Technical Information
Proline Promag L 800
Electromagnetic flowmeter

Weight-optimized sensor and intelligent energy efficient mode

Application

- The electromagnetic measuring principle is unaffected by pressure, temperature and flow profile
- Fully suitable for standard applications in the water and wastewater industry

Device properties

- Up to 30 % less sensor weight
- Nominal diameter: DN 50 to 600 (2 to 24")
- Maximum reduced installation length to DVGW/ISO
- Transmitter housing made of durable polycarbonate
- All in 1 housing incl. batteries & wireless modem
- Measuring intervals can be adapted individually

Your benefits

- Reduced installation costs – flexible mounting by one-of-a-kind lap-joint flange concept (DN < 350/14")
- 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

Endress+Hauser
People for Process Automation

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Document information

Symbols used

Electrical symbols

Symbol	Meaning
A0011197	**Direct current** A terminal at which DC voltage is present or through which direct current flows.
 A0011198	**Alternating current** A terminal at which alternating voltage (sinusoidal) is present or through which alternating current flows.
 A0011200	**Ground connection** A grounded terminal which, from the viewpoint of the user, is grounded via a grounding system.
 A0011199	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.
 A0011201	**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
 A0011182	**Permitted** Indicates procedures, processes or actions that are permitted.
 A0011183	**Preferred** Indicates procedures, processes or actions that are preferred.
 A0011200	**Forbidden** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0011194	**Reference to documentation** Refers to the corresponding device documentation.
 A0011195	**Reference to page** Refers to the corresponding page number.
 A0011196	**Reference to graphic** Refers to the corresponding graphic number and page number.

Symbols in graphics

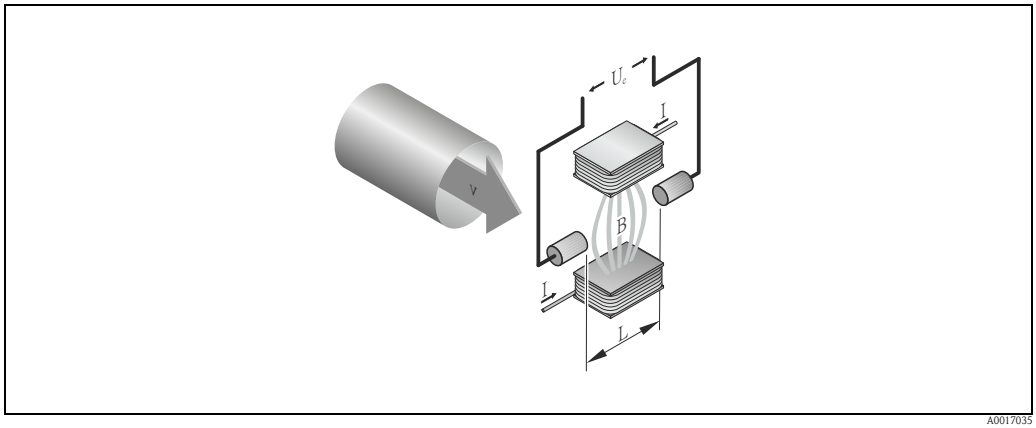
Symbol	Meaning
1, 2, 3 ...	Item numbers
A, B, C etc.	Views
A-A, B-B, C-C etc.	Sections
 A0013441	Flow direction

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.



A0017035

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

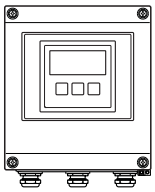
Ue *Induced voltage*
B *Magnetic induction (magnetic field)*
L *Electrode spacing*
v *Flow velocity*
Q *Volume flow*
A *Pipe cross-section*
I *Current strength*

Measuring system

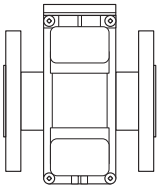
The device consists of a transmitter and a sensor.

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.

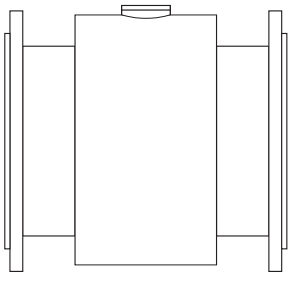
Transmitter

Promag 800  A0017117	Device versions and materials: ■ Compact housing: polycarbonate plastic ■ Wall-mount housing: polycarbonate plastic Configuration ■ Local operation, key-based operation, eight-line ■ Config5800 software operating tool Separate GSM/GPRS antenna optionally available.

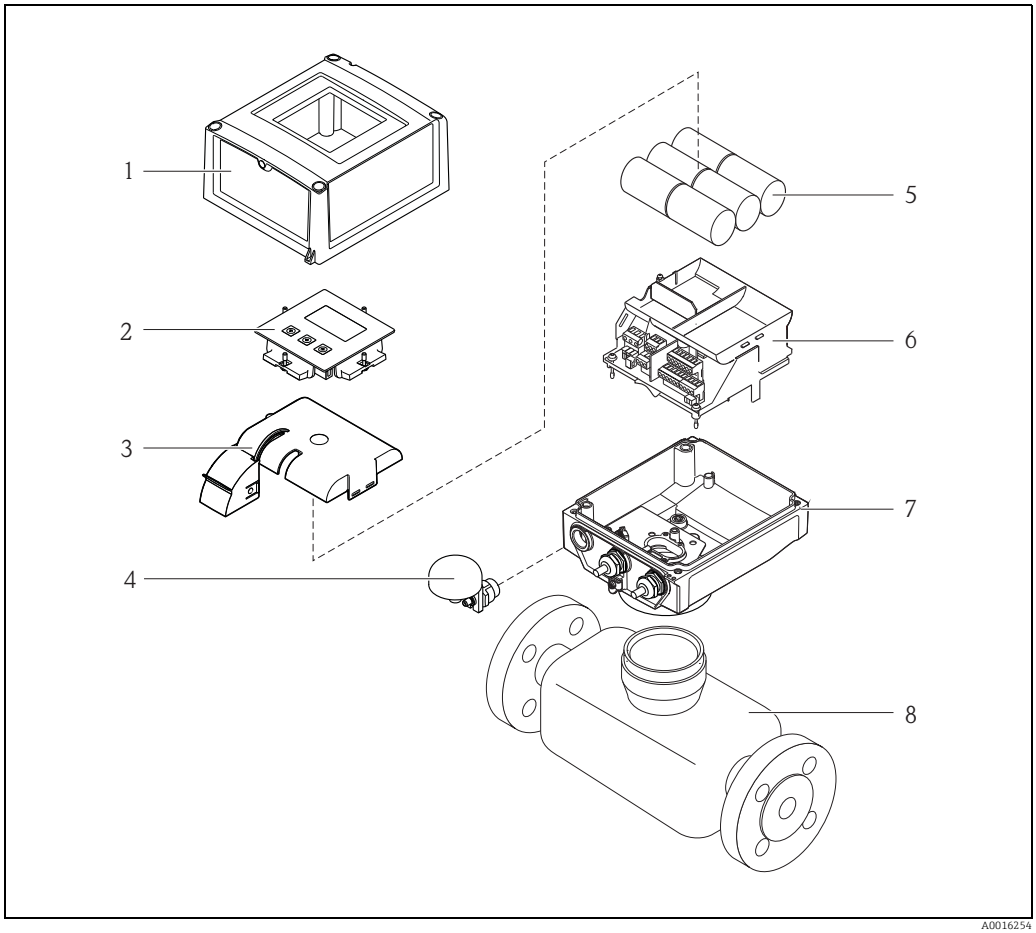
Sensor

Promag L (DN ≤ 300)  A0017040	Nominal diameters: DN 50 to 300 (2 to 12") Materials: ■ Sensor: aluminum coated AlSi10Mg ■ Measuring tube: stainless steel 1.4301/304, 1.4306/304L ■ Liner: PTFE, polyurethane ■ Electrodes: 1.4435, Alloy C-22 ■ Connection housing, remote version: aluminum coated AlSi10Mg

Promag L (DN > 300)	Nominal diameters: DN 350 to 600 (14 to 24") Materials: ■ Sensor: carbon steel with protective varnish ■ Measuring tube: stainless steel 202, 304 ■ Liner: polyurethane, hard rubber ■ Electrodes: 1.4435, Alloy C-22 ■ Connection housing, remote version: aluminum coated AlSi10Mg



Device design



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.

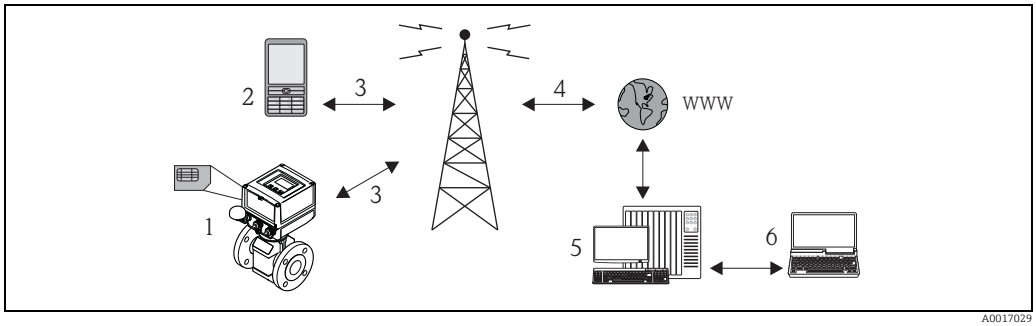
E-mails can only be sent to an SMTP server that does not require a password and user name. Port 25 normally fulfills these criteria.
This must be verified by your e-mail provider.

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.

Input

Measured variable

Direct measured variables

Volume flow (proportional to induced voltage)

Calculated measured variables

Mass 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 (→ 46)

Recommended measuring range

"Limiting flow" section

Operable flow range

Over 1000 : 1

Input signal

Status input (auxiliary input)

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

Output

Output signal

Status/pulse output

- 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 (RL = 240 Ω, V_{OUT} = 24 V DC): 50 Hz
- Isolated from other secondary circuits: 500 V DC

GSM/GPRS

GSM/GPRS modem

- 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
  - 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

“Not conductive” in the event of fault or power supply failure

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)

- The integrated data logger can log the following data:
  - 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.

The data logger gives users the option of second, parallel data recording in a higher resolution within a specific period of time.

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.

Power supply

Battery concept

Battery arrangement options

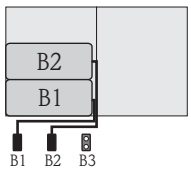
Three battery terminals are available in the measuring device. These terminals are assigned different uses depending on the number and arrangement of the batteries. B1 and B2 are the terminals for power supply to the measuring device, B3 is the terminal for the GSM/GPRS modem.

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.

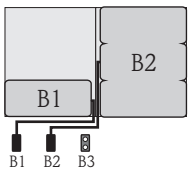
If power is supplied to the measuring device externally and the power supply fails, the battery in terminal B1 acts as a backup power supply.

The GSM/GPRS modem is always powered by the battery in terminal B3.
This is also the case if the measuring device uses an external power supply.

