



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

# Proline Promag 50P, 53P

## Electromagnetic Flow Measuring System

Flow rate measurement in chemical or process applications



### Application

Electromagnetic flowmeter for bidirectional measurement of liquids with a minimum conductivity of  $\geq 5 \mu\text{S/cm}$ :

- Acids and caustic solutions
- Paints
- Pastes, mashes
- Water, wastewater etc.
- Flow measurement up to 44,000 GPM (9600 m<sup>3</sup>/h)
- Fluid temperature up to 356°F (180°C)
- Process pressures up to 580 psi (40 bar)
- Fitting lengths to DVGW/ISO

Application-specific lining materials:

- PTFE und PFA

Approvals for hazardous area:

- ATEX, FM, CSA, TIIS

Connection to process control system:

- HART®, Profibus® DP/PA, FOUNDATION™  
Fieldbus, MODBUS® RS485

### Your benefits

Promag measuring devices offer you cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions.

The **Proline transmitter concept** comprises:

- Modular device and operating concept resulting in a higher degree of efficiency
- Software options for batching, electrode cleaning and for measuring pulsating flow.
- Uniform operating concept

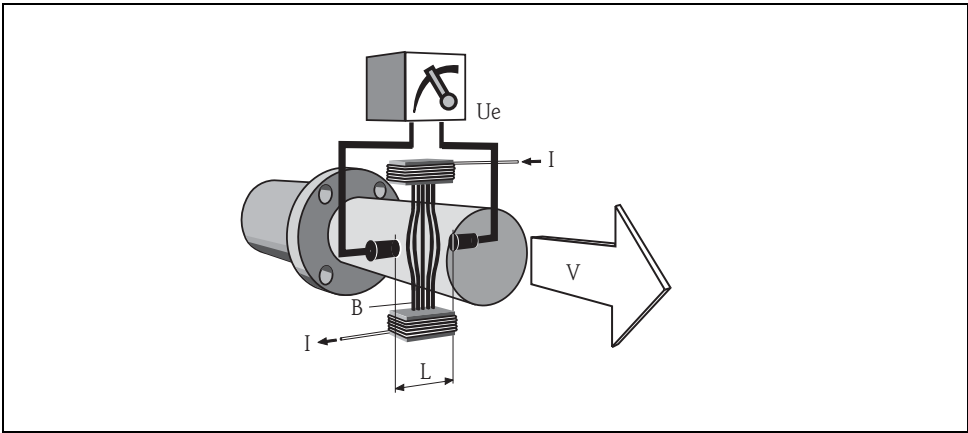
The tried-and-tested **Promag sensors** offer:

- No pressure loss
- Not sensitive to vibrations
- Simple installation and commissioning

# Function and system design

## Measuring principle

Faraday’s law of induction states that a voltage is induced in a conductor moving in a magnetic field. In electromagnetic measuring, the flowing medium corresponds to the moving conductor. The induced voltage is proportional to the flow velocity and is detected by two measuring electrodes and transmitted to the amplifier. Flow volume is computed on the basis of the pipe's diameter. The constant magnetic field is generated by a switched direct current of alternating polarity.



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

- Ue = induced voltage
- B = magnetic induction (magnetic field)
- L = electrode gap
- v = flow velocity
- Q = volume flow
- A = pipe cross-section
- I = current strength

## Measuring system

The measuring system consists of a transmitter and a sensor.  
Two versions are available:

- Compact version: transmitter and sensor form a single mechanical unit.
- Remote version: transmitter and sensor are installed separately.

Transmitter:  
The Promag 50/53 transmitters incorporate a high impedance amplifier of  $1 \times 10^{12}$  ohms or greater.

- Promag 50 (user interface with push buttons for operation, two-line display)
- Promag 53 (“Touch Control” without opening the housing, four-line display)

Sensor:

- 1/2" to 24" (DN 15 to 600)

## Input

|                     |                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measured variable   | Flow rate (proportional to induced voltage)                                                                                                                                                                                                                                                                                                     |
| Measuring range     | Typically $v = 0.033$ to $33$ ft/s ( $0.01$ to $10$ m/s) with the specified measuring accuracy                                                                                                                                                                                                                                                  |
| Operable flow range | Over $1000 : 1$                                                                                                                                                                                                                                                                                                                                 |
| Input signal        | Status input (auxiliary input):<br>$U = 3$ to $30$ V DC, $R_i = 5$ k $\Omega$ , galvanically isolated.<br>Configurable for: totalizer(s) reset, measured value suppression, error-message reset.<br><br>Status input (auxiliary input) with PROFIBUS DP and MODBUS RS485:<br>$U = 3$ to $30$ V DC, $R_i = 3$ k $\Omega$ , galvanically isolated |

Switching level: 3 to 30 V DC, independent of polarity

Configurable for: totalizer(s) reset, measured value suppression, error-message reset, batching start/stop (optional), batch totalizer reset (optional)

Current input (for Promag 53 only):

Active/passive selectable, galvanically isolated, full scale value selectable, resolution: 3  $\mu$ A, temperature coefficient: typ. 0.003% o.r./°F (0.005% o.r./°C), o.r. = of reading

active: 4 to 20 mA,  $R_i \leq 150 \Omega$ ,  $U_{out} = 24$  V DC, short-circuit-proof

passive: 0/4 to 20 mA,  $R_i \leq 150 \Omega$ ,  $U_{max} = 30$  V DC

## Output

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### Output signal

#### Promag 50

Current output:

active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100 s), full scale value selectable, temperature coefficient: typ. 0.003% o.r./°F (0.005% o.r./°C), o.r. = of reading, resolution: 0.5  $\mu$ A

- active: 0/4 to 20 mA,  $R_L < 700 \Omega$  (HART:  $R_L \geq 250 \Omega$ )
- passive: 4 to 20 mA, operating voltage  $V_S$  18 to 30 V DC,  $R_i \leq 150 \Omega$

Pulse/frequency output:

passive, open collector, 30 V DC, 250 mA, galvanically isolated.

- Frequency output: full scale frequency 2 to 1000 Hz ( $f_{max} = 1250$  Hz), on/off ratio 1:1, pulse width max. 10 s.
- Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.5 to 2000 ms)

PROFIBUS DP interface:

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- Profile version 3.0
- Data transmission rate: 9.6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Function blocks: 1 x analog input, 3 x totalizer
- Output data: volume flow, totalizer
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

## PROFIBUS PA interface:

- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profile version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 1 x analog input, 1 x totalizer
- Output data: volume flow, totalizer
- Input data: positive zero return (ON/OFF), control totalizer, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

**Promag 53**

## Current output:

active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C (o.r. = of reading), resolution: 0.5  $\mu$ A

- active: 0/4 to 20 mA,  $R_L < 700 \Omega$  (HART:  $R_L \geq 250 \Omega$ )
- passive: 4 to 20 mA, operating voltage  $V_S$  18 to 30 V DC,  $R_i \leq 150 \Omega$

## Pulse/frequency output:

active/passive selectable, galvanically isolated (Ex i version: only passive)

- active: 24 V DC, 25 mA (max. 250 mA during 20 ms),  $R_L > 100 \Omega$
- passive: open collector, 30 V DC, 250 mA
- Frequency output: full scale frequency 2 to 10000 Hz ( $f_{\max} = 12500$  Hz), EEx-ia: 2 to 5000 Hz; on/off ratio 1:1; pulse width max. 10 s.
- Pulse output: pulse value and pulse polarity adjustable, pulse width configurable (0.05 to 2000 ms)

## PROFIBUS DP interface:

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- Profile version 3.0
- Data transmission rate: 9.6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Function blocks: 2 x analog input, 3 x totalizer
- Output data: volume flow, calculated mass flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Available output combination → Page 7 ff.

## PROFIBUS PA interface:

- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profile version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 2 x analog input, 3 x totalizer
- Output data: volume flow, calculated mass flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

MODBUS interface:

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- MODBUS device type: Slave
- Address range: 1 to 247
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Supported MODBUS function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Transmission mode: RTU oder ASCII
- Supported baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Response time:
  - Direct data access = typically 25 to 50 ms
  - Auto-scan buffer (data range) = typically 3 to 5 ms
- Available output combination → Page 7 ff.

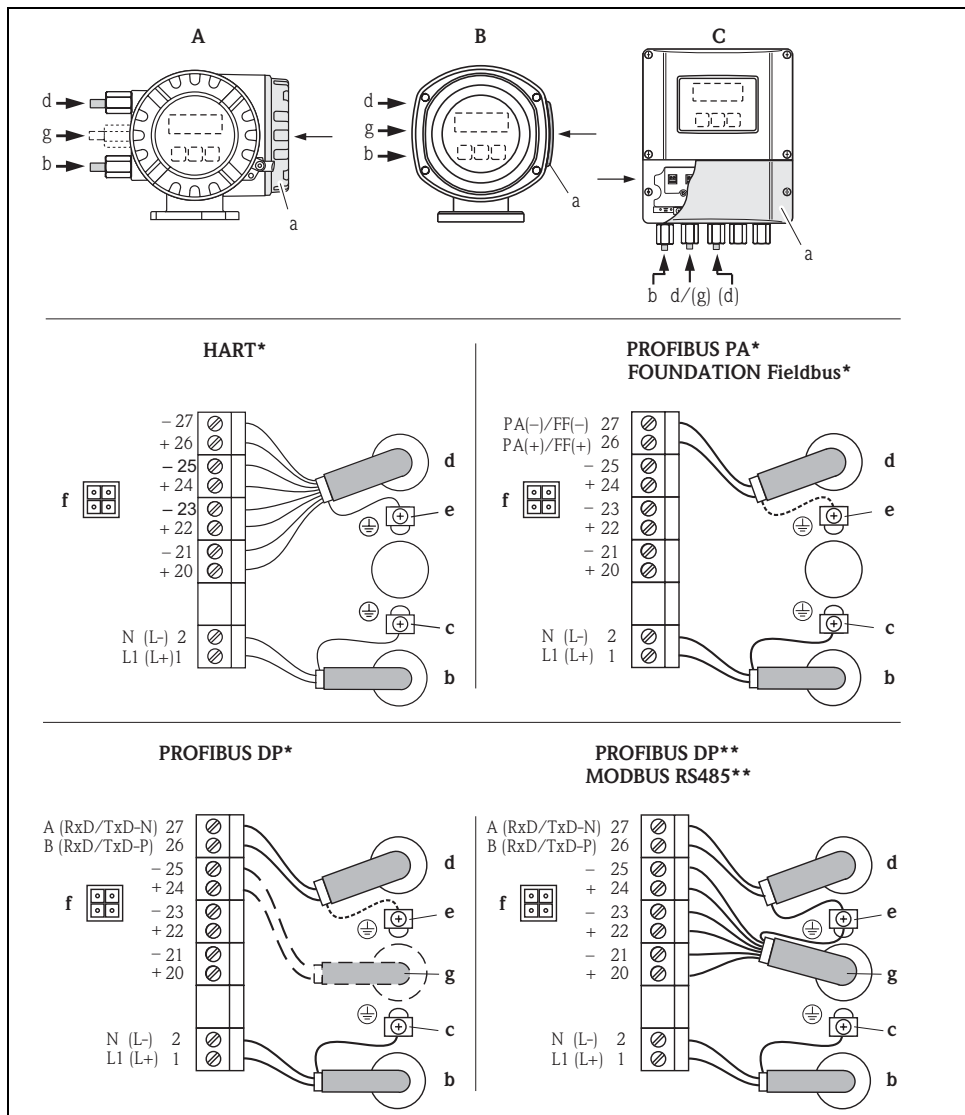
FOUNDATION Fieldbus interface:

- FOUNDATION Fieldbus H1
- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- ITK version 4.01
- Current consumption: 12 mA
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Bus connection with integrated reverse polarity protection
- Function blocks: 5 x analog input, 1 x discrete output, 1 x PID
- Output data: volume flow, calculated mass flow, temperature, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), reset totalizer
- Link Master (LM) functionality is supported

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Signal on alarm</b>    | <ul style="list-style-type: none"><li>■ Current output → failure response selectable (e.g. in accord. with NAMUR Recom. NE 43)</li><li>■ Pulse/frequency output → failure response selectable</li><li>■ Status output (Promag 50) → non-conductive by fault or power supply failure</li><li>■ Relay output (Promag 53) → de-energized by fault or power supply failure</li></ul>                                                                                                                                                                                   |
| <b>Load</b>               | See "Output signal"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Switching output</b>   | <p>Status output (Promag 50, Promag 53):<br/>Open collector, max. 30 V DC / 250 mA, galvanically isolated.<br/>Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.</p> <p>Relay outputs (Promag 53):<br/>Normally closed (NC or break) or normally open (NO or make) contacts available<br/>(default: relay 1 = NO, relay 2 = NC)<br/>max. 30 V / 0.5 A AC; 60 V / 0.1 A DC, galvanically isolated.<br/>Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values, batching contacts.</p> |
| <b>Low flow cutoff</b>    | Switch points for low flow cutoff are selectable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Galvanic isolation</b> | All circuits for inputs, outputs, and power supply are galvanically isolated from each other.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

# Power supply

Electrical connection  
Measuring unit



Cable cross section max. 16 AWG (2.5 mm<sup>2</sup>)

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

- \*) not changeable communication board
- \*\*) changeable communication board
- a Cover of the connection compartment
- b Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC  
Terminal No. 1: L1 for AC, L+ for DC  
Terminal No. 2: N for AC, L- for DC
- c Ground terminal for protective conductor
- d Signal cable: see Terminal assignment → Page 7 ff.  
Fieldbus cable:  
Terminal No. 26: DP (A) / PA (+) / FF (+) / MODBUS RS485 (A) / (PA, FF: with reverse polarity protection)  
Terminal No. 27: DP (B) / PA (-) / FF (-) / MODBUS RS485 (B) / (PA, FF: with reverse polarity protection)
- e Ground terminal for signal-cable shield / Fieldbus cable / RS485 line
- f Service connector for connecting service interface FXA 193 (Fieldcheck, Tof Tool - Fieldtool Package)
- g Signal cable: see Terminal assignment → Page 7 ff.  
Cable for external termination (only for PROFIBUS DP with fixed assignment communication board):  
Terminal No. 24: +5 V  
Terminal No. 25: DGND

**Terminal assignment, Promag 50**

| Order variant                            | Terminal No. (inputs / outputs) |                 |                                |                                   |
|------------------------------------------|---------------------------------|-----------------|--------------------------------|-----------------------------------|
|                                          | 20 (+) / 21 (-)                 | 22 (+) / 23 (-) | 24 (+) / 25 (-)                | 26 (+) / 27 (-)                   |
| 50***_*****W                             | —                               | —               | —                              | Current output HART               |
| 50***_*****A                             | —                               | —               | Frequency output               | Current output HART               |
| 50***_*****D                             | Status input                    | Status output   | Frequency output               | Current output HART               |
| 50***_*****H                             | —                               | —               | —                              | PROFIBUS PA                       |
| 50***_*****J                             | —                               | —               | +5 V (external termination)    | PROFIBUS DP                       |
| 50***_*****S                             | —                               | —               | Frequency output Ex i, passive | Current output Ex i active, HART  |
| 50***_*****T                             | —                               | —               | Frequency output Ex i, passive | Current output Ex i passive, HART |
| Ground connection, power supply → Page 6 |                                 |                 |                                |                                   |

