Technical Information
TI 046D/06/en
50096461

Electromagnetic Flow Measuring System *PROline promag 50/53 W*

Flow measurement in water or wastewater applications

Features and benefits
- Nominal diameters DN 25...2000
- Hard rubber or polyurethane lining
- Fitting lengths to DVGW and ISO
- High accuracy:
  – Promag 50: ± 0.5% (option: ± 0.2%)
  – Promag 53: ± 0.2%
- Easy servicing and maintenance. Validation on site without removal of the sensor:
  – Optimized plant maintenance
  – Incorporation in QA systems
- Robust field housing, IP 67
- IP 67 wall-mount housing for straightforward installation of the remote version
- Promag 53 with Touch Control: Operation without opening the housing.
- Quick Setup menus for straightforward commissioning in the field
- Interfaces for integration into all major process-control systems:
  – HART interface as standard
  – Promag 50: PROFIBUS-PA
  – Promag 53: PROFIBUS-PA/-DP, FOUNDATION Fieldbus
- Potable-water approvals: KTW, NSF, WRC, etc.

Application
All fluids with a minimum conductivity of ≥ 5 µS/cm can be measured:
- drinking water
- wastewater
- wastewater sludge, etc.

A minimum conductivity of ≥ 20 µS/cm is required for measuring demineralized water.

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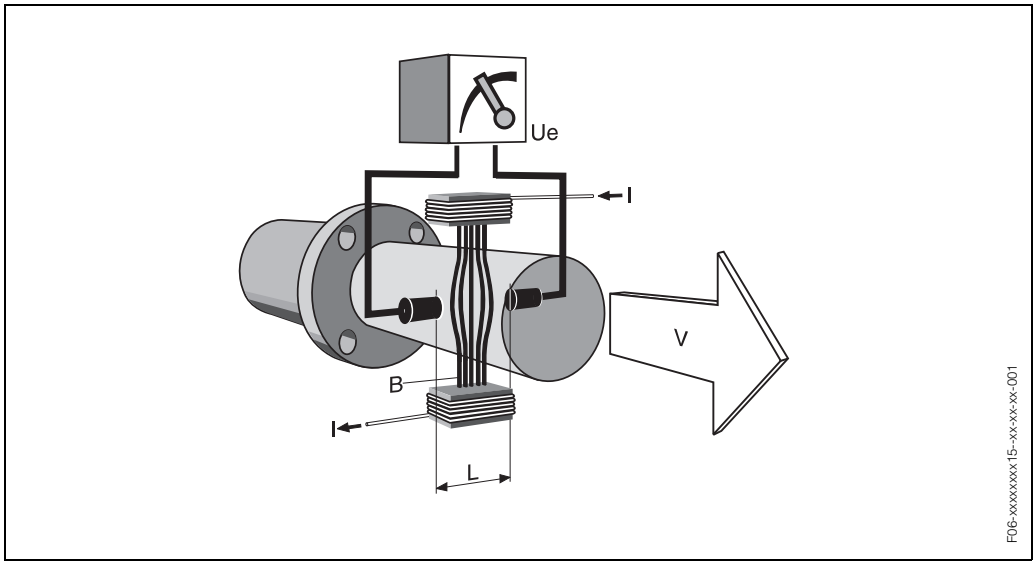
The Power of Know How

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.



Ue = B · L · v
Q = A · 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:
- Promag 50 (user interface with push buttons for operation, two-line display)
- Promag 53 ("Touch Control" without opening the housing, four-line display)

Sensor:
- Promag W (DN 25...2000)

Input

Measured variable

Flow rate (proportional to induced voltage)

Measuring range

Typically v = 0.01...10 m/s with the specified measuring accuracy

Operable flow range

Over 1000 : 1

Input signal

Status input (auxiliary input):
U = 3...30 V DC, R_i = 5 kΩ, galvanically isolated.
Configurable for: totalizer(s) reset, measured-value suppression, error-message reset, start/pause batching.

Output

Output signal

Promag 50

Current output:
active/passive selectable, galvanically isolated, time constant selectable (0.01...100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C; resolution: 0.5 µA
- active: 0/4...20 mA, R_L < 700 Ω (HART: R_L ≥ 250 Ω)
- passive: 4...20 mA, max. 30 V DC, R_i ≤ 150 Ω

Pulse/frequency output:
passive, open collector, 30 V DC, 250 mA, galvanically isolated.
- Frequency output: full scale frequency 2...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...2000 ms)

Promag 53

Current output:
active/passive selectable, galvanically isolated, time constant selectable (0.01...100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C; resolution: 0.5 µA
- active: 0/4...20 mA, R_L < 700 Ω (HART: R_L ≥ 250 Ω)
- passive: 4...20 mA, max. 30 V DC, R_i ≤ 150 Ω

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 Ω
- passive: open collector, 30 V DC, 250 mA

- Frequency output: full scale frequency 2...10000 Hz (f_{max} = 12500 Hz), on/off ratio 1:1, pulse width max. 10 s.
- Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.05...2000 ms)

Signal on alarm

- Current output → failure response selectable
- 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):
Open collector, max. 30 V DC / 250 mA, galvanically isolated.
Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.

Relay output (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

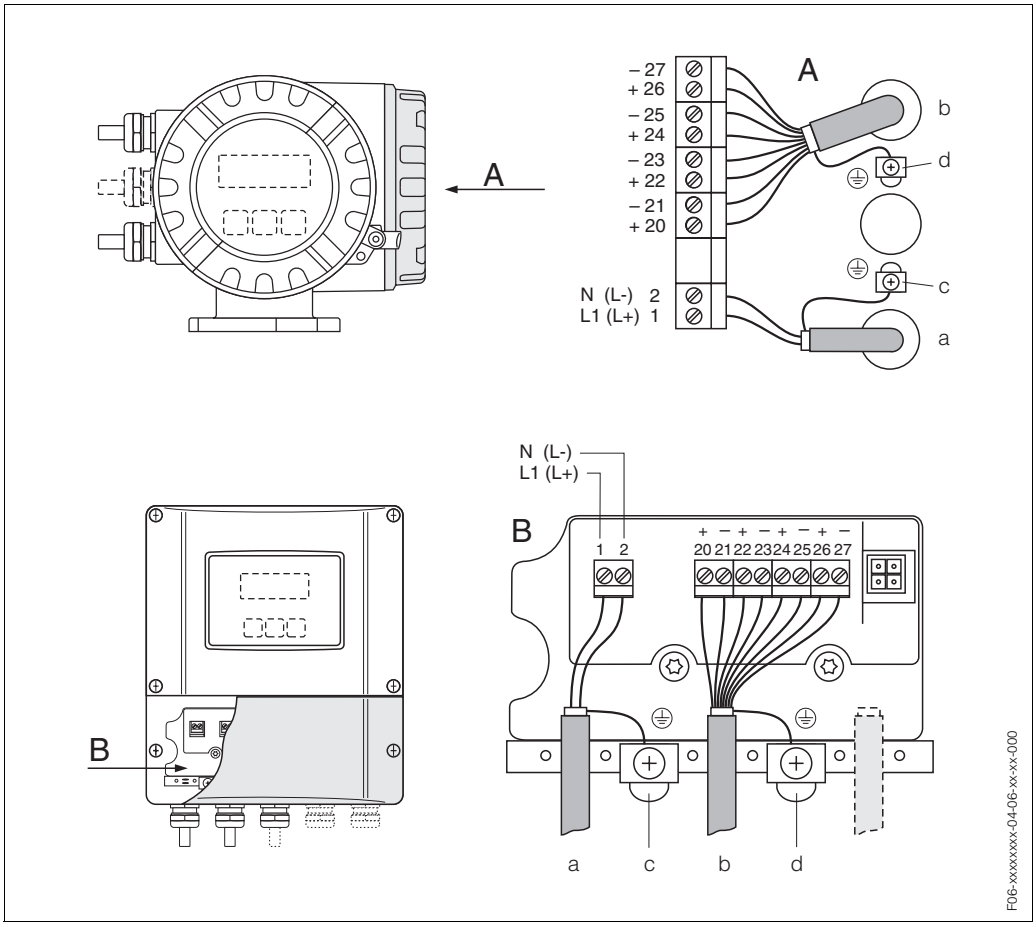
Switch points for low flow cutoff are selectable

Galvanic isolation

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

Power supply

Electrical connection measuring unit



A = View A (field housing), B = View B (wall-mounted housing)

a Cable for power supply: 85...260 V AC, 20...55 V AC, 16...62 V DC; power consumption: 15 VA / 15 W
*Terminal **No. 1**: L1 for AC, L+ for DC*
*Terminal **No. 2**: N for AC, L– for DC*
*b Signal cable: terminals **No. 20–27** → Page 5*
c Ground terminal for protective conductor
d Ground terminal for signal cable shield

Terminal assignment, Promag 50

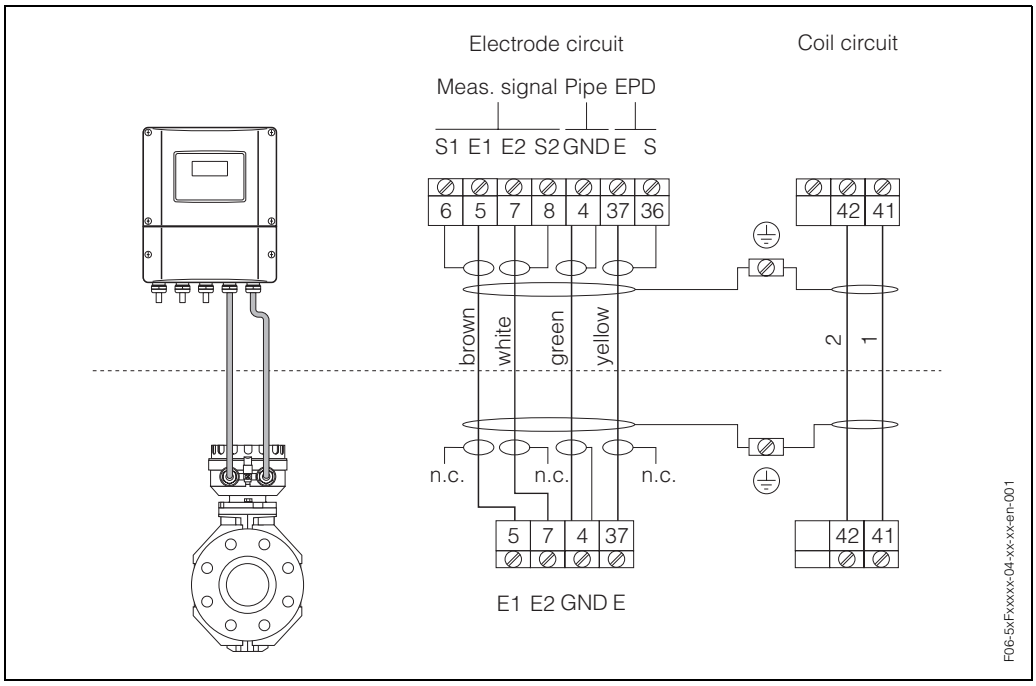
Order variant	Terminal No. (inputs / outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
50***-**********W	–	–	–	Current output HART
50***-**********A	–	–	Frequency output	Current output HART
50***-**********D	Status input	Status output	Frequency output	Current output HART
Ground connection, power supply → Page 4				

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). Replacement 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	Relay output	Frequency output	Current output HART
Flexible communication boards				
53***-**********C	Relay output	Relay output	Frequency output	Current output HART
53***-**********D	Status input	Relay output	Frequency output	Current output HART
53***-**********L	Status input	Relay output	Relay output	Current output HART
53***-**********M	Status input	Frequency output	Frequency output	Current output HART
53***-**********2	Relay output	Current output	Frequency output	Current output HART
Ground connection, power supply → Page 4				