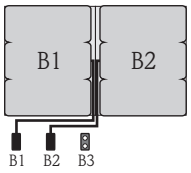
Configuration 1

Configuration of batteries	Connectors	Number of batteries	Battery usage
	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: 5L8B**–**F0*********		

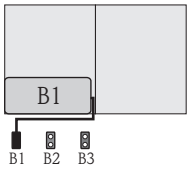
Configuration 2

Configuration of batteries	Connectors	Number of batteries	Battery usage
	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: 5L8B**–**G0*********		

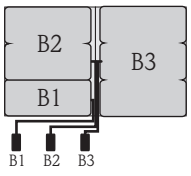
Configuration 3

Configuration of batteries	Connectors	Number of batteries	Battery usage
	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: 5L8B**–**H0*********		

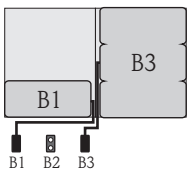
Configuration 4

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	–	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: 5L8B**–**J0*********		

Configuration 5

Configuration of batteries	Connectors	Number of batteries	Battery usage
	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: 5L8B**–**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: 5L8B**–**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

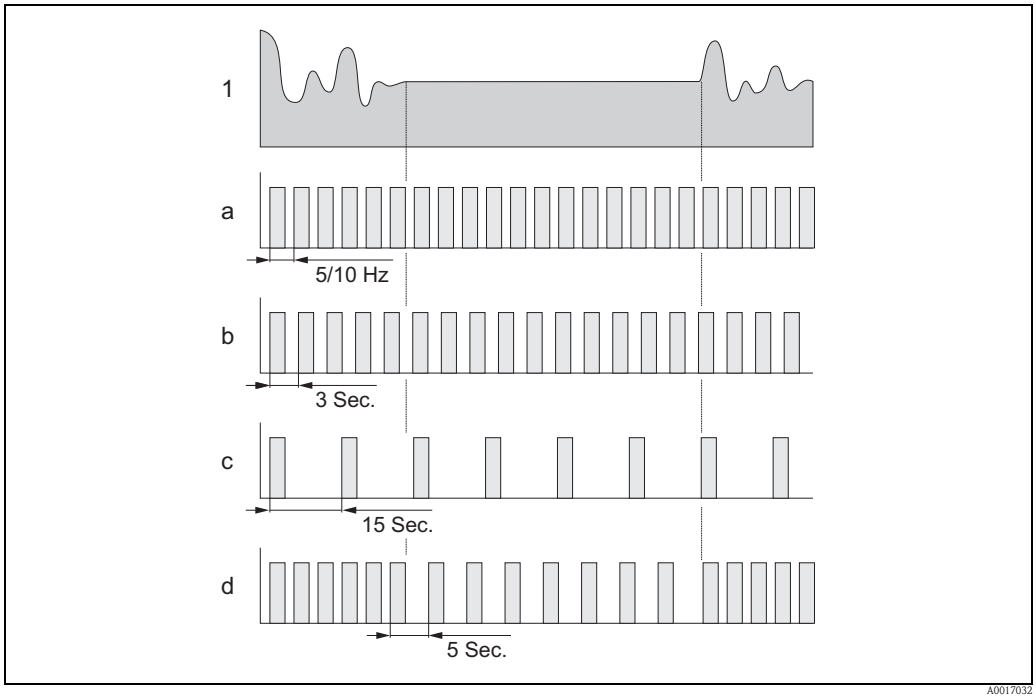
Lithium-thionyl chloride high-power batteries are categorized as Class 9: "Miscellaneous Hazardous Materials".
Comply strictly with the hazardous material regulations described in the safety data sheet.
You can request the safety data sheet from your Endress+Hauser Sales Center.

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.



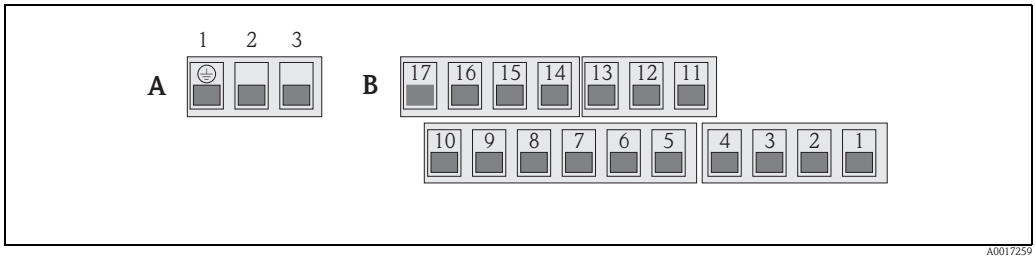
Operating principle of the different measured value acquisition methods

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



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)

Supply voltage

Power from batteries

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

Battery life → 10

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

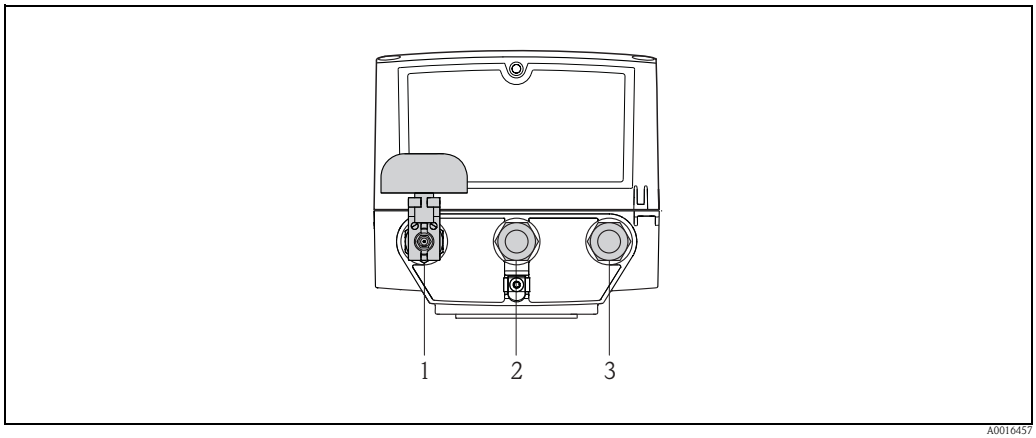
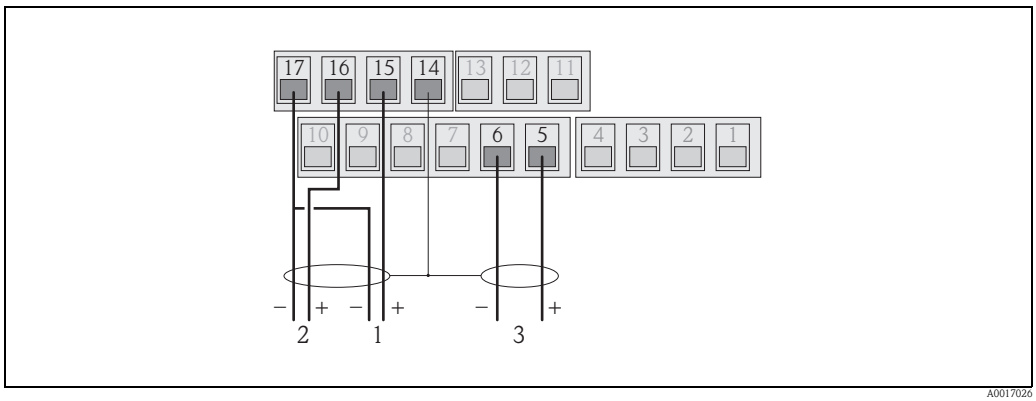


Fig. 1: Cable entries for the compact version

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

Connecting the inputs and outputs



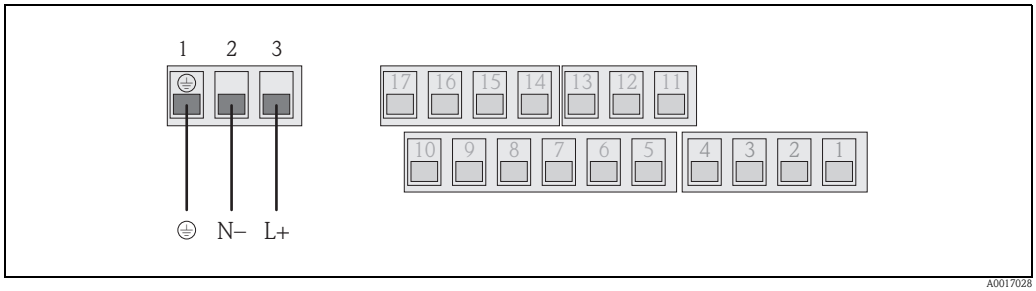
Connecting the outputs

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)



Connecting the external power supply (optional)

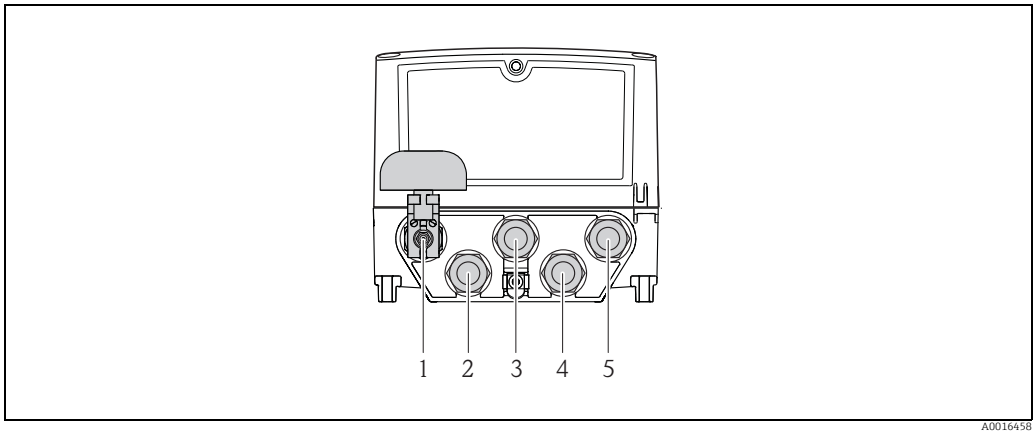
External power supply	
Terminal	**Connection**
1	Protective ground
2	N –
3	L +

Orderable combinations:

Ordered feature "Power supply"	Power supply	Number of batteries
5L8B**-**J**********	100 to 240 V AC 12 to 60 V DC	1 back-up battery
5L8B**-**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

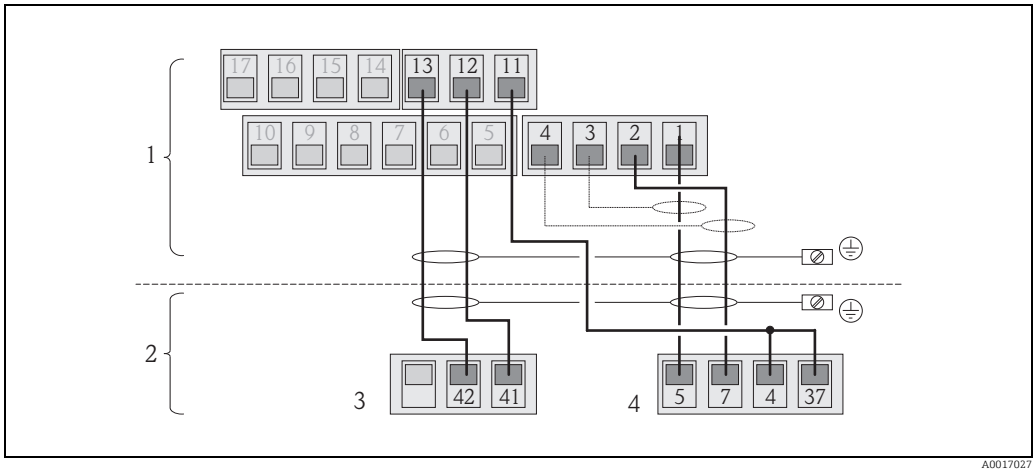
Cable entries for the remote version



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



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, Terminals bridged (green)
37	
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)

