- This device cannot cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Remarks regarding wireless equipment

The use of wireless devices can be restricted in certain situations or environments. Such restrictions can apply in airplanes, vehicles, hospitals, in the vicinity of explosives, in hazardous areas etc. If you are unsure which directive applies for the use of this device, request usage approval prior to switching on the device.

Measuring device approval

The measuring device is (optionally) approved as a cold water meter (MI-001) for volume measurement in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2004/22/EC (MID), type-examination certificate ATLab-I13-001. The device is qualified to OIML R49 and has an OIML Certificate of Conformity (optional).

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com
→ Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide



Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories


Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser Sales Center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

For the transmitter

Accessories	Description
Display protection	Is used to protect the display from impact or abrasion caused by sand in desert areas.
Connecting cable for Remote version	Coil and electrode cables, various lengths, reinforced cables available on request.
Ground cable	Set, consisting of two ground cables for potential equalization.
Pipe mounting set	Pipe mounting set for transmitter.
Conversion kit compact → remote	For converting a compact device version to a remote device version.

For the sensor

Accessories	Description
Ground disks for flange connections	Are used to ground the fluid in lined measuring tubes to ensure proper measurement.  For details, see Installation Instructions EA070D

Communication-specific accessories

Accessories	Description
Commubox FXA291 (USB version)	Connects the measuring device to a computer with the Config5800 software operating tool installed: <ul style="list-style-type: none"> Configuration of the measuring device for establishing GSM/GPRS communication (only possible using the Config5800 software operating tool) Saving data or reading out data from the data logger.

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: <ul style="list-style-type: none"> Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections. Graphic representation of the calculation results. Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: <ul style="list-style-type: none"> Via the Internet: https://wapps.endress.com/applicator On CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: <ul style="list-style-type: none"> Via the Internet: www.endress.com/lifecyclemanagement On CD-ROM for local PC installation.

Documentation



The document types listed are available:

- On the CD-ROM supplied with the device
- In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Standard documentation

Device type	Communication	Document type	Documentation code
5W8B**-	GSM/GPRS	Brief Operating Instructions	KA00056D
		Operating Instructions	BA00148D

Supplementary device-dependent documentation

Device type	Document type	Approval	Documentation code
	Installation Instructions	-	Specified for each individual accessory

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