Electrical connection remote version



n.c. = isolated cable shields, not connected

Cable entry

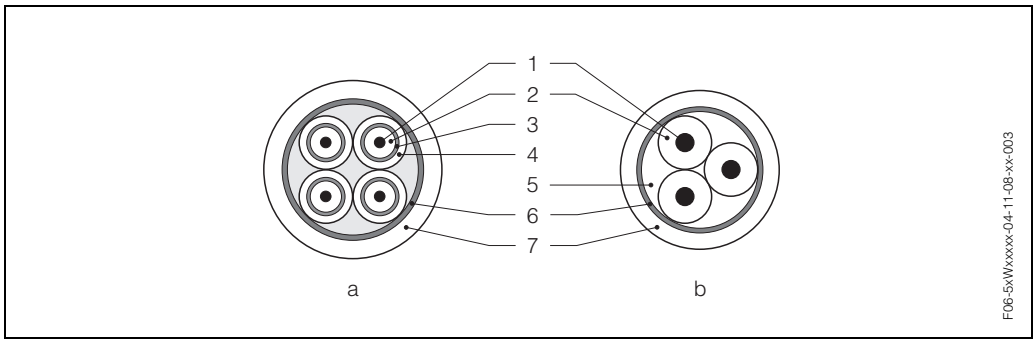
Power supply and signal cables (inputs/outputs):
- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, 1/2"

Connecting cable for remote version:
- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, 1/2"

Cable specifications remote version

Coil cable:
- 2 x 0.75 mm^2 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: –20…+80 °C

Signal cable:
- 3 x 0.38 mm^2 PVC cable with common, braided copper shield (Ø approx. 7 mm) and individually shielded cores.
- With Empty Pipe Detection (EPD): 4 x 0.38 mm^2 PVC cable with common, braided copper shield (Ø approx. 7 mm) and individually shielded cores.
- Conductor resistance: ≤ 50 Ω/km
- Capacitance: core/shield: ≤ 420 pF/m
- Permanent operating temperature: –20…+80 °C



a = signal cable, b = coil current cable (cross-section: max. 2.5 mm^2)

1 = core, 2 = core insulation, 3 = core shield, 4 = core jacket, 5 = core strengthening, 6 = cable shield, 7 = outer jacket

Optionally, E+H also supplies reinforced connecting cables with an additional, metal strenghtening braid. We recommend such cables for the following cases:
- Cables laid underground
- Danger of rodent attack
- Device used with ingress protection 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, and NAMUR Recommendation NE 21.

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

Supply voltage

85…260 V AC, 45…65 Hz
20…55 V AC, 45…65 Hz
16…62 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

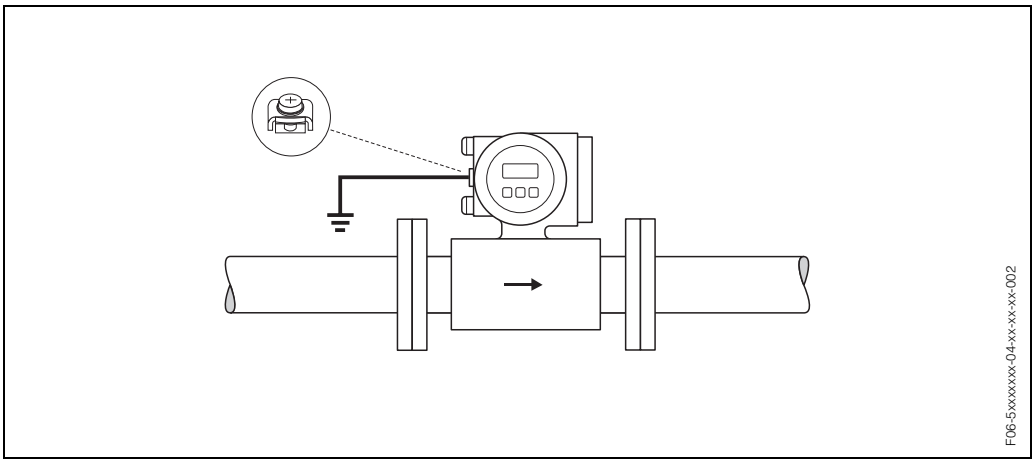
Power supply failure

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 potential matching. This usually means that additional potential matching measures are unnecessary.

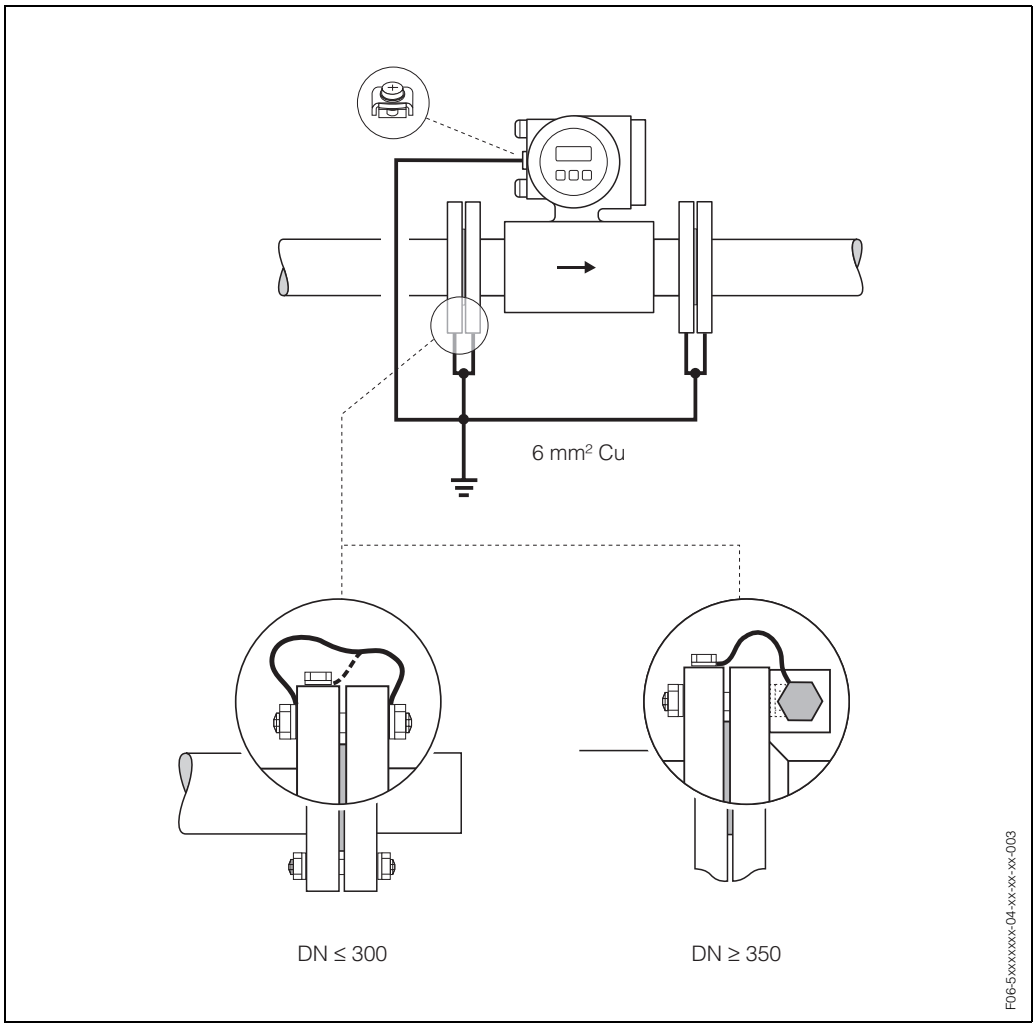
Note:
For installation in metal pipes, it is advisable to connect the ground terminal of the transmitter housing to the piping.



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 means of the ground terminal provided for the purpose.

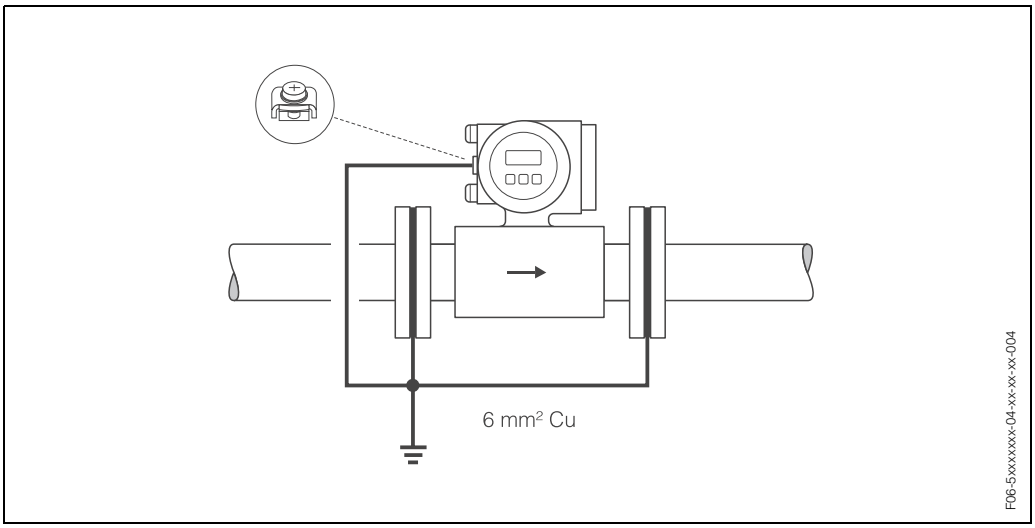
Note:
The ground cable for flange-to-flange connections can be ordered separately as an accessory from E+H.
- DN ≤ 300: The ground cable is in direct connection with the conductive flange coating and is secured by the flange screws.
- DN ≥ 350: The ground cable connects directly to the metal transport bracket.



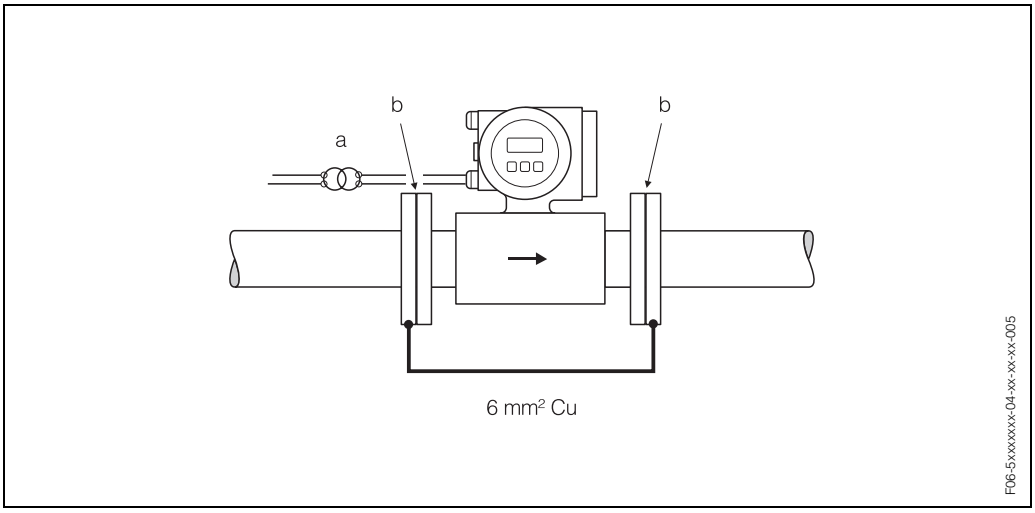
Plastic pipes and isolating lined pipes
Normally, potential is matched using the reference electrodes in the measuring tube. However, in exceptional cases it is possible that, due to the grounding plan of a system, large matching currents flow over the reference electrodes. This can lead to destruction 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 (DN 15...300) can be ordered separately from E+H as an accessory.
- Ground disks (incl. seals) increase the installation length. You can find the dimensions of ground disks on Page 26.