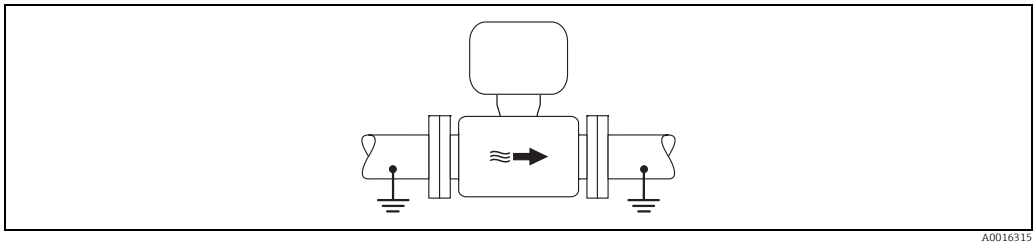
Potential equalization

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

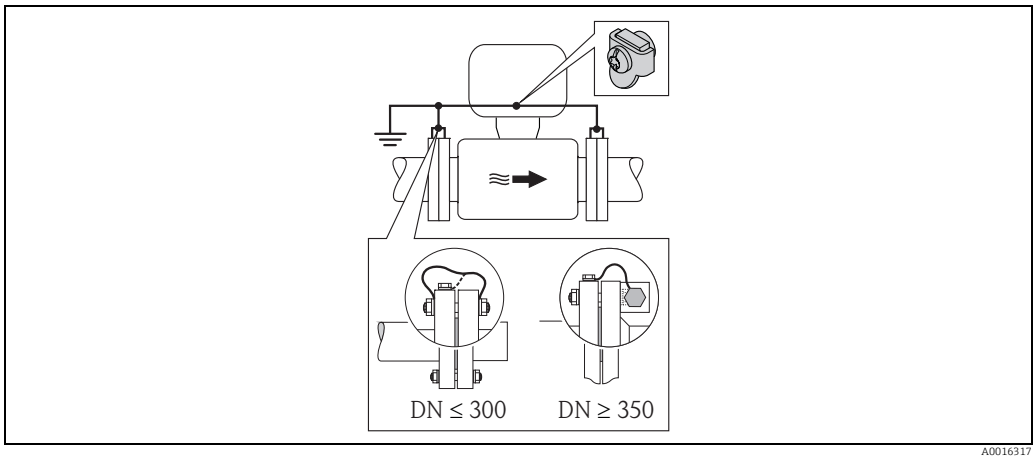


Potential equalization via Measuring tube

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

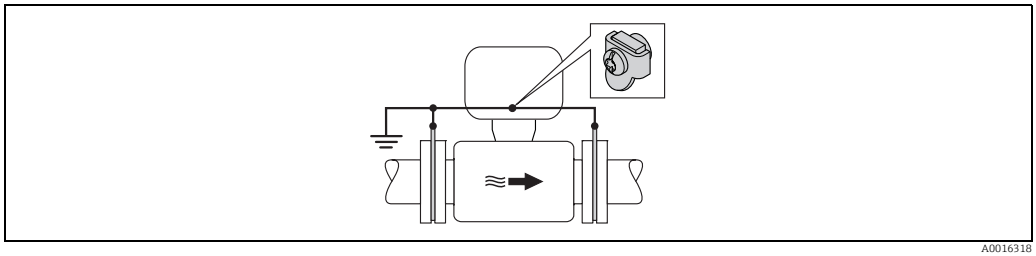
For mounting consider the following:
- Connect both sensor flanges to the particular pipe flange via a ground cable and ground them. Ground cable = copper wire, at least 6 mm² (0.0093 in²).
- Connect the transmitter or sensor connection housing, as applicable, to ground potential by means of the ground terminal provided for the purpose. For mounting the ground cable:
  - If DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
  - If DN ≥ 350 (14"): Mount the ground cable directly on the metal transport bracket.

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 → 46.

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

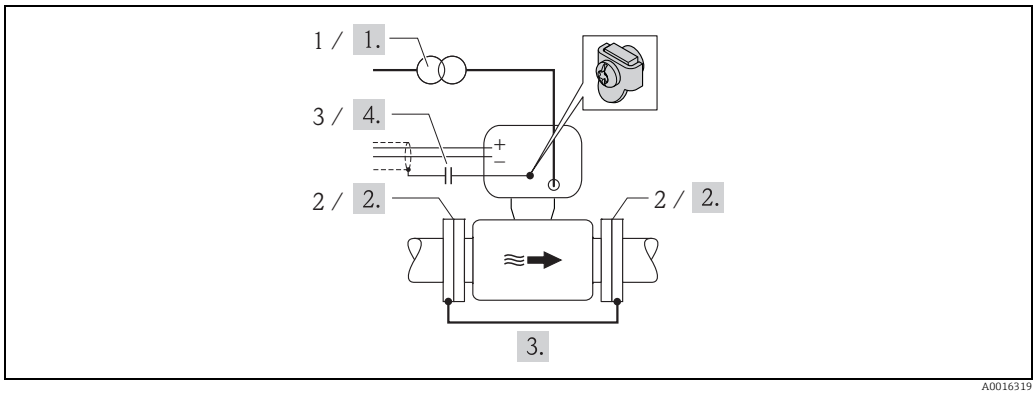
For mounting consider the following:
The ground disks have to be connected to the ground terminal via a ground cable and to the ground potential. Ground cable = copper wire, at least 6 mm² (0.0093 in²).

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 → 46.

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 → 46.

Terminals

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

Cable entries

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)

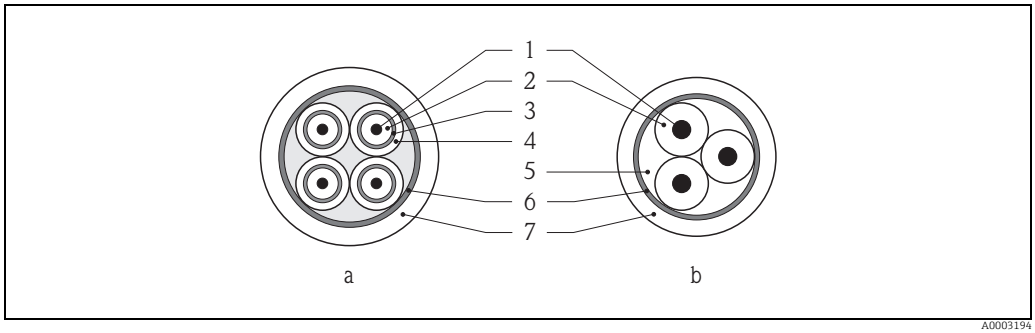
Remote version cable specifications

Electrode cable

- 3 × 0.38 mm² 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
- Operating temperature: −20 to +80 °C (−4 to 176 °F)
- Cable cross-section: max. 2.5 mm²

Coil current cable

- 2 × 0.75 mm² PVC cable with common, braided copper shield (Ø ~ 7 mm)
- Conductor resistance: ≤ 37 Ω/km
- Capacitance: core/core, shield grounded: ≤ 120 pF/m
- Operating temperature: −20 to +80 °C (−4 to 176 °F)
- Cable cross-section: max. 2.5 mm²
- Test voltage for cable insulation: ≥ 1433 V AC r.m.s 50/60 Hz or ≥ 2026 V DC



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.

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 ± 2) °C / (+82 ± 4) °F
- Ambient temperature range: (+22 ± 2) °C / (+72 ± 4) °F
- Warm-up period: 30 minutes

Installation conditions

- Inlet run > 10 × DN
- Outlet run > 5 × 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.

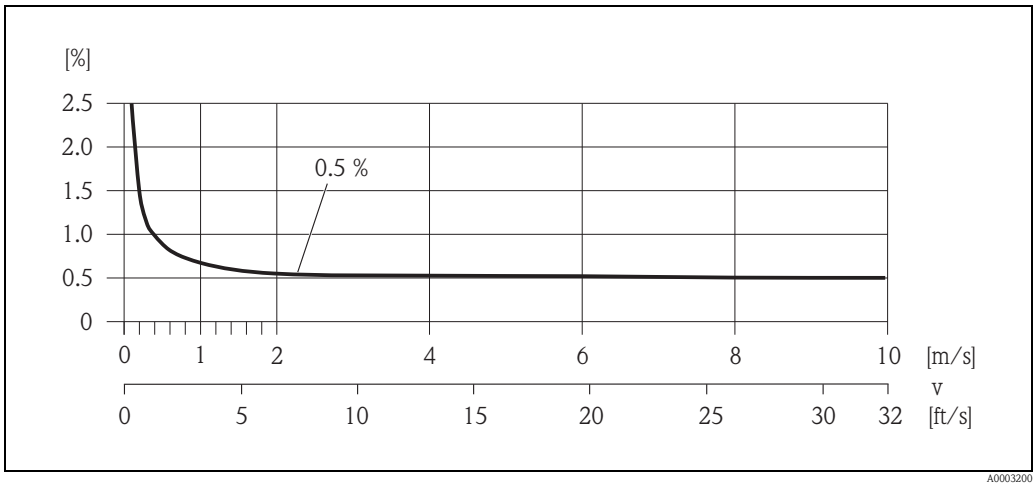
Maximum measured error

Pulse output

±0.5% o.r. ± 2 mm/s (±0.5% o.r. ± 0.08 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

Repeatability

Max. ±0.2% o.r. ± 2.0 mm/s (±0.2% o.r. ± 0.08 in/s)

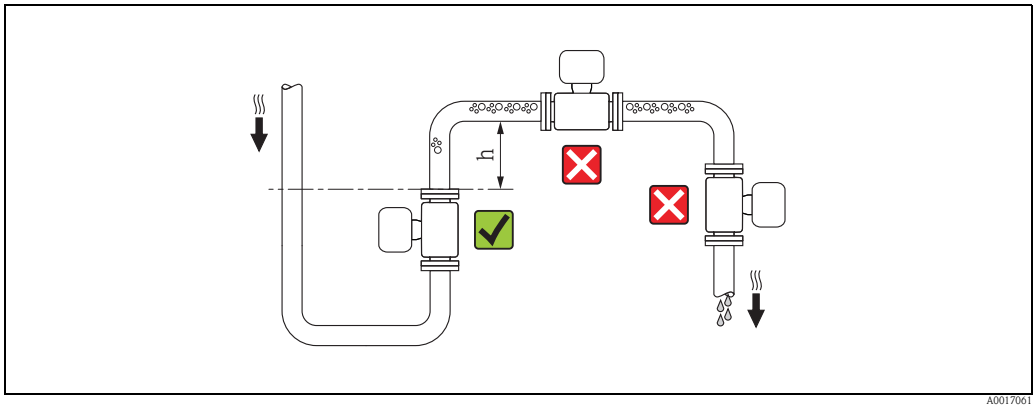
o.r. = of reading

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 (≥ 2 × DN) to the next pipe elbow.



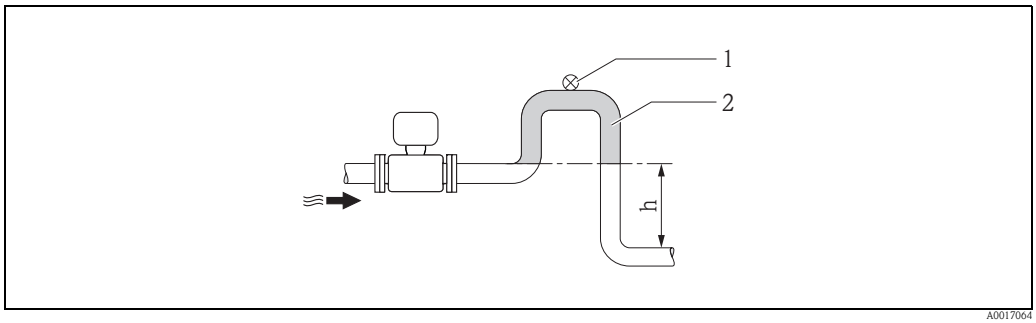
Selecting the mounting location

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 ≥ 5 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 (→ 27)



Installation in a down pipe

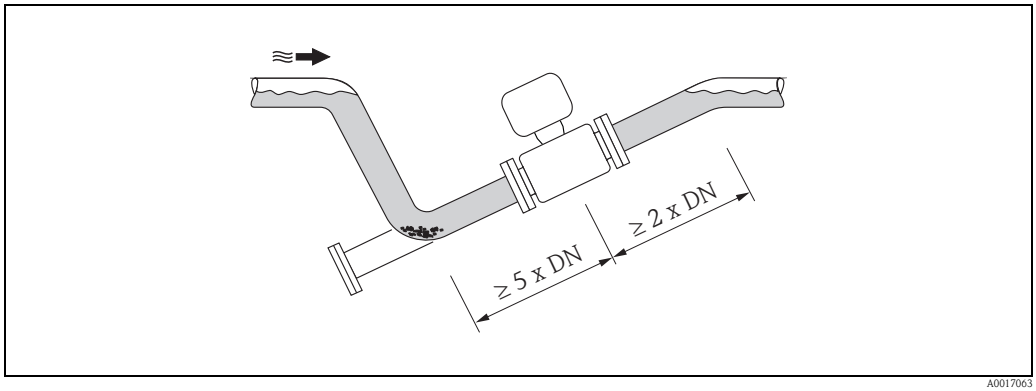
1 Vent valve
2 Pipe siphon
h Length of down pipe, h ≥ 5 m (16.4 ft)

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.

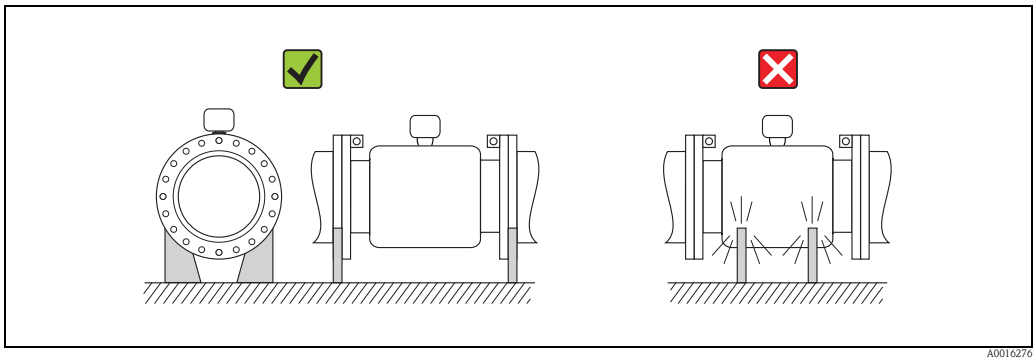


Installation in a partially filled pipe

For very heavy sensors

If the nominal diameter DN ≥ 350 (14"), mount the sensor on a foundation of adequate load-bearing strength.

