



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 $\geq 5 \mu\text{S}/\text{cm}$:

- Acids and caustic solutions
- Paints
- Pastes, mashs
- Water, wastewater etc.
- Flow measurement up to 44,000 GPM (9600 m³/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

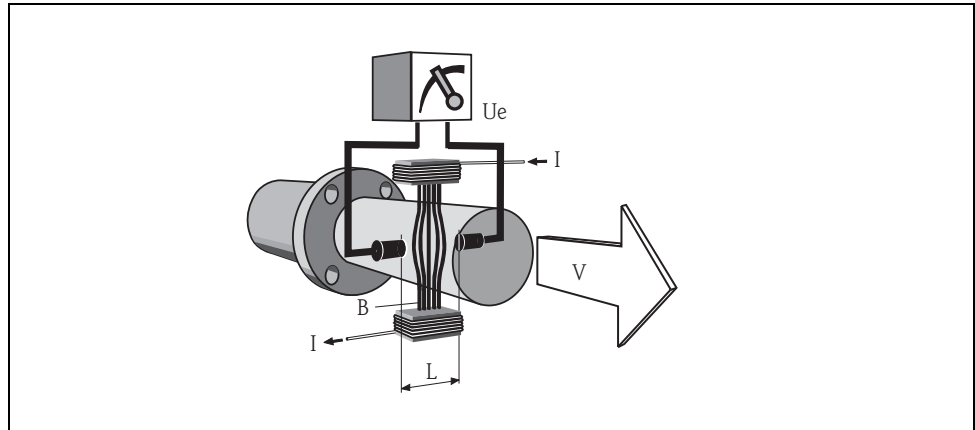
The tried-and-tested **Promag sensors** offer:

- 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.



A0003191

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

$$Q = A \cdot v$$

U_e = 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 1×10^{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): $U = 3$ to 30 V DC, $R_i = 5$ k Ω , galvanically isolated. Configurable for: totalizer(s) reset, measured value suppression, error-message reset. Status input (auxiliary input) with PROFIBUS DP and MODBUS RS485: $U = 3$ to 30 V DC, $R_i = 3$ k Ω , 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 μ A,
 temperature coefficient: typ. 0.003% o.r./ $^{\circ}$ F (0.005% o.r./ $^{\circ}$ 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

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./ $^{\circ}$ F (0.005% o.r./ $^{\circ}$ C), o.r. = of reading,
 resolution: 0.5 μ 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 μ 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

Signal on alarm

- Current output → failure response selectable (e.g. in accord. with NAMUR Recom. NE 43)
- Pulse/frequency output → failure response selectable
- Status output (Promag 50) → non-conductive by fault or power supply failure
- Relay output (Promag 53) → de-energized by fault or power supply failure

Load

See "Output signal"

Switching output

Status output (Promag 50, Promag 53):
 Open collector, max. 30 V DC / 250 mA, galvanically isolated.
 Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.

Relay outputs (Promag 53):
 Normally closed (NC or break) or normally open (NO or make) contacts available
 (default: relay 1 = NO, relay 2 = NC)
 max. 30 V / 0.5 A AC; 60 V / 0.1 A DC, galvanically isolated.
 Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values, batching contacts.

Low flow cutoff

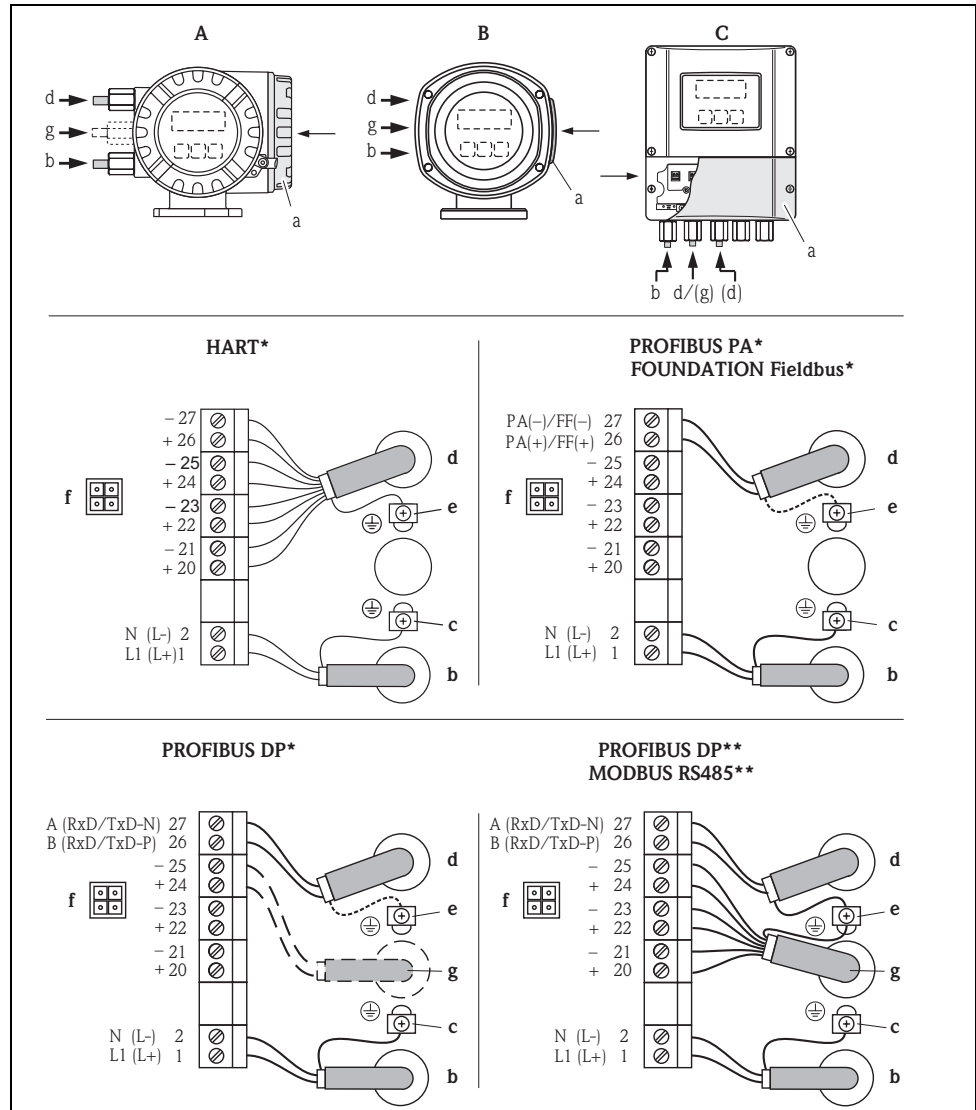
Switch points for low flow cutoff are selectable

Galvanic isolation

All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

Power supply

Electrical connection
Measuring unit



a0002441

Cable cross section max. 16 AWG (2.5 mm²)

- 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

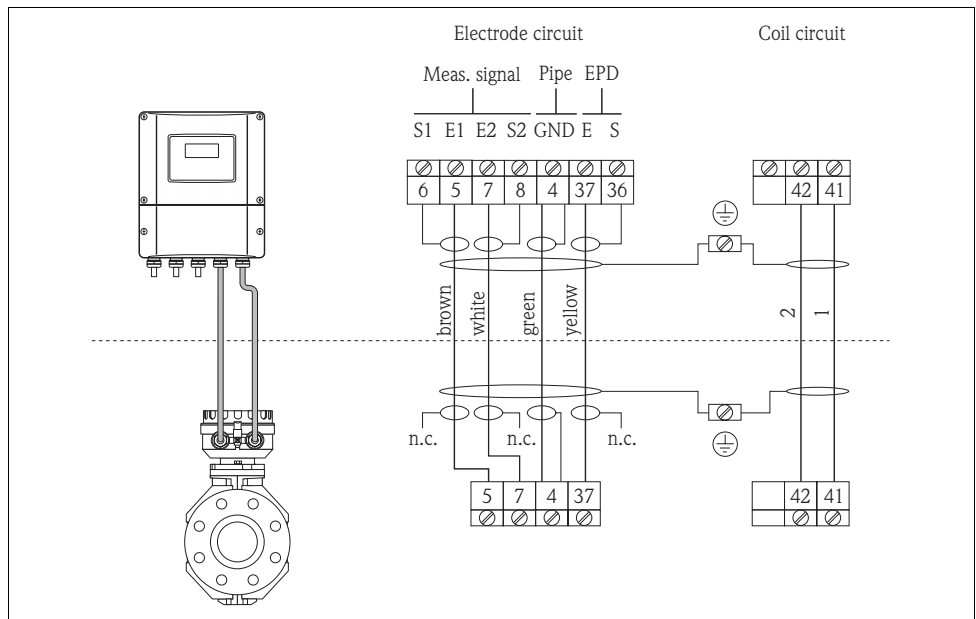
The inputs and outputs on the communication board can be either permanently assigned or variable, depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

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

Order variant	Terminal No. (inputs / outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
53***_*****M	Status input	Frequency output	Frequency output	Current output HART
53***_*****N	Current output	Frequency output	Status input	MODBUS RS485
53***_*****P	Current output	Frequency output	Status input	PROFIBUS DP
53***_*****V	Relay output 2	Relay output 1	Status input	PROFIBUS DP
53***_*****2	Relay output	Current output	Frequency output	Current output HART
53***_*****4	Current input	Relay output	Frequency output	Current output HART
53***_*****5	Status input	Current input	Frequency output	Current output HART
53***_*****7	Relay output 2	Relay output 1	Status input	MODBUS RS485

Ground connection, power supply → Page 6

Electrical connection remote version



n.c. = isolated cable shields, not connected

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"