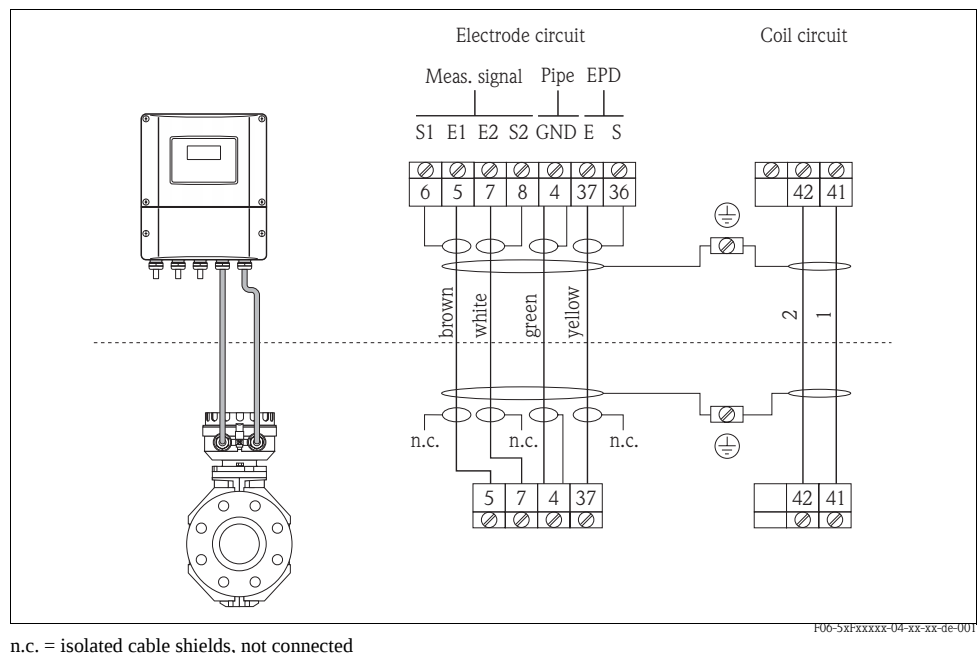
**Terminal assignment, Promag 53**

The inputs and outputs on the communication board can be either permanently assigned or variable, depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

| Order variant                                 | Terminal No. (inputs / outputs) |                 |                     |                                 |
|-----------------------------------------------|---------------------------------|-----------------|---------------------|---------------------------------|
|                                               | 20 (+) / 21 (-)                 | 22 (+) / 23 (-) | 24 (+) / 25 (-)     | 26 (+) / 27 (-)                 |
| Fixed communication boards (fixed assignment) |                                 |                 |                     |                                 |
| 53***_*****A                                  | —                               | —               | Frequency output    | Current output HART             |
| 53***_*****B                                  | Relay output 2                  | Relay output 1  | Frequency output    | Current output HART             |
| 53***_*****F                                  | —                               | —               | —                   | PROFIBUS PA IS                  |
| 53***_*****G                                  | —                               | —               | —                   | FOUNDATION Fieldbus, IS         |
| 53***_*****H                                  | —                               | —               | —                   | PROFIBUS PA                     |
| 53***_*****J                                  | —                               | —               | —                   | PROFIBUS DP                     |
| 53***_*****K                                  | —                               | —               | —                   | FOUNDATION Fieldbus             |
| 53***_*****Q                                  | —                               | —               | Status input        | MODBUS RS485                    |
| 53***_*****S                                  | —                               | —               | Frequency output IS | Current output IS active, HART  |
| 53***_*****T                                  | —                               | —               | Frequency output IS | Current output IS passive, HART |
| Flexible communication boards                 |                                 |                 |                     |                                 |
| 53***_*****C                                  | Relay output 2                  | Relay output 1  | Frequency output    | Current output HART             |
| 53***_*****D                                  | Status input                    | Relay output    | Frequency output    | Current output HART             |
| 53***_*****L                                  | Status input                    | Relay output 2  | Relay output 1      | Current output HART             |

|                                          | Terminal No. (inputs / outputs) |                  |                  |                        |
|------------------------------------------|---------------------------------|------------------|------------------|------------------------|
| Order variant                            | 20 (+) / 21 (-)                 | 22 (+) / 23 (-)  | 24 (+) / 25 (-)  | 26 (+) / 27 (-)        |
| 53***_***** <b>M</b>                     | Status input                    | Frequency output | Frequency output | Current output<br>HART |
| 53***_***** <b>N</b>                     | Current output                  | Frequency output | Status input     | MODBUS RS485           |
| 53***_***** <b>P</b>                     | Current output                  | Frequency output | Status input     | PROFIBUS DP            |
| 53***_***** <b>V</b>                     | Relay output 2                  | Relay output 1   | Status input     | PROFIBUS DP            |
| 53***_***** <b>2</b>                     | Relay output                    | Current output   | Frequency output | Current output<br>HART |
| 53***_***** <b>4</b>                     | Current input                   | Relay output     | Frequency output | Current output<br>HART |
| 53***_***** <b>5</b>                     | Status input                    | Current input    | Frequency output | Current output<br>HART |
| 53***_***** <b>7</b>                     | Relay output 2                  | Relay output 1   | Status input     | MODBUS RS485           |
| Ground connection, power supply → Page 6 |                                 |                  |                  |                        |

### Electrical connection remote version



### Cable entry

Power-supply and signal cables (inputs/outputs):

- Cable entry M20 x 1.5 (8 to 12 mm)
- Sensor cable entry for armoured cables M20 x 1.5 (9.5 to 16 mm)
- Threads for cable entries 1/2" NPT, G 1/2"

Connecting cable for remote version:

- Cable entry M20 x 1.5 (8 to 12 mm)
- Sensor cable entry for armoured cables M20 x 1.5 (9.5 to 16 mm)
- Threads for cable entries 1/2" NPT, G 1/2"

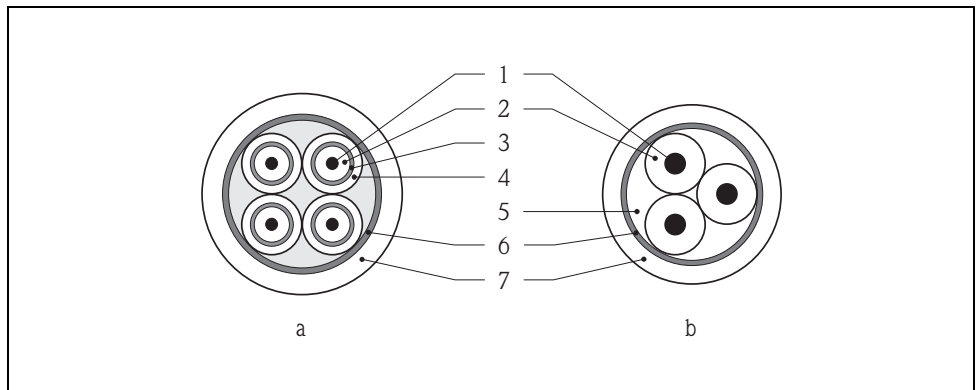
### Cable specifications remote version

#### Coil cable:

- 2 x 18 AWG (0.75 mm<sup>2</sup>) PVC cable with common, braided copper shield (Ø approx. 7 mm)
- Conductor resistance:  $\leq 37 \Omega/\text{km}$
- Capacitance: core/core, shield grounded:  $\leq 120 \text{ pF/m}$
- Permanent operating temperature: -4 to +180°F (-20 to +80°C)
- Cable cross-section: max. 16 AWG (2.5 mm<sup>2</sup>)

#### Signal cable:

- 3 x 20 AWG (0.38 mm<sup>2</sup>) PVC cable with common, braided copper shield (Ø approx. 0.28" / 7 mm) and individually shielded cores
- With Empty Pipe Detection (EPD): 4 x 20 AWG (0.38 mm<sup>2</sup>) PVC cable with common, braided copper shield (Ø approx. 0.28" / 7 mm) and individually shielded cores.
- Conductor resistance:  $\leq 50 \Omega/\text{km}$
- Capacitance: core/shield:  $\leq 420 \text{ pF/m}$
- Permanent operating temperature: -4 to +180°F (-20 to +80°C)
- Cable cross-section: max. 16 AWG (2.5 mm<sup>2</sup>)



a = signal cable, b = coil current cable (cross-section: max. 16 AWG / 2.5 mm<sup>2</sup>)  
 1 = core, 2 = core insulation, 3 = core shield, 4 = core jacket, 5 = core strengthening,  
 6 = cable shield, 7 = outer jacket

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Optionally, Endress+Hauser also supplies reinforced connecting cables with an additional, metal strengthening braid. We recommend such cables for the following cases:

- Cables laid underground
- Danger of rodent attack
- Device used with ingress protection NEMA 6P (IP 68)

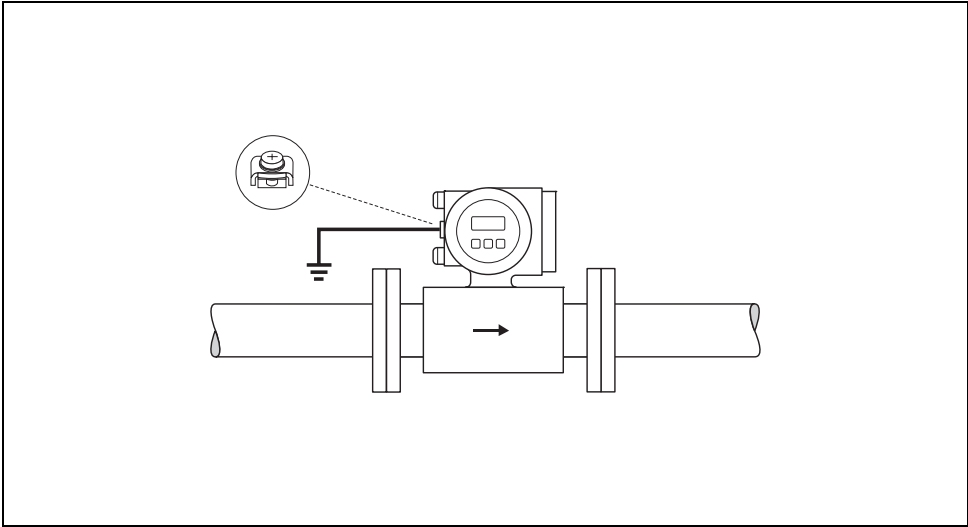
#### Operation in zones of severe electrical interference:

The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/A1, and NAMUR recommendation NE 21.

#### Caution!

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

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supply voltage         | 85 to 260 V AC, 45 to 65 Hz<br>20 to 55 V AC, 45 to 65 Hz<br>16 to 62 V DC                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                        | PROFIBUS PA and FOUNDATION Fieldbus<br>Non-hazardous: 9 to 32 V DC<br>Intrinsically safe: 9 to 24 V DC<br>Explosion proof: 9 to 32 V DC                                                                                                                                                                                                                                                                                                                                                                                                  |
| Power consumption      | AC: <15 VA (including sensor)<br>DC: <15 W (including sensor)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                        | Switch-on current:<br>■ max. 13.5 A (< 50 ms) at 24 V DC<br>■ max. 3 A (< 5 ms) at 260 V AC                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Power supply failure   | Lasting min. 1 power cycle:<br>■ EEPROM or T-DAT (Promag 53 only) retain the measuring system data in the event of a power supply failure<br>■ S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point, etc.)                                                                                                                                                                                                                                         |
| Potential equalisation | <p><b>Standard case</b></p> <p>Perfect measurement is only ensured when the medium and the sensor have the same electrical potential. Most Promag sensors have a standard installed reference electrode which guarantees the required connection. This usually means that additional potential matching measures are unnecessary.</p> <p>Note!</p> <p>For installation in metal pipes, it is advisable to connect the ground terminal of the transmitter housing to the piping. Also, observe company-internal grounding guidelines.</p> |



A0004375

**Caution!**

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

**Metal, ungrounded piping**

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

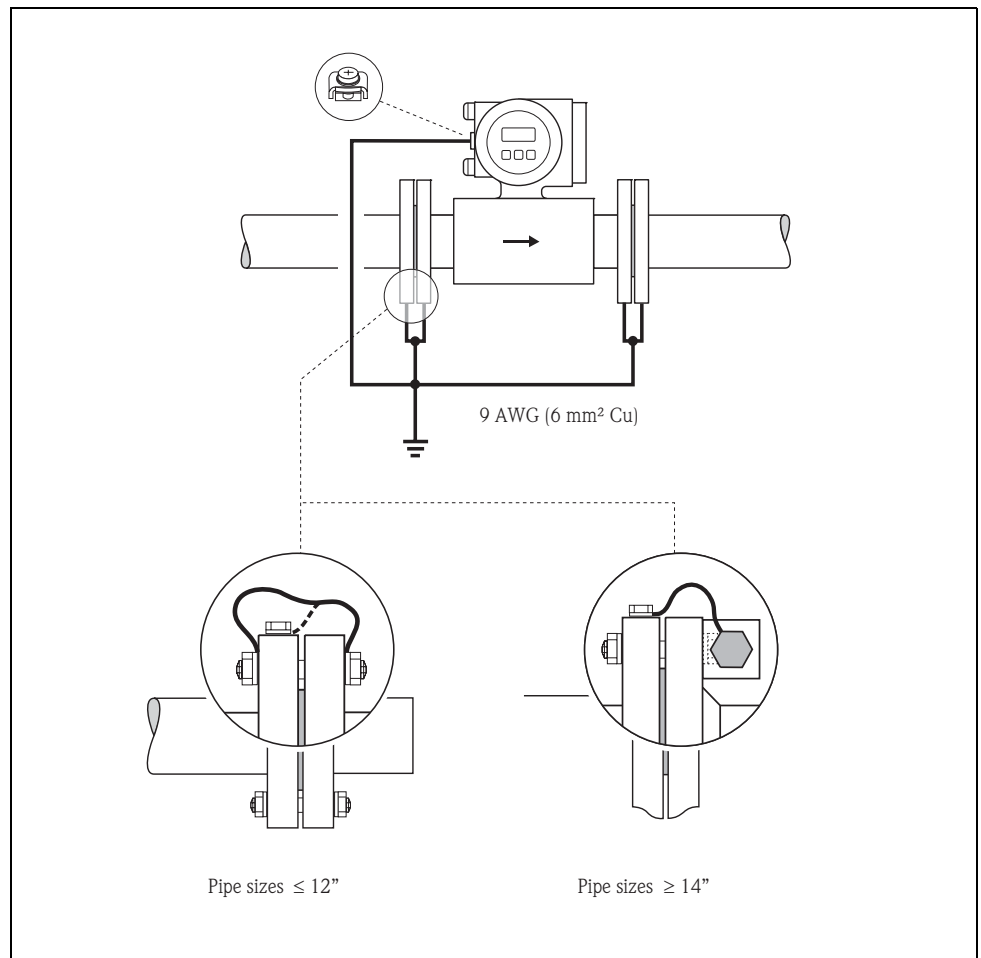
**Caution!**

Also, observe company-internal grounding guidelines.

**Note!**

The ground cable for flange-to-flange connections can be ordered separately as an accessory from Endress+Hauser.

- Sensor sizes  $\leq 12"$  (DN  $\leq 300$ ): The ground cable is in direct connection with the conductive flange coating and is secured by the flange screws.
- Sensor sizes  $\geq 14"$  (DN  $\geq 350$ ): The ground cable connects directly to the metal transport bracket.



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### Plastic pipes and isolating lined pipes

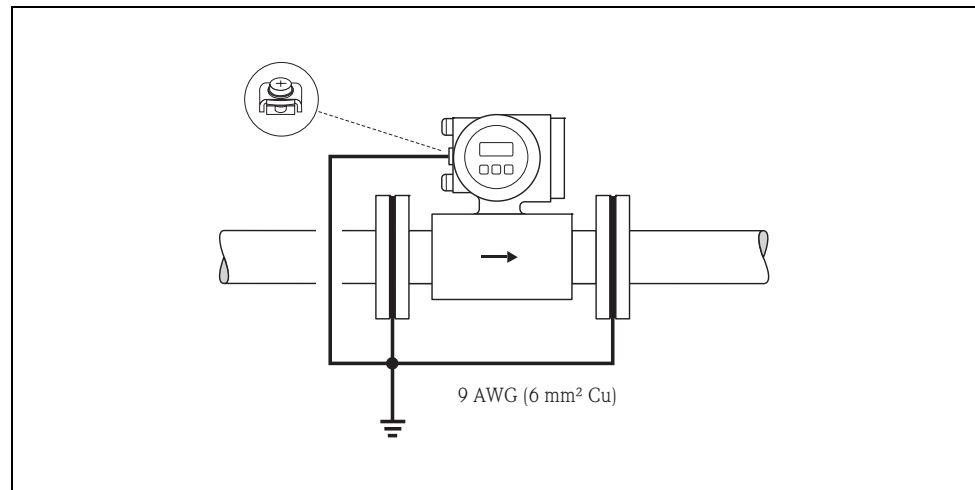
Normally, potential is matched using the reference electrodes in the measuring tube. However, in exceptional cases it is possible that, due to the grounding plan of a system, large matching currents flow over the reference electrodes. This can lead to destruction of the sensor, e.g. through electrochemical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

When using ground disks, note the following points:

- Ground disks (1/2" to 12" / DN 15 to 300) can be ordered separately from Endress+Hauser as an accessory.
- Ground disks (incl. seals) increase the installation length. You can find the dimensions of ground disks on Page 31.

Caution!

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

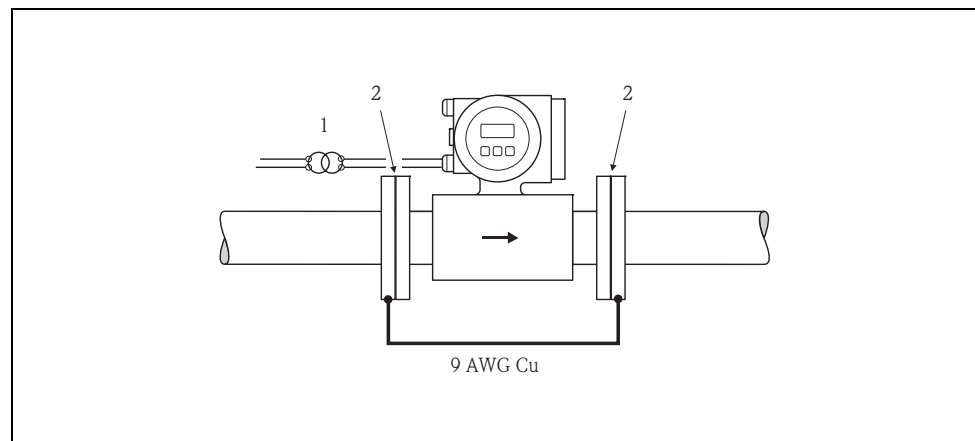


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### Pipes with cathodic protection

In such cases, install the measuring instrument without potential in the piping:

- When installing the measuring device, make sure that there is an electrical connection between the two piping runs (copper wire, 9 AWG / 6 mm²).
- Make sure that the installation materials do not establish a conductive connection to the measuring device and that the installation materials withstand the tightening torques applied when the threaded fasteners are tightened.
- Also comply with the regulations applicable to potential-free installation.