Do not support the weight of the sensor on the metal casing as this could damage the metal casing and the internal magnetic coils.



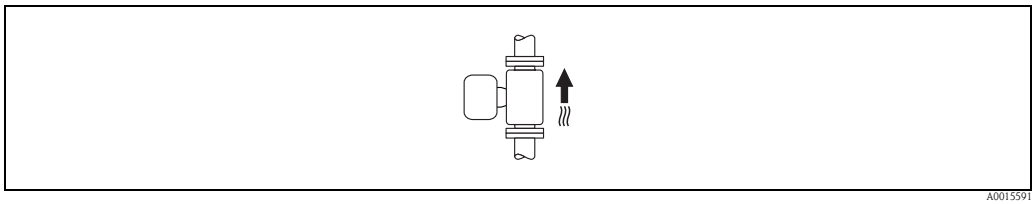
Correct support for large nominal diameters DN ≥ 350 (14")

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

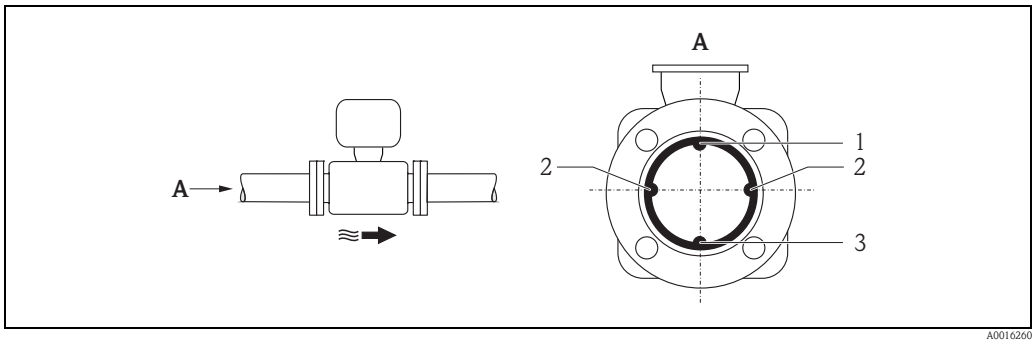
Vertical orientation is optimal in the following scenarios:
- For self-emptying piping systems.
- For sludge containing sand or stones where the solids tend to settle at the bottom.



Vertical orientation

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.



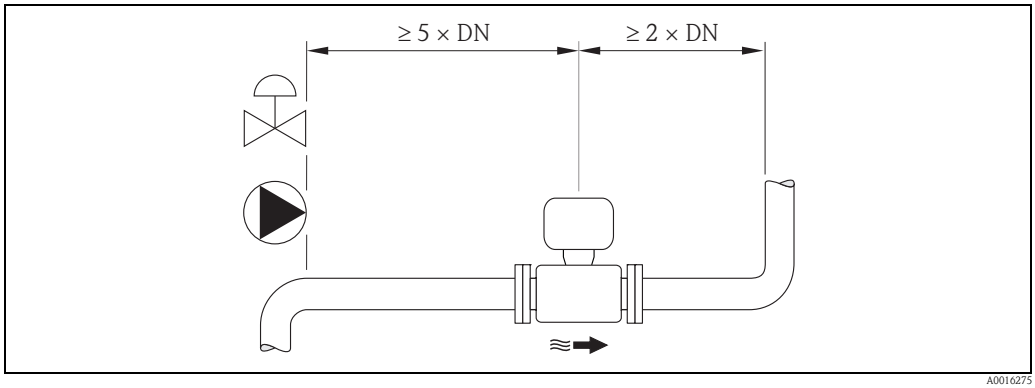
Horizontal orientation

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 ≥ 5 × DN
- Outlet run ≥ 2 × DN



Inlet and outlet runs

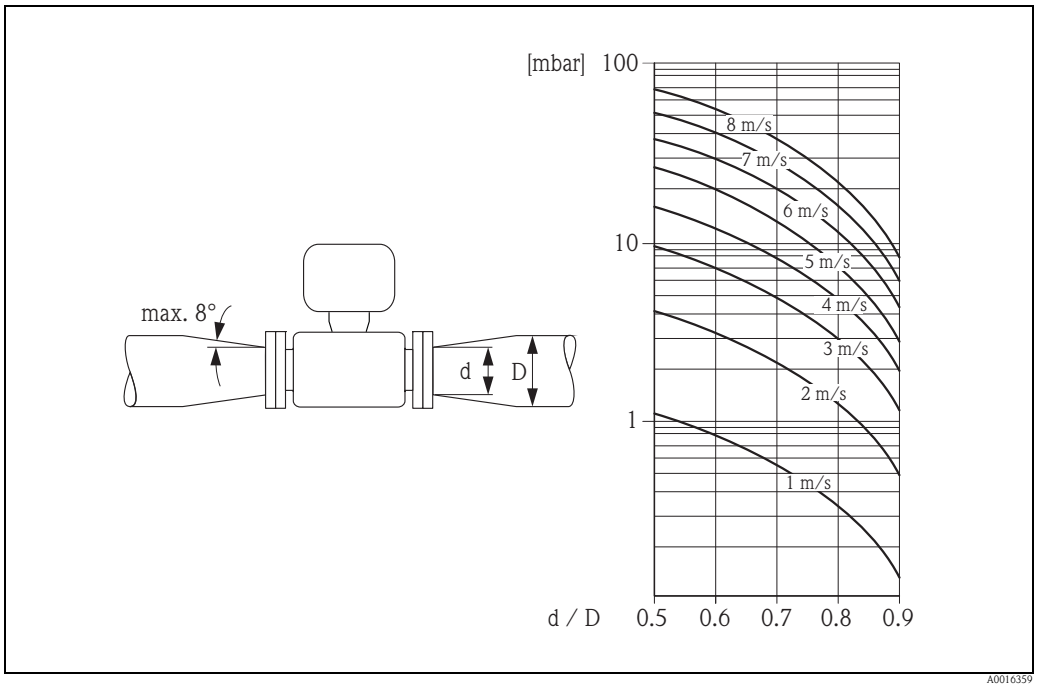
Adapters

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

Transmitter

–20 to +60 °C (–4 to +140 °F)

Sensor

- Flange material carbon steel: –10 to +60 °C (14 to +140 °F)
- Flange material stainless steel: –40 to +60 °C (–40 to +140 °F)

The permitted temperature range of the measuring tube lining may not be undershot or overshot, "Medium temperature range" section.

Note the following points:
- Install the measuring device in a shady location.
  – 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

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.

Note the following points:
- 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:
  – 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

–200 to 4000 m (–656 to 13124 ft)

Atmosphere

If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing.

If you are unsure, please contact your Endress+Hauser Sales Center for clarification.

Degree of protection

Transmitter
- Standard: IP66/67, Type 4X enclosure
- When housing is open: IP20, Type 1 enclosure

Sensor
- Standard: IP66/67, Type 4X enclosure
- Optionally available for remote version: IP68, Type 6P enclosure
  (for DN ≤ 300 (12") only possible in conjunction with stainless steel flanges)

Not suitable for use in corrosive atmospheres/liquids or underground if special precautions are not taken.

Shock resistance

Acceleration up to 2 g following IEC 600 68-2-6

Vibration resistance

Acceleration up to 2 g following IEC 600 68-2-6

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.

- 0 to +80 °C (+32 to +176 °F) for hard rubber, DN 350 to 600 (14 to 24")
- –20 to +50 °C (–4 to +122 °F) for polyurethane, DN 50 to 600 (2 to 24")
- –20 to +90 °C (–4 to +194 °F) for PTFE, DN 50 to 300 (2 to 12")

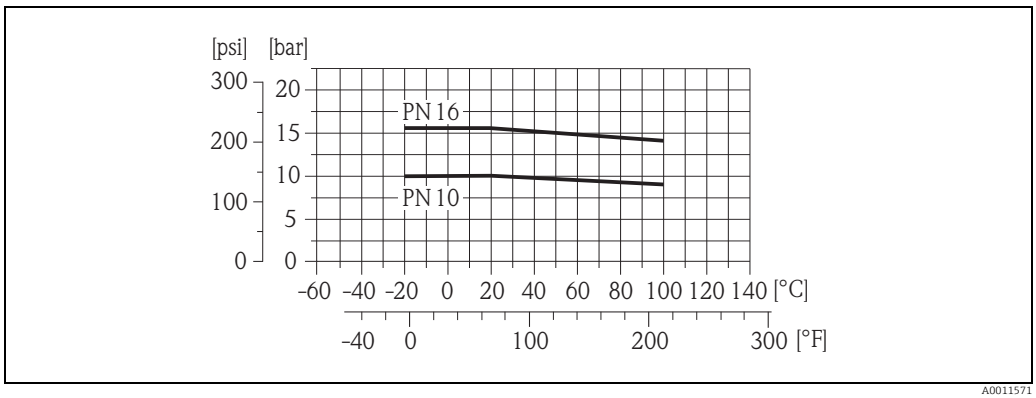
Conductivity

The minimum conductivity is 50 µS/cm.

Pressure-temperature ratings

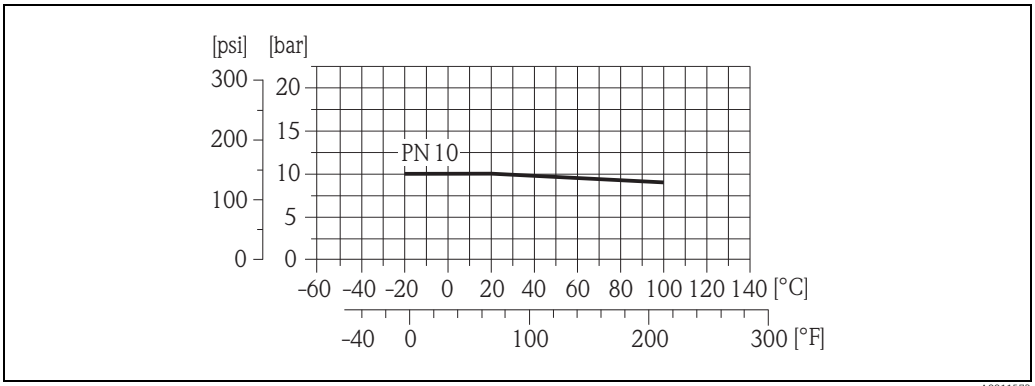
The following material load diagrams refer to the entire device and not just the process connection.