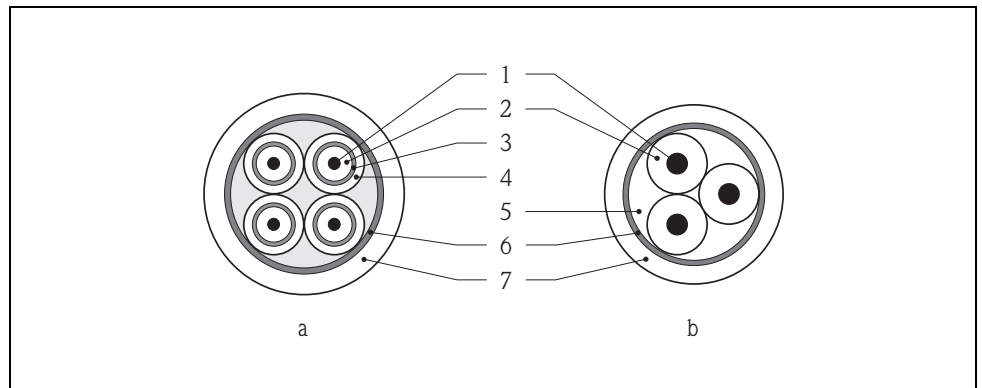
Cable specifications remote version

Coil cable:

- 2 x 18 AWG (0.75 mm²) PVC cable with common, braided copper shield (Ø approx. 7 mm)
- Conductor resistance: ≤ 37 Ω/km
- Capacitance: core/core, shield grounded: ≤ 120 pF/m
- Permanent operating temperature: -4 to +180°F (-20 to +80°C)
- Cable cross-section: max. 16 AWG (2.5 mm²)

Signal cable:

- 3 x 20 AWG (0.38 mm²) 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 mm²) PVC cable with common, braided copper shield (Ø approx. 0.28" / 7 mm) and individually shielded cores.
- Conductor resistance: ≤ 50 Ω/km
- Capacitance: core/shield: ≤ 420 pF/m
- Permanent operating temperature: -4 to +180°F (-20 to +80°C)
- Cable cross-section: max. 16 AWG (2.5 mm²)



a = signal cable, b = coil current cable (cross-section: max. 16 AWG / 2.5 mm²)
 1 = core, 2 = core insulation, 3 = core shield, 4 = core jacket, 5 = core strengthening,
 6 = cable shield, 7 = outer jacket

A0003194

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
 20 to 55 V AC, 45 to 65 Hz
 16 to 62 V DC

PROFIBUS PA and FOUNDATION Fieldbus
 Non-hazardous: 9 to 32 V DC
 Intrinsically safe: 9 to 24 V DC
 Explosion proof: 9 to 32 V DC

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

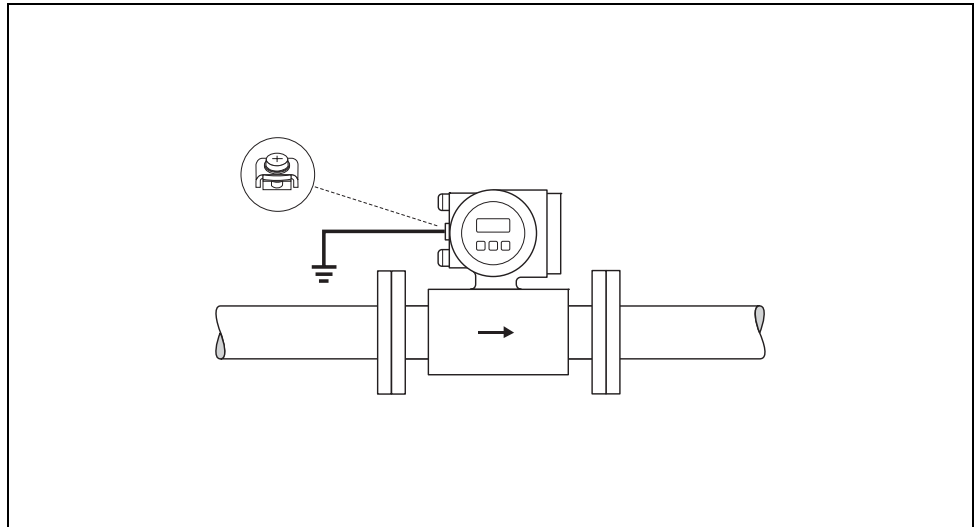
Switch-on current:
 ■ max. 13.5 A (< 50 ms) at 24 V DC
 ■ max. 3 A (< 5 ms) at 260 V AC

Power supply failure Lasting min. 1 power cycle:
 ■ EEPROM or T-DAT (Promag 53 only) retain the measuring system data in the event of a power supply failure
 ■ S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point, etc.)

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

Note!

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



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.

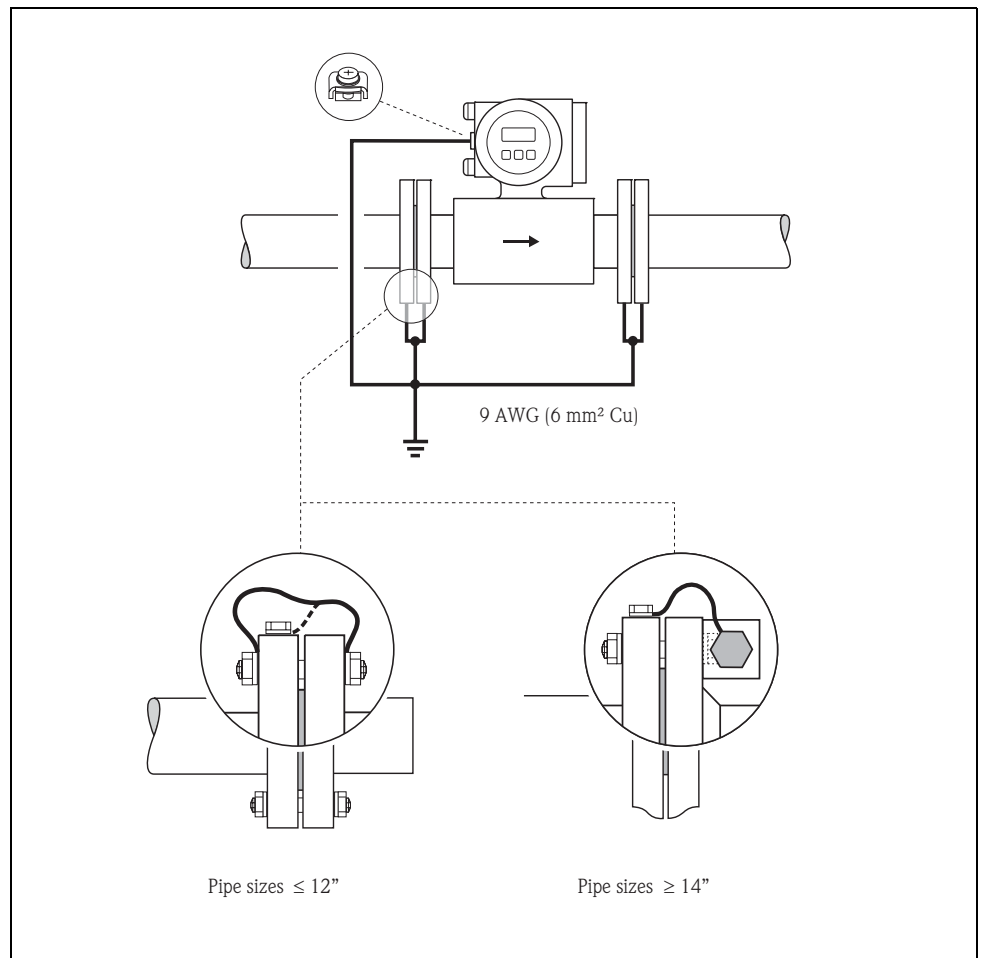
Caution!

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 ≤ 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 ≥ 350): The ground cable connects directly to the metal transport bracket.



A0004376

Plastic pipes and isolating lined pipes

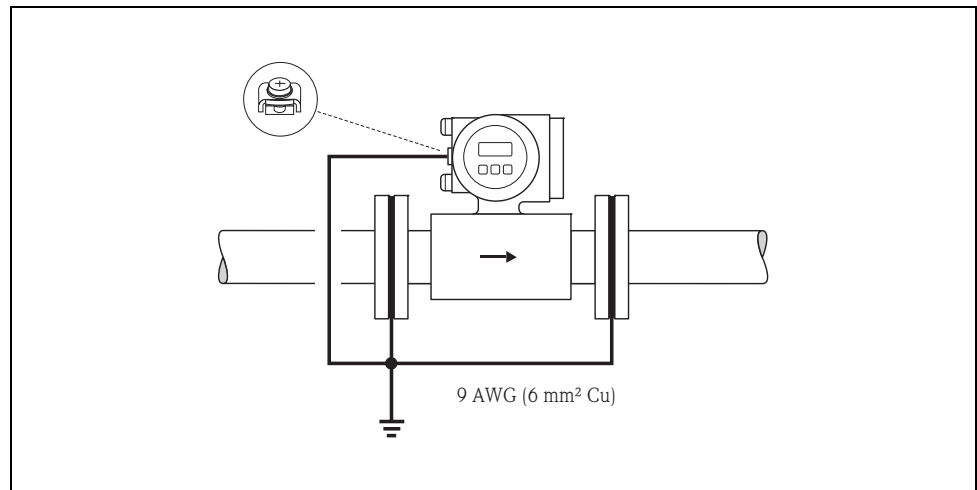
Normally, potential is matched using the reference electrodes in the measuring tube. However, in exceptional cases it is possible that, due to the grounding plan of a system, large matching currents flow over the reference electrodes. This can lead to destruction of the sensor, e.g. through electrochemical 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.