A0004378

1 = isolation transformer, 2 = electrically isolated

## Performance characteristics

**Reference operating conditions**

- To DIN EN 29104 and VDI/VDE 2641:
- Medium temperature: +28°C ± 2 K
  - Ambient temperature: +22°C ± 2 K
  - Warm-up period: 30 minutes

Installation:

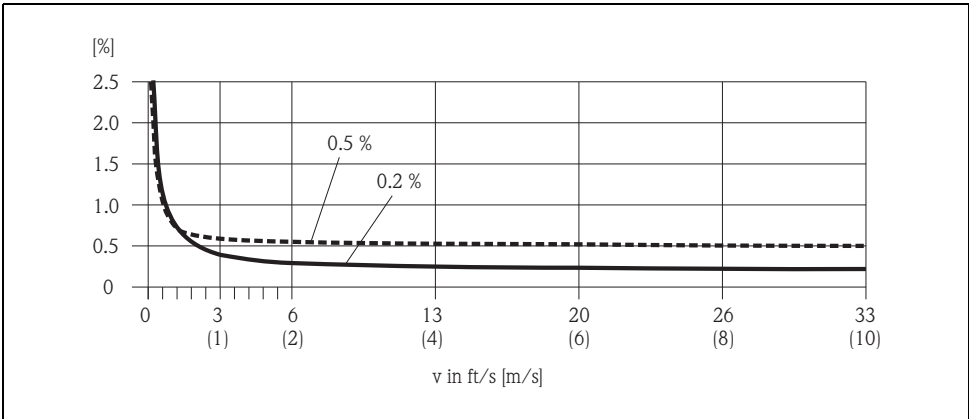
- Inlet run >10 x Dia. (DN)
- Outlet run > 5 x Dia. (DN)
- Sensor and transmitter grounded.
- Sensor centered relative to the pipe.

**Maximum measured error**

Promag 50:  
Pulse output: ± 0.5% o.r. ± 1 mm/s (o.r. = of reading)  
Current output: plus typically ± 5 µA

Promag 53:  
Pulse output: ± 0.2% o.r. ± 2 mm/s (o.r. = of reading)  
Current output: plus typically ± 5 µA

Supply voltage fluctuations have no effect within the specified range.



Max. measured error in % of reading

F06-5xxxxxxxx-05-xx-xx-xx-000

**Repeatability**

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

## Operating conditions

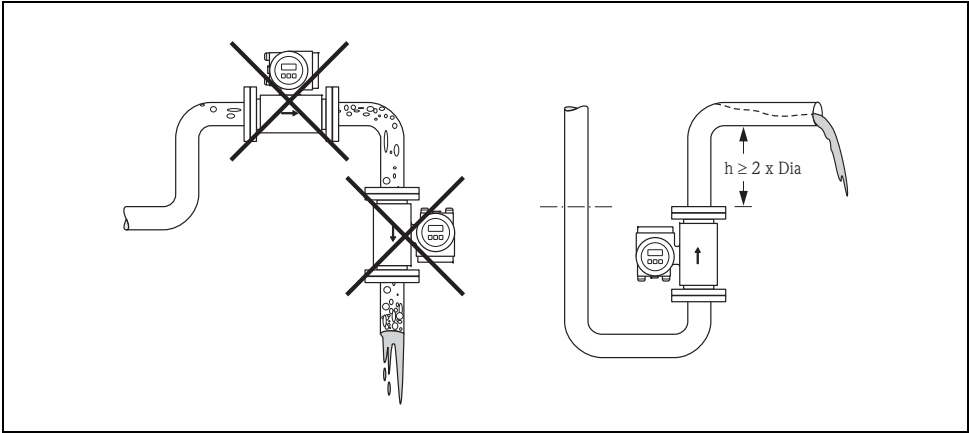
### Installation conditions

**Installation instructions**

**Mounting location**

Correct measuring is possible only if the pipe is full. Avoid the following locations:

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

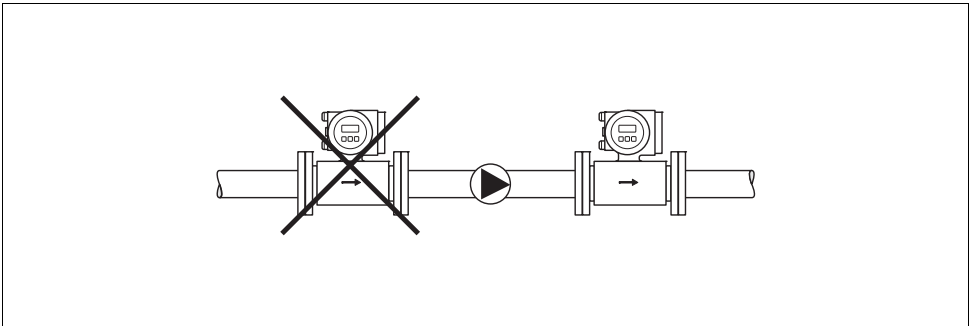


F06-5xxxxxxx-11-00-00-xx-000

**Installation of pumps**

Do not install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the lining's resistance to partial vacuum can be found on Page 21.

It might be necessary to install pulse dampers in systems incorporating reciprocating, diaphragm or peristaltic pumps. Information on the measuring system's resistance to vibration and shock can be found on Page 20.



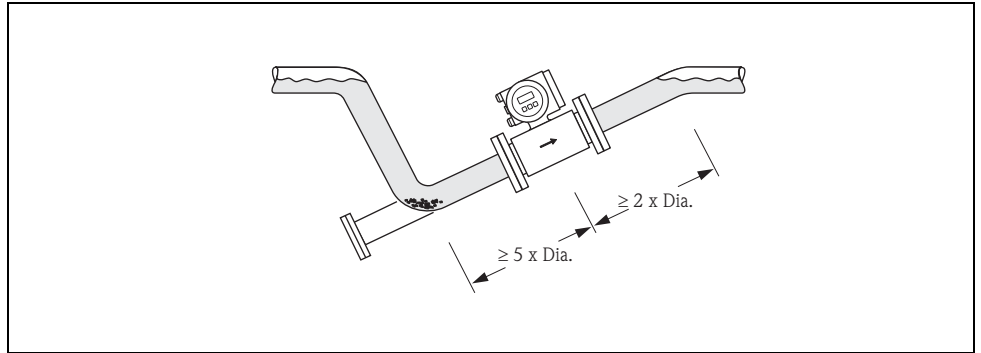
F06-5xxxxxxx-11-00-00-xx-001

**Partially filled pipes**

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

**Caution!**

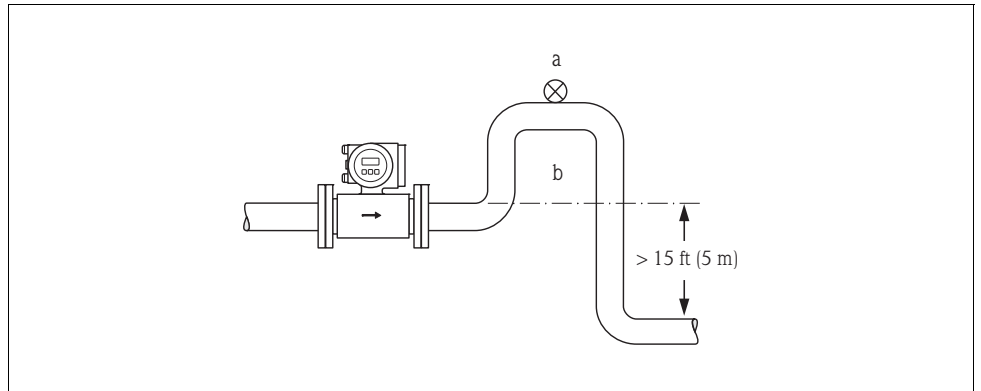
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.



F06-5xxxxxxx-11-00-00-xx-002

**Vertical pipes**

Install a siphon (b) or a vent valve (a) downstream of the sensor in vertical pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. These measures also prevent the system losing prime, which could cause air inclusions. Information on the lining's resistance to partial vacuum can be found on Page 21.



F06-5xxxxxxx-11-00-00-xx-003

a = vent valve, b = siphon

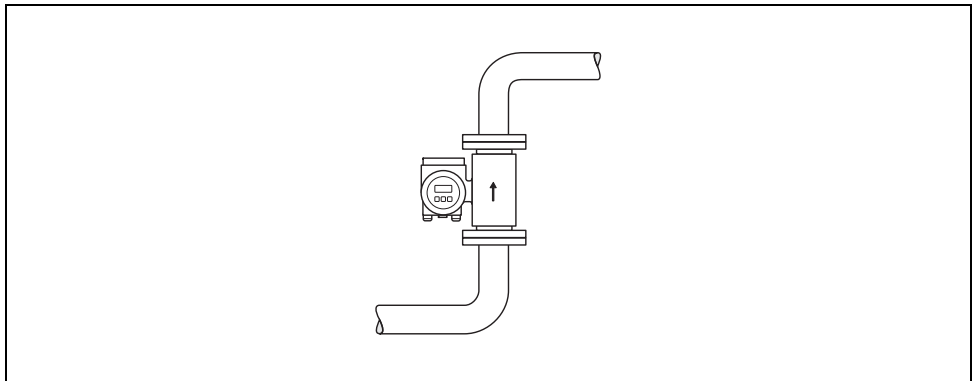
### Orientation

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

- Electrode Cleaning Circuitry (ECC) to remove electrically conductive deposits in the measuring tube, e.g. in accretive mediums.
- Empty Pipe Detection (EPD) for recognition of partially filled measuring tubes, or for degassing mediums or for applications with fluctuating process pressure.

#### Vertical orientation:

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



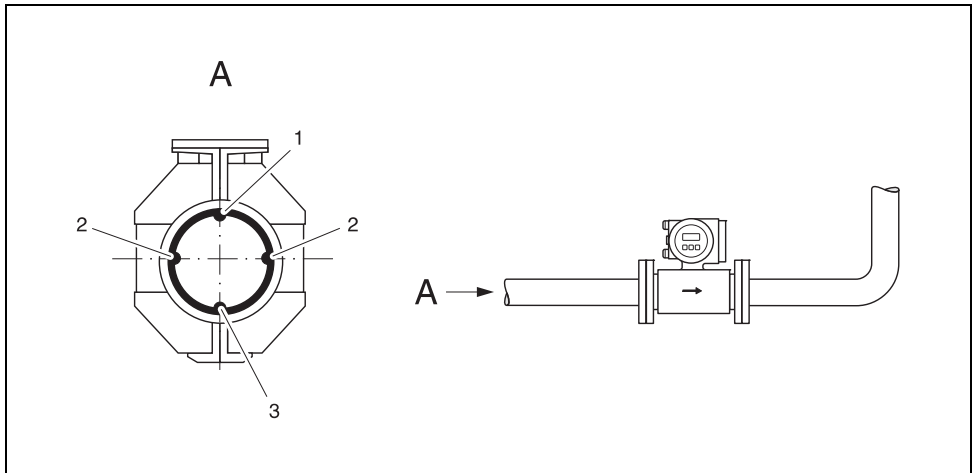
F06-5xxxxxxx-11-00-00-xx-004

#### Horizontal orientation:

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

#### Caution!

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



F06-5xxxxxxx-11-00-xx-xx-000

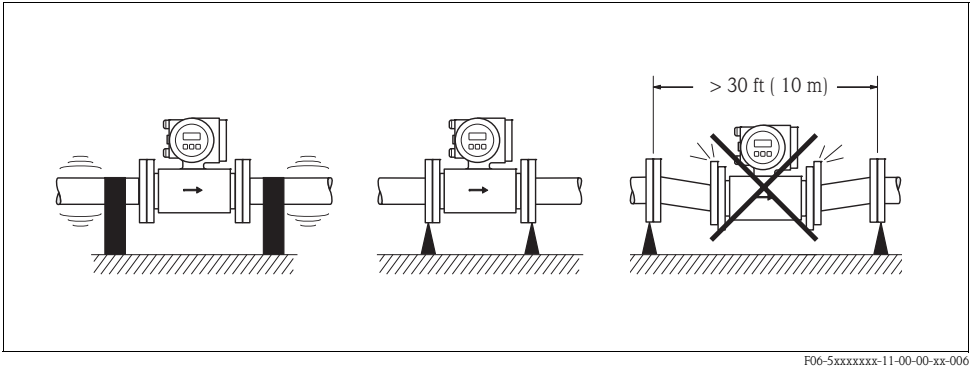
- 1 = EPD electrode (Empty Pipe Detection)
- 2 = Measuring electrodes (signal detection)
- 3 = Reference electrode (potential equalisation)

**Vibrations**

Secure the piping and the sensor if vibration is severe.

**Caution!**

It is advisable to install sensor and transmitter separately if vibration is excessively severe. Information on resistance to vibration and shock can be found on Page 20.

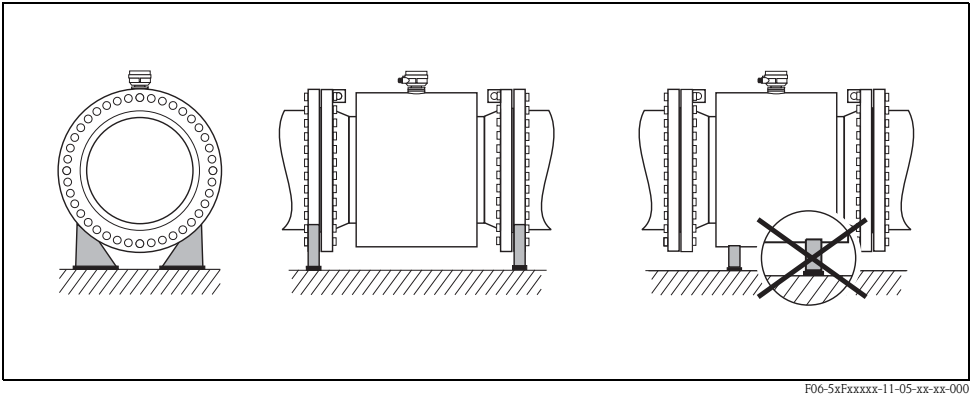


**Foundations, supports**

If the nominal diameter is  $\geq 14"$  (DN  $\geq 350$ ), mount the transmitter on a foundation of adequate load-bearing strength.

**Caution!**

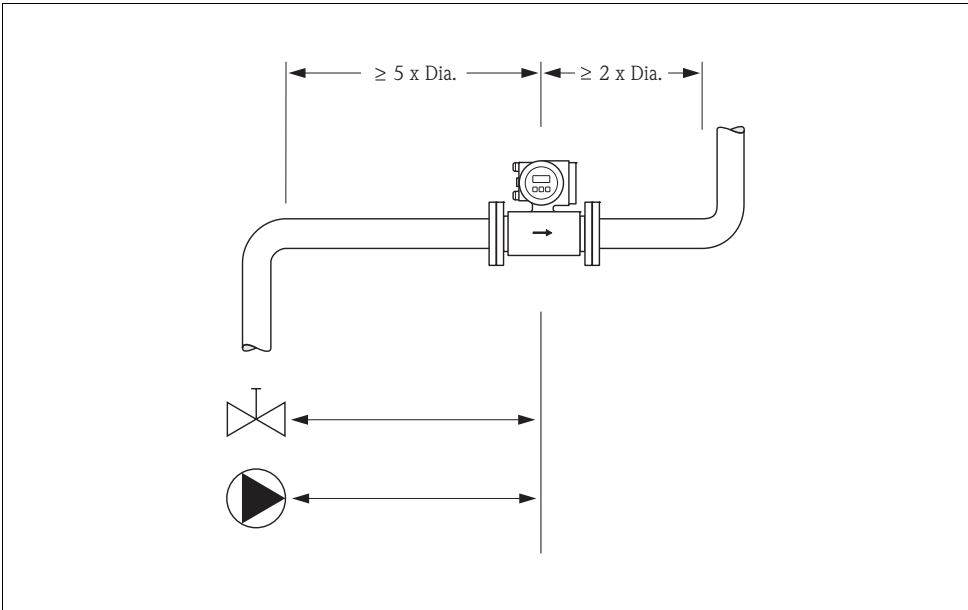
Do not allow the casing to take the weight of the sensor. This would buckle the casing and damage the internal magnetic coils.