Caution:
Risk of damage from electrochemical corrosion. Note the electrochemical insulation rating, if the ground disks and measuring electrodes are made of different materials.



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, 6 mm^2).
- 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.



a = isolating transformer, b = electrically insulated

Performance characteristics

Reference operating conditions

To DIN 19200 and VDI/VDE 2641:
- Medium temperature: +28 °C ± 2 K
- Ambient temperature: +22 °C ± 2 K
- Warm-up period: 30 minutes

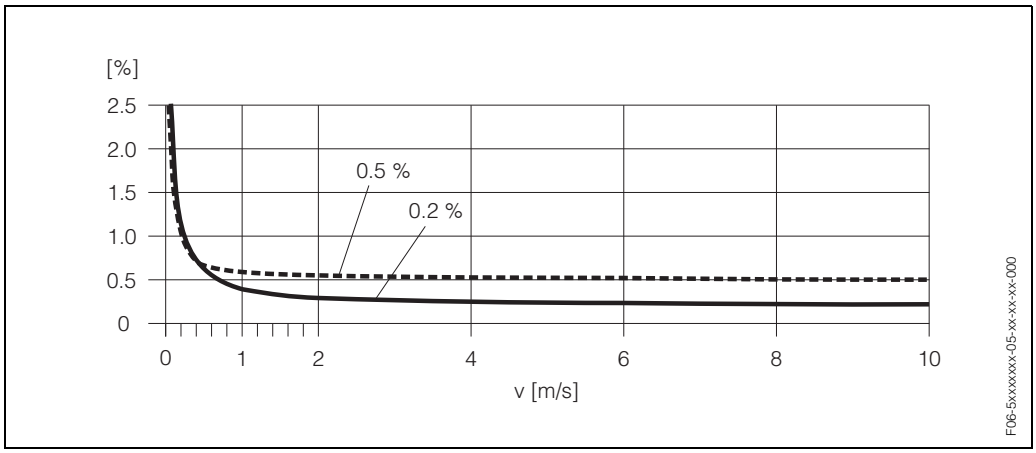
Installation:
- Inlet run >10 x DN
- Outlet run > 5 x DN
- Sensor and transmitter grounded.
- Sensor centred relative to the pipe.

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

Repeatability

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

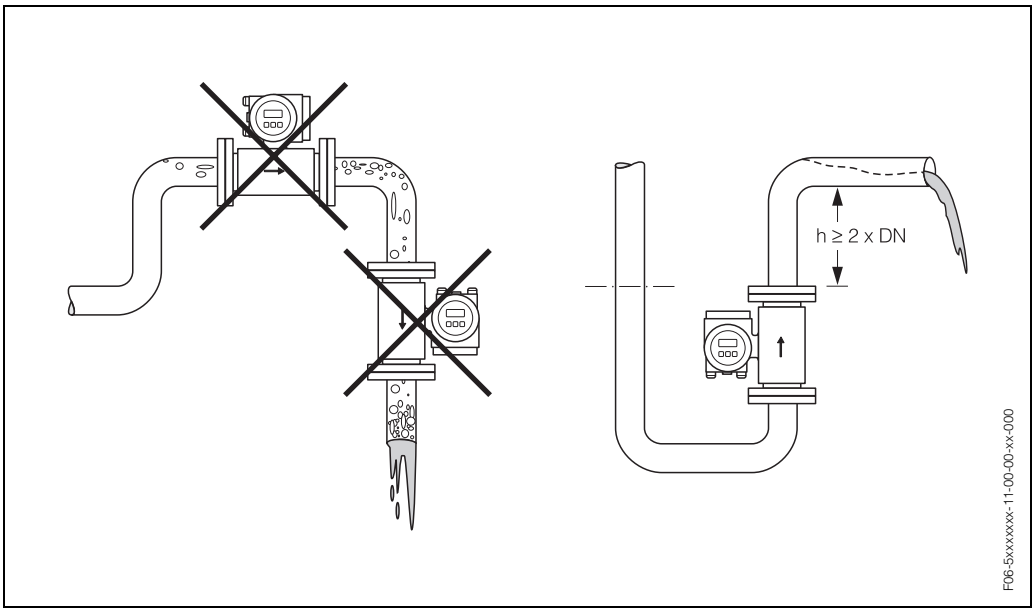
Operating conditions

Installation conditions

Installation instructions

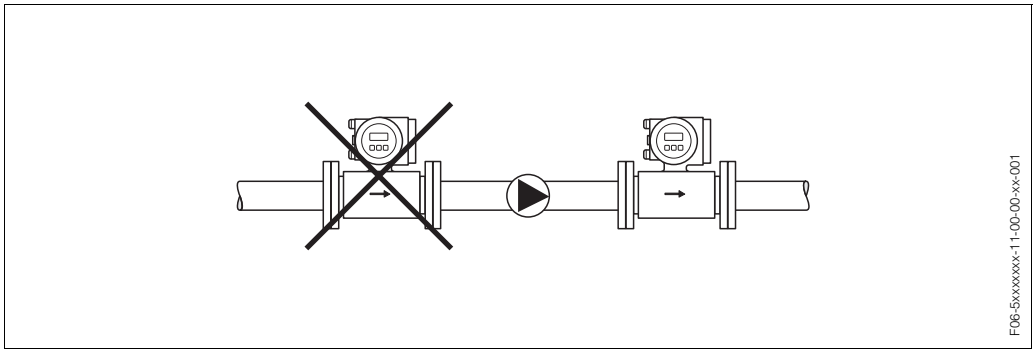
Mounting location

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.



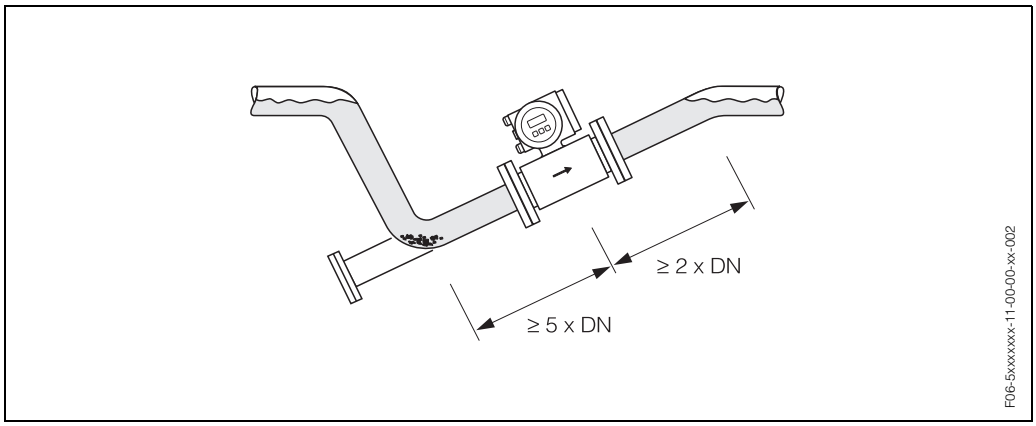
Installation of pumps

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.
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 16.

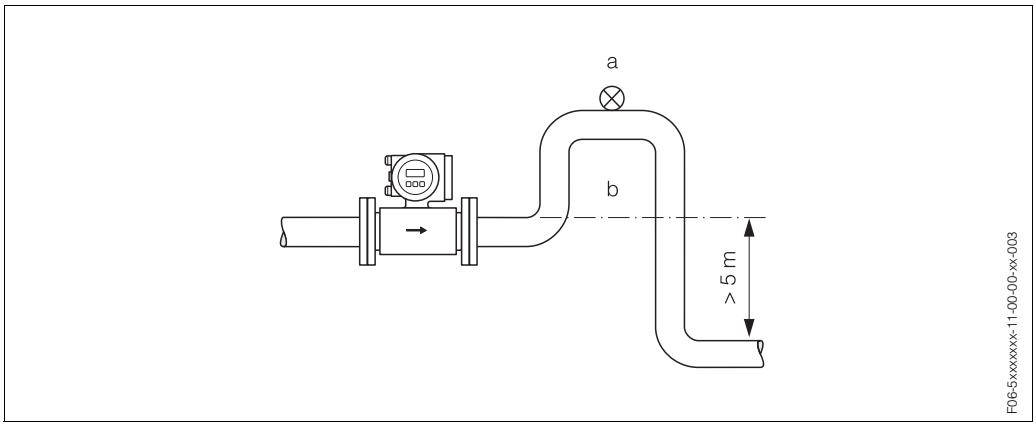


Partially filled pipes
Partially filled pipes with gradients necessitate a drain-type configuration. The Empty Pipe Detection (EPD) function offers additional protection by detecting empty or partially filled pipes.

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.



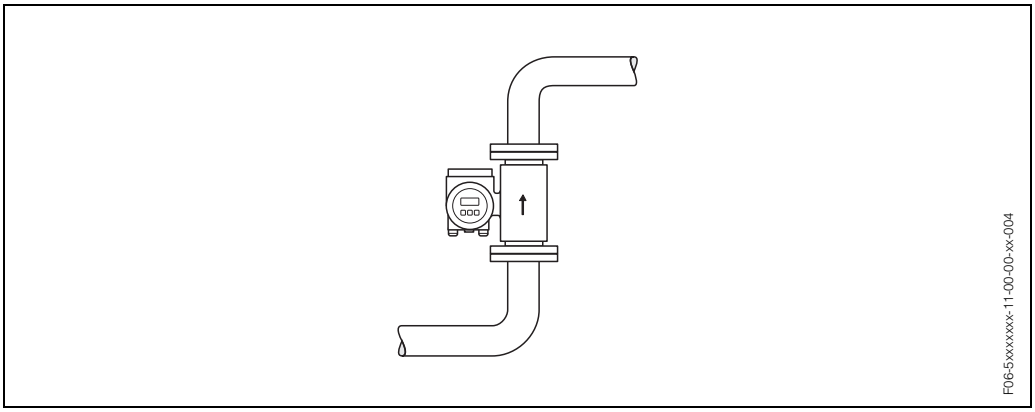
Vertical pipes
Install a siphon (b) or a vent valve (a) downstream of the sensor in vertical pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. These measures also prevent the system losing prime, which could cause air inclusions.



a = vent valve, b = siphon

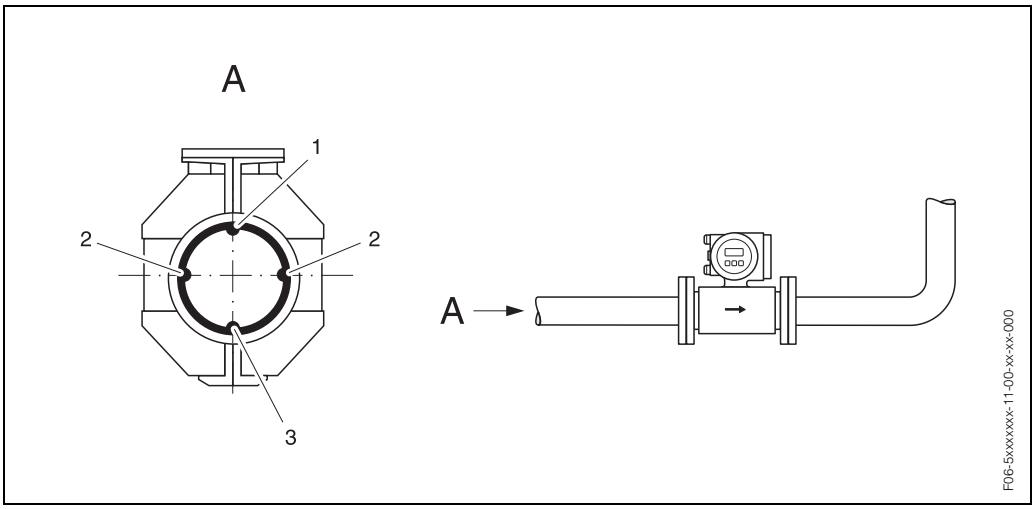
Orientation
An optimum orientation helps avoid gas and air accumulations and deposits in the measuring tube. Promag, nevertheless, supplies a range of options and accessories for correct measuring of problematic mediums:
- Electrode Cleaning Circuitry (ECC) to remove electrically conductive deposits 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.
- Exchangeable measuring electrodes for abrasive mediums.