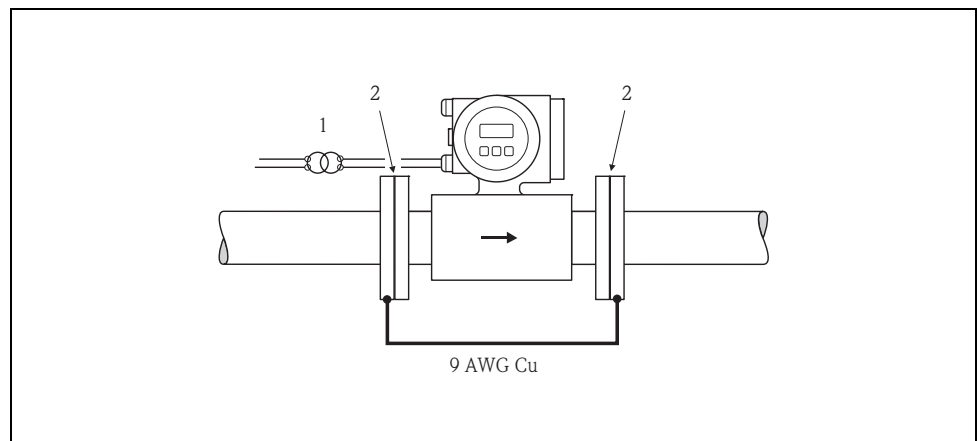


A0004377

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: $+28^{\circ}\text{C} \pm 2\text{ K}$
- Ambient temperature: $+22^{\circ}\text{C} \pm 2\text{ K}$
- Warm-up period: 30 minutes

Installation:

- Inlet run $>10 \times \text{Dia. (DN)}$
- Outlet run $> 5 \times \text{Dia. (DN)}$
- Sensor and transmitter grounded.
- Sensor centered relative to the pipe.

Maximum measured error

Promag 50:

Pulse output: $\pm 0.5\%$ o.r. $\pm 1\text{ mm/s}$ (o.r. = of reading)

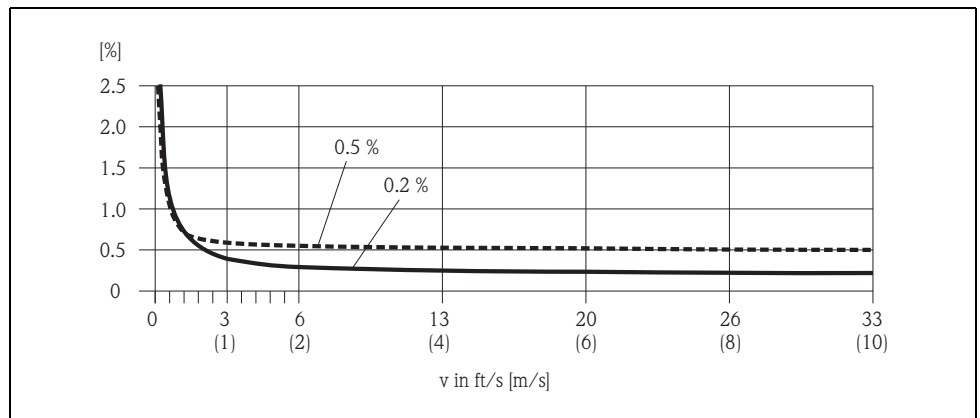
Current output: plus typically $\pm 5\ \mu\text{A}$

Promag 53:

Pulse output: $\pm 0.2\%$ o.r. $\pm 2\text{ mm/s}$ (o.r. = of reading)

Current output: plus typically $\pm 5\ \mu\text{A}$

Supply voltage fluctuations have no effect within the specified range.



Max. measured error in % of reading

F06-5xxxxxxx05-xx-xx-xx-000

Repeatability

max. $\pm 0.1\%$ o.r. $\pm 0.5\text{ mm/s}$ (o.r. = of reading)

Operating conditions

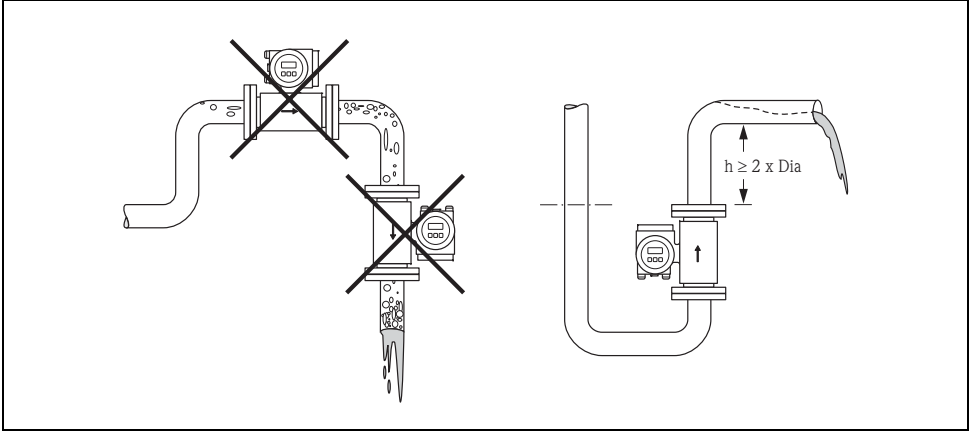
Installation conditions

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.

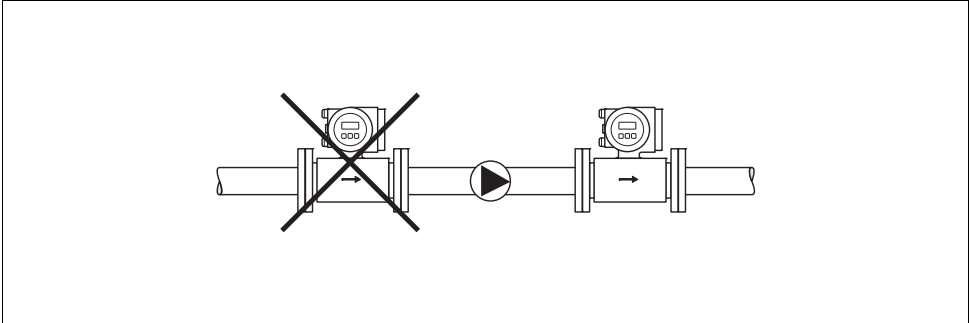


F06-5xxxxxxx-11-00-00-xx-000

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.



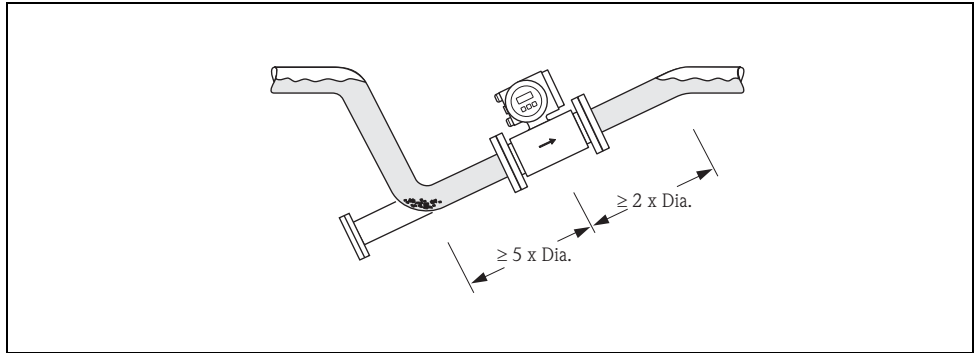
F06-5xxxxxxx-11-00-00-xx-001

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!

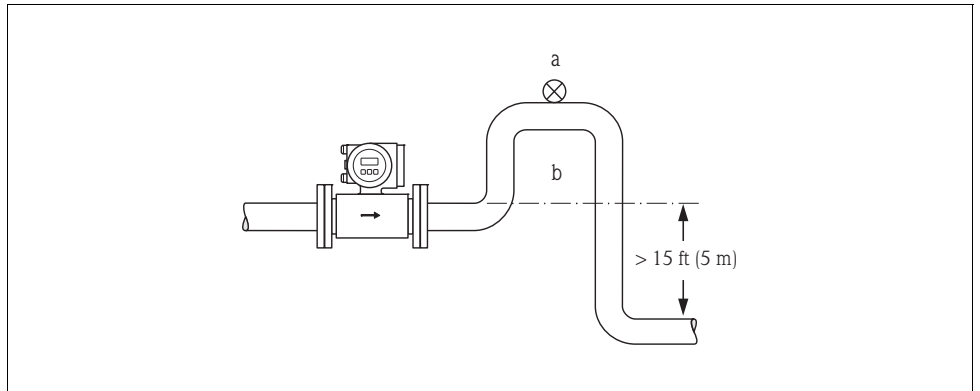
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.



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

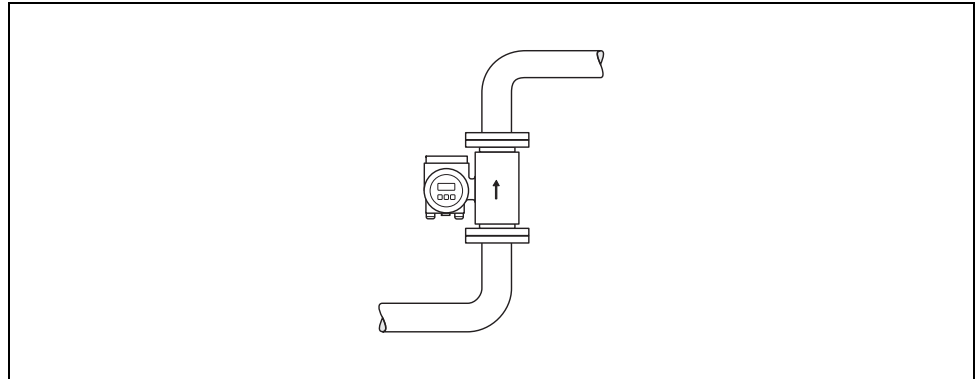
Orientation

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.