Inlet and outlet runs

If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc. Compliance with the following requirements for the inlet and outlet runs is necessary in order to ensure measuring accuracy:

- Inlet run  $\geq 5 \times \text{Dia}$
- Outlet run  $\geq 2 \times \text{Dia}$



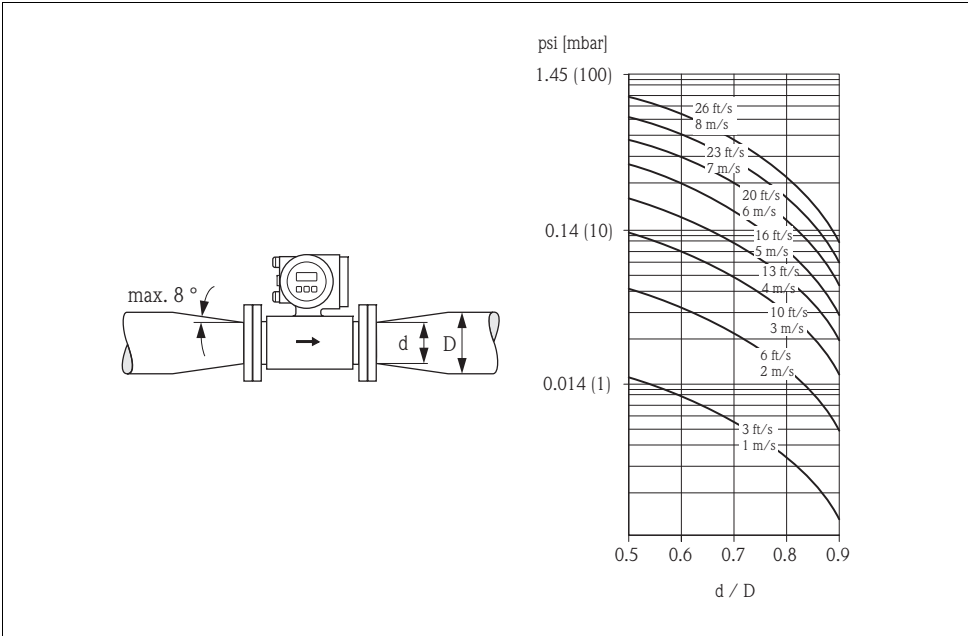
F06-5xxxxxxx-11-00-00-xx-005

Adapters

Suitable adapters to DIN EN 545 (double-flange junction sections) 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 applies only to fluids of viscosity similar to water:

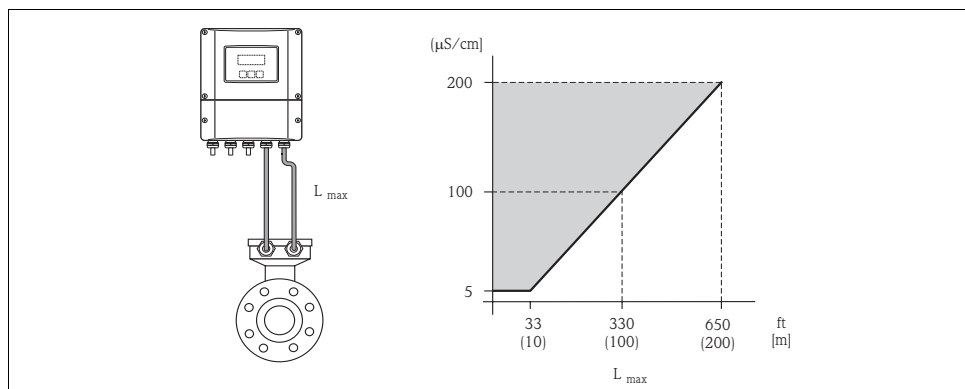
1. Calculate the ratio of the diameters  $d/D$ .
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the  $d/D$  ratio.



F06-5xFxxxxx-05-xx-xx-xx-000

**Length of connecting cable**

Permissible cable length  $L_{\max}$  depends on the conductivity of the medium. A minimum conductivity of 20  $\mu\text{S}/\text{cm}$  is required for measuring demineralized water.



F06-5xxxxxxx-05-xx-xx-xx-006

Gray shaded area = permissible range for medium conductivity

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

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

In order to ensure measuring accuracy, moreover, comply with the following instructions when installing the remote version:

- Secure the cable run or route the cable in a conduit. Movement of the cable can falsify the measuring signal, particularly if the conductivity of the medium is low.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalisation between sensor and transmitter, if necessary.

**Environment****Ambient temperature**

Transmitter:

- Standard: -5 to +140°F (-20 to +60°C)
- Optional: -40 to +140°F (-40 to +60°C)

Note!

At ambient temperatures below -5°F (-20°C) the readability of the display may be impaired.

Sensor:

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

Caution!

It is not allowed to use the device beyond the min. and max. lining specified temperature values (→ "Medium temperature range").

Note the following points:

- Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- If both fluid and ambient temperatures are high, install the transmitter at a remote location from the sensor (→ "Medium temperature range").

Note!

HE or Harsh Environment Protection for sensor:

Provides enhanced moisture ingress protection for humid ambient environments. Apply in applications with severe temperature cycling and humid environments. Refer to ordering information, page 38.

**Storage temperature**

- The storage temperature corresponds to the ambient temperature range of the transmitter and sensor (see "Ambient temperature").
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective plates or caps on the process connections until the device is ready to install. This is particularly important in the case of sensors with PTFE linings.

|                      |                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Degree of protection | <div><div></div>Standard: NEMA 4X (IP 67) for transmitter and sensor</div> <div><div></div>Optional: NEMA 6P (IP 68) for sensor in remote version</div> |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|

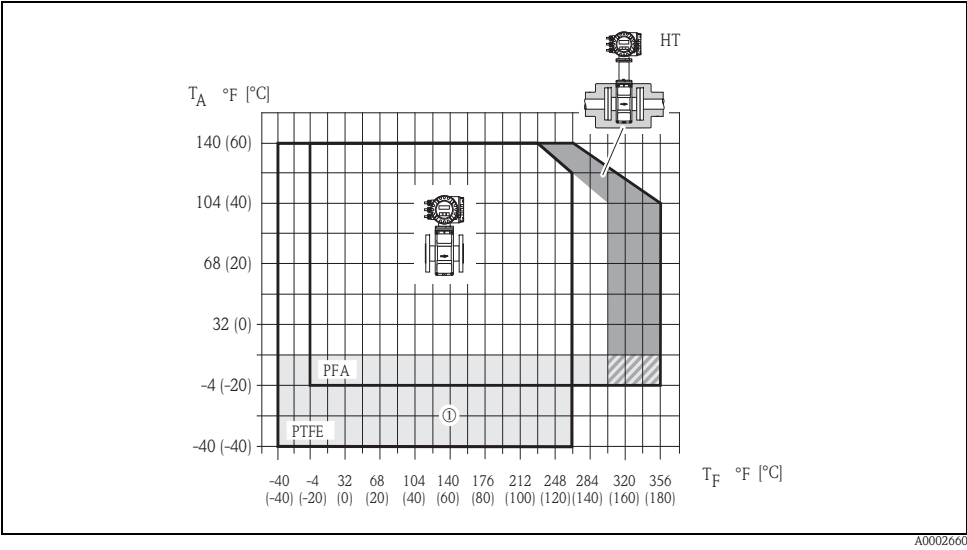
|                                |                                                                                                       |
|--------------------------------|-------------------------------------------------------------------------------------------------------|
| Shock and vibration resistance | Acceleration up to 2 g by analogy with IEC 60068-2-6<br>(high-temperature version: no data available) |
|--------------------------------|-------------------------------------------------------------------------------------------------------|

|                                     |                                               |
|-------------------------------------|-----------------------------------------------|
| Electromagnetic compatibility (EMC) | To EN 61326/A1 and NAMUR recommendation NE 21 |
|-------------------------------------|-----------------------------------------------|

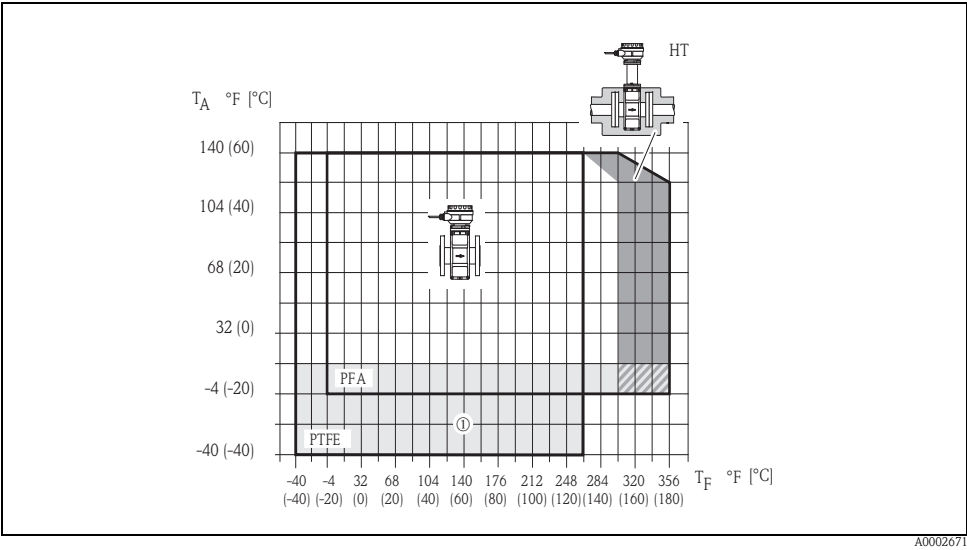
Process conditions

|                          |                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Medium temperature range | <div>The permissible medium temperature depends on the measuring-tube lining:</div> <div><div></div>-40 to +265°F (-40 to +130°C) for PTFE (1/2" to 24" / DN 15 to 600), for restrictions → refer to diagrams</div> <div><div></div>-4 to +355°F (-20 to +180°C for PFA (1" to 8" / DN 25 to 200), for restrictions → refer to diagrams</div> |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Compact version (PFA and PTFE lining)  
T<sub>A</sub> = ambient temperature, T<sub>F</sub> = fluid temperature, HT = high-temperature version, with insulation  
① = temperature range from 14 to -40°F (-10°C to -40°C) only applies for flanges made of stainless steel



Remote version (PFA and PTFE lining)  
T<sub>A</sub> = ambient temperature, T<sub>F</sub> = fluid temperature, HT = high-temperature version, with insulation  
① = temperature range from 14 to -40°F (-10°C to -40°C) only applies for flanges made of stainless steel



**Conductivity**

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

Note that in the case of the remote version, the minimum conductivity is also influenced by the length of the connecting cable → see “Length of connecting cable”

**Medium pressure range  
(nominal pressure)**

EN 1092-1 (DIN 2501):  
PN 10 (DN 200 to 600)  
PN 16 (DN 65 to 600)  
PN 25 (DN 200 to 600)  
PN 40 (DN 15 to 150)

ANSI B16.5:  
Class 150 (1/2" to 24")  
Class 300 (1/2" to 6")

JIS B2238:  
10K (DN 50 to 300)  
20K (DN 15 to 300)

AS2129:  
Table E (DN 25, 50)

AS4087:  
Cl. 14 (DN 50)

**Pressure tightness  
(liner)**

| Nominal diameter             |        | Measuring tube lining | Resistance to partial vacuum of measuring tube lining<br>Limit values for abs. pressure psi [mbar] at various fluid temperatures |                 |                  |                  |                  |                  |
|------------------------------|--------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|------------------|------------------|------------------|
| [mm]                         | [inch] |                       | 75°F<br>(25°C)                                                                                                                   | 175°F<br>(80°C) | 212°F<br>(100°C) | 265°F<br>(130°C) | 300°F<br>(150°C) | 355°F<br>(180°C) |
| 15                           | 1/2"   | PTFE                  | 0                                                                                                                                | 0               | 0                | 1.45 (100)       | –                | –                |
| 25                           | 1"     | PTFE / PFA            | 0 / 0                                                                                                                            | 0 / 0           | 0 / 0            | 1.45 (100) / 0   | – / 0            | – / 0            |
| 32                           | –      | PTFE / PFA            | 0 / 0                                                                                                                            | 0 / 0           | 0 / 0            | 1.45 (100) / 0   | – / 0            | – / 0            |
| 40                           | 1 1/2" | PTFE / PFA            | 0 / 0                                                                                                                            | 0 / 0           | 0 / 0            | 1.45 (100) / 0   | – / 0            | – / 0            |
| 50                           | 2"     | PTFE / PFA            | 0 / 0                                                                                                                            | 0 / 0           | 0 / 0            | 1.45 (100) / 0   | – / 0            | – / 0            |
| 65                           | –      | PTFE / PFA            | 0 / 0                                                                                                                            | *               | 0.6 (40) / 0     | 1.9 (130) / 0    | – / 0            | – / 0            |
| 80                           | 3"     | PTFE / PFA            | 0 / 0                                                                                                                            | *               | 0.6 (40) / 0     | 1.9 (130) / 0    | – / 0            | – / 0            |
| 100                          | 4"     | PTFE / PFA            | 0 / 0                                                                                                                            | *               | 1.9 (135) / 0    | 2.5 (170) / 0    | – / 0            | – / 0            |
| 125                          | –      | PTFE / PFA            | 1.9 (135) / 0                                                                                                                    | *               | 3.5 (240) / 0    | 5.6 (385) / 0    | – / 0            | – / 0            |
| 150                          | 6"     | PTFE / PFA            | 1.9 (135) / 0                                                                                                                    | *               | 3.5 (240) / 0    | 5.6 (385) / 0    | – / 0            | – / 0            |
| 200                          | 8"     | PTFE / PFA            | 2.9 (200) / 0                                                                                                                    | *               | 4.2 (290) / 0    | 5.9 (410) / 0    | – / 0            | – / 0            |
| 250                          | 10"    | PTFE                  | 4.8 (330)                                                                                                                        | *               | 5.8 (400)        | 7.7 (530)        | –                | –                |
| 300                          | 12"    | PTFE                  | 5.8 (400)                                                                                                                        | *               | 7.3 (500)        | 9.1 (630)        | –                | –                |
| 350                          | 14"    | PTFE                  | 6.8 (470)                                                                                                                        | *               | 8.7 (600)        | 10.6 (730)       | –                | –                |
| 400                          | 16"    | PTFE                  | 7.8 (540)                                                                                                                        | *               | 9.7 (670)        | 11.6 (800)       | –                | –                |
| 450                          | 18"    | PTFE                  | No vacuum is permissible!                                                                                                        |                 |                  |                  |                  |                  |
| 500                          | 20"    | PTFE                  |                                                                                                                                  |                 |                  |                  |                  |                  |
| 600                          | 24"    | PTFE                  |                                                                                                                                  |                 |                  |                  |                  |                  |
| * No value can be specified. |        |                       |                                                                                                                                  |                 |                  |                  |                  |                  |

Limiting flow

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is 6 to 10 ft/s (2 to 3 m/s). The velocity of flow (v), moreover, has to be matched to the physical properties of the medium:

- v < 6 ft/s (2 m/s): for abrasive mediums such as potter's clay, lime milk, ore slurry etc.
- v > 6 ft/s (2 m/s): for accretive mediums such as wastewater sludge, etc.