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



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

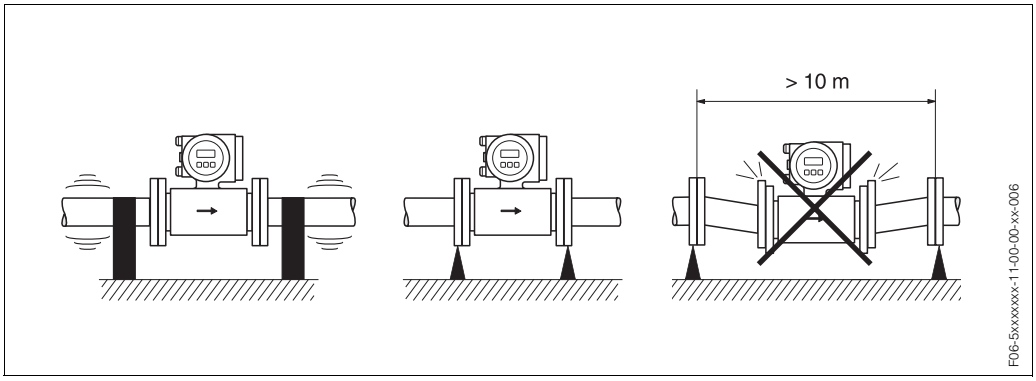
Caution:
Empty Pipe Detection functions correctly only when the measuring device is installed horizontally and the transmitter housing is facing upward. Otherwise there is no guarantee that Empty Pipe Detection will respond if the measuring tube is only partially filled or empty.



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

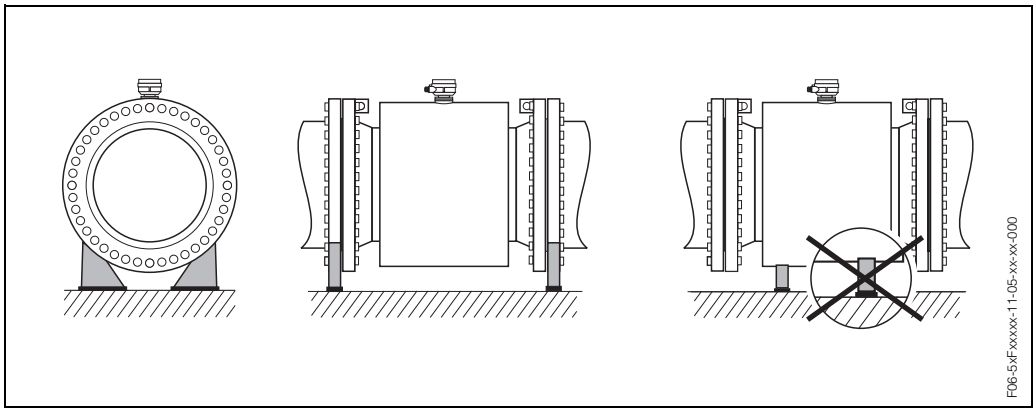
Vibrations
Secure the piping and the sensor if vibration is severe.

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 16.



Foundations, supports
If the nominal diameter is DN ≥ 350, mount the transmitter on a foundation of adequate load-bearing strength.

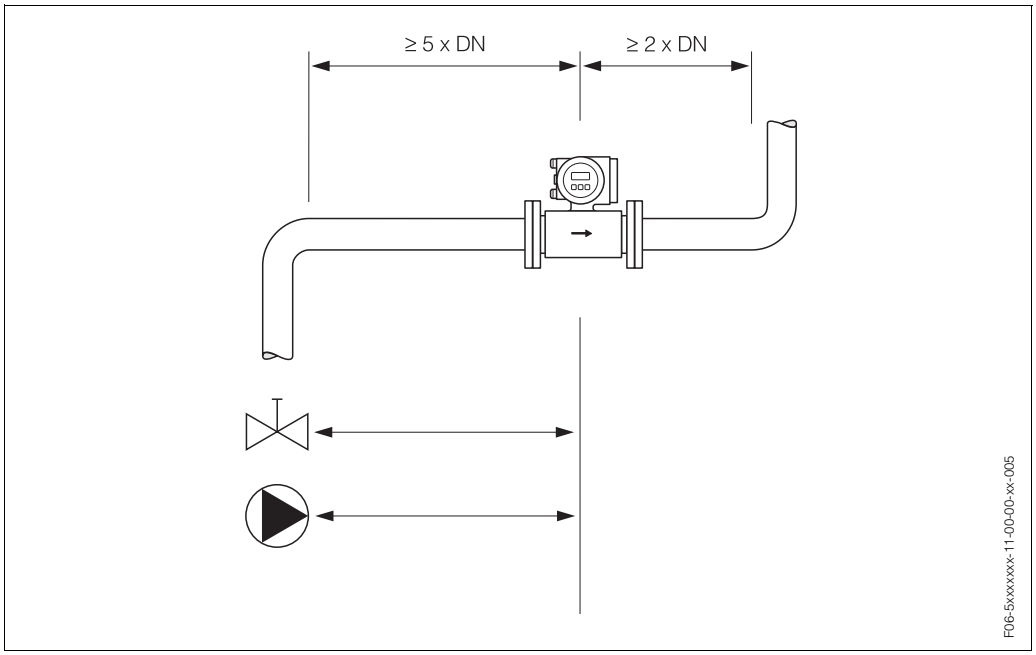
Caution:
Do not allow the casing to take the weight of the sensor. This would buckle the casing and damage the internal magnetic coils.



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:

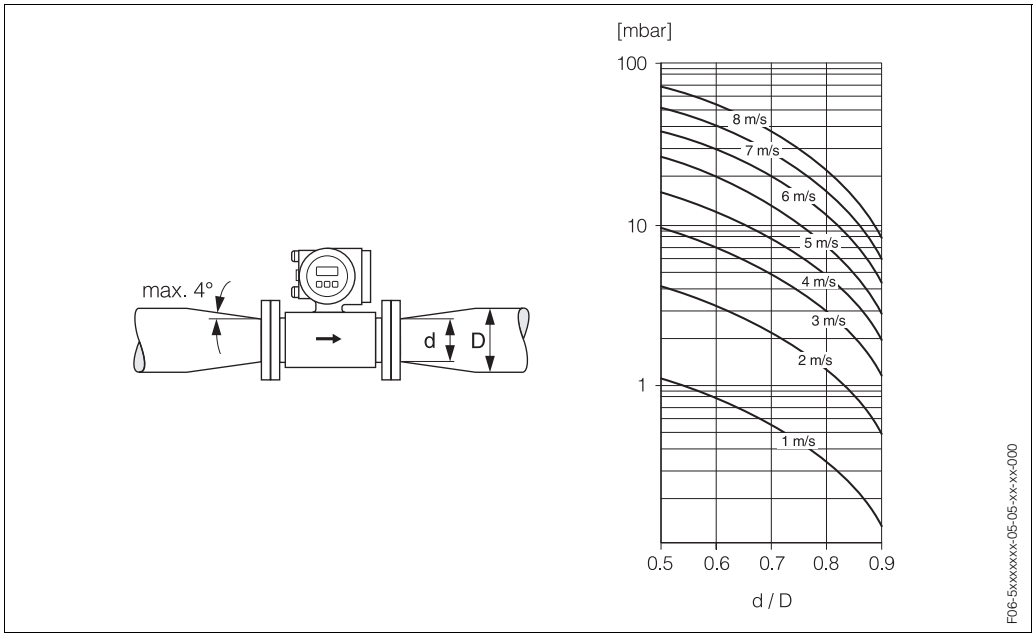
- Inlet run ≥ 5 x DN
- Outlet run ≥ 2 x DN



Adapters

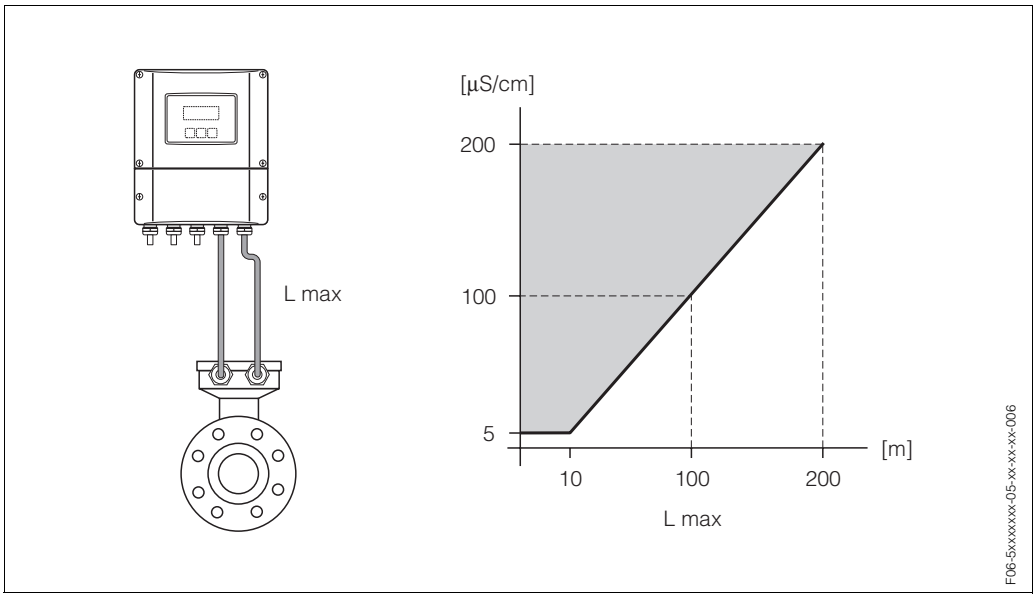
Suitable adapters to (E) DIN EN 545 (double flange junction sections) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.
The nomogram shown here can be used to calculate the pressure loss caused 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.



Length of connecting cable

Permissible cable length Lmax depends on the conductivity of the medium. A minimum conductivity of 20 µS/cm is required for measuring demineralized water.



Gray shaded area = permissible range for medium conductivity
Lmax = length of connecting cable in [m]
Medium conductivity in [µS/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

–20...+60 °C (sensor, transmitter)

Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.

Storage temperature

–10...+50 °C (preferably +20 °C)

Degree of protection

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

Shock and vibration resistance

Acceleration up to 2 g by analogy with IEC 68-2-6

Electromagnetic compatibility (EMC)

To EN 61326 and NAMUR recommendation NE 21

Process conditions

Medium temperature range

The permissible medium temperature depends on the measuring-tube lining:
- 0...+80 °C for hard rubber (DN 65...2000)
- –20...+70 °C for polyurethane (DN 25...2000)

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)

DIN 2501:
PN 6 (DN 1200...2000)
PN 10 (DN 200...2000)
PN 16 (DN 65...2000)
PN 25 (DN 200...1000)
PN 40 (DN 25...150)

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

AWWA:
Class D (28...78")

JIS B2238:
10K (DN 50...300)
20K (DN 25...300)

Pressure tightness (liner)

Nominal diameter		Measuring tube lining	Resistance to partial vacuum of measuring tube lining Limit values for abs. pressure [mbar] at various fluid temperatures						
[mm]	[inch]		25 °C	70 °C	80 °C	100 °C	130 °C	150 °C	180 °C
25…2000	1…78"	Polyurethane	0	0	–	–	–	–	–
65…2000	3…78"	Hard rubber	0	0	0	–	–	–	–

Limiting flow

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is 2...3 m/s. The velocity of flow (v), moreover, has to be matched to the physical properties of the medium:
- v < 2 m/s: for abrasive mediums such as potter's clay, lime milk, ore slurry, etc.
- v > 2 m/s: for accretive mediums such as wastewater sludge, etc.