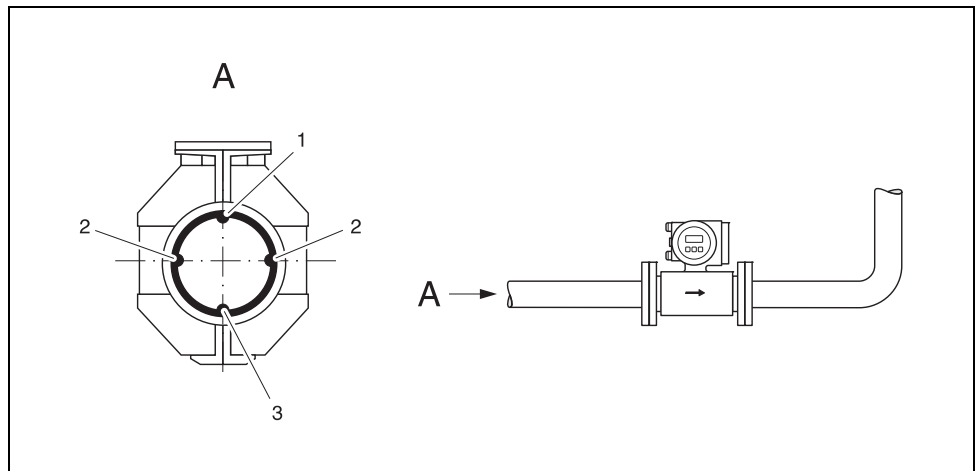
F06-5xxxxxxx-11-00-00-xx-004

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

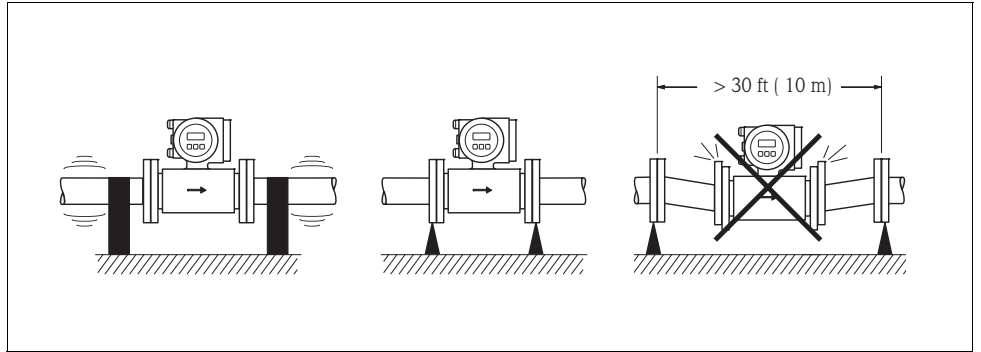
- 1 = EPD electrode (Empty Pipe Detection)
 2 = Measuring electrodes (signal detection)
 3 = Reference electrode (potential equalisation)

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.



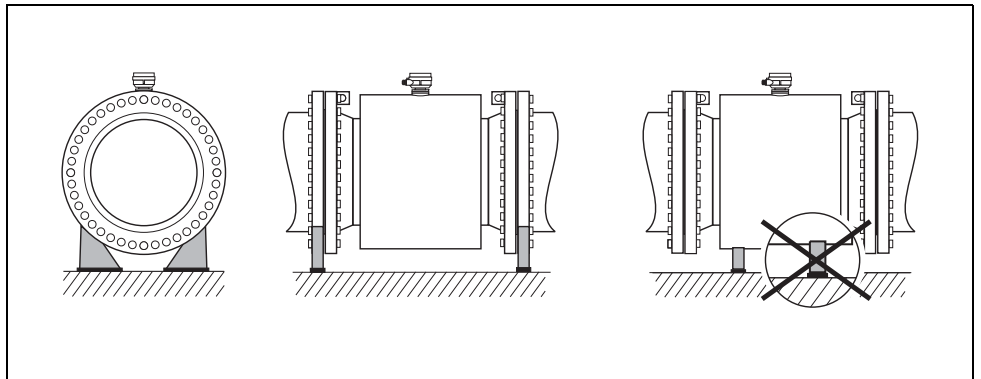
F06-5xxxxxx-11-00-00-xx-006

Foundations, supports

If the nominal diameter is $\geq 14"$ (DN ≥ 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.

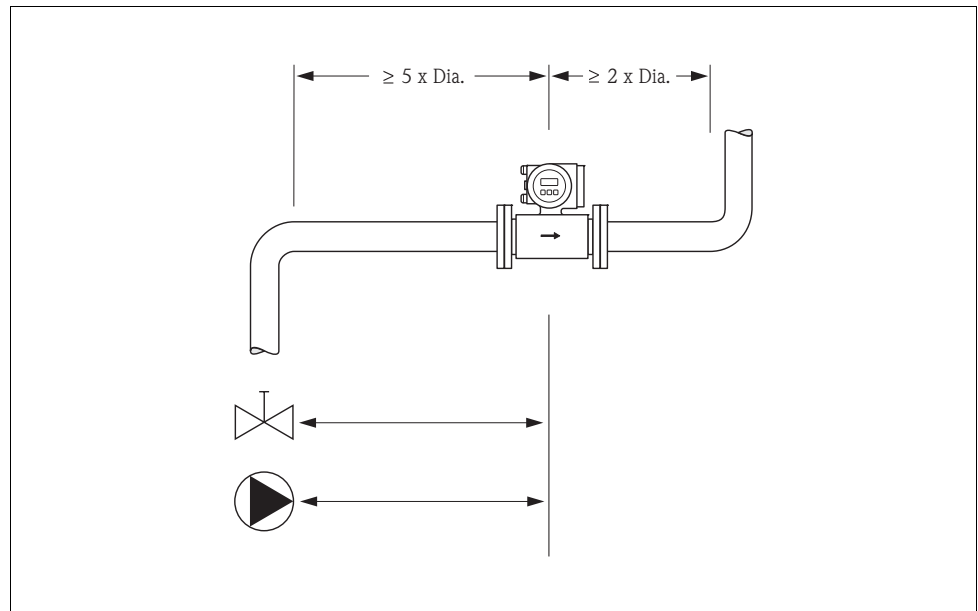


F06-5xFxxxxx-11-05-xx-xx-000

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 $\geq 2 \times \text{Dia}$



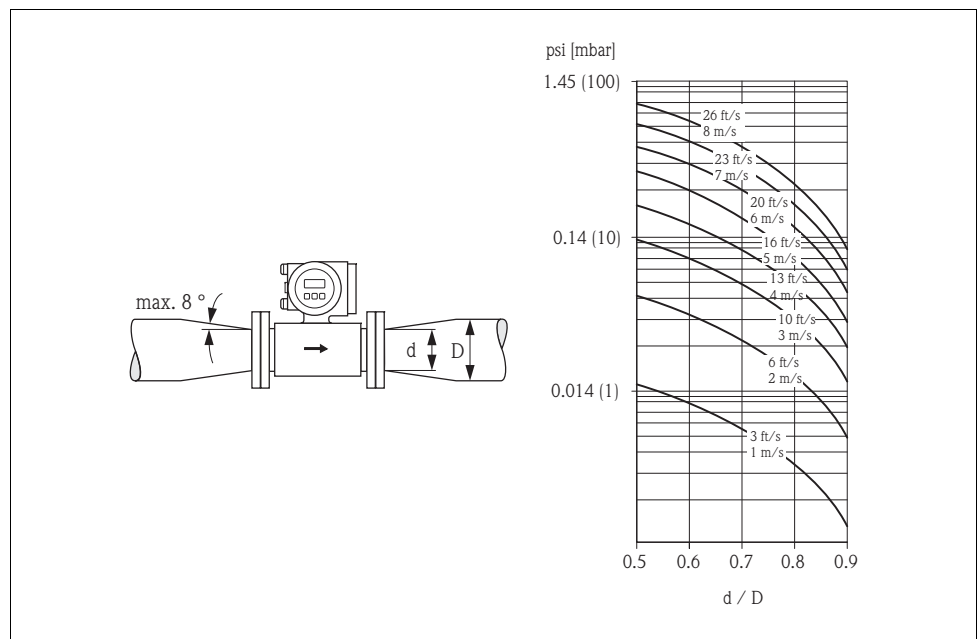
F06-5xxxxxxx-11-00-00-xx-005

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:

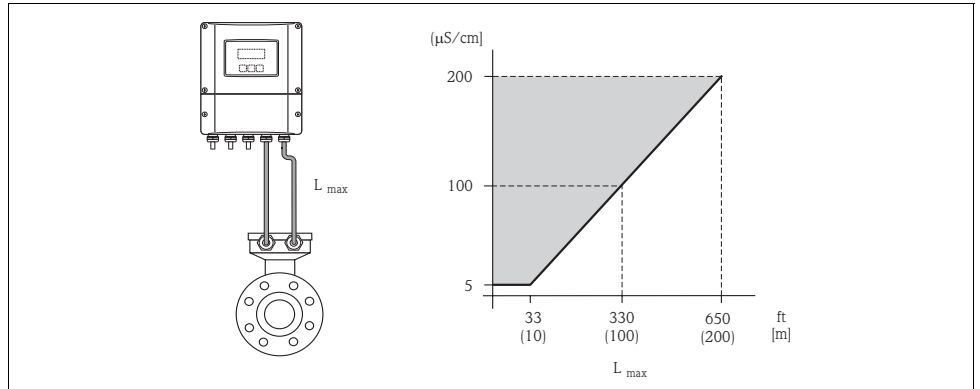
1. Calculate the ratio of the diameters d/D .
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



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 $\mu\text{S/cm}$ 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 [$\mu\text{S/cm}$]

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

- Standard: NEMA 4X (IP 67) for transmitter and sensor
- Optional: NEMA 6P (IP 68) for sensor in remote version