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

| Flow characteristics (US units) |      |                                                    |                                  |                                  |                            |
|---------------------------------|------|----------------------------------------------------|----------------------------------|----------------------------------|----------------------------|
| Nominal diameter                |      | Recommended flow rate                              | Factory settings                 |                                  |                            |
| [inch]                          | [mm] | Min./max. full scale value<br>(v ~ 1 or ~ 33 ft/s) | Full scale value<br>(v ~ 8 ft/s) | Pulse weighting<br>(~ 2 pulse/s) | Creepage<br>(v ~ 0.1 ft/s) |
| 1/2"                            | 15   | 1.0 to 27 gal/min                                  | 6 gal/min                        | 0.05 gal                         | 0.10 gal/min               |
| 1"                              | 25   | 2.5 to 80 gal/min                                  | 18 gal/min                       | 0.20 gal                         | 0.25 gal/min               |
| 1 1/4"                          | 32   | 4 to 130 gal/min                                   | 30 gal/min                       | 0.20 gal                         | 0.50 gal/min               |
| 1 1/2"                          | 40   | 7 to 190 gal/min                                   | 50 gal/min                       | 0.50 gal                         | 0.75 gal/min               |
| 2"                              | 50   | 10 to 300 gal/min                                  | 75 gal/min                       | 0.50 gal                         | 1.25 gal/min               |
| 2 1/2"                          | 65   | 16 to 500 gal/min                                  | 130 gal/min                      | 1 gal                            | 2.0 gal/min                |
| 3"                              | 80   | 24 to 800 gal/min                                  | 200 gal/min                      | 2 gal                            | 2.5 gal/min                |
| 4"                              | 100  | 40 to 1250 gal/min                                 | 300 gal/min                      | 2 gal                            | 4.0 gal/min                |
| 5"                              | 125  | 60 to 1950 gal/min                                 | 450 gal/min                      | 5 gal                            | 7.0 gal/min                |
| 6"                              | 150  | 90 to 2650 gal/min                                 | 600 gal/min                      | 5 gal                            | 12 gal/min                 |
| 8"                              | 200  | 155 to 4850 gal/min                                | 1200 gal/min                     | 10 gal                           | 15 gal/min                 |
| 10"                             | 250  | 250 to 7500 gal/min                                | 1500 gal/min                     | 15 gal                           | 30 gal/min                 |
| 12"                             | 300  | 350 to 10,600 gal/min                              | 2400 gal/min                     | 25 gal                           | 45 gal/min                 |
| 14"                             | 350  | 500 to 15,000 gal/min                              | 3600 gal/min                     | 30 gal                           | 60 gal/min                 |
| 16"                             | 400  | 600 to 19,000 gal/min                              | 4800 gal/min                     | 50 gal                           | 60 gal/min                 |
| 18"                             | 450  | 800 to 24,000 gal/min                              | 6000 gal/min                     | 50 gal                           | 90 gal/min                 |
| 20"                             | 500  | 1000 to 30,000 gal/min                             | 7500 gal/min                     | 75 gal                           | 120 gal/min                |
| 24"                             | 600  | 1400 to 44,000 gal/min                             | 10,500 gal/min                   | 100 gal                          | 180 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 to DIN EN 545 → Page 18

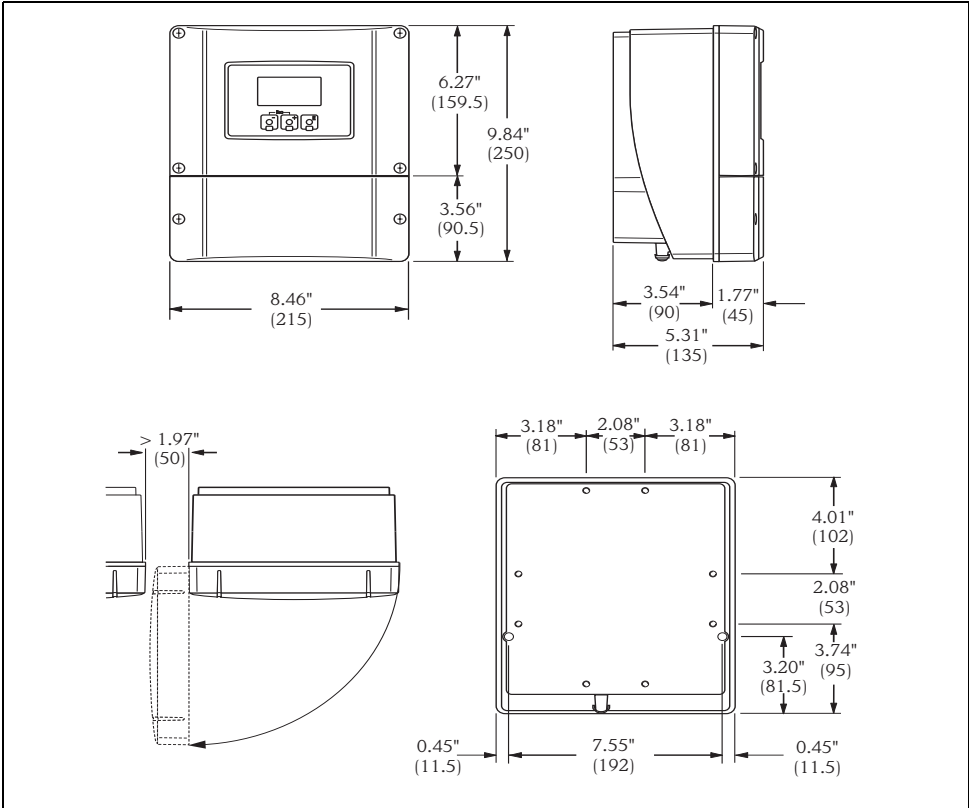
Measuring tube specifications

| Nominal diameter |        | Pressure rating   |         |         |               |     | Inside diameter of measuring tube |                          |
|------------------|--------|-------------------|---------|---------|---------------|-----|-----------------------------------|--------------------------|
| [mm]             | [inch] | EN (DIN)<br>[bar] | AS 2129 | AS 4087 | ANSI<br>[lbs] | JIS | with PFA<br>inches (mm)           | with PTFE<br>inches (mm) |
| 15               | 1/2"   | PN 40             | –       | –       | Cl 150        | 20K | –                                 | 0.59 (15)                |
| 25               | 1"     | PN 40             | Table E | –       | Cl 150        | 20K | 0.91 (23)                         | 1.02 (26)                |
| 32               | –      | PN 40             | –       | –       | –             | 20K | 1.26 (32)                         | 1.38 (35)                |
| 40               | 1 1/2" | PN 40             | –       | –       | Cl 150        | 20K | 1.42 (36)                         | 1.61 (41)                |
| 50               | 2"     | PN 40             | Table E | Cl. 14  | Cl 150        | 10K | 1.89 (48)                         | 2.05 (52)                |
| 65               | –      | PN 16             | –       | –       | –             | 10K | 2.48 (63)                         | 2.64 (67)                |
| 80               | 3"     | PN 16             | –       | –       | Cl 150        | 10K | 2.95 (75)                         | 3.15 (80)                |
| 100              | 4"     | PN 16             | –       | –       | Cl 150        | 10K | 3.98 (101)                        | 4.09 (104)               |
| 125              | –      | PN 16             | –       | –       | –             | 10K | 4.96 (126)                        | 5.08 (129)               |
| 150              | 6"     | PN 16             | –       | –       | Cl 150        | 10K | 6.06 (154)                        | 6.14 (156)               |
| 200              | 8"     | PN 10             | –       | –       | Cl 150        | 10K | 7.91 (201)                        | 7.95 (202)               |
| 250              | 10"    | PN 10             | –       | –       | Cl 150        | 10K | –                                 | 10.1 (256)               |
| 300              | 12"    | PN 10             | –       | –       | Cl 150        | 10K | –                                 | 12.0 (306)               |
| 350              | 14"    | PN 10             | –       | –       | Cl 150        | –   | –                                 | 13.3 (337)               |
| 400              | 16"    | PN 10             | –       | –       | Cl 150        | –   | –                                 | 15.2 (387)               |
| 450              | 18"    | PN 10             | –       | –       | Cl 150        | –   | –                                 | 17.0 (432)               |
| 500              | 20"    | PN 10             | –       | –       | Cl 150        | –   | –                                 | 19.2 (487)               |
| 600              | 24"    | PN 10             | –       | –       | Cl 150        | –   | –                                 | 23.3 (593)               |

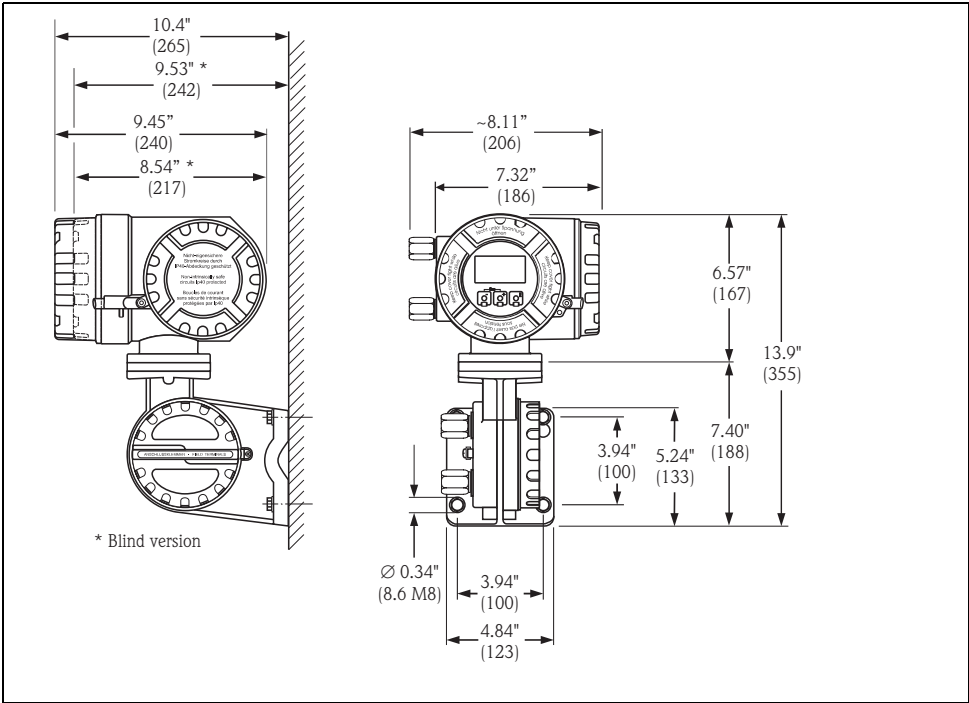
Mechanical construction

Design / dimensions

Dimensions: Wall-mount housing (non hazardous area and II3G / zone 2)



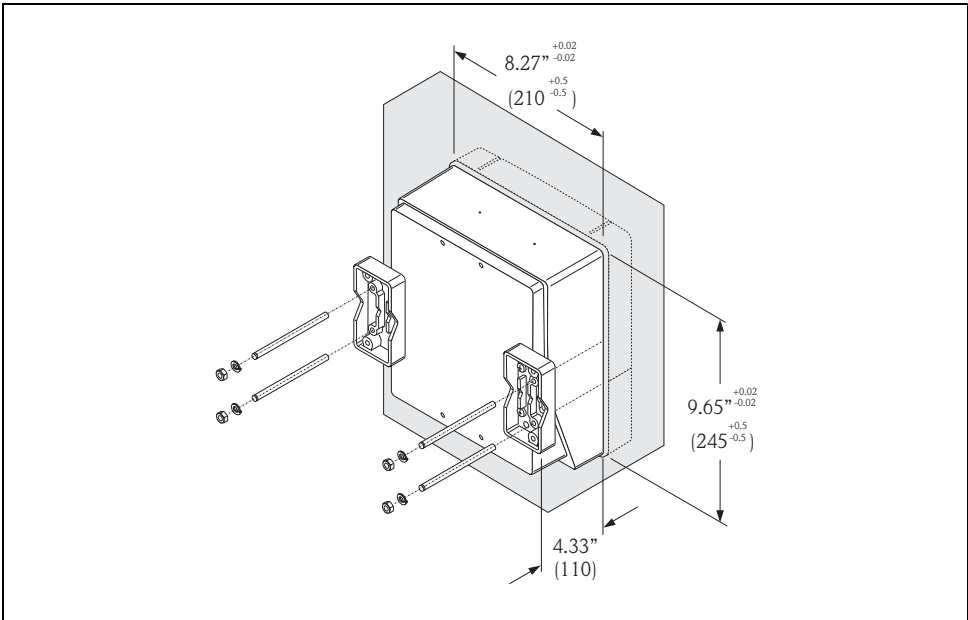
Dimensions: Remote field housing (II2GD / zone 1)



There is a separate mounting kit for the wall-mounted housing. It can be ordered from Endress+Hauser as an accessory. The following installation variants are possible:

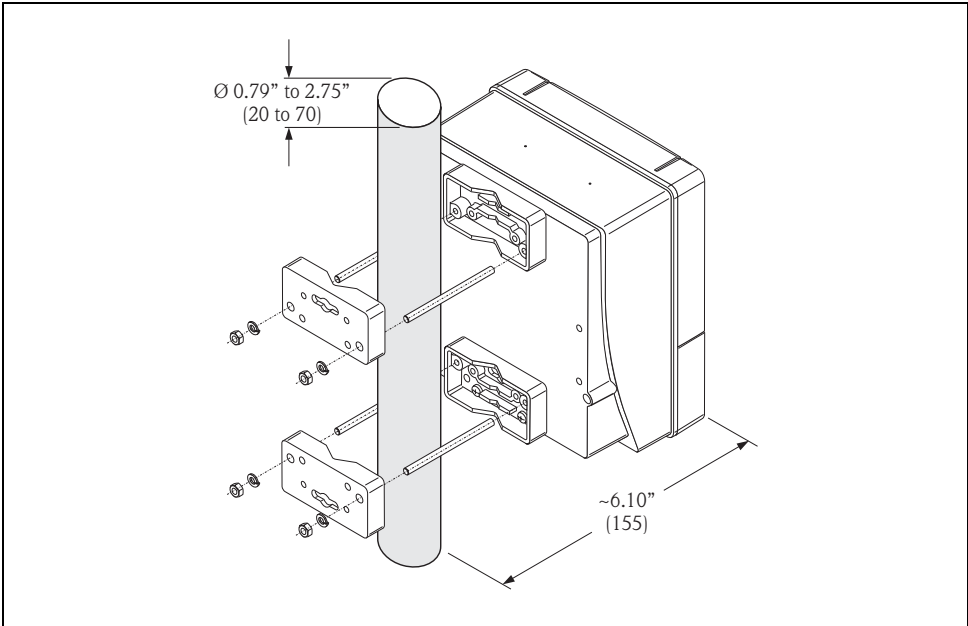
- Panel-mounted installation
- Pipe mounting

**Panel-mounted installation**



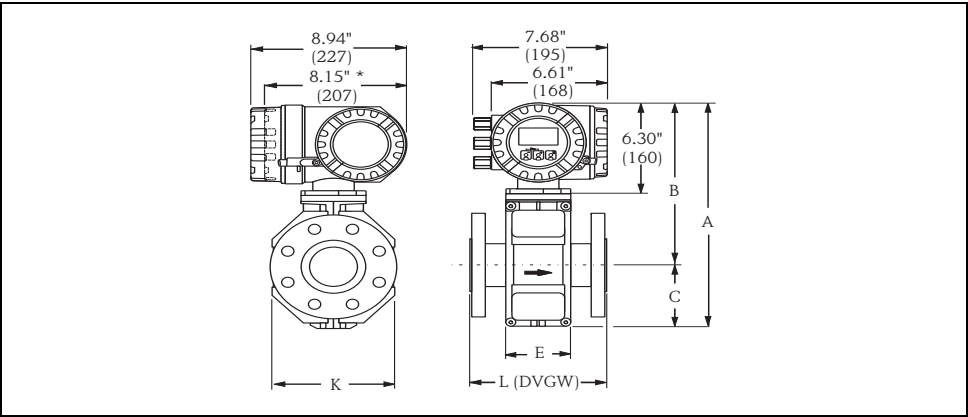
A0001131

**Pipe mounting**



A0001132

Compact version ≤ 12" (DN ≤ 300)

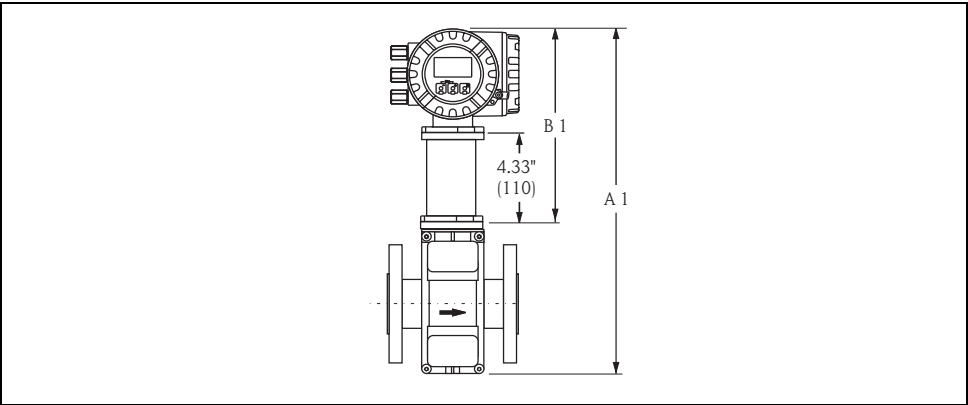


F06-53Pxxxxx-06-00-xx-xx-000

| DN                   |             | L           | A           | B           | C           | K           | E           |
|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| EN (DIN) / JIS / AS* | ANSI [inch] |             |             |             |             |             |             |
|                      |             | inches (mm) | inches (mm) | inches (mm) | inches (mm) | inches (mm) | inches (mm) |
| 15                   | 1/2"        | 7.87 (200)  | 13.3 (341)  | 10.1 (257)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 25                   | 1"          | 7.87 (200)  | 13.3 (341)  | 10.1 (257)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 32                   | —           | 7.87 (200)  | 13.3 (341)  | 10.1 (257)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 40                   | 1 1/2"      | 7.87 (200)  | 13.3 (341)  | 10.1 (257)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 50                   | 2"          | 7.87 (200)  | 13.3 (341)  | 10.1 (257)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 65                   | —           | 7.87 (200)  | 15.4 (391)  | 11.1 (282)  | 4.29 (109)  | 7.08 (180)  | 3.7 (94)    |
| 80                   | 3"          | 7.87 (200)  | 15.4 (391)  | 11.1 (282)  | 4.29 (109)  | 7.08 (180)  | 3.7 (94)    |
| 100                  | 4"          | 9.84 (250)  | 15.4 (391)  | 11.1 (282)  | 4.29 (109)  | 7.08 (180)  | 3.7 (94)    |
| 125                  | —           | 9.84 (250)  | 18.6 (472)  | 12.7 (322)  | 5.90 (150)  | 10.2 (260)  | 5.51 (140)  |
| 150                  | 6"          | 11.8 (300)  | 18.6 (472)  | 12.7 (322)  | 5.90 (150)  | 10.2 (260)  | 5.51 (140)  |
| 200                  | 8"          | 13.8 (350)  | 20.7 (527)  | 13.6 (347)  | 7.08 (180)  | 12.7 (324)  | 6.14 (156)  |
| 250                  | 10"         | 17.7 (450)  | 22.7 (577)  | 14.6 (372)  | 8.07 (205)  | 15.7 (400)  | 6.14 (156)  |
| 300                  | 12"         | 19.7 (500)  | 24.7 (627)  | 15.6 (397)  | 9.05 (230)  | 18.1 (460)  | 6.53 (166)  |

The fitting length (L) is always the same, regardless of the pressure rating.  
\* Only DN 25 and 50 are available if flanges according to AS are used.