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



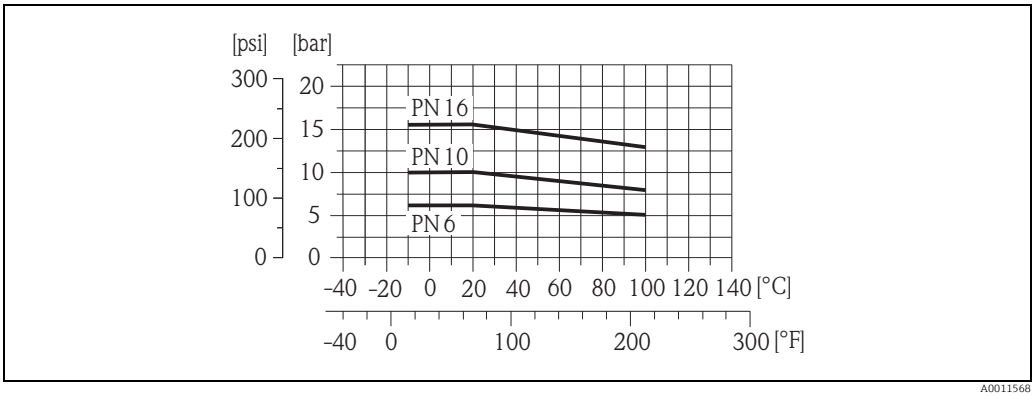
Lap joint flange PN 10/16, materials 1.4306/304L and 1.4307/304L, DN 50 to 300 (2 to 12")

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



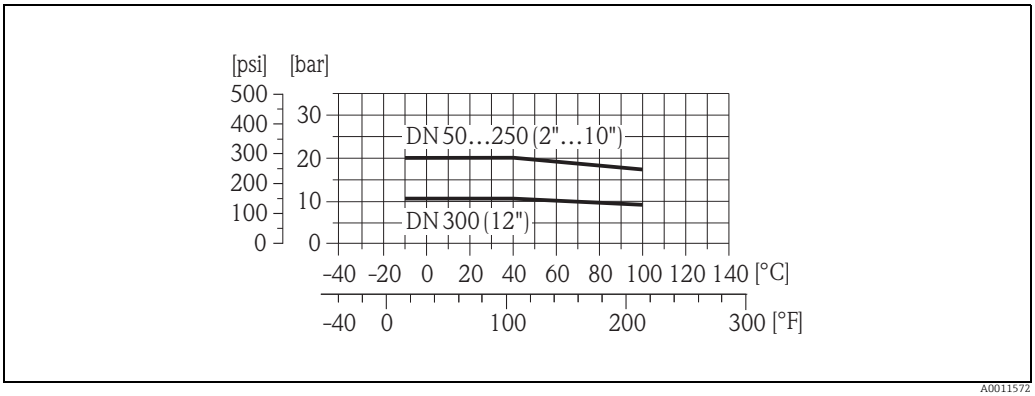
Lap joint flange PN 10, material 1.4301/304, DN 50 to 300 (2 to 12")

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



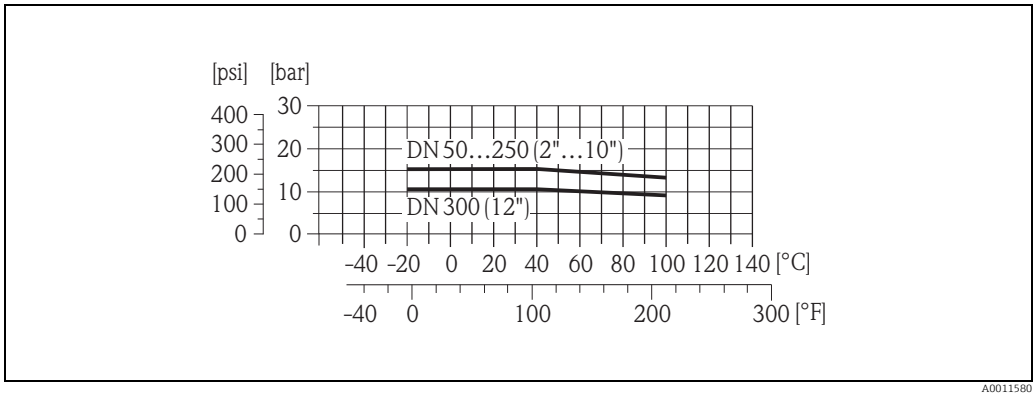
Fixed flange PN 6/10, materials 1.0038 (S235JRG2) and A105, DN 350 to 600 (14 to 24");
Lap joint flange PN 16, material 1.0038 (S235JRG2), DN 50 to 150 (2 to 6")

Flange connection according to ASME B16.5



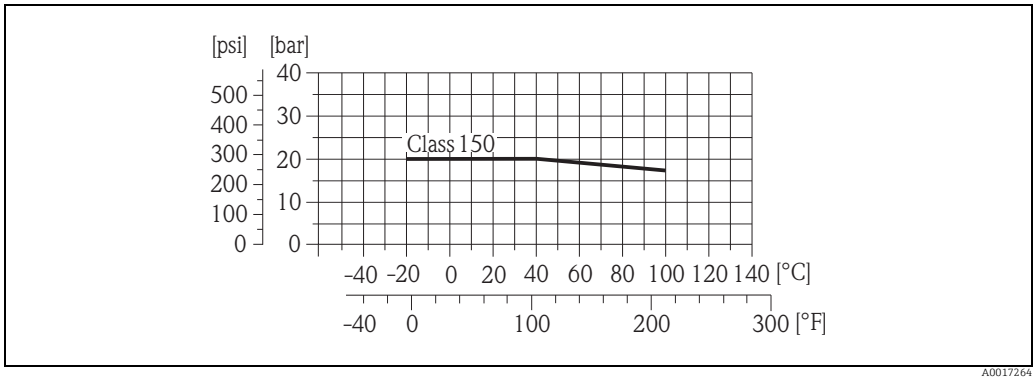
Lap joint flange Class 150, material A105, DN 50 to 300 (2 to 12")

Flange connection according to ASME B16.5



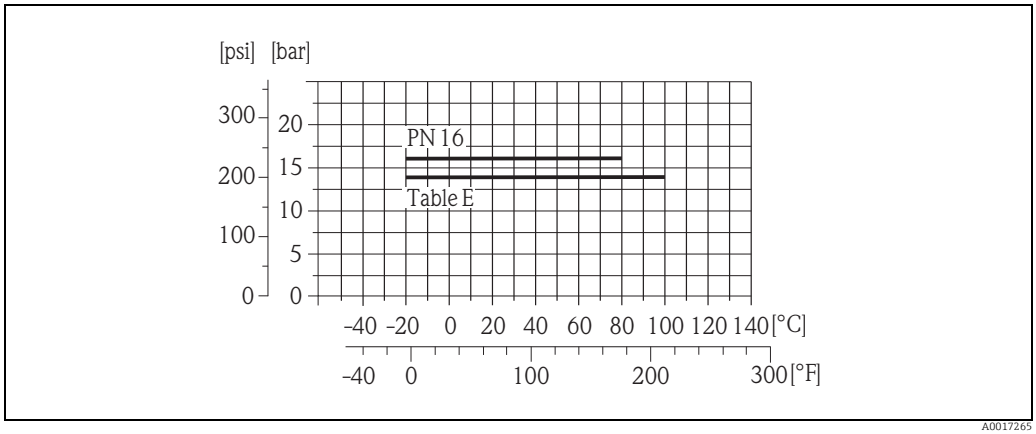
Lap joint flange Class 150, material 316L, DN 50 to 300 (2 to 12")

Flange connection according to ASME B16.5



Fixed flange Class 150, material A105, DN 350 to 600 (14 to 24")

Flange connection according to AS 2129 and AS 4087



Fixed flange PN 16
Materials 1.0044 (S275JR), 1.0425/316L (P265GH) and A105
DN 350 to 600 (14 to 24")

Fixed flange Table E
Materials 1.0038 (S235JRG2), 1.0345 (P235GH), 1.0425/316L (P265GH), A105 and FE410 WB
DN 350 to 600 (14 to 24")

Pressure tightness

Liner: polyurethane, hard rubber

Nominal diameter		Measuring tube lining	Liner pressure tightness: limit values for absolute pressure at different fluid temperatures		
			25 °C (77 °F)	50 °C (122 °F)	80 °C (176 °F)
[mm]	[in]		[mbar]/[psi]	[mbar]/[psi]	[mbar]/[psi]
50 to 600	2 to 24"	Polyurethane	0	0	–
350 to 600	14 to 24"	Hard rubber	0	0	0

Measuring tube lining: PTFE

Nominal diameter		Measuring tube lining	Liner pressure tightness: limit values for absolute pressure at different fluid temperatures			
			25 °C (77 °F)		90 °C (194 °F)	
[mm]	[in]		[mbar]	[psi]	[mbar]	[psi]
50	2"	PTFE	0	0	0	0
65	–	PTFE	0	0	40	0.58
80	3"	PTFE	0	0	40	0.58
100	4"	PTFE	0	0	135	1.96
125	–	PTFE	135	1.96	240	3.48
150	6"	PTFE	135	1.96	240	3.48
200	8"	PTFE	200	2.90	290	4.21
250	10"	PTFE	330	4.79	400	5.80
300	12"	PTFE	400	5.80	500	7.25

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 ≈ 0.5 or 10 m/s)	Factory setting: Full scale value (v ≈ 2.5 m/s)	Factory setting: Pulse value approx. 2 pulse/s for (v ≈ 2.5 m/s)	Factory setting: Low flow cut off (v ≈ 0.04 m/s)
50	60 to 1180 dm³/min	300 dm3/min	0.10 dm3	10 dm3/min
65	100 to 2000 dm³/min	500 dm3/min	0.20 dm3	15 dm3/min
80	150 to 3020 dm³/min	750 dm3/min	0.30 dm3	20 dm3/min
100	240 to 4750 dm³/min	1200 dm3/min	0.50 dm3	40 dm3/min
125	370 to 7400 dm³/min	1850 dm3/min	0.75 dm3	60 dm3/min
150	32 to 640 m³/h	150 m3/h	0.001 m3	5 m3/h
200	58 to 1135 m³/h	300 m3/h	0.002 m3	10 m3/h
250	90 to 1800 m³/h	500 m3/h	0.003 m3	15 m3/h
300	130 to 2500 m³/h	750 m3/h	0.004 m3	20 m3/h
350	175 to 3500 m³/h	1000 m3/h	0.006 m3	25 m3/h
375	200 to 4000 m³/h	1200 m3/h	0.008 m3	35 m3/h
400	226 to 4600 m³/h	1200 m3/h	0.008 m3	35 m3/h
450	286 to 5800 m³/h	1500 m3/h	0.010 m3	40 m3/h
500	353 to 7100 m³/h	2000 m3/h	0.012 m3	50 m3/h
600	510 to 10200 m³/h	2500 m3/h	0.017 m3	80 m3/h

Flow characteristic values in US units

Nominal diameter [in]	Recommended flow min./max. full scale value (v ≈ 0.5 or 10 m/s)	Factory setting: Full scale value (v ≈ 2.5 m/s)	Factory setting: Pulse value approx. 2 pulse/s for (v ≈ 2.5 m/s)	Factory setting: Low flow cut off (v ≈ 0.04 m/s)
2"	16 to 320 gal/min	80 gal/min	0.03 gal	2.50 gal/min
2 ½"	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
14"	770 to 15000 gal/min	4000 gal/min	1.50 gal	115.0 gal/min
15"	880 to 17000 gal/min	5000 gal/min	2.00 gal	150.0 gal/min
16"	1000 to 19000 gal/min	5000 gal/min	2.00 gal	150.0 gal/min
18"	1265 to 25000 gal/min	6500 gal/min	2.50 gal	200.0 gal/min
20"	1600 to 30000 gal/min	7500 gal/min	3.00 gal	250.0 gal/min
24"	2250 to 44000 gal/min	12000 gal/min	5.00 gal	350.0 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”→ 22)

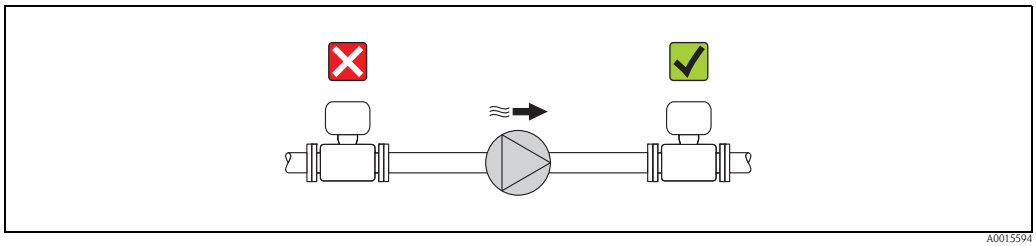
System pressure

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.

Information on the lining's resistance to partial vacuum can be found in the "Pressure tightness" section → 27.

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

For information on the measuring system's resistance to vibration and shock, see the "Shock resistance" and "Vibration resistance" sections → 23.



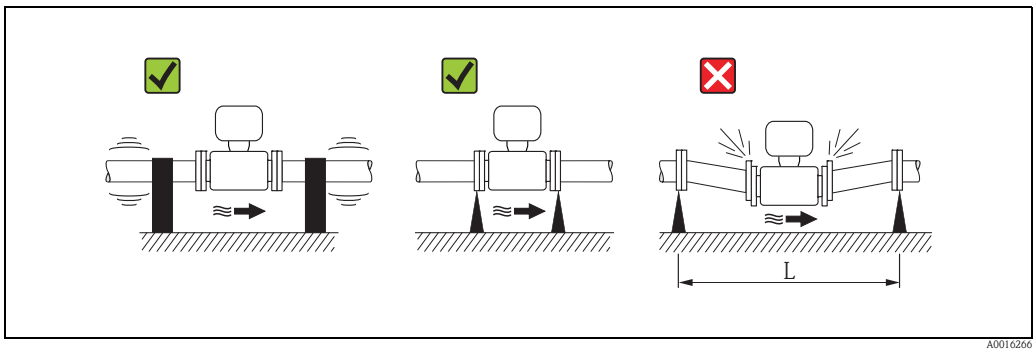
A0015594

Installation if using pumps

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.