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

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

Process conditions

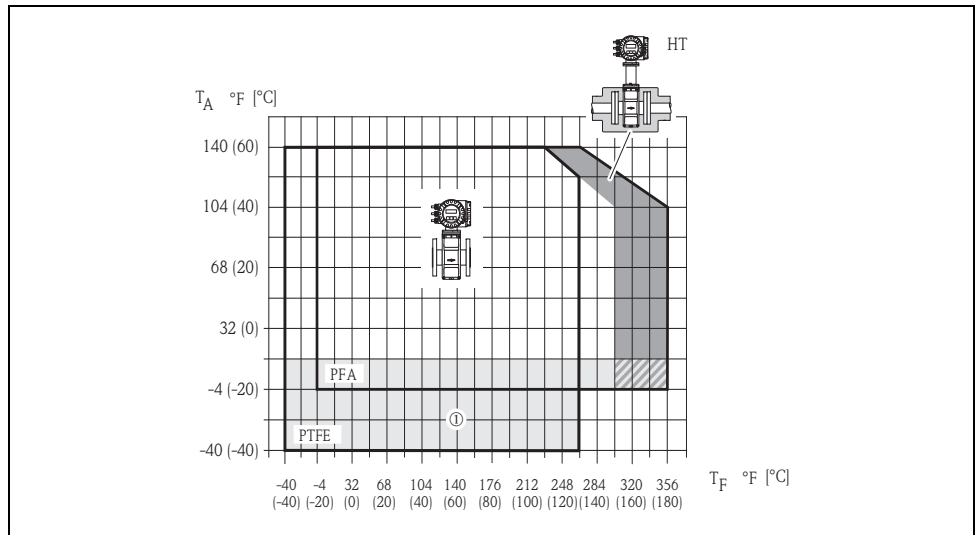
Medium temperature range

The permissible medium temperature depends on the measuring-tube lining:

- -40 to +265°F (-40 to +130°C) for PTFE (1/2" to 24" / DN 15 to 600), for restrictions → refer to diagrams
- -4 to +355°F (-20 to +180°C for PFA (1" to 8" / DN 25 to 200), for restrictions → refer to diagrams

Compact version (PFA and PTFE lining)

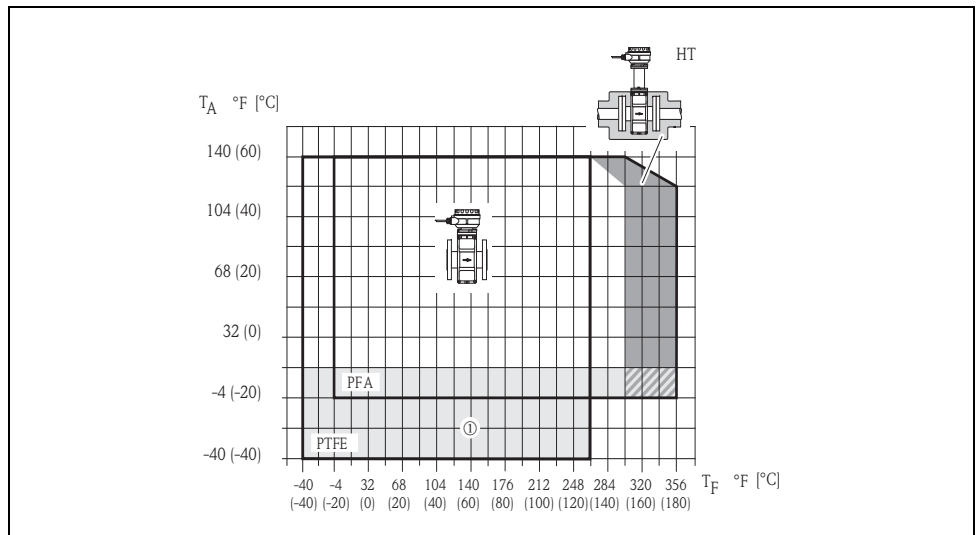
T_A = ambient temperature, T_F = fluid temperature, HT = high-temperature version, with insulation
 ① = temperature range from 14 to -40°F (-10°C to -40°C) only applies for flanges made of stainless steel



A0002600

Remote version (PFA and PTFE lining)

T_A = ambient temperature, T_F = 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



A0002671

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					
			Limit values for abs. pressure psi [mbar] at various fluid temperatures					
[mm]	[inch]		75°F (25°C)	175°F (80°C)	212°F (100°C)	265°F (130°C)	300°F (150°C)	355°F (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 Min./max. full scale value (v ~ 0.3 or 10 m/s)	Factory settings			
[mm]	[inch]		Full scale value (v ~ 2.5 m/s)	Pulse weighting (~ 2 pulse/s)	Creepage (v ~ 0.04 m/s)	
15	1/2"	4...100 dm ³ /min	25 dm ³ /min	0.20 dm ³	0.5 dm ³ /min	
25	1"	9...300 dm ³ /min	75 dm ³ /min	0.50 dm ³	1 dm ³ /min	
32	1 1/4"	15...500 dm ³ /min	125 dm ³ /min	1.00 dm ³	2 dm ³ /min	
40	1 1/2"	25...700 dm ³ /min	200 dm ³ /min	1.50 dm ³	3 dm ³ /min	
50	2"	35...1100 dm ³ /min	300 dm ³ /min	2.50 dm ³	5 dm ³ /min	
65	2 1/2"	60...2000 dm ³ /min	500 dm ³ /min	5.00 dm ³	8 dm ³ /min	
80	3"	90...3000 dm ³ /min	750 dm ³ /min	5.00 dm ³	12 dm ³ /min	
100	4"	145...4700 dm ³ /min	1200 dm ³ /min	10.00 dm ³	20 dm ³ /min	
125	5"	220...7500 dm ³ /min	1850 dm ³ /min	15.00 dm ³	30 dm ³ /min	
150	6"	20...600 m ³ /h	150 m ³ /h	0.025 m ³	2.5 m ³ /h	
200	8"	35...1100 m ³ /h	300 m ³ /h	0.05 m ³	5.0 m ³ /h	
250	10"	55...1700 m ³ /h	500 m ³ /h	0.05 m ³	7.5 m ³ /h	
300	12"	80...2400 m ³ /h	750 m ³ /h	0.10 m ³	10 m ³ /h	
350	14"	110...3300 m ³ /h	1000 m ³ /h	0.10 m ³	15 m ³ /h	
400	16"	140...4200 m ³ /h	1200 m ³ /h	0.15 m ³	20 m ³ /h	
450	18"	180...5400 m ³ /h	1500 m ³ /h	0.25 m ³	25 m ³ /h	
500	20"	220...6600 m ³ /h	2000 m ³ /h	0.25 m ³	30 m ³ /h	
600	24"	310...9600 m ³ /h	2500 m ³ /h	0.30 m ³	40 m ³ /h	

Flow characteristics (US units)					
Nominal diameter		Recommended flow rate Min./max. full scale value (v ~ 1 or ~ 33 ft/s)	Factory settings		
[inch]	[mm]		Full scale value (v ~ 8 ft/s)	Pulse weighting (~ 2 pulse/s)	Creepage (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

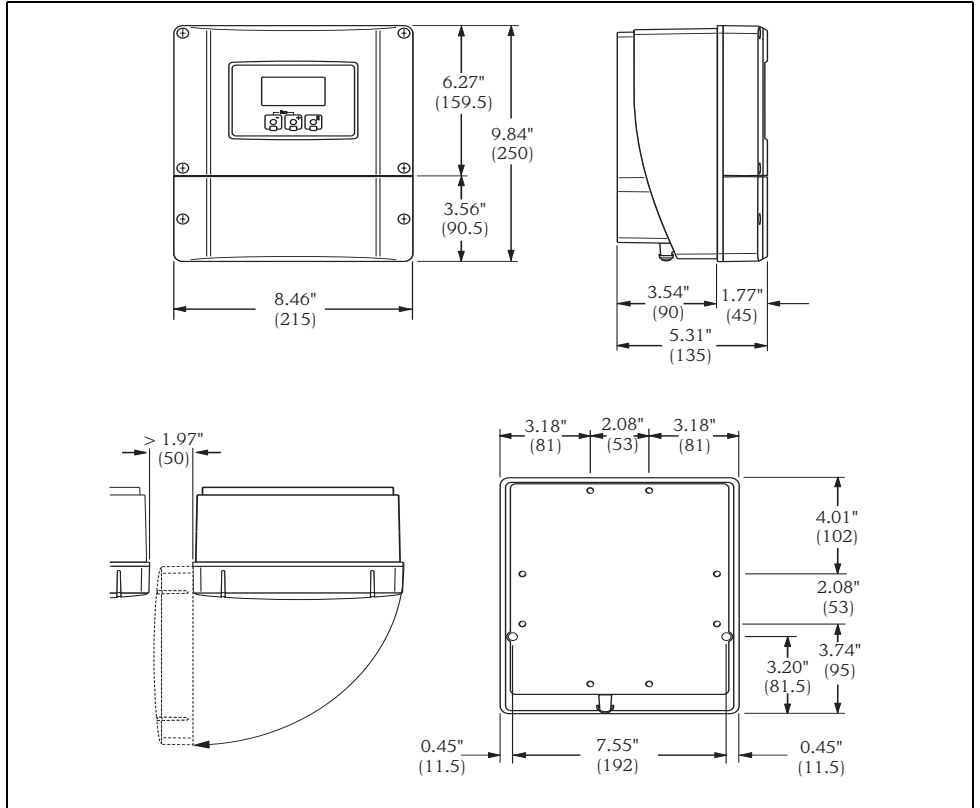
Measuring tube specifications

Nominal diameter		Pressure rating					Inside diameter of measuring tube	
[mm]	[inch]	EN (DIN) [bar]	AS 2129	AS 4087	ANSI [lbs]	JIS	with PFA inches (mm)	with PTFE 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