Flow characteristics of Promag W (SI units)

Nominal diameter		Recommended flow rate	Factory settings		
[mm]	[inch]	Min./max. full scale value (v ~ 0.3 or 10 m/s)	Full scale value (v ~ 2.5 m/s)	Pulse weighting (~ 2 pulse/s)	Creepage (v ~ 0.04 m/s)
25	1"	9…300 dm³/min	75 dm³/min	0.50 dm³	1 dm³/min
32	1 1/4"	15…500 dm³/min	125 dm³/min	1.00 dm³	2 dm³/min
40	1 1/2"	25…700 dm³/min	200 dm³/min	1.50 dm³	3 dm³/min
50	2"	35…1100 dm³/min	300 dm³/min	2.50 dm³	5 dm³/min
65	2 1/2"	60…2000 dm³/min	500 dm³/min	5.00 dm³	8 dm³/min
80	3"	90…3000 dm³/min	750 dm³/min	5.00 dm³	12 dm³/min
100	4"	145…4700 dm³/min	1200 dm³/min	10.00 dm³	20 dm³/min
125	5"	220…7500 dm³/min	1850 dm³/min	15.00 dm³	30 dm³/min
150	6"	20…600 m³/h	150 m³/h	0.025 m³	2.5 m³/h
200	8"	35…1100 m³/h	300 m³/h	0.05 m³	5.0 m³/h
250	10"	55…1700 m³/h	500 m³/h	0.05 m³	7.5 m³/h
300	12"	80…2400 m³/h	750 m³/h	0.10 m³	10 m³/h
350	14"	110…3300 m³/h	1000 m³/h	0.10 m³	15 m³/h
400	16"	140…4200 m³/h	1200 m³/h	0.15 m³	20 m³/h
450	18"	180…5400 m³/h	1500 m³/h	0.25 m³	25 m³/h
500	20"	220…6600 m³/h	2000 m³/h	0.25 m³	30 m³/h
600	24"	310…9600 m³/h	2500 m³/h	0.30 m³	40 m³/h
700	28"	420…13500 m³/h	3500 m³/h	0.50 m³	50 m³/h
–	30"	480…15000 m³/h	4000 m³/h	0.50 m³	60 m³/h
800	32"	550…18000 m³/h	4500 m³/h	0.75 m³	75 m³/h
900	36"	690…22500 m³/h	6000 m³/h	0.75 m³	100 m³/h
1000	40"	850…28000 m³/h	7000 m³/h	1.00 m³	125 m³/h
–	42"	950…30000 m³/h	8000 m³/h	1.00 m³	125 m³/h
1200	48"	1250…40000 m³/h	10000 m³/h	1.50 m³	150 m³/h
–	54"	1550…50000 m³/h	13000 m³/h	1.50 m³	200 m³/h
1400	–	1700…55000 m³/h	14000 m³/h	2.00 m³	225 m³/h
–	60"	1950…60000 m³/h	16000 m³/h	2.00 m³	250 m³/h
1600	–	2200…70000 m³/h	18000 m³/h	2.50 m³	300 m³/h
–	66"	2500…80000 m³/h	20500 m³/h	2.50 m³	325 m³/h
1800	72"	2800…90000 m³/h	23000 m³/h	3.00 m³	350 m³/h
–	78"	3300…100000 m³/h	28500 m³/h	3.50 m³	450 m³/h
2000	–	3400…110000 m³/h	28500 m³/h	3.50 m³	450 m³/h

Flow characteristics of Promag W (US units)

Nominal diameter		Recommended flow rate	Factory settings		
[inch]	[mm]	Min./max. full scale value (v ~ 0.3 or 10 m/s)	Full scale value (v ~ 2.5 m/s)	Pulse weighting (~ 2 pulse/s)	Creepage (v ~ 0.04 m/s)
1"	25	2.5…80 gal/min	18 gal/min	0.20 gal	0.25 gal/min
1 1/4"	32	4…130 gal/min	30 gal/min	0.20 gal	0.50 gal/min
1 1/2"	40	7…190 gal/min	50 gal/min	0.50 gal	0.75 gal/min
2"	50	10…300 gal/min	75 gal/min	0.50 gal	1.25 gal/min
2 1/2"	65	16…500 gal/min	130 gal/min	1 gal	2.0 gal/min
3"	80	24…800 gal/min	200 gal/min	2 gal	2.5 gal/min
4"	100	40…1250 gal/min	300 gal/min	2 gal	4.0 gal/min
5"	125	60…1950 gal/min	450 gal/min	5 gal	7.0 gal/min
6"	150	90…2650 gal/min	600 gal/min	5 gal	12 gal/min
8"	200	155…4850 gal/min	1200 gal/min	10 gal	15 gal/min
10"	250	250…7500 gal/min	1500 gal/min	15 gal	30 gal/min
12"	300	350…10600 gal/min	2400 gal/min	25 gal	45 gal/min
14"	350	500…15000 gal/min	3600 gal/min	30 gal	60 gal/min
16"	400	600…19000 gal/min	4800 gal/min	50 gal	60 gal/min
18"	450	800…24000 gal/min	6000 gal/min	50 gal	90 gal/min
20"	500	1000…30000 gal/min	7500 gal/min	75 gal	120 gal/min
24"	600	1400…44000 gal/min	10500 gal/min	100 gal	180 gal/min
28"	700	1900…60000 gal/min	13500 gal/min	125 gal	210 gal/min
30"	–	2150…67000 gal/min	16500 gal/min	150 gal	270 gal/min
32"	800	2450…80000 gal/min	19500 gal/min	200 gal	300 gal/min
36"	900	3100…100000 gal/min	24000 gal/min	225 gal	360 gal/min
40"	1000	3800…125000 gal/min	30000 gal/min	250 gal	480 gal/min
42"	–	4200…135000 gal/min	33000 gal/min	250 gal	600 gal/min
48"	1200	5500…175000 gal/min	42000 gal/min	400 gal	600 gal/min
54"	–	9…300 Mgal/d	75 Mgal/d	0.0005 Mgal	1.3 Mgal/d
–	1400	10…340 Mgal/d	85 Mgal/d	0.0005 Mgal	1.3 Mgal/d
60"	–	12…380 Mgal/d	95 Mgal/d	0.0005 Mgal	1.3 Mgal/d
–	1600	13…450 Mgal/d	110 Mgal/d	0.00075 Mgal	1.7 Mgal/d
66"	–	14…500 Mgal/d	120 Mgal/d	0.00075 Mgal	2.2 Mgal/d
72"	1800	16…570 Mgal/d	140 Mgal/d	0.00075 Mgal	2.6 Mgal/d
78"	–	18…650 Mgal/d	175 Mgal/d	0.001 Mgal	3.0 Mgal/d
–	2000	20…700 Mgal/d	175 Mgal/d	0.001 Mgal	3.0 Mgal/d

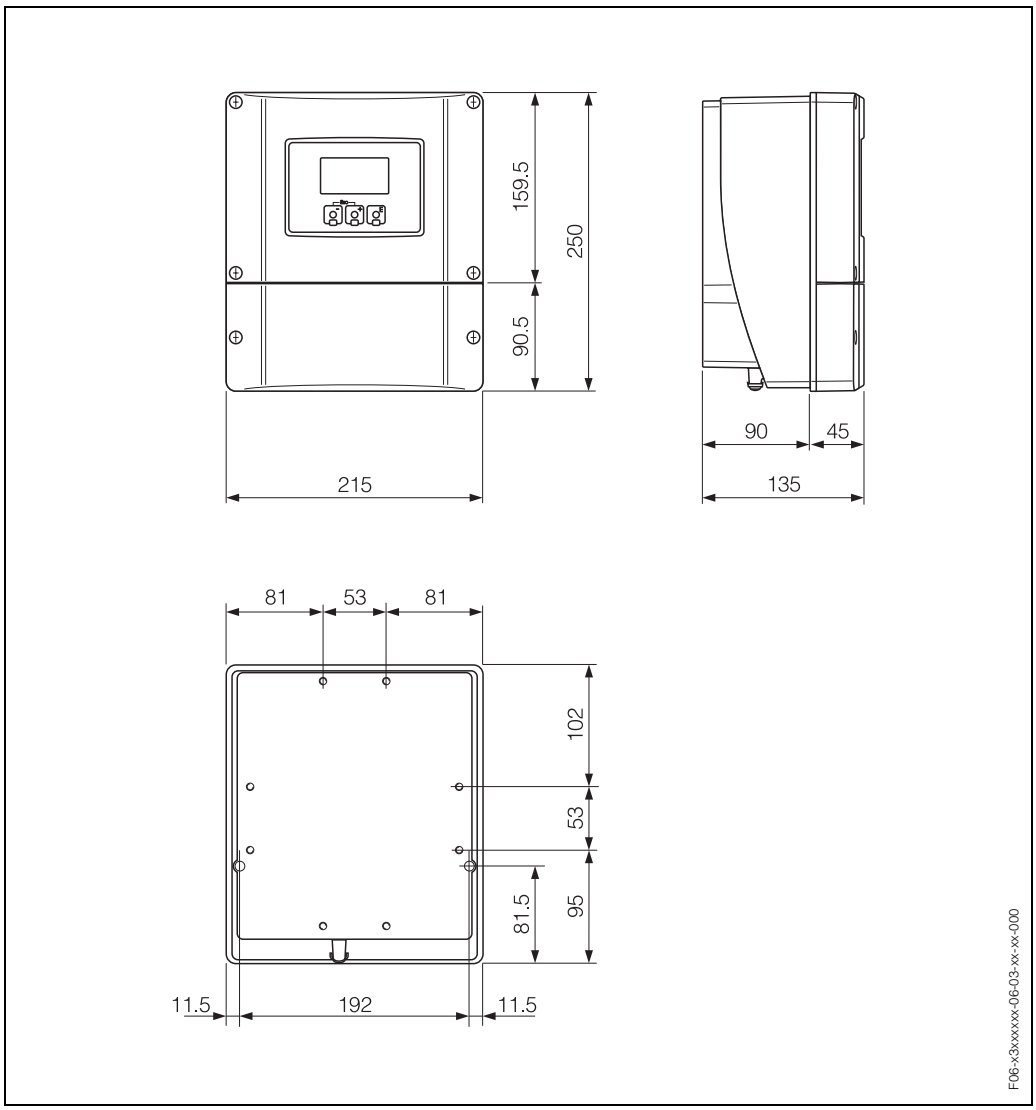
Pressure loss

- No pressure loss if the sensor is installed in a pipe of the same nominal diameter.
- Pressure losses for configurations incorporating adapters to (E) DIN EN 545 → Page 15