For information on the measuring system's resistance to vibration and shock, see the "Shock resistance" and "Vibration resistance" sections → 23.



A0016266

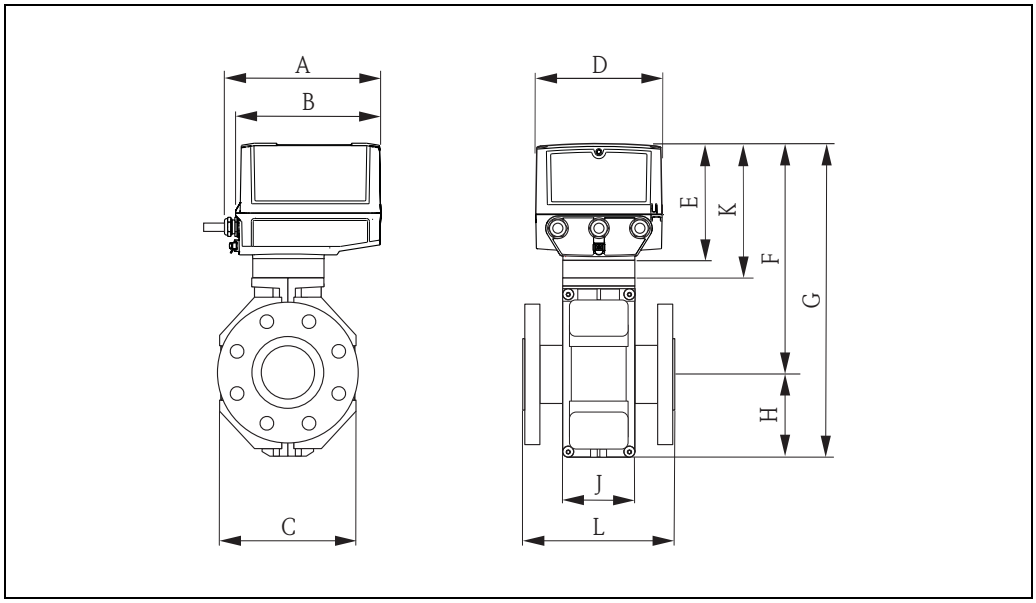
Measures to prevent vibration of the device

L > 10 m (33 ft)

Mechanical construction

Design, dimensions

Compact version DN 50 to 300 (2 to 12")



A0017392

Dimensions in SI units

DN [mm]	L[1)] [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	J [mm]	K [mm]
50	200	216	189	120	165	157	269	353	84	94	182
65	200	216	189	180	165	157	294	403	109	94	182
80	200	216	189	180	165	157	294	403	109	94	182
100	250	216	189	180	165	157	294	403	109	94	182
125	250	216	189	260	165	157	334	484	150	140	182
150	300	216	189	260	165	157	334	484	150	140	182
200	350	216	189	324	165	157	359	539	180	156	182
250	450	216	189	400	165	157	384	589	205	156	182
300	500	216	189	460	165	157	409	639	230	166	182

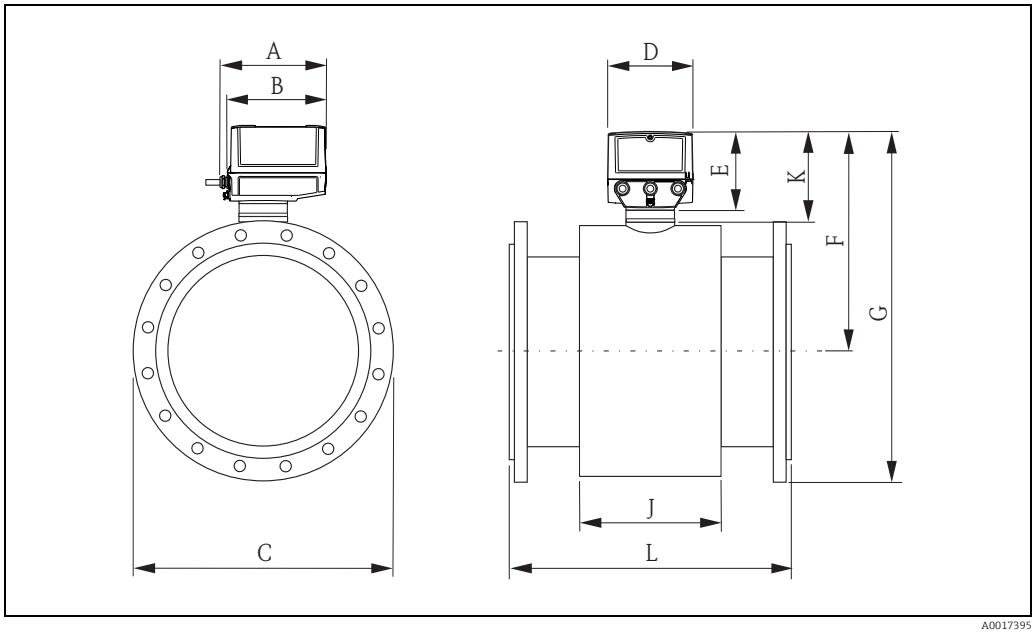
[1)] The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Dimensions in US units

DN [in]	L[1)] [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	J [in]	K [in]
2"	7.87	8.50	7.44	4.72	6.50	6.18	10.59	13.90	3.32	3.70	7.17
3"	7.87	8.50	7.44	7.10	6.50	6.18	11.57	15.87	4.30	3.70	7.17
4"	9.84	8.50	7.44	7.10	6.50	6.18	11.57	15.87	4.30	3.70	7.17
6"	11.8	8.50	7.44	10.2	6.50	6.18	13.15	19.06	5.91	5.51	7.17
8"	13.8	8.50	7.44	12.8	6.50	6.18	14.13	21.22	7.10	6.14	7.17
10"	17.7	8.50	7.44	15.8	6.50	6.18	15.12	23.19	8.08	6.14	7.17
12"	19.7	8.50	7.44	18.1	6.50	6.18	16.10	25.16	9.06	6.54	7.17

[1)] The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Compact version DN 350 to 600 (14 to 24")



Dimensions in SI units

DN [mm]	L [mm]	A [mm]	B [mm]	D [mm]	E [mm]	F [mm]	J [mm]	K [mm]
350	550	216	189	165	157	433	290	192
375	600	216	189	165	157	459	290	192
400	600	216	189	165	157	459	290	192
450	600	216	189	165	157	487	290	192
500	600	216	189	165	157	512	290	192
600	600	216	189	165	157	553	290	192

DN	C for pressure ratings					G for pressure ratings				
	PN 6	PN 10	PN 16	ASME	AS	PN 6	PN 10	PN 16	ASME	AS
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	490	505	520	533	525	678	685	749	700	695
375	–	–	–	–	550	–	–	–	–	734
400	540	565	580	597	580	729	741	807	757	749
450	595	615	640	635	640	784	794	870	804	807
500	645	670	715	699	705	834	847	973	861	864
600	755	780	840	813	825	930	943	1073	959	965

Dimensions in US units

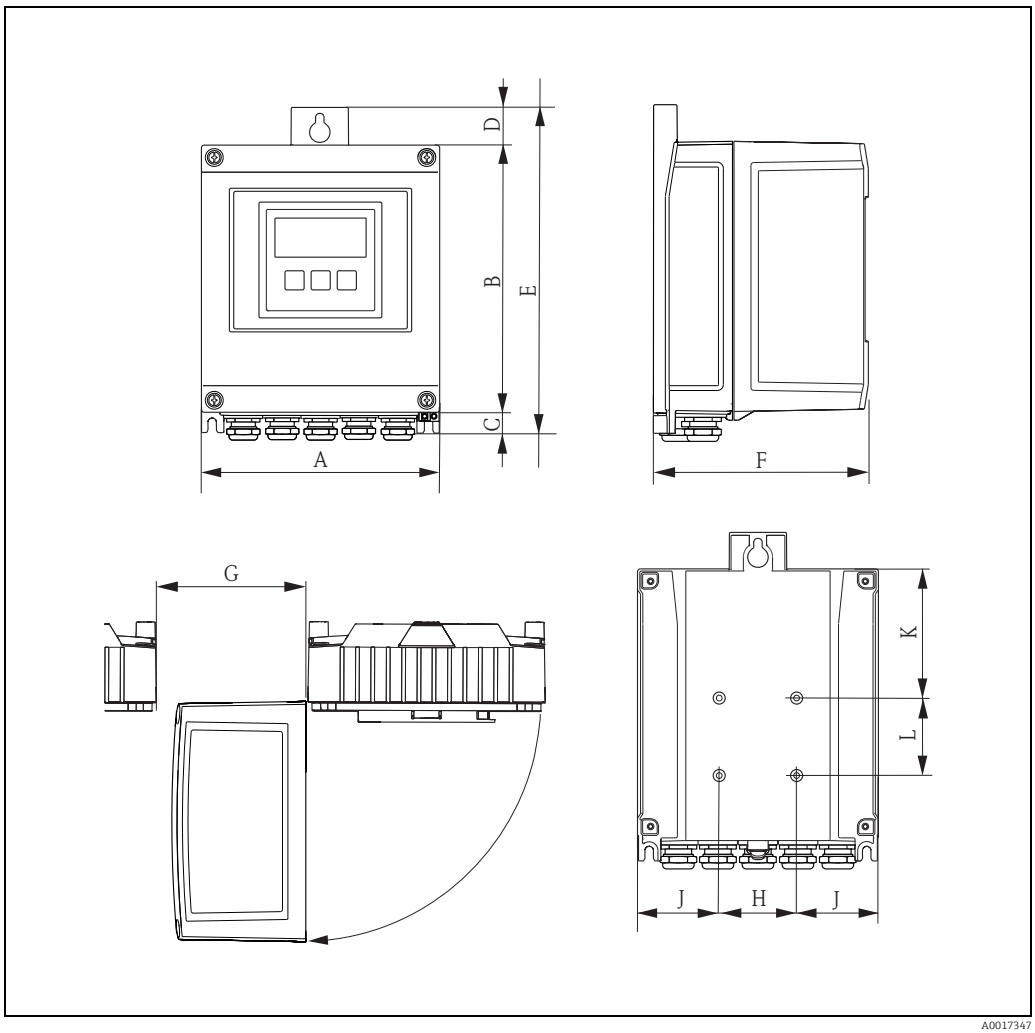
DN [in]	L [in]	A [in]	B [in]	D [in]	E [in]	F [in]	J [in]	K [in]
14"	21.6	8.50	7.44	6.50	6.18	17.05	11.42	7.56

DN [in]	L [in]	A [in]	B [in]	D [in]	E [in]	F [in]	J [in]	K [in]
15"	23.6	8.50	7.44	6.50	6.18	18.07	11.42	7.56
16"	23.6	8.50	7.44	6.50	6.18	18.07	11.42	7.56
18"	23.6	8.50	7.44	6.50	6.18	19.17	11.42	7.56
20"	23.6	8.50	7.44	6.50	6.18	20.16	11.42	7.56
24"	23.6	8.50	7.44	6.50	6.18	21.77	11.42	7.56

DN	C for pressure ratings					G for pressure ratings				
	PN 6	PN 10	PN 16	ASME	AS	PN 6	PN 10	PN 16	ASME	AS
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
14"	19.29	19.88	20.5	20.98	20.67	26.69	26.97	29.5	27.56	27.36
15"	–	–	–	–	21.67	–	–	–	–	28.90
16"	21.26	25.83	22.8	22.80	22.83	28.70	29.17	31.8	29.80	29.49
18"	23.43	24.21	25.2	25.00	25.20	30.87	31.26	34.3	31.65	31.77
20"	25.39	26.38	28.1	27.52	27.76	32.83	33.35	38.3	33.90	34.02
24"	29.72	30.71	33.1	32.01	32.48	36.61	37.13	42.2	37.76	37.99