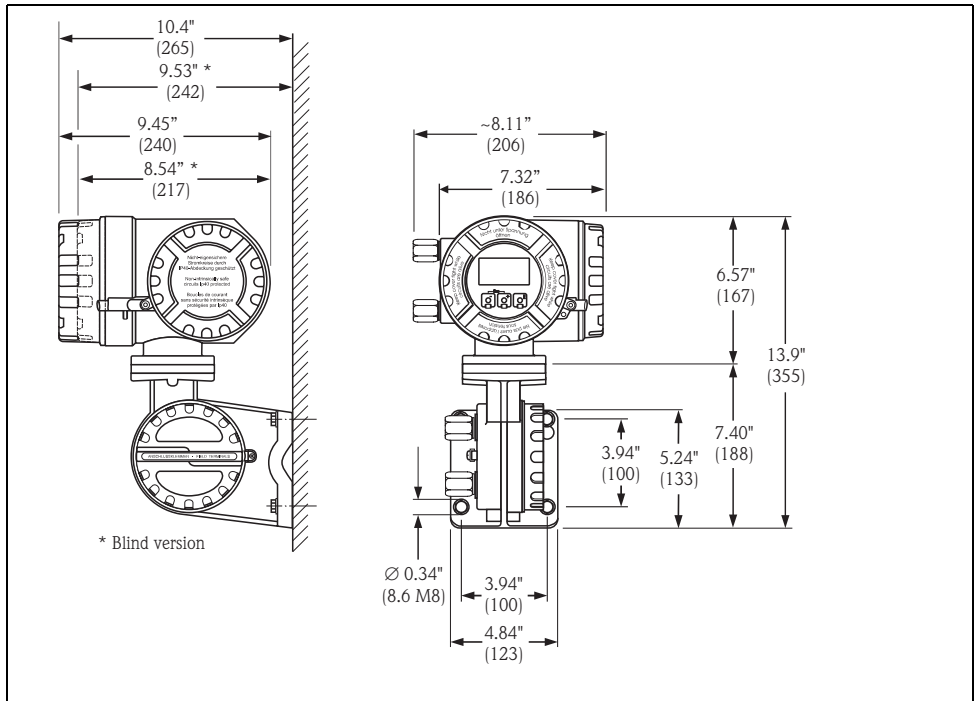
Design / dimensions

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



A0001150

Dimensions: Remote field housing (II2GD / zone 1)

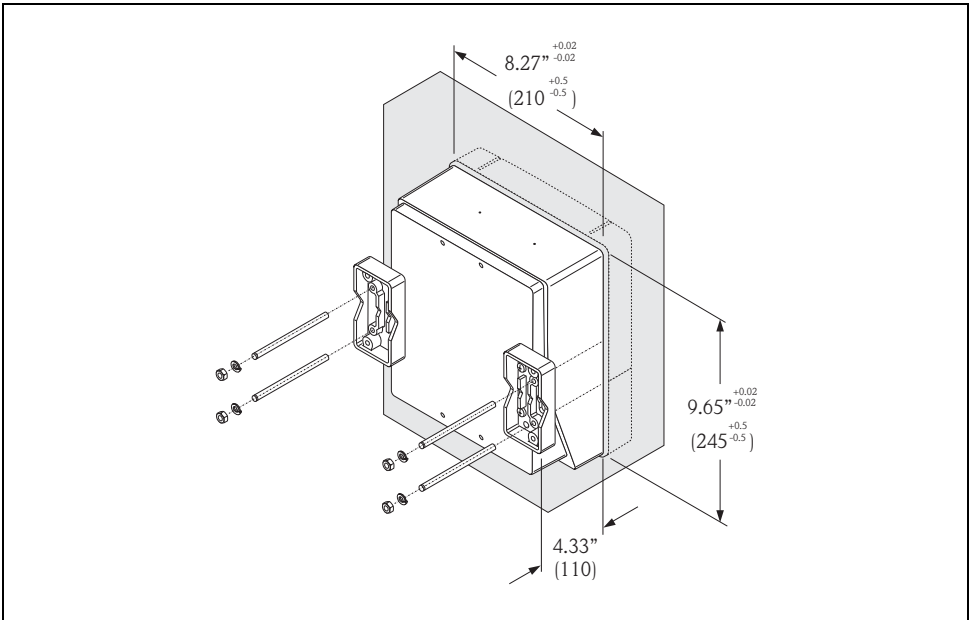


A0002128

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:

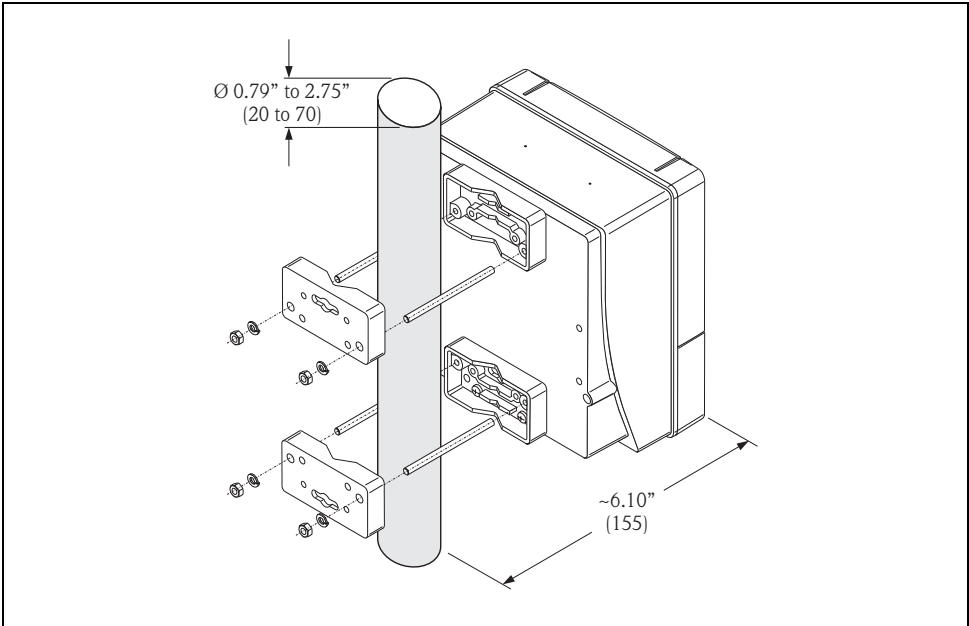
- Panel-mounted installation
- Pipe mounting

Panel-mounted installation



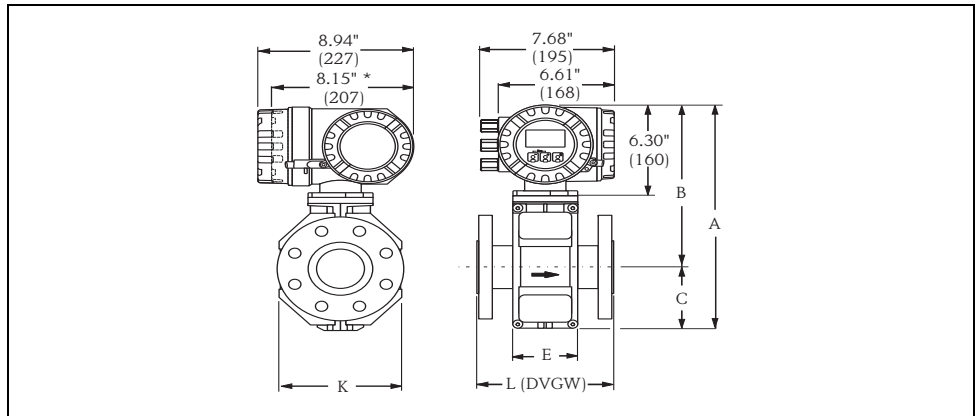
A0001131

Pipe mounting



A0001132

Compact version ≤ 12" (DN ≤ 300)



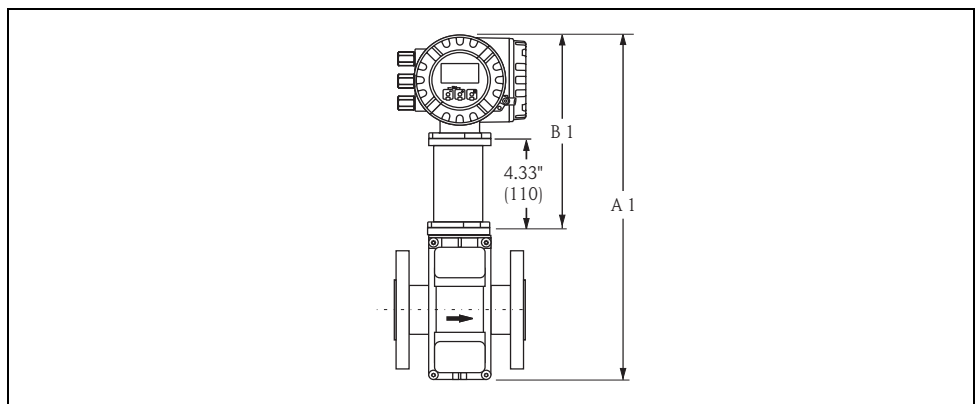
F06-53Fxxxxx-06-00-xx-xx-000

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)	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.

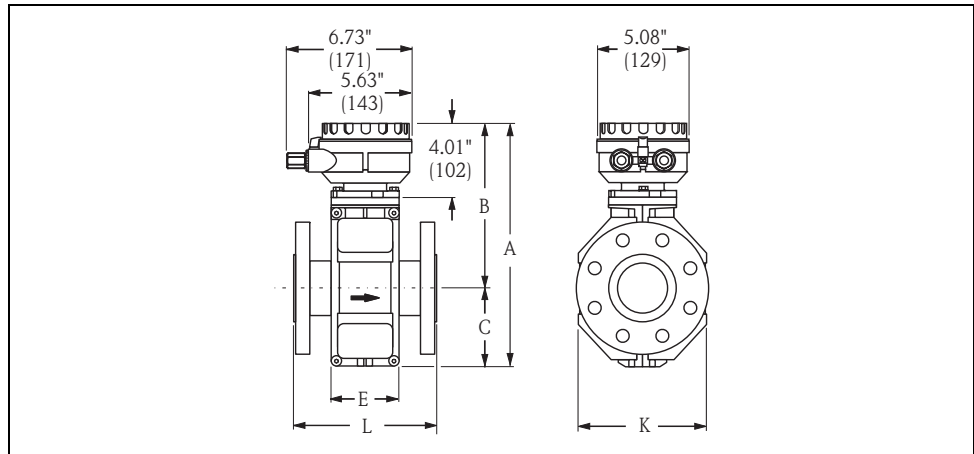
High temperature version ≤ 12" (DN ≤ 300)



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

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

Remote version $\leq 12''$ (DN ≤ 300)



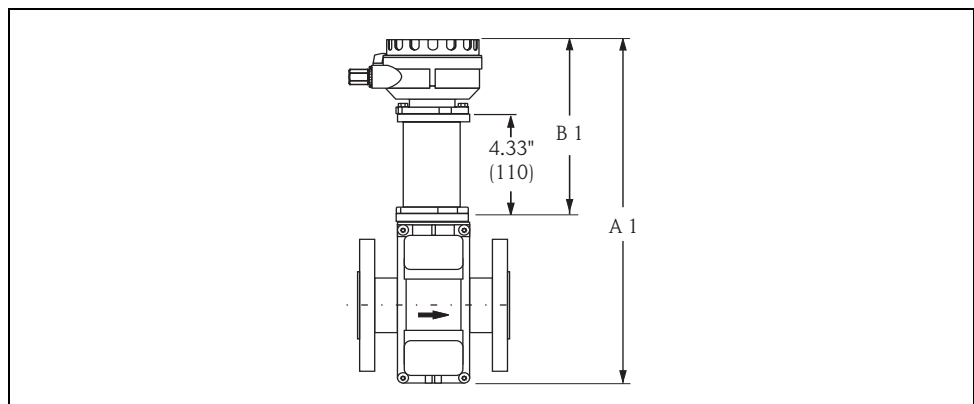
A0003219

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.