Mechanical construction

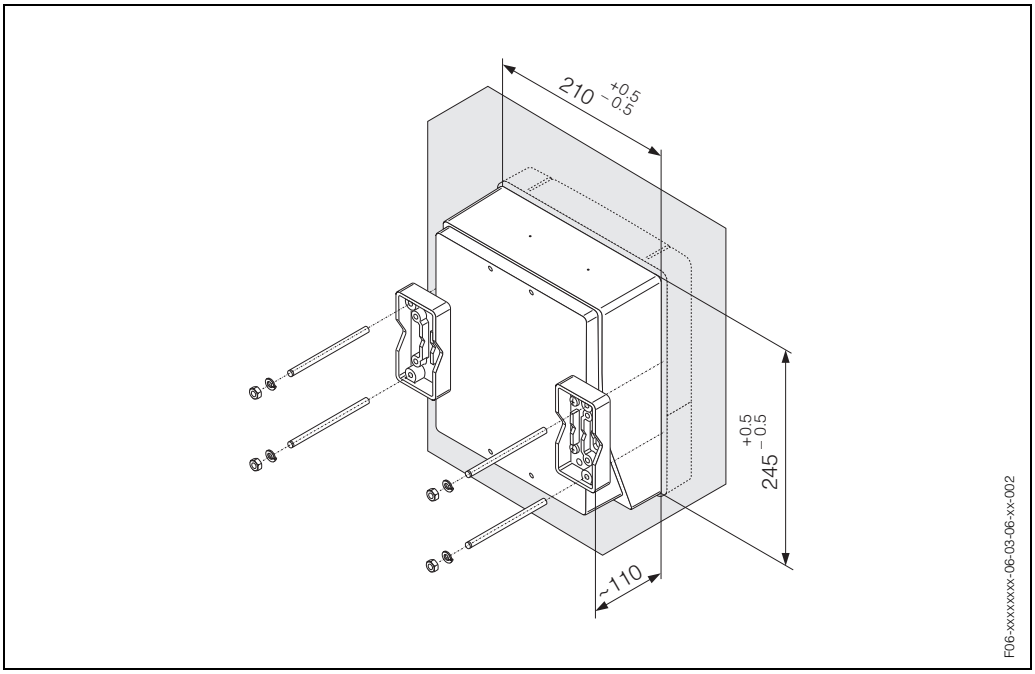
Design / dimensions

Wall-mounted housing

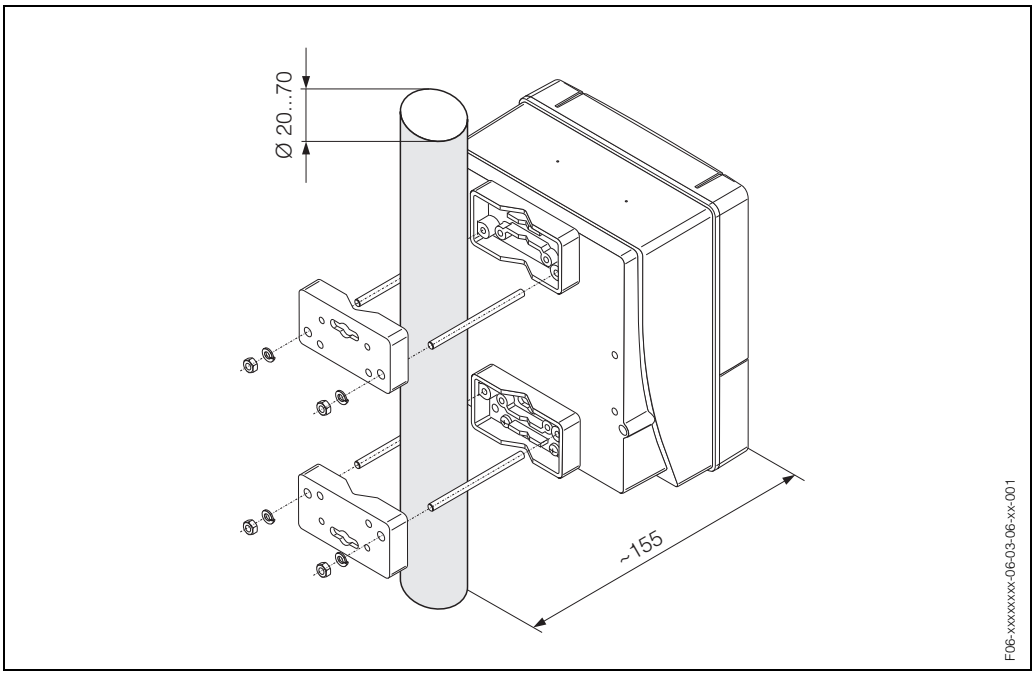


There is a separate mounting kit for the wall-mounted housing. It can be ordered from E+H as an accessory. The following installation variants are possible:
- Panel-mounted installation
- Pipe mounting

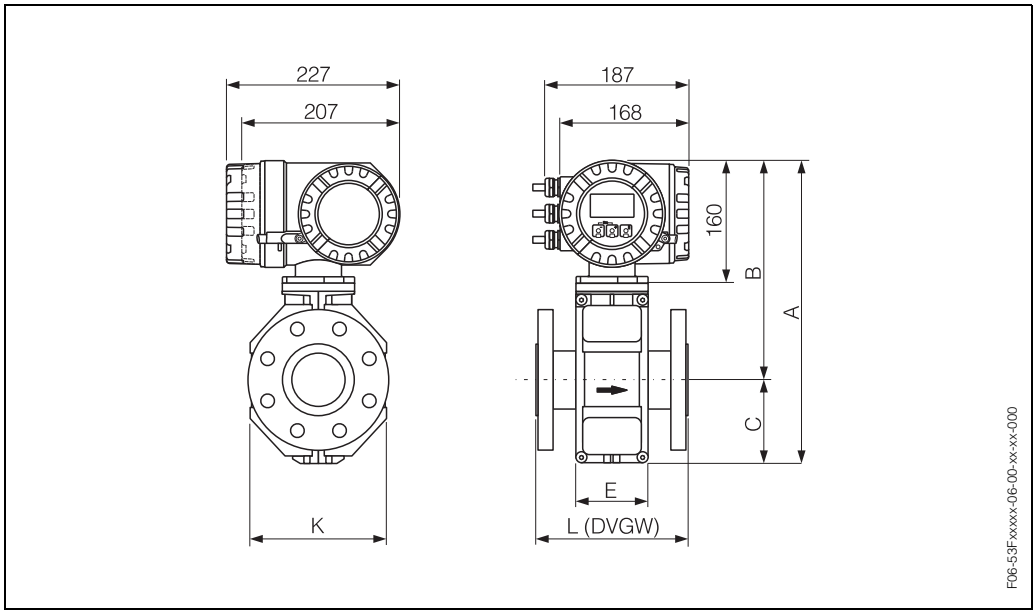
Panel-mounted installation



Pipe mounting

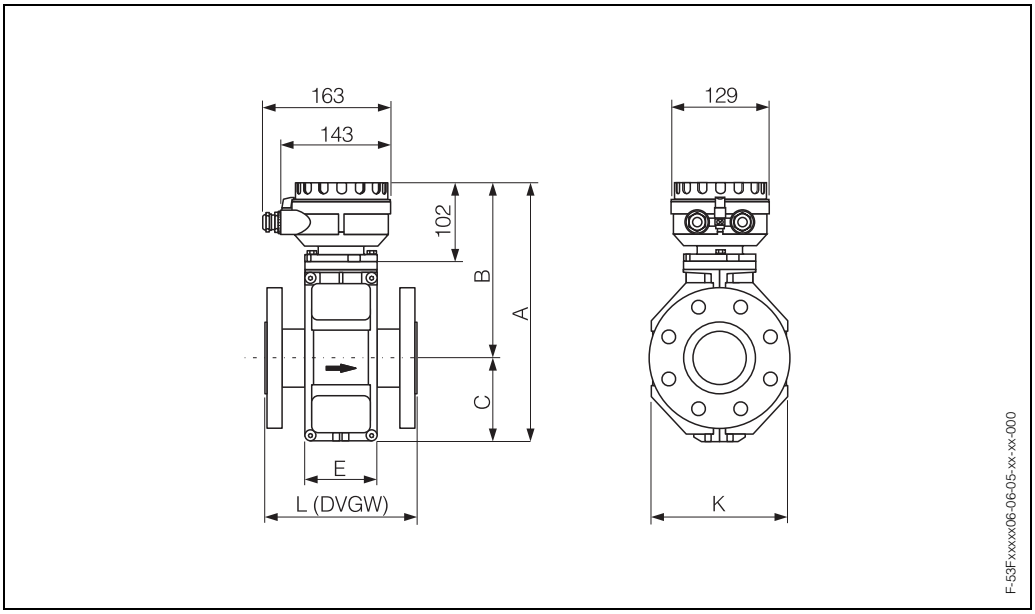


Promag W / DN ≤ 300 (compact version)



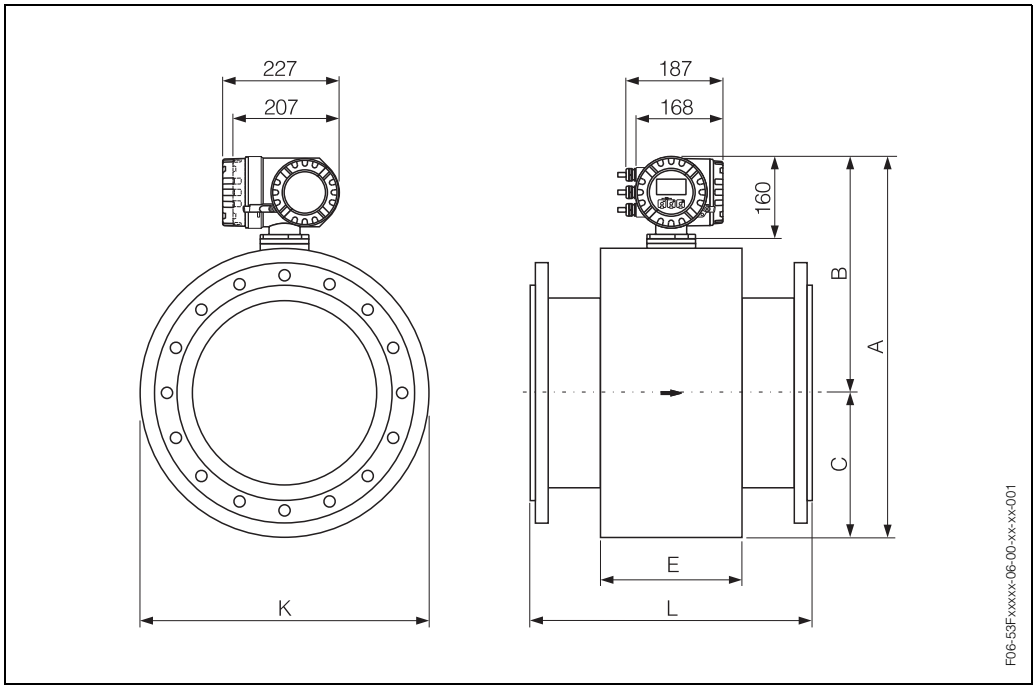
DN		L	A	B	C	K	E
DIN [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1"	200	341	257	84	120	94
32	–	200	341	257	84	120	94
40	1 1/2"	200	341	257	84	120	94
50	2"	200	341	257	84	120	94
65	–	200	391	282	109	180	94
80	3"	200	391	282	109	180	94
100	4"	250	391	282	109	180	94
125	–	250	472	322	150	260	140
150	6"	300	472	322	150	260	140
200	8"	350	527	347	180	324	156
250	10"	450	577	372	205	400	156
300	12"	500	627	397	230	460	166
The fitting length (L) is always the same, regardless of the pressure rating.							