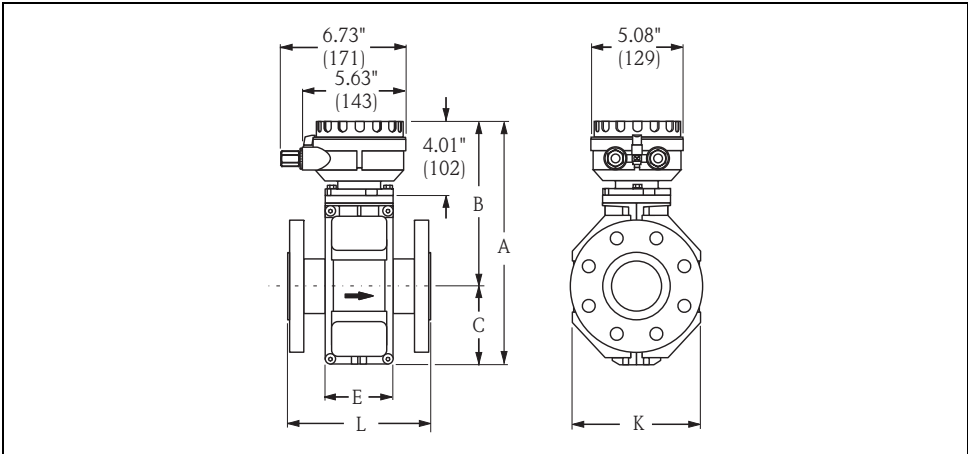
High temperature version ≤ 12" (DN ≤ 300)



F06-5xPxxxxx-06-00-00-xx-xx-000

Measurement A1, B1 = Measurement A, B of the standard compact version plus 4.33" (110 mm)

Remote version ≤ 12" (DN ≤ 300)

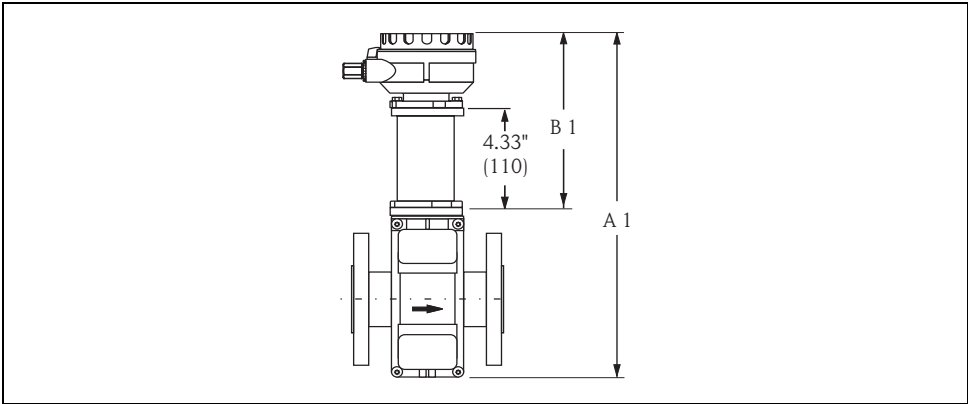


A0003219

| DN                        |             | L           | A           | B           | C           | K           | E           |
|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| EN (DIN) / JIS / AS* [mm] | ANSI [inch] | inches (mm) | inches (mm) | inches (mm) | inches (mm) | inches (mm) | inches (mm) |
| 15                        | 1/2"        | 7.87 (200)  | 11.2 (286)  | 7.95 (202)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 25                        | 1"          | 7.87 (200)  | 11.2 (286)  | 7.95 (202)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 32                        | –           | 7.87 (200)  | 11.2 (286)  | 7.95 (202)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 40                        | 1 1/2"      | 7.87 (200)  | 11.2 (286)  | 7.95 (202)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 50                        | 2"          | 7.87 (200)  | 11.2 (286)  | 7.95 (202)  | 3.31 (84)   | 4.72 (120)  | 3.7 (94)    |
| 65                        | –           | 7.87 (200)  | 13.2 (336)  | 8.94 (227)  | 4.29 (109)  | 7.08 (180)  | 3.7 (94)    |
| 80                        | 3"          | 7.87 (200)  | 13.2 (336)  | 8.94 (227)  | 4.29 (109)  | 7.08 (180)  | 3.7 (94)    |
| 100                       | 4"          | 9.84 (250)  | 13.2 (336)  | 8.94 (227)  | 4.29 (109)  | 7.08 (180)  | 3.7 (94)    |
| 125                       | –           | 9.84 (250)  | 16.4 (417)  | 10.5 (267)  | 5.90 (150)  | 10.2 (260)  | 5.51 (140)  |
| 150                       | 6"          | 11.8 (300)  | 16.4 (417)  | 10.5 (267)  | 5.90 (150)  | 10.2 (260)  | 5.51 (140)  |
| 200                       | 8"          | 13.8 (350)  | 18.6 (472)  | 11.5 (292)  | 7.08 (180)  | 12.7 (324)  | 6.14 (156)  |
| 250                       | 10"         | 17.7 (450)  | 20.5 (522)  | 12.5 (317)  | 8.07 (205)  | 15.7 (400)  | 6.14 (156)  |
| 300                       | 12"         | 19.7 (500)  | 22.5 (572)  | 13.5 (342)  | 9.05 (230)  | 18.1 (460)  | 6.53 (166)  |

The fitting length (L) is always the same, regardless of the pressure rating.  
\* Only DN 25 and 50 are available if flanges according to AS are used.

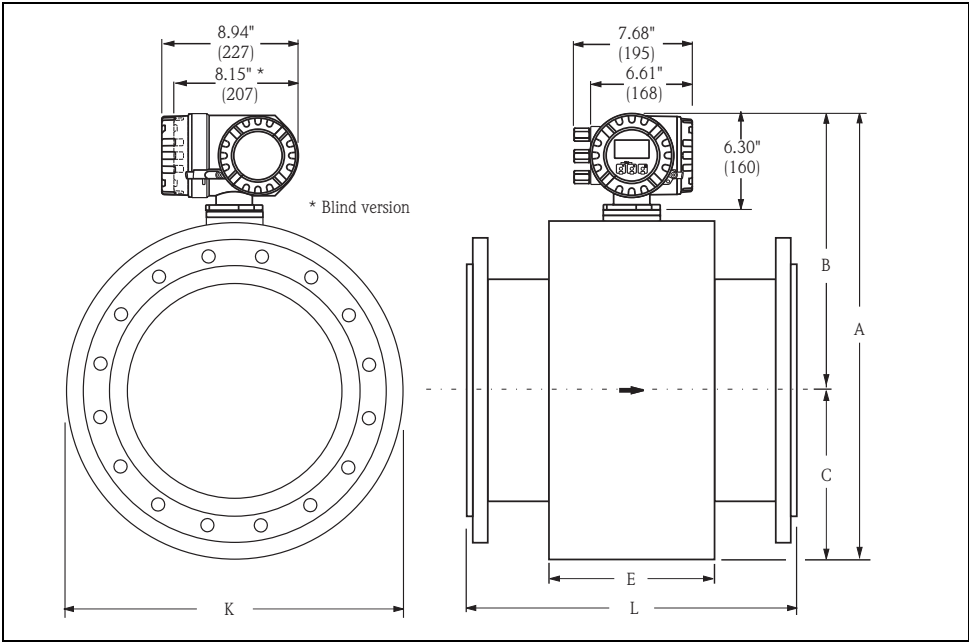
High-temperature version ≤ 12" (DN ≤ 300)



F06-xxPxxxxx-06-05-00-xx-000

Measurement A1, B1 = Measurement A, B of the standard compact version plus 4.33" (110 mm)

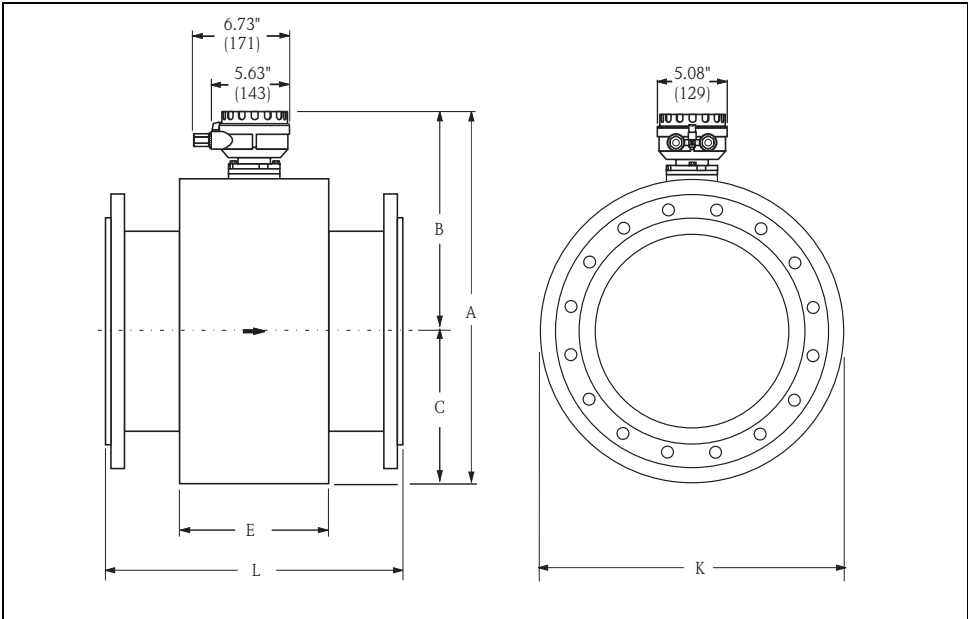
Compact version ≥ 14" (DN ≥ 350)



F06-53Fxxxxx-06-00-xx-xx-001

| DN                                                                            |        | L          | A            | B            | C            | K          | E          |
|-------------------------------------------------------------------------------|--------|------------|--------------|--------------|--------------|------------|------------|
| EN (DIN)                                                                      | ANSI   | inches     | inches       | inches       | inches       | inches     | inches     |
| [mm]                                                                          | [inch] | (mm)       | (mm)         | (mm)         | (mm)         | (mm)       | (mm)       |
| 350                                                                           | 14"    | 21.6 (550) | 29.1 (738.5) | 17.9 (456.5) | 11.1 (282.0) | 22.2 (564) | 10.9 (276) |
| 400                                                                           | 16"    | 23.6 (600) | 31.1 (790.5) | 18.9 (482.5) | 12.1 (308.0) | 24.2 (616) | 10.9 (276) |
| 450                                                                           | 18"    | 25.6 (650) | 33.1 (840.5) | 19.9 (507.5) | 13.1 (333.0) | 26.2 (666) | 11.5 (292) |
| 500                                                                           | 20"    | 25.6 (650) | 35.1 (891.5) | 20.9 (533.0) | 14.1 (358.5) | 28.2 (717) | 11.5 (292) |
| 600                                                                           | 24"    | 30.7 (780) | 39.2 (995.5) | 23.0 (585.0) | 16.2 (410.5) | 32.3 (821) | 15.8 (402) |
| The fitting length (L) is always the same, regardless of the pressure rating. |        |            |              |              |              |            |            |

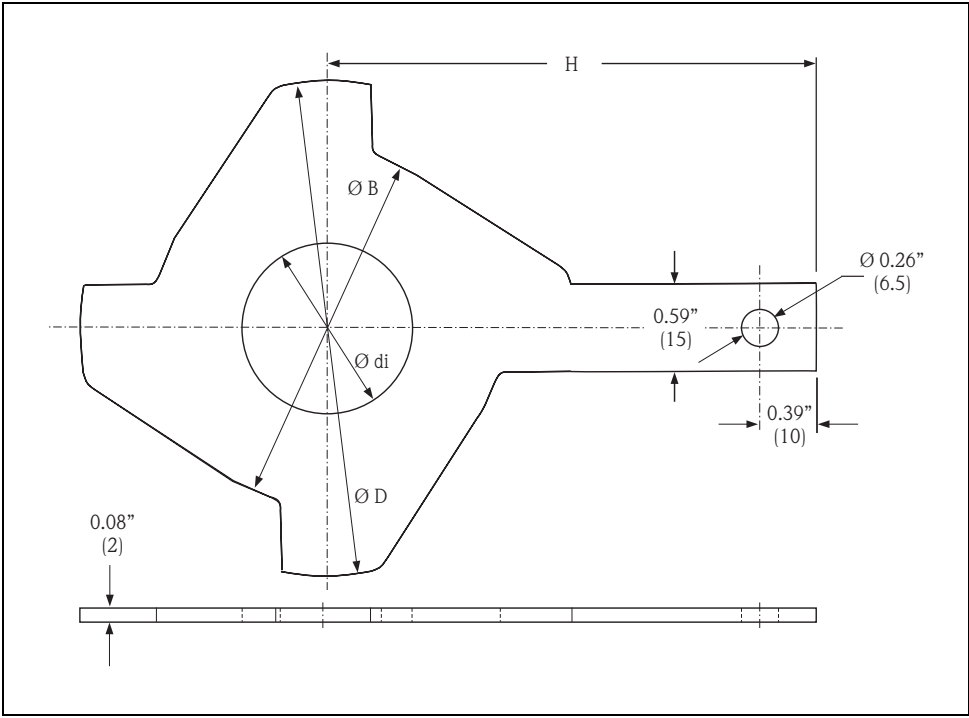
Remote version ≥ 14" (DN ≥ 350)



A0003220

| DN                                                                            |                | L<br>inches<br>(mm) | A<br>inches<br>(mm) | B<br>inches<br>(mm) | C<br>inches<br>(mm) | K<br>inches<br>(mm) | E<br>inches<br>(mm) |
|-------------------------------------------------------------------------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| EN (DIN)<br>[mm]                                                              | ANSI<br>[inch] |                     |                     |                     |                     |                     |                     |
| 350                                                                           | 14"            | 21.6 (550)          | 26.9 (683.5)        | 15.8 (401.5)        | 11.1 (282.0)        | 22.2 (564)          | 10.9 (276)          |
| 400                                                                           | 16"            | 23.6 (600)          | 29.0 (735.5)        | 16.8 (427.5)        | 12.1 (308.0)        | 24.2 (616)          | 10.9 (276)          |
| 450                                                                           | 18"            | 25.6 (650)          | 30.9 (785.5)        | 17.8 (452.5)        | 13.1 (333.0)        | 26.2 (666)          | 11.5 (292)          |
| 500                                                                           | 20"            | 25.6 (650)          | 32.9 (836.5)        | 18.8 (478.0)        | 14.1 (358.5)        | 28.2 (717)          | 11.5 (292)          |
| 600                                                                           | 24"            | 30.7 (780)          | 37.0 (940.5)        | 20.9 (530.0)        | 16.2 (410.5)        | 32.3 (821)          | 15.8 (402)          |
| The fitting length (L) is always the same, regardless of the pressure rating. |                |                     |                     |                     |                     |                     |                     |

Ground disk 1/2" to 12" (DN 15 to 300)



A0003221

| DN <sup>1)</sup>                  |                   | di             | B              | D               | H              |
|-----------------------------------|-------------------|----------------|----------------|-----------------|----------------|
| EN (DIN) / JIS / AS <sup>4)</sup> | ANSI              | inches<br>(mm) | inches<br>(mm) | inches<br>(mm)] | inches<br>(mm) |
| 15                                | 1/2"              | 0.63 (16)      | 1.69 (43)      | 2.42 (61.5)     | 2.87 (73)      |
| 25                                | 1"                | 1.02 (26)      | 2.44 (62)      | 3.05 (77.5)     | 3.44 (87.5)    |
| 32                                | –                 | 35             | 80             | 87.5            | 94.5           |
| 40                                | 1 1/2"            | 1.61 (41)      | 3.23 (82)      | 3.98 (101)      | 4.06 (103)     |
| 50                                | 2"                | 2.05 (52)      | 3.98 (101)     | 4.55 (115.5)    | 4.25 (108)     |
| 65                                | –                 | 68             | 121            | 131.5           | 118            |
| 80                                | 3"                | 3.15 (80)      | 5.16 (131)     | 6.08 (154.5)    | 5.31 (135)     |
| 100                               | 4"                | 4.09 (104)     | 6.14 (156)     | 7.34 (186.5)    | 6.02 (153)     |
| 125                               | –                 | 130            | 187            | 206.5           | 160            |
| 150                               | 6"                | 6.22 (158)     | 8.54 (217)     | 10.1 (256)      | 7.24 (184)     |
| 200                               | 8"                | 8.11 (206)     | 10.5 (267)     | 11.3 (288)      | 8.07 (205)     |
| 250                               | 10"               | 10.2 (260)     | 12.9 (328)     | 14.1 (359)      | 9.45 (240)     |
| 300 <sup>2)</sup>                 | 12" <sup>2)</sup> | 12.3 (312)     | 14.8 (375)     | 16.3 (413)      | 10.7 (273)     |
| 300 <sup>3)</sup>                 | 12" <sup>3)</sup> | 12.2 (310)     | 14.8 (375)     | 15.9 (404)      | 10.6 (268)     |

<sup>1)</sup> Ground disks can, with the exception of 12" (DN 300), be used for all flange norms / pressure ratings.  
<sup>2)</sup> PN 10/16, Class 150  
<sup>3)</sup> PN 25, JIS 10K/20K  
<sup>4)</sup> Only DN 25 and 50 are available if flanges according to AS are used.