Transmitter remote version, wall-mount housing

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



A0017347

Dimensions in SI units

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

Dimensions in US units

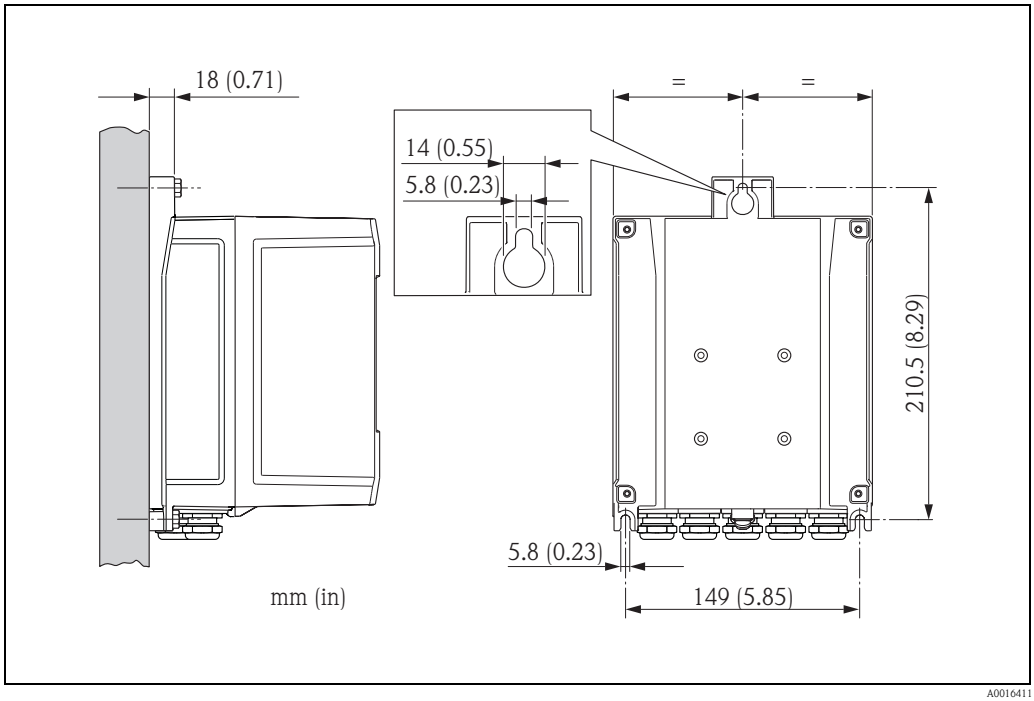
A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	J [in]	K [in]	L [in]
6.50	7.28	0.59	0.98	8.86	5.96	1.97	2.09	2.20	3.48	2.09

Installing the wall-mount housing

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

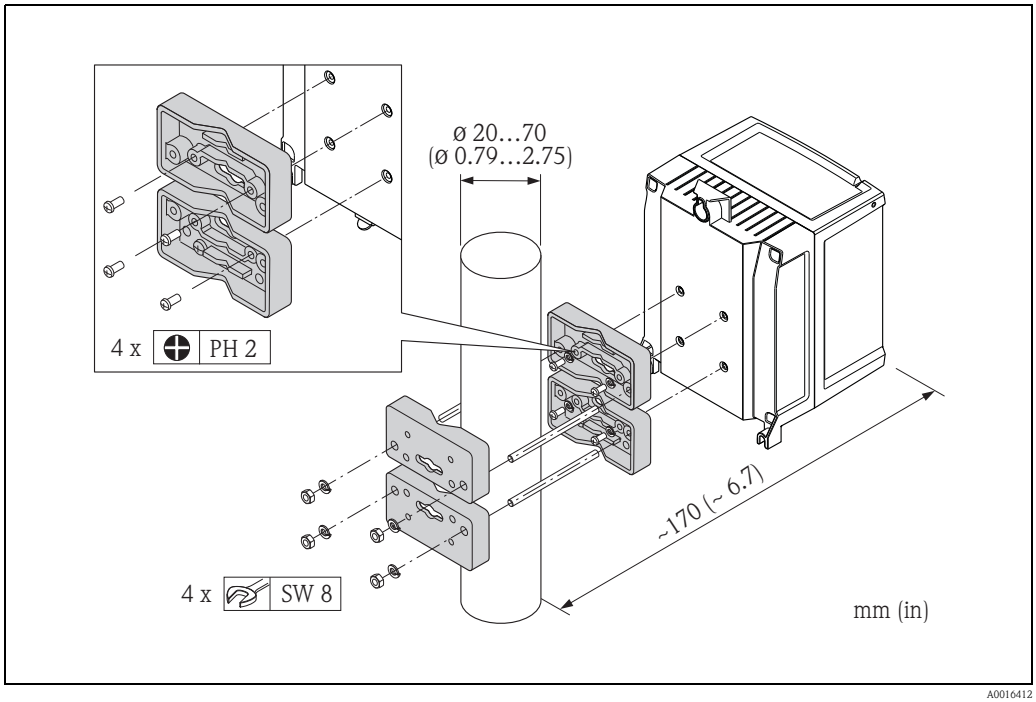
- Direct wall mounting
- Pipe mounting (with separate mounting kit, accessories → 46)

Direct wall mounting



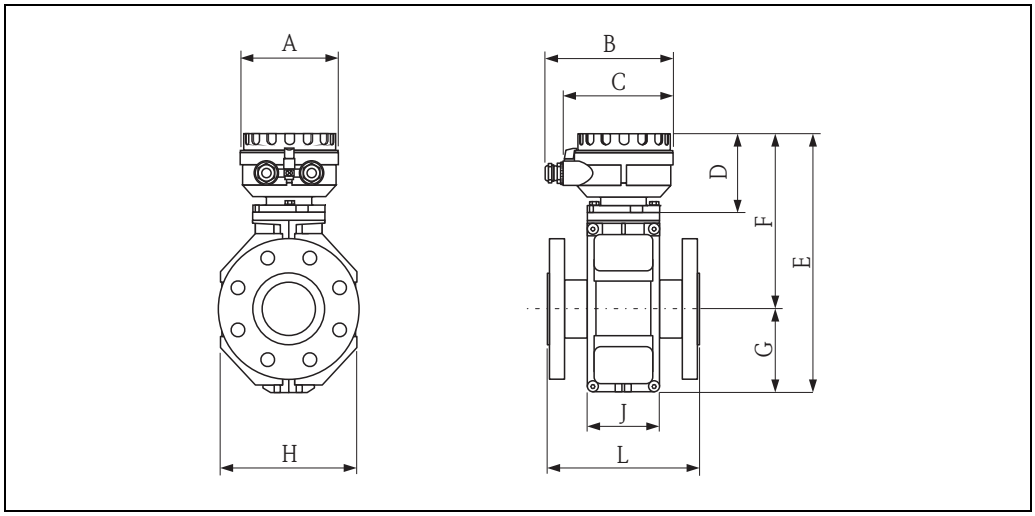
A0016411

Pipe mounting



A0016412

Sensor remote version, DN 50 to 300 (2 to 12")



A0012462

Dimensions in SI units

DN [mm]	L[1] [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	J [mm]
50	200	129	163	143	102	286	202	84	120	94
65	200					336	227	109	180	94
80	200					336	227	109	180	94
100	250					336	227	109	180	94
125	250					417	267	150	260	140
150	300					417	267	150	260	140
200	350					472	292	180	324	156
250	450					522	317	205	400	156
300	500					572	342	230	460	166

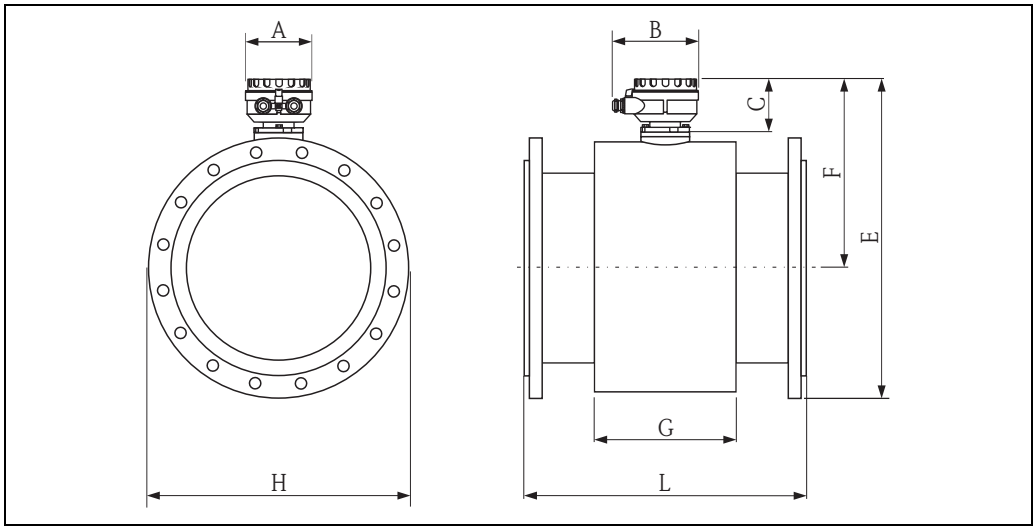
[1] The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Dimensions in US units

DN [in]	L[1] [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	J [in]
2"	7.87	5.08	6.42	5.63	4.02	11.3	7.95	3.32	4.72	3.70
3"	7.87					13.2	8.94	4.30	7.10	3.70
4"	9.84					13.2	8.94	4.30	7.10	3.70
6"	11.8					16.4	10.5	5.91	10.2	5.51
8"	13.8					18.6	11.5	7.10	12.8	6.14
10"	17.7					20.6	12.5	8.08	15.8	6.14
12"	19.7					22.5	13.5	9.06	18.1	6.54

[1] The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Sensor remote version DN 350 to 600 (14 to 24")



Dimensions in SI units

DN [mm]	L [mm]	A [mm]	B [mm]	C [mm]	F [mm]	G [mm]
350	550	129	163	102	353	290
375	600				379	
400	600				379	
450	600				407	
500	600				432	
600	600				473	

DN	E for pressure ratings					H for pressure ratings				
	PN 6	PN 10	PN 16[1)]	ASME	AS	PN 6	PN 10	PN 16	ASME	AS
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	598	605	613 (611)	620	615	490	505	520	533	525
375	–	–	–	–	654	–	–	–	–	550
400	649	661	667 (667)	677	669	540	565	580	597	580
450	704	714	727 (724)	724	727	595	615	640	635	640
500	754	767	790 (786)	781	784	645	670	715	699	705
600	850	863	893 (898)	879	885	755	780	840	813	825

1) (in brackets: values for "Sensor options", option CK)

Dimensions in US units

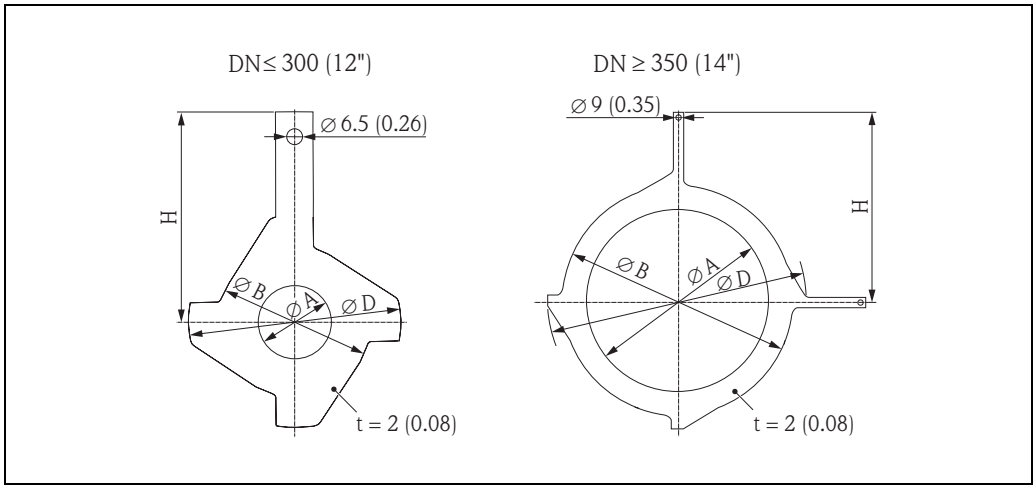
DN [in]	L [in]	A [in]	B [in]	C [in]	F [in]	G [in]
14"	21.6	5.08	6.42	4.02	13.9	11.42
15"	23.6				14.9	
16"	23.6				14.9	
18"	23.6				16.0	
20"	23.6				17.0	
24"	23.6				18.6	