Promag W / DN ≤ 300 (remote version)



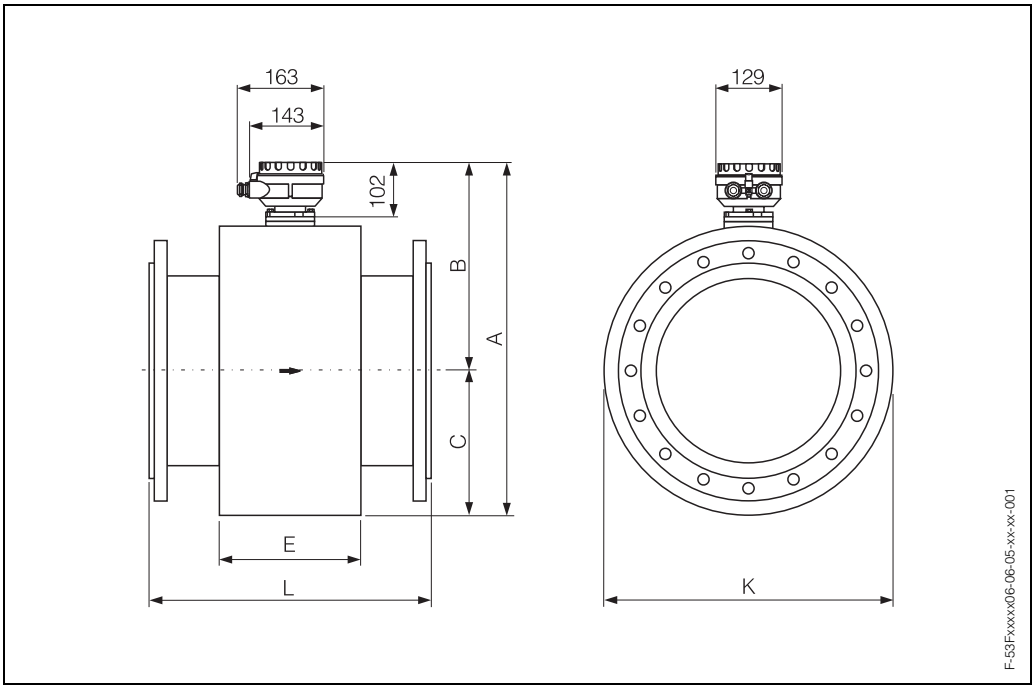
DN		L	A	B	C	K	E
DIN [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1"	200	286	202	84	120	94
32	–	200	286	202	84	120	94
40	1 1/2"	200	286	202	84	120	94
50	2"	200	286	202	84	120	94
65	–	200	336	227	109	180	94
80	3"	200	336	227	109	180	94
100	4"	250	336	227	109	180	94
125	–	250	417	267	150	260	140
150	6"	300	417	267	150	260	140
200	8"	350	472	292	180	324	156
250	10"	450	522	317	205	400	156
300	12"	500	572	342	230	460	166
The fitting length (L) is always the same, regardless of the pressure rating.							

Promag W / DN ≥ 350 (compact version)



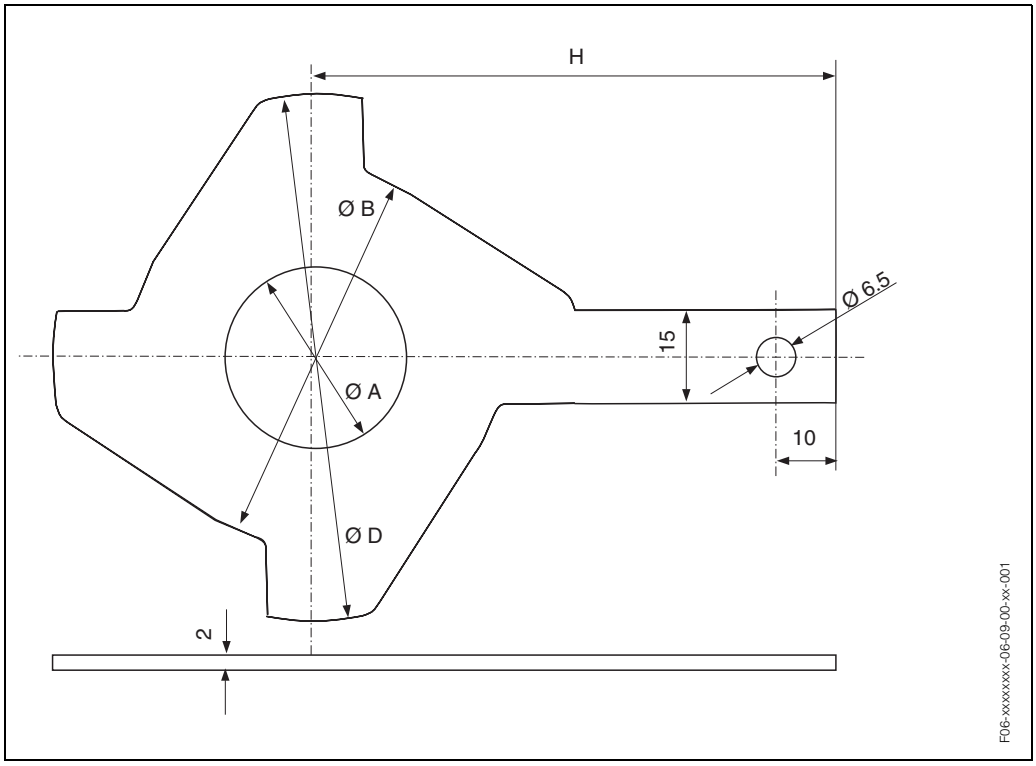
DN		L	A	B	C	K	E
DIN [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	14"	550	738.5	456.5	282.0	564	276
400	16"	600	790.5	482.5	308.0	616	276
450	18"	650	840.5	507.5	333.0	666	292
500	20"	650	891.5	533.0	358.5	717	292
600	24"	780	995.5	585.0	410.5	821	402
700	28"	910	1198.5	686.5	512.0	1024	589
750	30"	975	1198.5	686.5	512.0	1024	626
800	32"	1040	1241.5	708.0	533.5	1067	647
900	36"	1170	1394.5	784.5	610.0	1220	785
1000	40"	1300	1546.5	860.5	686.0	1372	862
1050	42"	1365	1598.5	886.5	712.0	1424	912
1200	48"	1560	1796.5	985.5	811.0	1622	992
1350	54"	1755	1998.5	1086.5	912.0	1824	1252
1400	56"	1820	2148.5	1161.5	987.0	1974	1252
1500	60"	1950	2196.5	1185.5	1011.0	2022	1392
1600	64"	2080	2286.5	1230.5	1056.0	2112	1482
1650	66"	2145	2360.5	1267.5	1093.0	2186	1482
1800	72"	2340	2550.5	1362.5	1188.0	2376	1632
2000	78"	2600	2650.5	1412.5	1238.0	2476	1732
The fitting length (L) is always the same, regardless of the pressure rating.							

Promag W / DN ≥ 350 (remote version)



DN		L	A	B	C	K	E
DIN [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	14"	550	683.5	401.5	282.0	564	276
400	16"	600	735.5	427.5	308.0	616	276
450	18"	650	785.5	452.5	333.0	666	292
500	20"	650	836.5	478.0	358.5	717	292
600	24"	780	940.5	530.0	410.5	821	402
700	28"	910	1143.5	631.5	512.0	1024	589
750	30"	975	1143.5	631.5	512.0	1024	626
800	32"	1040	1186.5	653.0	533.5	1067	647
900	36"	1170	1339.5	729.5	610.0	1220	785
1000	40"	1300	1491.5	805.5	686.0	1372	862
1050	42"	1365	1543.5	831.5	712.0	1424	912
1200	48"	1560	1741.5	930.5	811.0	1622	992
1350	54"	1755	1943.5	1031.5	912.0	1824	1252
1400	56"	1820	2093.5	1106.5	987.0	1974	1252
1500	60"	1950	2141.5	1130.5	1011.0	2022	1392
1600	64"	2080	2231.5	1175.5	1056.0	2112	1482
1650	66"	2145	2305.5	1212.5	1093.0	2186	1482
1800	72"	2340	2495.5	1307.5	1188.0	2376	1632
2000	78"	2600	2595.5	1357.5	1238.0	2476	1732
The fitting length (L) is always the same, regardless of the pressure rating.							

Ground disk (DN 25...300)



DN [1]		A	B	D	H
DIN [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]
25	1"	30	62	77.5	87.5
32	–	38.5	80	87.5	94.5
40	1 1/2"	44.5	82	101	103
50	2"	56.5	101	115.5	108
65	–	72.5	121	131.5	118
80	3"	85	131	154.5	135
100	4"	110	156	186.5	153
125	–	135	187	206.5	160
150	6"	163	217	256	184
200	8"	210.5	267	288	205
250	10"	265	328	359	240
300 [2]	12" [2]	317	375	413	273
300 [3]	12" [3]	317	375	404	268

[1] Ground disks, apart from those for DN 300, can be used for all suppliable flange standards / pressure ratings.
[2] PN 10/16, Cl. 150
[3] PN 25, JIS 10K/20K

Weight

Weight data of Promag W in kg

Nominal diameter		Compact version				Remote version (without cable)				
		DIN		ANSI / AWWA		Sensor				Wall housing
[mm]	[inch]									
25	1"	PN 40	7.3	Class 150	7.3	PN 40	5.3	Class 150	5.3	6.0
32	1 1/4"		8.0		–		6.0		–	6.0
40	1 1/2"		9.4		9.4		7.4		7.4	6.0
50	2"		10.6		10.6		8.6		8.6	6.0
65	2 1/2"	PN 16	12.0		–	PN 16	10.0		–	6.0
80	3"		14.0		14.0		12.0		12.0	6.0
100	4"		16.0		16.0		14.0		14.0	6.0
125	5"		21.5		–		19.5		–	6.0
150	6"		25.5		25.5		23.5		23.5	6.0
200	8"	PN 10	45		45	PN 10	43		43	6.0
250	10"		65		75		63		73	6.0
300	12"		70		110		68		108	6.0
350	14"		115		175		113		173	6.0
400	16"		135		205		133		203	6.0
450	18"		175		255		173		253	6.0
500	20"		175		285		173		283	6.0
600	24"		235		405		233		403	6.0
700	28"		355	Class D	400		353	Class D	398	6.0
–	30"		–		460		–		458	6.0
800	32"		435		550		433		548	6.0
900	36"		575		800		573		798	6.0
1000	40"		700		900		698		898	6.0
–	42"	PN 6	–		1100	PN 6	–		1098	6.0
1200	48"		850		1400		848		1398	6.0
–	54"		–		2200		–		2198	6.0
1400	–		1300		–		1298		–	6.0
–	60"		–		2700		–		2698	6.0
1600	–		1700		–		1698		–	6.0
–	66"		–		3700		–		3698	6.0
1800	72"		2200		4100		2198		4098	6.0
–	78"		–		4600		–		4598	6.0
2000	–		2800		–		2798		–	6.0

Transmitter Promag 50/53 (compact version): 3.4 kg
High temperature version: +1.5 kg
(Weight data valid for standard pressure ratings and without packaging material)

Materials

Transmitter housing:
- Compact housing: powder coated die-cast aluminium
- Wall-mounted housing: powder coated die-cast aluminium

Sensor housing:
- DN 25...300: powder-coated die-cast aluminium
- DN 350…2000: painted steel (Amerlock 400)

Measuring tube:
- DN < 350: stainless steel 1.4301 or 1.4306/304L; with non-stainless flange material with Al/Zn protective coating
- DN > 300: stainless steel 1.4301/304; with non-stainless flange material with Amerlock 400 paint

Flange:
- DIN :
  Stainless steel 1.4571, ST37 / FE 410W B (DN < 350 with Al/Zn protective coating / DN > 300 with Amerlock 400 paint)
- ANSI:
  A105, 316L (DN < 350 with Al/Zn protective coating / DN > 300 with Amerlock 400 paint)
- AWWA: A105
- JIS:
  S20C, SUS 316L (DN < 350 with Al/Zn protective coating / DN > 300 with Amerlock 400 paint)