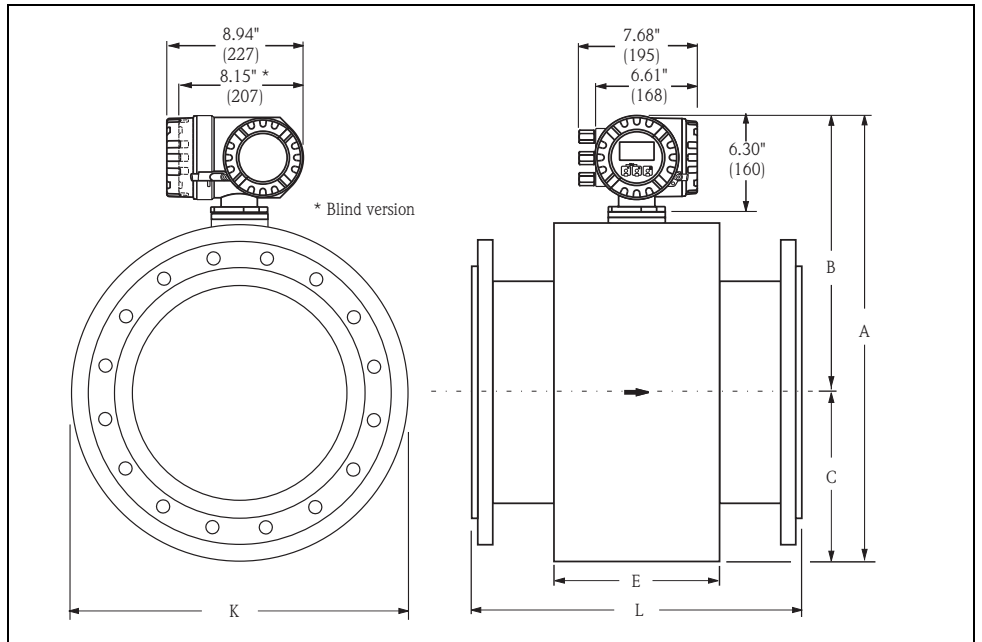
High-temperature version $\leq 12''$ (DN ≤ 300)



F00-xxPxxxxx-06-05-00-xx-000

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

Compact version $\geq 14''$ (DN ≥ 350)

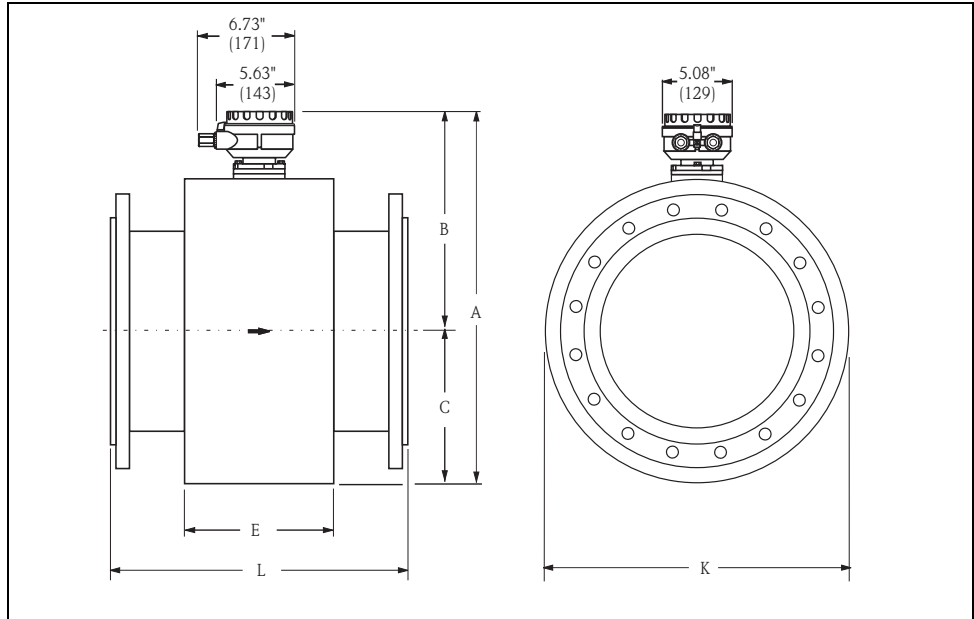


F06-53Fxxxxx-06-00-xx-xx-001

DN		L	A	B	C	K	E
EN (DIN) [mm]	ANSI [inch]	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (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 $\geq 14''$ (DN ≥ 350)

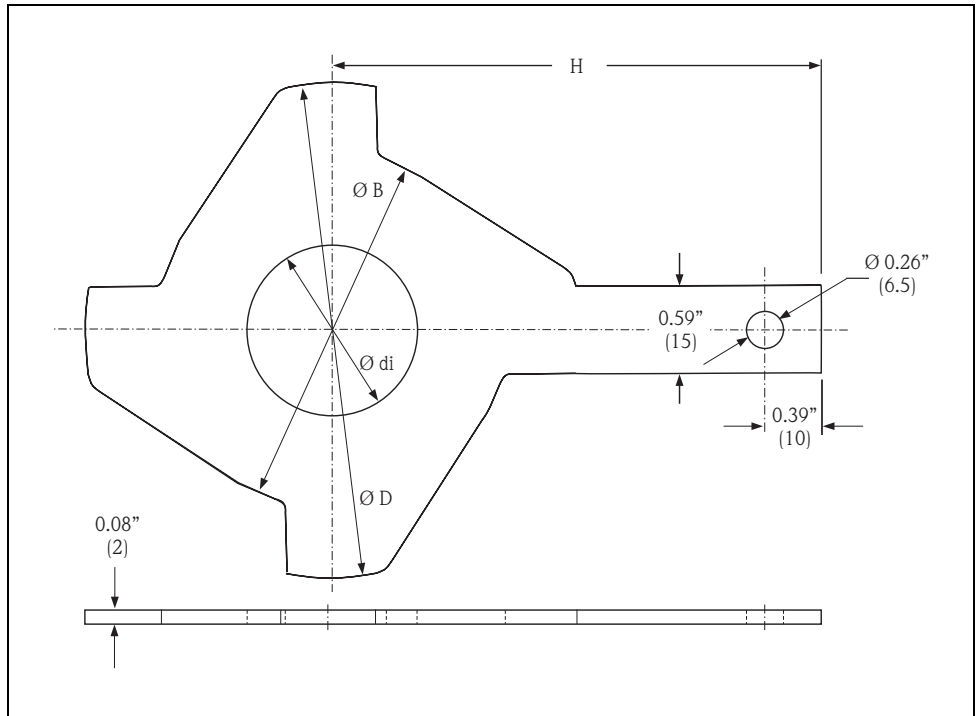


A0003220

DN		L	A	B	C	K	E
EN (DIN) [mm]	ANSI [inch]	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)
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 ¹⁾		di	B	D	H
EN (DIN) / JIS / AS ⁴⁾ [mm]	ANSI [inch]	inches (mm)	inches (mm)	inches (mm)]	inches (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 ²⁾	12" ²⁾	12.3 (312)	14.8 (375)	16.3 (413)	10.7 (273)
300 ³⁾	12" ³⁾	12.2 (310)	14.8 (375)	15.9 (404)	10.6 (268)

¹⁾ Ground disks can, with the exception of 12" (DN 300), be used for all flange norms / pressure ratings.