DN	E for pressure ratings					H for pressure ratings				
	PN 6	PN 10	PN 16[1)]	ASME	AS	PN 6	PN 10	PN 16	ASME	AS
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
14"	23.5	23.8	24.1 (24.1)	24.4	24.2	19.3	19.9	20.5	21.0	20.7
15"	–	–	–	–	25.7	–	–	–	–	21.7
16"	25.6	26.0	26.3 (26.3)	26.7	26.3	21.3	22.2	22.8	23.5	22.8
18"	27.7	28.1	28.6 (28.5)	28.5	28.6	23.4	24.2	25.2	25.0	25.2
20"	29.7	30.2	31.1 (30.9)	30.7	30.9	25.4	26.4	28.1	27.5	27.8
24"	33.5	34.0	35.2 (35.4)	34.6	34.8	29.7	30.7	33.1	32.0	32.5

1) (in brackets: values for "Sensor options", option CK)

Accessories

Ground disks for flange connections



Dimensions in SI and US units

DN		Pressure rating	A		B		D		H	
[mm]	[in]		[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
50	2"	1)	52	2.05	101	3.98	115.5	4.55	108	4.25
65	2 ½"	1)	68	2.68	121	4.76	131.5	5.18	118	4.65
80	3"	1)	80	3.15	131	5.16	154.5	6.08	135	5.31
100	4"	1)	104	4.09	156	6.14	186.5	7.34	153	6.02
125	5"	1)	130	5.12	187	7.36	206.5	8.13	160	6.30
150	6"	1)	158	6.22	217	8.54	256	10.08	184	7.24
200	8"	1)	206	8.11	267	10.51	288	11.34	205	8.07
250	10"	1)	260	10.24	328	12.91	359	14.13	240	9.45
300	12"	1)	312	12.28	375	14.76	413	16.26	273	10.75
350	14"	DIN, PN 6	343	13.50	433	16.54	479	18.86	365	14.37
		DIN, PN 10			420	17.05				
		ASME, Cl.150								
400	16"	DIN, PN 6	393	15.47	470	18.50	542	21.34	395	15.55
		DIN, PN 10			480	18.90				
		ASME, Cl.150								
450	18"	DIN, PN 6	439	17.28	525	20.67	583	22.95	417	16.42
		DIN, PN 10			538	21.18				
		ASME, Cl.150								
500	20"	DIN, PN 6	493	19.41	575	23.31	650	25.59	460	18.11
		DIN, PN 10			592	22.64				
		ASME, Cl.150								
600	24"	DIN, PN 6	593	23.35	676	27.28	766	30.16	522	20.55
		DIN, PN 10			693	26.61				
		ASME, Cl.150								

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

Weight **Weight (SI units)**

Promag L (lap joint flange/welded flange DN > 300)

Weight data of Promag L in kg (excluding packaging material)

Nominal diameter		Compact version (sensor and transmitter) excluding batteries								Remote version (sensor and connection housing) excluding connecting cable, transmitter and batteries							
[mm]	[in]	EN (DIN)		EN (DIN)		EN (DIN)		ASME		AS		EN (DIN)		EN (DIN)		EN (DIN)		ASME		AS	
50	2"	PN 16	8.6	PN 10	–	PN 6	–	ASME / Class 150	8.6	PN 16. Tabelle E	–	PN 16	8.6	PN 10	–	PN 6	–	ASME / Class 150	8.6	PN 16. Tabelle E	–
65	–		10.0		–		–		–		–		10.0		–		–		–		–
80	3"		12.0		–		–		12.0		–		12.0		–		–		12.0		–
100	4"		14.0		–		–		14.0		–		14.0		–		–		14.0		–
125	–		19.5		–		–		–		–		19.5		–		–		–		–
150	6"		23.5		–		–		23.5		–		23.5		–		–		23.5		–
200	8"		–		43		–		43		–		–		43		–		43		–
250	10"		–		63		–		63		–		–		63		–		63		–
300	12"		–		68		–		68		–		–		68		–		68		–
350	14"		105		88		77		137		99		105		87		76		136		98
375	15"		–		–		–		–		105		–		–		–		–		104
400	16"		123		104		89		168		120		123		103		88		167		119
450	18"		140		112		99		191		133*		140		111		98		190		132*
500	20"		180		132		114		228		182		180		131		113		227		181
600	24"		225		155		155		302		260		225		154		154		301		259

*DN 450 for AS Tab E = 143 kg

*DN 450 for AS Tab E = 142 kg
Transmitter remote version = 1.5 kg

Weight of battery block with: one battery = 100 g/two batteries = 190 g/three batteries = 290 g

Promag L (lap joint flange)

Weight data of Promag L in kg (for standard pressure ratings, excluding packaging material)

Nominal diameter		Compact version (sensor and transmitter) excluding batteries		Remote version (sensor and connection housing) excluding connecting cable, transmitter and batteries	
[mm]	[in]	EN (DIN)		EN (DIN)	
50	2"	PN 10	5.2	PN 10	5.2
65	–		6.0		6.0
80	3"		7.0		7.0
100	4"		9.5		9.5
125	–		13.0		13.0
150	6"		17.0		17.0
200	8"		35.5		35.5
250	10"		54.0		54.0
300	12"		55.0		55.0

Transmitter remote version = 1.5 kg

Weight of battery block with: one battery = 100 g/two batteries = 190 g/three batteries = 290 g

Weight (US units)

Promag L (lap joint flange)

Weight data of Promag L 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	
[mm]	[in]		ASME		ASME
50	2"	Class 150	19.0	Class 150	19.0
65	–		–		–
80	3"		26.5		26.5
100	4"		30.9		30.9
125	–		–		–
150	6"		51.8		51.8
200	8"		94.8		94.8
250	10"		139		139
300	12"		150		238
				Transmitter remote version = 3.3 lbs	
		Weight of battery block with: one battery = 3.53 oz/two batteries = 6.7 oz/three batteries = 10.2 oz			

Measuring tube specifications

Nominal diameter		Pressure rating			Measuring tube internal diameter					
		EN (DIN)	AS 2129 AS 4087	ASME	Hard rubber		Polyurethane		PTFE	
[mm]	[in]				[mm]	[in]	[mm]	[in]	[mm]	[in]
50	2"	PN 10/16		Class 150	–	–	50.3	2.0	51.7	2.0
65*	2"	PN 10/16		Class 150	–	–	66.1	2.6	67.7	2.7
80	3"	PN 10/16		Class 150	–	–	78.9	3.1	79.9	3.1
100	4"	PN 10/16		Class 150	–	–	104.3	4.1	103.8	4.1
125	5"	PN 10/16		Class 150	–	–	129.7	5.1	129.1	5.1
150	6"	PN 10/16		Class 150	–	–	158.3	6.2	156.3	6.2
200	8"	PN 10/16		Class 150	–	–	206.7	8.1	202.1	8.0
250	10"	PN 10/16		Class 150	–	–	260.6	10.3	256.2	10.1
300	12"	PN 10/16			–	–	311.5	12.3	305.5	12.0
				Class 150	–	–	309.9	12.2	303.9	12.0
350	14"	PN 6			341	13.4	344	13.5	–	–
		PN 10			341	13.4	344	13.5	–	–
			PN 16 Table E		339	13.3	342	13.4	–	–
				Class 150	339	13.3	342	13.4	–	–
375	15"	PN 10			391	15.4	–	–	–	–
			PN 16	–	389	15.3	392	15.4	–	–
400	16"	PN 6			391	15.4	394	13.5	–	–
		PN 10			442	17.4	394	13.5	–	–
			PN 16 Table E		389	15.3	392	13.4	–	–
				Class 150	389	15.3	392	13.4	–	–
450	18"	PN 6			442	17.4	445	17.5	–	–
		PN 10			493	19.4	445	17.5	–	–
			PN 16 Table E		440	17.3	443	17.4	–	–
				Class 150	438	17.2	441	17.3	–	–
500	20"	PN 6			493	19.4	496	19.5	–	–
		PN 10			595	23.4	496	19.5	–	–
			PN 16 Table E		489	19.2	492	19.3	–	–
				Class 150	489	19.2	492	19.3	–	–
600	24"	PN 6			595	23.4	598	23.5	–	–
		PN 10			590	23.2	598	23.5	–	–
			PN 16 Table E		591	23.2	594	23.4	–	–
				Class 150	589	23.1	592	23.3	–	–

* Designed acc. to EN 1092-1 (not to DIN 2501)

Material

Transmitter housing

- Compact housing: polycarbonate plastic
- Wall-mount housing: polycarbonate plastic

Sensor housing

- DN 50 to 300 (2 to 12"): aluminum coated AlSi10Mg
- DN 350 to 600 (14 to 24"): carbon steel with protective varnish

Sensor connection housing, remote version

Aluminum coated AlSi10Mg

Measuring tubes

- DN 50 to 300 (2 to 12"): stainless steel 1.4301/304 or 1.4306/304L
- DN 350 to 600 (14 to 24"): stainless steel 202 or 304

Measuring tube lining

- DN 50 to 300 (2 to 12"): PTFE
- DN 50 to 600 (2 to 24"): polyurethane
- DN 350 to 600 (14 to 24"): hard rubber

Electrodes

1.4435/304L, Alloy C-22

Process connections

EN 1092-1 (DIN 2501)

- DN ≤ 300 (12"): 1.0038 (S235JRG2), 1.4301/304, 1.4306/304L, 1.4307/304L
- DN ≥ 350 (14"): 1.0038 (S235JRG2), A105

ASME B16.5

- DN ≤ 300 (12"): A105, 316L
- DN ≥ 350 (14"): A105

AS 2129

DN ≥ 350 (14"): 1.0038 (S235JRG2), 1.0345 (P235GH), 1.0425/316L (P265GH), A105, FE 410 WB

AS 4087

DN ≥ 350 (14"): 1.0044 (S275JR), 1.0425/316L (P265GH), A105

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

Flange connections:
- EN 1092-1 (DIN 2501)
  - DN ≤ 300 = form A
  - DN ≥ 350 = flat face
- ASME
- AS

Surface roughness

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

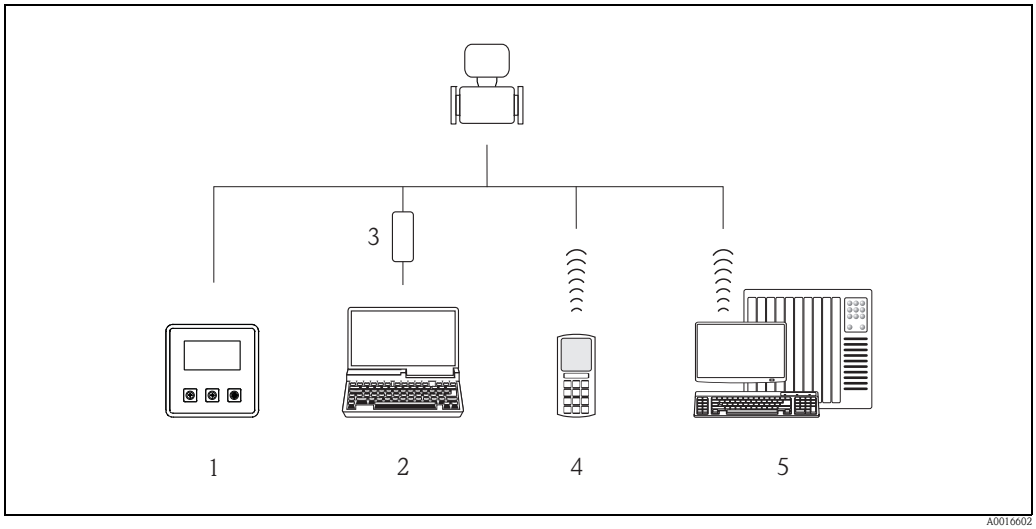
GSM/GPRS antenna

- 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 → 24.

Operability

Operating concept

Operating options



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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)

Local 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 → 46).

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 ans 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.

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: ■ 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.

Sevice-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ■ 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: ■ 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: ■ 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
5L8B**-	GSM/GPRS	Brief Operating Instructions	KA00055D
		Operating Instructions	BA00147D

Supplementary device-dependent documentation

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

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