Weight

| Weight data in kg                                                                |        |                 |      |         |                                |               |         |              |  |
|----------------------------------------------------------------------------------|--------|-----------------|------|---------|--------------------------------|---------------|---------|--------------|--|
| Nominal diameter                                                                 |        | Compact version |      |         | Remote version (without cable) |               |         |              |  |
|                                                                                  |        | EN (DIN) / AS*  | JIS  | ANSI    | EN (DIN) / AS*                 | Sensor<br>JIS | ANSI    | Wall housing |  |
| [mm]                                                                             | [inch] |                 |      |         |                                |               |         |              |  |
| 15                                                                               | 1/2"   | 6.5             | 6.5  | 14 lbs  | 4.5                            | 4.5           | 10 lbs  | 13 lbs       |  |
| 25                                                                               | 1"     | 7.3             | 7.3  | 16 lbs  | 5.3                            | 5.3           | 12 lbs  | 13 lbs       |  |
| 32                                                                               | 1 1/4" | 8.0             | 7.3  | –       | 6.0                            | 5.3           | –       | 13 lbs       |  |
| 40                                                                               | 1 1/2" | 9.4             | 8.3  | 20 lbs  | 7.4                            | 6.3           | 16 lbs  | 13 lbs       |  |
| 50                                                                               | 2"     | 10.6            | 9.3  | 23 lbs  | 8.6                            | 7.3           | 19 lbs  | 13 lbs       |  |
| 65                                                                               | 2 1/2" | 12.0            | 11.1 | –       | 10.0                           | 9.1           | –       | 13 lbs       |  |
| 80                                                                               | 3"     | 14.0            | 12.5 | 31 lbs  | 12.0                           | 10.5          | 24 lbs  | 13 lbs       |  |
| 100                                                                              | 4"     | 16.0            | 14.7 | 35 lbs  | 14.0                           | 12.7          | 31 lbs  | 13 lbs       |  |
| 125                                                                              | 5"     | 21.5            | 21.0 | –       | 19.5                           | 19.0          | –       | 13 lbs       |  |
| 150                                                                              | 6"     | 25.5            | 24.5 | 56 lbs  | 23.5                           | 22.5          | 52 lbs  | 13 lbs       |  |
| 200                                                                              | 8"     | 45              | 41.9 | 99 lbs  | 43                             | 39.9          | 95 lbs  | 13 lbs       |  |
| 250                                                                              | 10"    | 65              | 69.4 | 165 lbs | 63                             | 67.4          | 161 lbs | 13 lbs       |  |
| 300                                                                              | 12"    | 70              | 72.3 | 242 lbs | 68                             | 70.3          | 238 lbs | 13 lbs       |  |
| 350                                                                              | 14"    | 115             |      | 386 lbs | 113                            |               | 381 lbs | 13 lbs       |  |
| 400                                                                              | 16"    | 135             |      | 452 lbs | 133                            |               | 448 lbs | 13 lbs       |  |
| 450                                                                              | 18"    | 175             |      | 562 lbs | 173                            |               | 558 lbs | 13 lbs       |  |
| 500                                                                              | 20"    | 175             |      | 628 lbs | 173                            |               | 624 lbs | 13 lbs       |  |
| 600                                                                              | 24"    | 235             |      | 893 lbs | 233                            |               | 888 lbs | 13 lbs       |  |
| Transmitter Promag (compact version): 7.5 lbs (3.4 kg)                           |        |                 |      |         |                                |               |         |              |  |
| High-temperature version: +3.3 lbs (1.5 kg)                                      |        |                 |      |         |                                |               |         |              |  |
| (Weight data valid for standard pressure ratings and without packaging material) |        |                 |      |         |                                |               |         |              |  |
| * Only DN 25 and 50 are available if flanges according to AS are used.           |        |                 |      |         |                                |               |         |              |  |

Materials

- Transmitter housing:
- Compact housing: powder coated die-cast aluminium or stainless steel field housing
  - Wall-mounted housing: powder coated die-cast aluminium
- Sensor housing:
- 1/2" to 12" (DN 15 to 300): powder-coated die-cast aluminium
  - 14" to 24" (DN 350 to 600): painted steel (Amerlock 400)
- Measuring tube:
- < 14" (DN < 350): stainless steel 1.4301 or 1.4306/304L; non-stainless flange material with Al/Zn protective coating
  - > 12" (DN > 300): stainless steel 1.4301/304; non-stainless flange material with Amerlock 400 paint
- Flange:
- EN 1092-1 (DIN 2501): 316L / 1.4571; RS37-2 (S235JRG2) / C22 / FE 410W B (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)
  - ANSI: A105, F316L SS (with flanges made of carbon steel: < 14" (DN < 350) with Al/Zn protective coating, > 12" (DN > 300) with Amerlock 400 paint)
  - JIS: RS37-2 (S235JRG2) / H II / 1.0425 / 316L (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating, DN > 300 with Amerlock 400 paint)

- AS 2129: (DN 25) A105 or RSt37-2 (S235JRG2)  
(DN 50) A105 oder St44-2 (S275JR)  
(with Al/Zn protective coating)
- AS 4087: A105 or St44-2 (S275JR)  
(with Al/Zn protective coating)

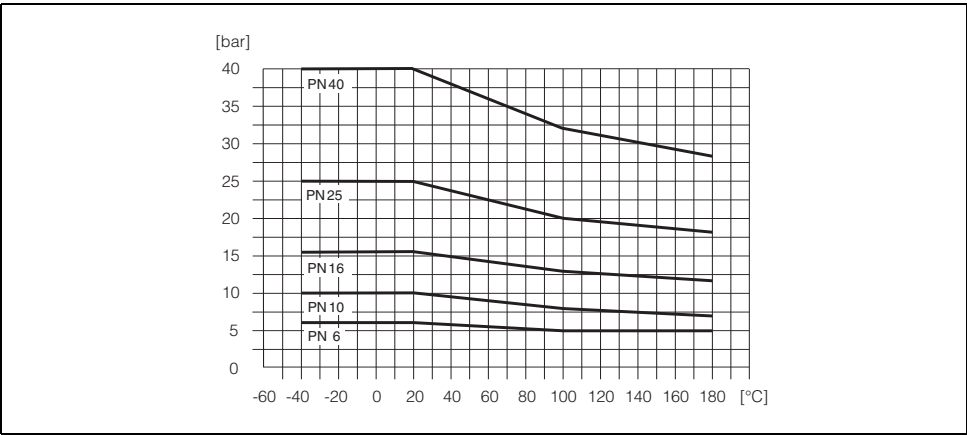
Ground disks: 1.4435/316L SS or Alloy C-22  
Electrodes: 1.4435/316L SS, platinum/rhodium 80/20 or Alloy C-22, tantalum  
Seals: Seals to DIN EN 1514-1

Material load diagrams

Caution!  
The following diagrams contain material load curves (reference curves) for various process connections relating to the fluid temperature. But the maximal permissible fluid temperature always depends on the lining material of the sensor and/or the sealing material (s. Page 20).

Flange connection to EN 1092-1 (DIN 2501)

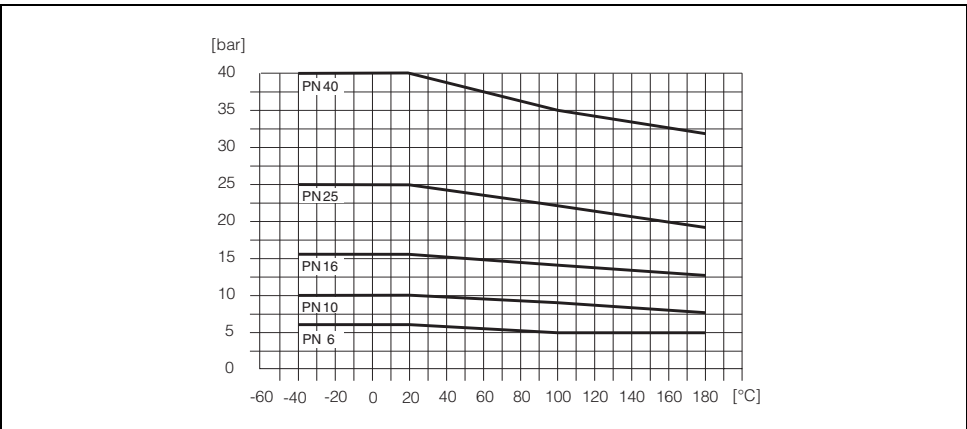
Flange material: RSt37-2 (S235JRG2) / C22 / FE 410W B



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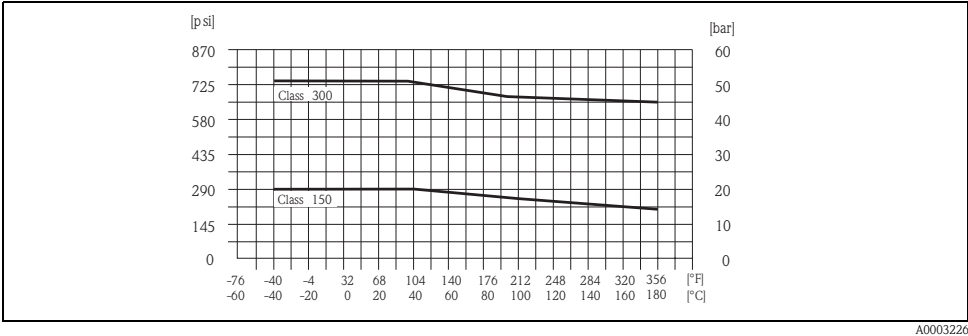
Flange connection to EN 1092-1 (DIN 2501)

Flange material: 316L / 1.4571

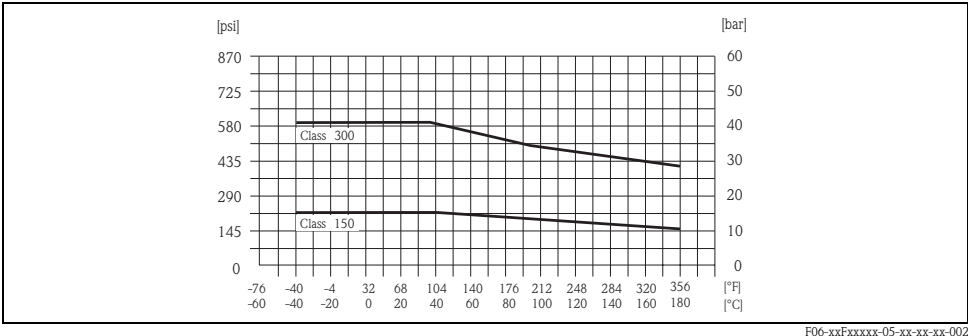


F06-xxFxxxxx-05-xx-xx-xx-001

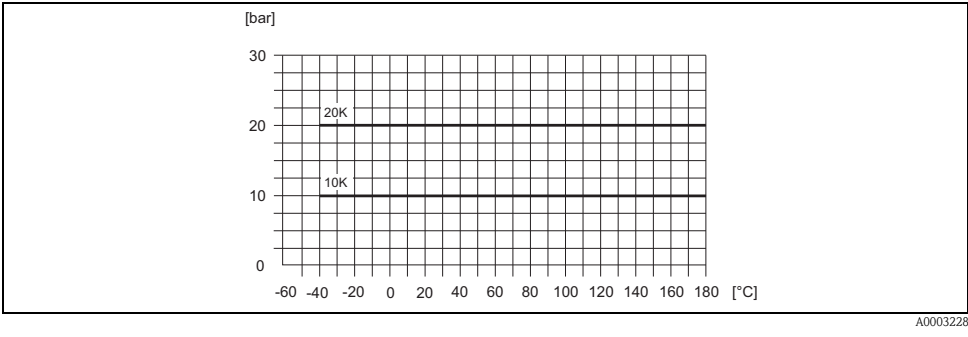
Flange connection to ANSI B16.5  
Flange material: A105



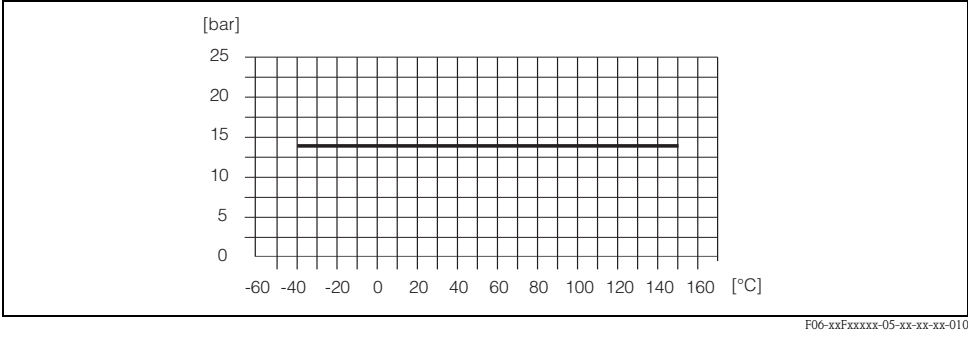
Flange connection to ANSI B16.5  
Flange material: F316L SS



Flange connection to JIS B2238  
Flange material: RSt37-2 (S235JRG2) / H II / 1.0425



Flange connection to AS2129 Table E or AS4087 Cl. 14  
Flange material: A105 / RSt37-2 (S235JRG2) / St44-2 (S275JR)



|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fitted electrodes</b>  | Measuring, reference and EPD electrodes <ul style="list-style-type: none"><li>■ Standard available with 1.4435/316L SS, Alloy C-22, tantalum, platinum/rhodium 80/20</li><li>■ Optional: measuring electrodes made of platinum/rhodium 80/20</li></ul>                                                                                                                                                                                                                                            |
| <b>Process connection</b> | Flange connection: <ul style="list-style-type: none"><li>■ EN 1092-1 (DIN 2501), &lt; DN 350 From A, &gt; DN 300 From B (dimensions acc. to DIN 2501; DN 65 PN 16 and DN 600 PN 16 exclusively to EN 10921)</li><li>■ ANSI B16.5</li><li>■ JIS B2238</li><li>■ AS2129 Table E</li><li>■ AS4087 Cl. 14</li></ul>                                                                                                                                                                                   |
| <b>Surface roughness</b>  | <ul style="list-style-type: none"><li>■ PFA liner: <math>\leq 16\text{ }\mu\text{in}</math> (<math>\leq 0.4\text{ }\mu\text{m}</math>)</li><li>■ Electrodes:<ul style="list-style-type: none"><li>– 1.4435/316L SS, Alloy C-22: 12 to 10 <math>\mu\text{in}</math> (0.3 to 0.5 <math>\mu\text{m}</math>)</li><li>– Tantalum, platinum/rhodium: 12 to 10 <math>\mu\text{in}</math> (0.3 to 0.5 <math>\mu\text{m}</math>)</li></ul></li></ul> (all data relate to parts in contact with the medium) |

## Human interface

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Display elements</b>   | <ul style="list-style-type: none"><li>■ Liquid-crystal display: backlit, two lines (Promag 50) or four lines (Promag 53) with 16 characters per line</li><li>■ Custom configurations for presenting different measured-value and status variables</li><li>■ Totalizer:<ul style="list-style-type: none"><li>Promag 50: 2 totalizers (7-digit plus 7-digit overflow with sign and units)</li><li>Promag 53: 3 totalizers (7-digit plus 7-digit overflow with sign and units)</li></ul></li></ul>                                                                                                                                                                                                                                                                                                                              |
| <b>Operating elements</b> | Unified operation concept for both types of transmitter:<br><br>Promag 50: <ul style="list-style-type: none"><li>■ Local operation with three push buttons (–, +, E)</li><li>■ Quick Setup menus for straightforward commissioning</li></ul><br>Promag 53: <ul style="list-style-type: none"><li>■ Local operation with Touch Control (–, +, E)</li><li>■ Application-specific Quick Setup menus for straightforward commissioning</li></ul>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Language group</b>     | Language groups available for operation in different countries:<br><br>Promag 50, Promag 53: <ul style="list-style-type: none"><li>■ Western Europe and America (WEA):<ul style="list-style-type: none"><li>English, German, Spanish, Italian, French, Dutch and Portuguese</li></ul></li><li>■ Eastern Europe and Scandinavia (EES):<ul style="list-style-type: none"><li>English, Russian, Polish, Norwegian, Finnish, Swedish and Czech</li></ul></li><li>■ South and east Asia (SEA):<ul style="list-style-type: none"><li>English, Japanese, Indonesian</li></ul></li></ul><br>Promag 53: <ul style="list-style-type: none"><li>■ China (CIN):<ul style="list-style-type: none"><li>English, Chinese</li></ul></li></ul><br>You can change the language group via the operating program “ToF Tool – Fieldtool Package.” |
| <b>Remote operation</b>   | Promag 50: Remote control via HART, PROFIBUS DP/PA<br>Promag 53: Remote control via HART, PROFIBUS DP/PA, MODBUS RS485, FOUNDATION Fieldbus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Certificates and approvals

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ex approvals</b>                      | Information about currently available Ex versions (ATEX, FM, CSA) can be supplied by your Endress+Hauser Sales Centre on request. All explosion protection data are given in a separate documentation which is available upon request.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>CE mark</b>                           | The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>C-Tick mark</b>                       | The measuring system is in conformity with the EMC requirements of the Australian Communications Authority (ACA).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Pressure Equipment Directive</b>      | Flow meters with a nominal diameter smaller or equal DN 25 are covered by Art. 3(3) of the European directive 97/23/EG (Pressure Equipment Directive) and are designed according to sound engineer practice. For larger nominal diameter, optional approvals according to Cat. III are available when required (depends on fluid and process pressure).                                                                                                                                                                                                                                                                                                                                  |
| <b>PROFIBUS DP/PA certification</b>      | <p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organisation). The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified to PROFIBUS PA, profile version 3.0 (device certification number: on request)</li> <li>■ The device can also be operated with certified devices of other manufacturers (interoperability)</li> </ul>                                                                                                                                                                                          |
| <b>FOUNDATION Fieldbus certification</b> | <p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified to FOUNDATION Fieldbus Specification</li> <li>■ The device meets all the specifications of the FOUNDATION Fieldbus H1.</li> <li>■ Interoperability Test Kit (ITK), revision status 4.0 (device certification number: on request)</li> <li>■ The device can also be operated with certified devices of other manufacturers</li> <li>■ Physical Layer Conformance Test of the Fieldbus Foundation</li> </ul> |
| <b>MODBUS certification</b>              | The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan.                                                                                                                                                                                                                                                                                                                                                        |
| <b>Other standards, guidelines</b>       | <p>EN 60529:<br/>Degrees of protection by housing (IP code)</p> <p>EN 61010:<br/>Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</p> <p>EN 61326/A1 (IEC 6326):<br/>Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR NE 21:<br/>Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.</p> <p>NAMUR NE 43:<br/>Standardisation of the signal level for the breakdown information of digital transmitters with analogue output signal.</p> <p>NAMUR NE 53<br/>Software of field devices and signal-processing devices with digital electronics.</p>                        |

## Accessories

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Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The Endress+Hauser service organisation can provide detailed information on request.