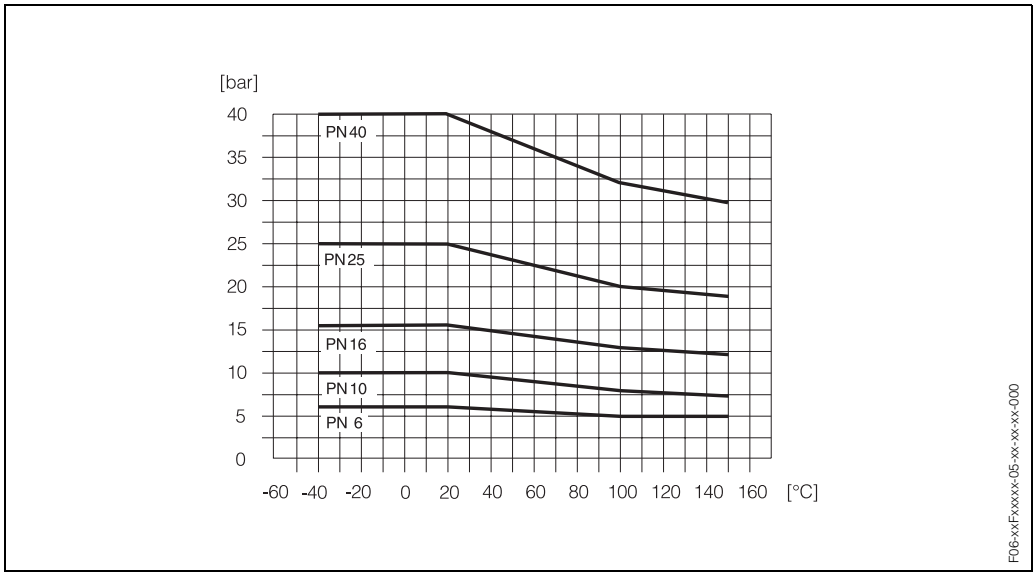
Ground disks:
- Standard: 1.4435/316L
- Option: Alloy C-22

Electrodes:
- Standard: 1.4435
- Option: Alloy C-22, tantalum

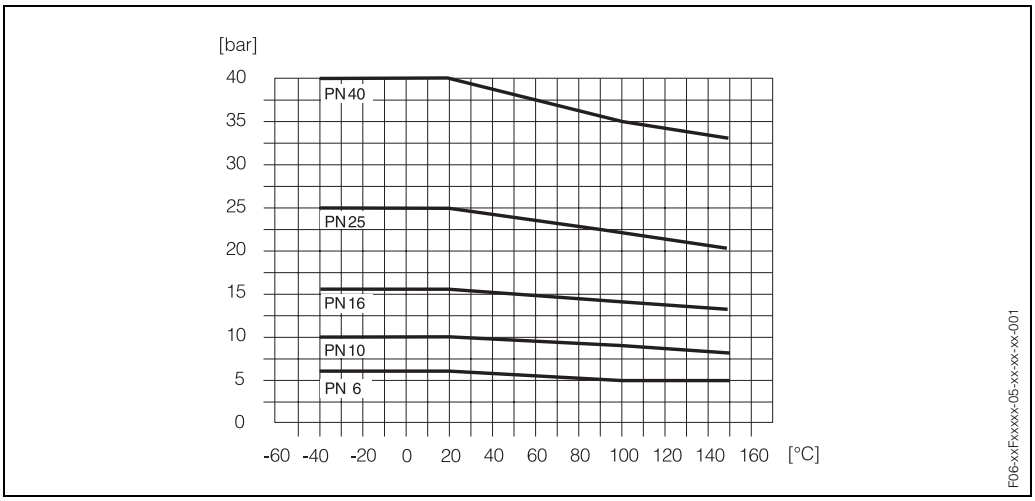
Seals:
Seals to DIN 2690

Material load diagrams

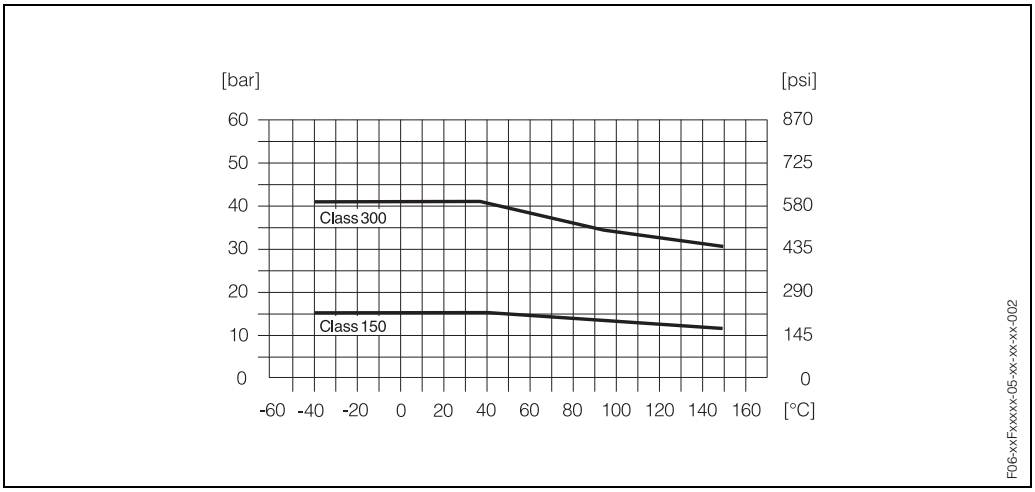
Flange material: steel 37.2
to DIN 2413 and 2505



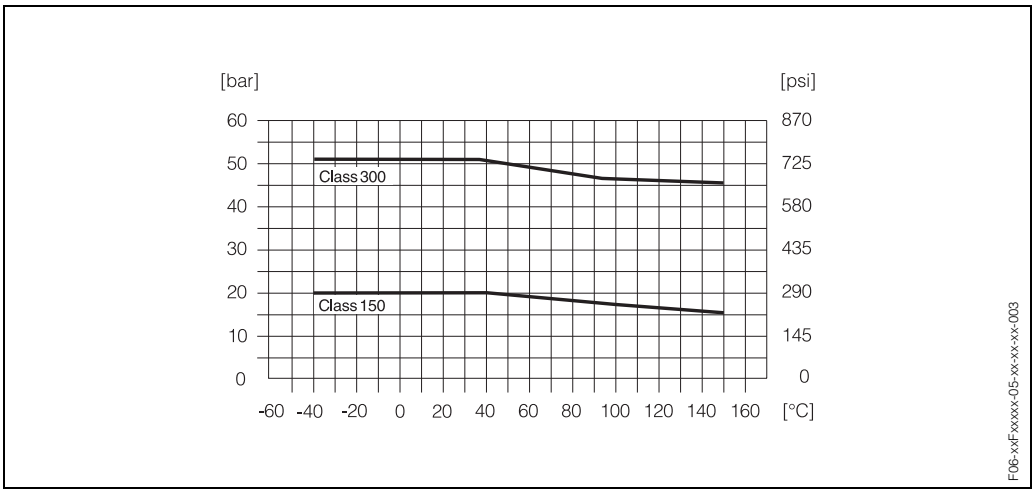
Flange material: stainless steel 1.4571
to DIN 2413 and 2505



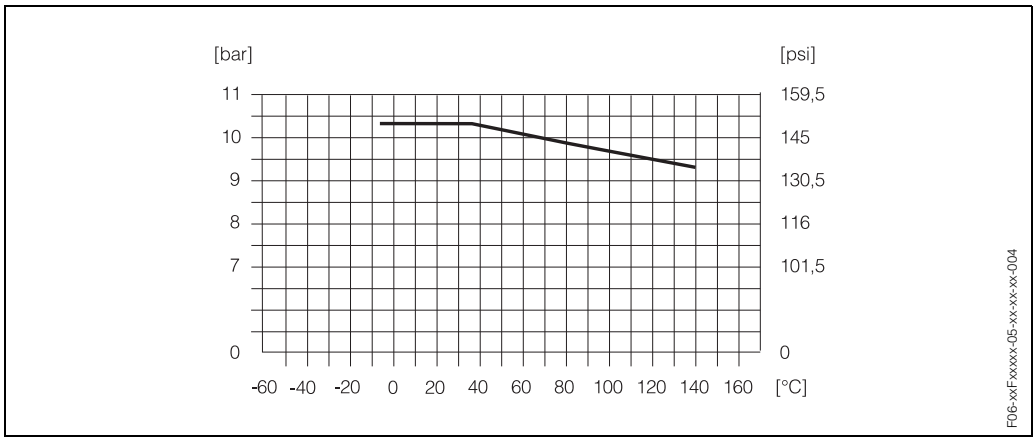
Flange material: steel 316L
to ANSI B16.5



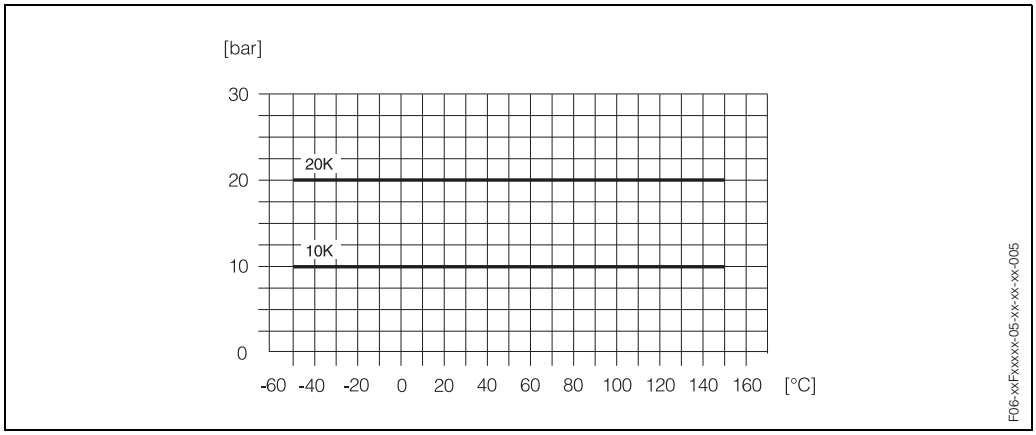
Flange material: steel A105
to ANSI B16.5



Flange material: steel A105
to AWWA C 207, Class D



Flange material: S20C / SUS 316L
to JIS B2238



Fitted electrodes

Measuring, reference and EPD electrodes:
- Standard with: 1.4435, Alloy C-22, tantalum
- Optional: exchangeable measuring electrodes made of 1.4435 (DN 350...2000)

Process connection

Flange connections: DIN (Dimensions to DIN 2501), ANSI, AWWA, JIS

Surface roughness

Electrodes:
– 1.4435, Alloy C-22: ≤ 0.4 µm
– Tantalum: ≤ 0.8 µm

Human interface

Display elements

- 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:
  Promag 50: 1 totalizer
  Promag 53: 3 totalizers

Operating elements

Unified operation concept for both types of transmitter:

Promag 50:
- Local operation with three push buttons (–, +, E)
- Quick Setup menus for straightforward commissioning

Promag 53:
- Local operation with three optical keys (–, +, E)
- Application-specific Quick Setup menus for straightforward commissionig

Remote operation

Promag 50:
Remote control via HART, PROFIBUS-PA

Promag 53:
Remote control via HART, PROFIBUS-PA/-DP, FOUNDATION Fieldbus

Certificates and approvals

Ex approvals

Information on the currently available Ex-rated versions (ATEX, FM, CSA, etc.) is available on request from your E+H sales outlet. All information relevant to explosion protection is available in separate Ex documents that you can order as necessary.

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.

Other standards and guidelines

EN 60529:
Degrees of protection by housing (IP code)

EN 61010:
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.

EN 61326 (IEC 1326):
Electromagnetic compatibility (EMC requirements)

NAMUR NE 21:
Association for Standards for Control and Regulation in the Chemical Industry

Ordering information

The E+H service organisation can provide detailed ordering information and information on the order codes on request.

Accessories

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

Supplementary documentation

- ❑ System Information Promag (SI 028D/06/en)
- ❑ Technical Information Promag 50/53 P (TI 047D/06/en)
- ❑ Technical Information Promag 50/53 H (TI 048D/06/en)
- ❑ Operating Instructions Promag 50 (BA 046D/06/en and BA 049D/06/en)
- ❑ Operating Instructions Promag 53 (BA 047D/06/en and BA 048D/06/en)
- ❑ Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

Subject to modification

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