²⁾ PN 10/16, Class 150

³⁾ PN 25, JIS 10K/20K

⁴⁾ 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		ANSI	Wall housing	
[mm]	[inch]					JIS				
15	1/2"	PN 40	6.5	6.5	14 lbs	PN 40	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"	PN 16	10.6	9.3	23 lbs	PN 16	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"	PN 10	21.5	21.0	–	PN 10	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"	PN 10	70	72.3	242 lbs	PN 10	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"	PN 10	175	–	628 lbs	PN 10	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; RSt37-2 (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: RSt37-2 (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

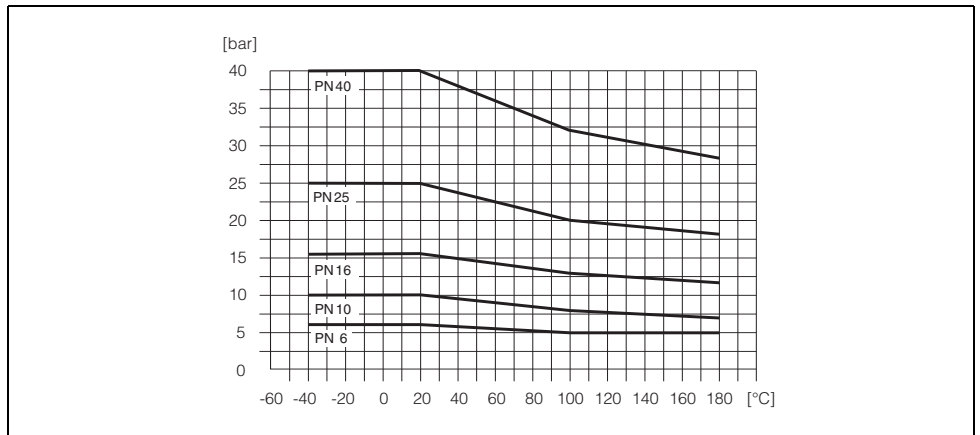
Material load diagrams

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)

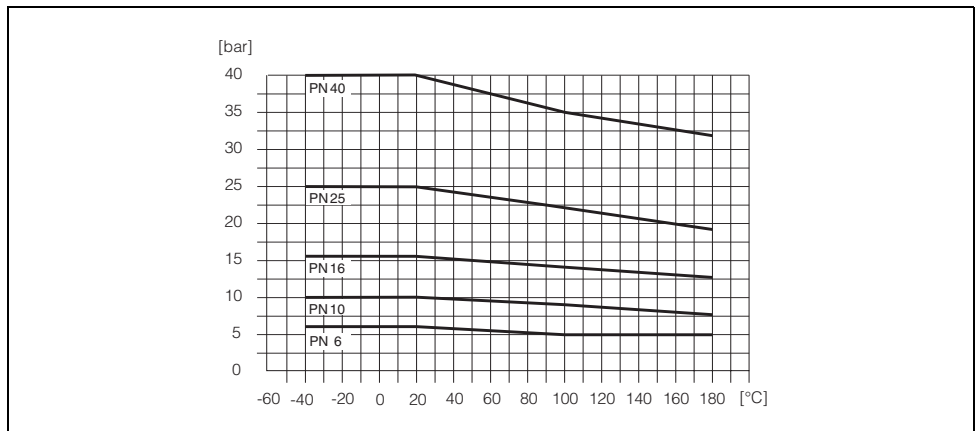
Flange material: RSt37-2 (S235JRG2) / C22 / FE 410W B



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

Flange connection to EN 1092-1 (DIN 2501)

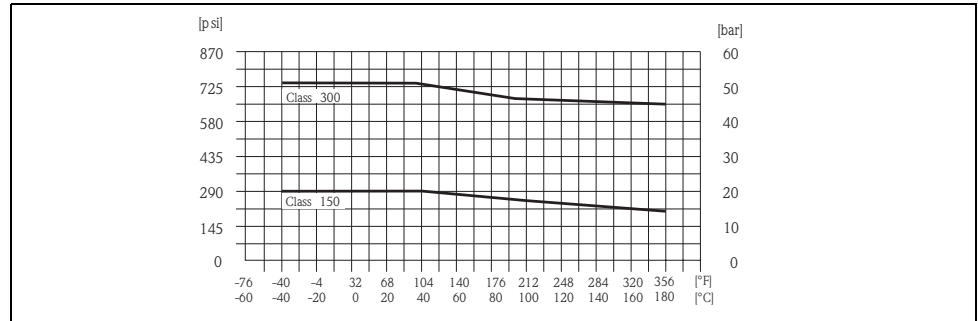
Flange material: 316L / 1.4571



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

Flange connection to ANSI B16.5

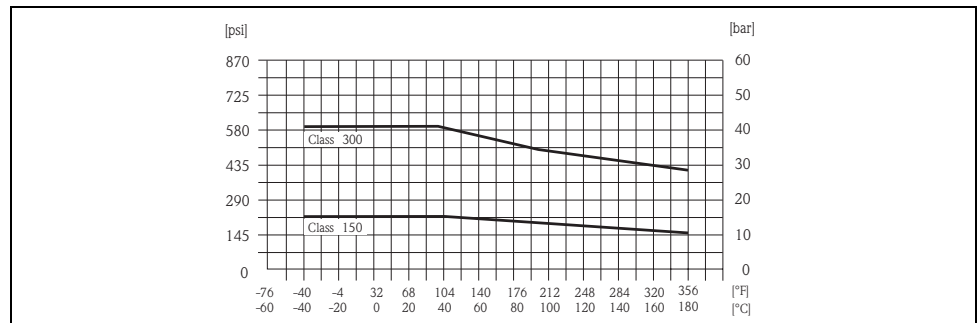
Flange material: A105



A0003226

Flange connection to ANSI B16.5

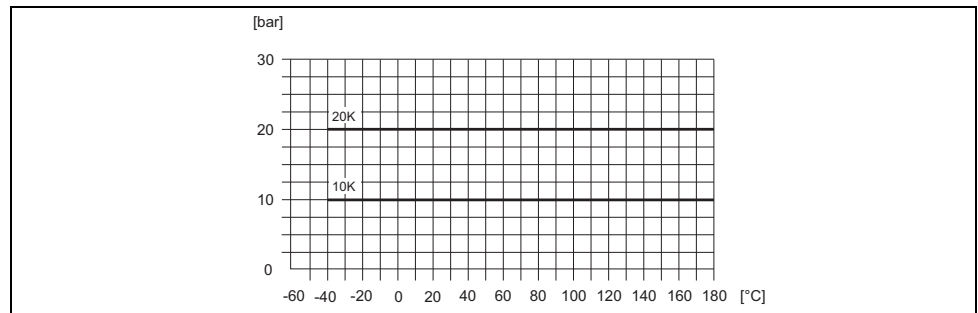
Flange material: F316L SS



F06-xxFxxxxx-05-xx-xx-xx-002

Flange connection to JIS B2238

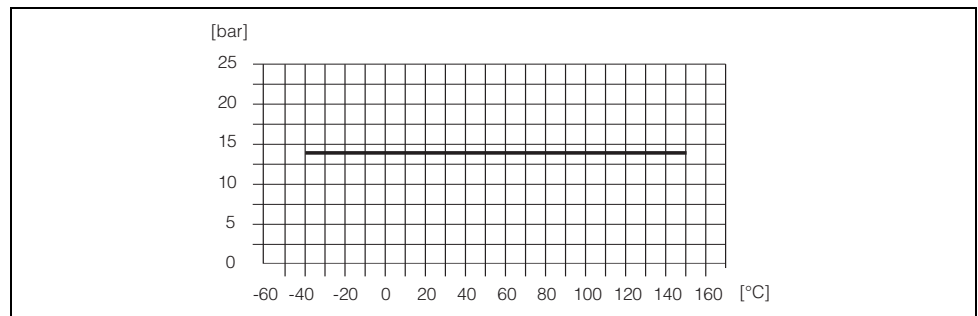
Flange material: RSt37-2 (S235)RG2) / H II / 1.0425



A0003228

Flange connection to AS2129 Table E or AS4087 Cl. 14

Flange material: A105 / RSt37-2 (S235)RG2) / St44-2 (S275)R)



F06-xxFxxxxx-05-xx-xx-xx-010

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

Human interface

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

Certificates and approvals

Ex approvals	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.
CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick mark	The measuring system is in conformity with the EMC requirements of the Australian Communications Authority (ACA).
Pressure Equipment Directive	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).
PROFIBUS DP/PA certification	<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"> ■ Certified to PROFIBUS PA, profile version 3.0 (device certification number: on request) ■ The device can also be operated with certified devices of other manufacturers (interoperability)
FOUNDATION Fieldbus certification	<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"> ■ Certified to FOUNDATION Fieldbus Specification ■ The device meets all the specifications of the FOUNDATION Fieldbus H1. ■ Interoperability Test Kit (ITK), revision status 4.0 (device certification number: on request) ■ The device can also be operated with certified devices of other manufacturers ■ Physical Layer Conformance Test of the Fieldbus Foundation
MODBUS certification	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.
Other standards, guidelines	<p>EN 60529: Degrees of protection by housing (IP code)</p> <p>EN 61010: Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</p> <p>EN 61326/A1 (IEC 6326): Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR NE 21: Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.</p> <p>NAMUR NE 43: Standardisation of the signal level for the breakdown information of digital transmitters with analogue output signal.</p> <p>NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics.</p>

Accessories

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

- 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

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

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

Promag 53 P 0 1 2 3 4 5 6 7 8 9 10 11 12

Nominal Diameter													7	Housing	
0	15	1 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)													
	B	PFA liner, high temperature version (available for 1" to 8" sensors, not for approval N)													
	E	PTFE liner													
2	Process connection													3	-40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, (only for approvals A and R)
	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													5	-40°F (-40°C) ambient temperature, NEMA 6P sensor, wall mount housing for transmitter (only for approvals A and R)
	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													6	-40°F (-40°C) ambient temperature, NEMA 4X (IP 67) remote field housing (only for approvals A and R)
	B	3-point calibration, 0.2%													
	E	SCS/A2LA 3-point 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)													
5	Certificates													8	Cable for remote
	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													9	Cable entries
	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													
*	Housing options													10	Power supply / display
	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.														
														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
															Fixed communication boards
														A	Current HART, frequency
														B	Current HART, frequency, 2 relays
														F	PROFIBUS-PA, IS
														G	Foundation Fieldbus, IS
														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

United States

Endress+Hauser, Inc.
2350 Endress Place
Greenwood, IN 46143
Tel. 317-535-7138
Sales 888-ENDRESS
Service 800-642-8737
fax 317-535-8498
inquiry@us.endress.com
www.us.endress.com

Canada

Endress+Hauser Canada
1075 Sutton Drive
Burlington, ON L7L 5Z8
Tel. 905-681-9292
800-668-3199
Fax 905-681-9444
www.ca.endress.com

Mexico

Endress+Hauser, México, S.A. de C.V.
Av. Gustavo Baz No. 43
Fracc. Bosques de Echegaray
Naucaipan de Juárez, C.P. 53310, Estado
de México
México
Tel: (52) 55-5371-1110
Fax (52) 55-5371-1128
eh.mexico@mx.endress.com