## Supplementary documentation

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- Flow Measurement (FA005D/06/en)
- Operating Instructions Promag 50 (BA046D/06/en, BA049D/06/en)
- Operating Instructions Promag 50 PROFIBUS PA (BA055D/06/en, BA056D/06/en)
- Operating Instructions Promag 53 (BA047D/06/en, BA048D/06/en)
- Operating Instructions Promag 53 PROFIBUS DP/PA (BA053D/06/en, BA054D/06/en)
- Operating Instructions Promag 53 FOUNDATION Fieldbus (BA051D/06/en, BA052D/06/en)
- Operating Instructions Promag 53 MODBUS (BA117D/06/en und BA118D/06/en)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

## Registered trademarks

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HART®

Registered trademark of HART Communication Foundation, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organisation, Karlsruhe, Germany

FOUNDATION™ Fieldbus

Registered trademark of the Fieldbus FOUNDATION, Austin, USA

MODBUS®

Registered trademark of the MODBUS Organisation

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, ToF Tool - Fieldtool® Package, Fieldcheck®, Applicator®

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

## Ordering Information

NOTE: Endress+Hauser reserves the right to change or modify product, specifications, and ordering information at any time without notice. Please consult Endress+Hauser or your local representative for the most recent information.

### Promag 50P Electromagnetic flowmeter

Promag 50 P    0   1   2   3   4   5   6   7   8   9   10   11   12

□ □ - □ □ □ □ □ □ □ □ □ □ □ □

#### Nominal Diameter

0   15   1/2"  
      25   1"  
      40   1-1/2"  
      50   2"  
      80   3"  
      1H   4"  
      1F   6"  
      2H   8"  
      2F   10"  
      3H   12"  
      3F   14"  
      4H   16"  
      4F   18"  
      5H   20"  
      6H   24"

#### 1 Liner

A   PFA liner, standard (available for 1" to 8" sensors)  
 B   PFA liner, high temperature version (available for 1" to 8" sensors, not for approval N)  
 E   PTFE liner

#### 2 Process connection

L   Class 150 ANSI B16.5 CS steel A105 flanges  
 M   Class 300 ANSI B16.5 CS steel A105 flanges (not for 8" and larger)  
 R   Class 150 ANSI B16.5 316L SS flanges  
 S   Class 300 ANSI B16.5 316L SS flanges (not for 8" and larger)

#### 3 Electrodes / material

0   Measuring, reference and EPD electrodes / 316L SS  
 1   Measuring, reference and EPD electrodes / Alloy C22  
 2   Measuring, reference and EPD electrodes / tantalum  
 3   Measuring electrodes only, Platinum/Rhodium 80/20% (not available for 14" to 24")  
 5   Measuring, reference and EPD electrodes, Platinum/Rhodium 80/20% (not available for 14" to 24")  
 G   Measuring, reference and EPD electrodes, bullet nose / 316L SS  
 H   Measuring, reference and EPD electrodes, bullet nose / Alloy C-22

#### 4 Calibration

A   3-point calibration, 0.5%  
 B   3-point calibration, 0.2%  
 D   SCS/A2LA 3-point 0.5% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)  
 E   SCS/A2LA 3-point 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)

#### 5 Certificates

1   Standard, no certificate  
 2   3.1B material certificate for pipe and flanges  
 3   2.3 pressure test certificate (1.5 x PN, 3 minutes)  
 4   3.1B material and 2.3 pressure test certificate

#### 6 Approvals

A   For use in non-hazardous areas  
 N   FM explosion proof Class I, Div. 1 / CSA Class I, Div. 1 (only for aluminum field housing, compact version, not for 14" and larger sensors)  
 R   FM non-incendive Class I, Div. 2 / CSA Class I, Div. 2

#### 7 Housing

A   NEMA 4X (IP 67) compact aluminum housing  
 C   NEMA 4X (IP 67) remote wall-mounted (only for approvals A or R)  
 G   NEMA 4X (IP 67) remote aluminum field housing for non-hazardous areas  
 K   NEMA 6P sensor, wall-mounted housing (only for approvals A or R)  
 N   NEMA 6P sensor, aluminum field housing, non-hazardous, not for liner B high temp. (only up to 12" sensor)  
 P   NEMA 4X (IP 67) compact aluminum housing, HE (harsh environment), compact and remote sensor sizes up to 12" only \*  
 S   NEMA 4X (IP 67) remote wall-mounted housing, HE (harsh environment), remote sensor sizes 14" to 24" (only for approvals A and R), available as TSP only \*  
 T   NEMA 4X (IP 67) remote field housing, HE (harsh environment), remote sensor sizes 1/2" to 12" only \*  
 1   -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, aluminum field housing (only for approvals A and R)  
 3   -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, (only for approvals A and R)  
 5   -40°F (-40°C) ambient temperature, NEMA 6P sensor, wall mount housing for transmitter (only for approvals A and R)  
 6   -40°F (-40°C) ambient temperature, NEMA 4X (IP 67) remote field housing (only for approvals A and R)

#### 8 Cable for remote

0   Without cable  
 1   15 foot coil and signal cable  
 2   30 foot coil and signal cable  
 5   Coil and signal cable, specify length (maximum 650 ft depending on conductivity of process material)

#### 9 Cable entries

B   1/2" NPT  
 L   1/2" NPT fieldbus connector (only for approval A and R)  
 X   Sensor only, without cable, compact version, up to 8" only

#### 10 Power supply / display

7   85 to 260 VAC, without display, remote configuration only (not for wall mount or SS housing)  
 8   20 to 55 VAC / 16 to 62 VDC, without display, remote configuration only (not for wall mount or SS housing)  
 A   85 to 260 VAC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)  
 B   20 to 55 VAC / 16 to 62 VDC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)  
 X   Sensor only (without transmitter, only available up to 8")

#### 11 Software

A   Standard software  
 C   ECC electrode cleaning circuit (only for approvals A and R)

#### 12 Outputs / Inputs

A   Current HART, frequency  
 D   Current HART, frequency, status output, status input  
 H   PROFIBUS-PA (approvals A and R only)  
 J   PROFIBUS-DP (approvals A and R only)  
 S   Current HART, frequency; active (not for approvals A and R)  
 T   Current HART, frequency; passive (not for approvals A and R)  
 W   Current HART  
 X   Sensor only

\*   Harsh environment (HE) option is available for process conditions where cool process temperatures in tropical (high humidity) environments or process fluids which undergo large cyclical temperature variations which can cause high amounts of moisture that could condense onto the measurement tube.

**Promag 53P Electromagnetic flowmeter**

|                                                                                                                                                                                                                                                                                                          | 0                                                                                 | 1                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                 | 5                                                                                 | 6                                                                                 | 7                                                                                 | 8                                                                                 | 9                                                                                  | 10                                                                                  | 11                                                                                  | 12                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Promag 53 P                                                                                                                                                                                                                                                                                              |  |  |  |  |  |  |  |  |  |  |  |  |                                                                          |
| Nominal Diameter                                                                                                                                                                                                                                                                                         | 7                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | Housing                                                                                                                                                     |
| 0                                                                                                                                                                                                                                                                                                        | 15 1/2"                                                                           |                                                                                   | 2F 10"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | A NEMA 4X (IP 67) compact aluminum housing                                                                                                                  |
|                                                                                                                                                                                                                                                                                                          | 25 1"                                                                             |                                                                                   | 3H 12"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | C NEMA 4X (IP 67) remote wall-mounted (only for approvals A or R)                                                                                           |
|                                                                                                                                                                                                                                                                                                          | 40 1-1/2"                                                                         |                                                                                   | 3F 14"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | G NEMA 4X (IP 67) remote aluminum field housing for non-hazardous areas                                                                                     |
|                                                                                                                                                                                                                                                                                                          | 50 2"                                                                             |                                                                                   | 4H 16"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | K NEMA 6P sensor, wall-mounted housing (only for approvals A or R)                                                                                          |
|                                                                                                                                                                                                                                                                                                          | 80 3"                                                                             |                                                                                   | 4F 18"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | N NEMA 6P sensor, aluminum field housing, non-hazardous, not for liner B high temp. (only up to 12" sensor)                                                 |
|                                                                                                                                                                                                                                                                                                          | 1H 4"                                                                             |                                                                                   | 5H 20"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | P NEMA 4X (IP 67) compact aluminum housing, HE (harsh environment), compact and remote sensor sizes up to 12" only *                                        |
|                                                                                                                                                                                                                                                                                                          | 1F 6"                                                                             |                                                                                   | 6H 24"                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | S NEMA 4X (IP 67) remote wall-mounted housing, HE (harsh environment), remote sensor sizes 14" to 24" (only for approvals A and R), available as TSP only * |
|                                                                                                                                                                                                                                                                                                          | 2H 8"                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | T NEMA 4X (IP 67) remote field housing, HE (harsh environment), remote sensor sizes 1/2" to 12" only *                                                      |
| 1 Liner                                                                                                                                                                                                                                                                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 1 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, aluminum field housing (only for approvals A and R)                                          |
| A PFA liner, standard (available for 1" to 8" sensors)                                                                                                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 3 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, (only for approvals A and R)                                                                 |
| B PFA liner, high temperature version (available for 1" to 8" sensors, not for approval N)                                                                                                                                                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 5 -40°F (-40°C) ambient temperature, NEMA 6P sensor, wall mount housing for transmitter (only for approvals A and R)                                        |
| E PTFE liner                                                                                                                                                                                                                                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 6 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67) remote field housing (only for approvals A and R)                                                      |
| 2 Process connection                                                                                                                                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 8 Cable for remote                                                                                                                                          |
| L Class 150 ANSI B16.5 CS steel A105 flanges                                                                                                                                                                                                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 0 Without cable                                                                                                                                             |
| M Class 300 ANSI B16.5 CS steel A105 flanges (not for 8" and larger)                                                                                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 1 15 foot coil and signal cable                                                                                                                             |
| R Class 150 ANSI B16.5 316L SS flanges                                                                                                                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 2 30 foot coil and signal cable                                                                                                                             |
| S Class 300 ANSI B16.5 316L SS flanges (not for 8" and larger)                                                                                                                                                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 5 Coil and signal cable, specify length (maximum 650 ft depending on conductivity of process material)                                                      |
| 3 Electrodes / material                                                                                                                                                                                                                                                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 9 Cable entries                                                                                                                                             |
| 0 Measuring, reference and EPD electrodes / 316L SS                                                                                                                                                                                                                                                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | B 1/2" NPT                                                                                                                                                  |
| 1 Measuring, reference and EPD electrodes / Alloy C22                                                                                                                                                                                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | L 1/2" NPT fieldbus connector (only for approval A and R)                                                                                                   |
| 2 Measuring, reference and EPD electrodes / tantalum                                                                                                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | X Sensor only, without cable, compact version, up to 8" only                                                                                                |
| 3 Measuring electrodes only, Platinum/Rhodium 80/20% (not available for 14" to 24")                                                                                                                                                                                                                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 10 Power supply / display                                                                                                                                   |
| 5 Measuring, reference and EPD electrodes, Platinum/Rhodium 80/20% (not available for 14" to 24")                                                                                                                                                                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 7 85 to 260 VAC, without display, remote configuration only (not for wall mount or SS housing)                                                              |
| G Measuring, reference and EPD electrodes, bullet nose / 316L SS                                                                                                                                                                                                                                         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 8 20 to 55 VAC / 16 to 62 VDC, without display, remote configuration only (not for wall mount or SS housing)                                                |
| H Measuring, reference and EPD electrodes, bullet nose / Alloy C-22                                                                                                                                                                                                                                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | A 85 to 260 VAC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)                                                                 |
| 4 Calibration                                                                                                                                                                                                                                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | B 20 to 55 VAC / 16 to 62 VDC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)                                                   |
| B 3-point calibration, 0.2%                                                                                                                                                                                                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | X Sensor only (without transmitter, only available up to 8")                                                                                                |
| E SCS/A2LA 3-point 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)                                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 11 Software                                                                                                                                                 |
| 5 Certificates                                                                                                                                                                                                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | A Standard software                                                                                                                                         |
| 1 Standard, no certificate                                                                                                                                                                                                                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | C ECC electrode cleaning circuit (only for approvals A and R)                                                                                               |
| 2 3.1B material certificate for pipe and flanges                                                                                                                                                                                                                                                         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 12 Outputs / Inputs                                                                                                                                         |
| 3 2.3 pressure test certificate (1.5 x PN, 3 minutes)                                                                                                                                                                                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | Fixed communication boards                                                                                                                                  |
| 4 3.1B material and 2.3 pressure test certificate                                                                                                                                                                                                                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | A Current HART, frequency                                                                                                                                   |
| 6 Approvals                                                                                                                                                                                                                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | B Current HART, frequency, 2 relays                                                                                                                         |
| A For use in non-hazardous areas                                                                                                                                                                                                                                                                         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | F PROFIBUS-PA, IS                                                                                                                                           |
| N FM explosion proof Class I, Div. 1 / CSA Class I, Div. 1 (only for aluminum field housing, compact version, not for 14" and larger sensors)                                                                                                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | G Foundation Fieldbus, IS                                                                                                                                   |
| R FM non-incendive Class I, Div. 2 / CSA Class I, Div. 2                                                                                                                                                                                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | H PROFIBUS-PA                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | J PROFIBUS-DP                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | K Foundation Fieldbus                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | Q Modbus RS485, status input                                                                                                                                |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | S Current HART, frequency; active I.S                                                                                                                       |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | T Current HART, frequency; passive I.S                                                                                                                      |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | Flexible communication boards                                                                                                                               |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | C Current HART, frequency, 2 relays, flexible module                                                                                                        |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | D Current HART, frequency, relay, and status input, flexible module                                                                                         |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | L Current HART, 2 relays and status input/output                                                                                                            |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | M Current HART, 2 frequency output, status input                                                                                                            |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | N Modbus RS 485, current and frequency output, status input                                                                                                 |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | P PROFIBUS-DP, current and frequency output, status input                                                                                                   |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | V PROFIBUS-DP, two relay outputs, status input                                                                                                              |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 2 Current HART, relay, current, frequency outputs                                                                                                           |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 4 Current HART, relay, frequency outputs, current input                                                                                                     |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 7 Modbus RS485, two relay outputs, status input                                                                                                             |
|                                                                                                                                                                                                                                                                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | X Sensor only                                                                                                                                               |
| * Housing options                                                                                                                                                                                                                                                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                                                                                             |
| Harsh environment (HE) option is available for process conditions where cool process temperatures in tropical (high humidity) environments or process fluids which undergo large cyclical temperature variations which can cause high amounts of moisture that could condense onto the measurement tube. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                                                                                             |

| United States                                                                                                                                                                                                                  | Canada                                                                                                                                                                 | Mexico                                                                                                                                                                                                                                                                |
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