Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Proline Promag 50H, 53H

Electromagnetic Flow Measuring System
Flow measurement in hygiene, food and beverage or process applications

Applications
Electromagnetic flowmeter for bidirectional measurement of liquids with a minimum conductivity of ≥ 5 µS/cm:
- Beverages, e.g. fruit juice, beer, wine
- Milk products, fruit mixtures
- Salt solutions
- Acids and causic solutions, etc.

- Flow measurement up to 4700 m^3/h
- Fluid temperature up to +150 °C
- Process pressures up to 40 bar
- CIP/SIP cleaning
- Stainless steel housing

Approvals in the food industry/hygiene sector:
- 3A authorization, EHEDG-tested, conformity with FDA

Application-specific lining materials:
- PFA

Approvals for hazardous area:
- ATEX, FM, CSA, TIIS

Connection to process control system:
- HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, MODBUS RS485

Features and 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 pulsating flow
- Uniform operating concept

The tried-and-tested **Promag sensors** offer:
- No pressure loss
- Insensitivity to vibrations
- Simple installation and commissioning

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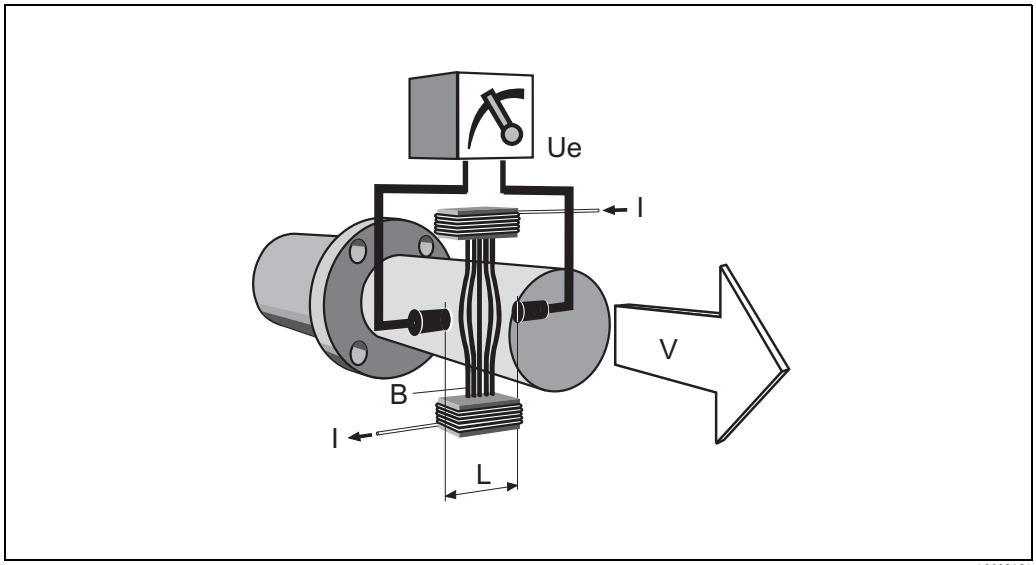
Endress+Hauser
People for Process Automation

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.



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

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

Measuring system

The measuring system consists of a transmitter and a sensor.
Two versions are available:
- Compact version: transmitter and sensor form a single mechanical unit.
- Remote version: transmitter and sensor are installed separately.

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

Sensor:
- DN 2…100

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.

Status input (auyiliary input) with PROFIBUS DP and MODBUS RS485:
U = 3…30 V DC, R_i = 3 kΩ, galvanically isolated
Switching level: 3...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 μA, temperature coefficient: typ. 0.005% o.r./°C (o.r. = of reading)
active: 4...20 mA, $R_i \leq 150\ \Omega$, U_{out} = 24 V DC, short-circuit-proof
passive: 0/4...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...100 s), full scale value selectable, temperature coefficient: typ. 0.005% o.r./°C (o.r. = of reading), resolution: 0.5 μA

- active: 0/4…20 mA, $R_L < 700\ \Omega$ (HART: $R_L \geq 250\ \Omega$)
- passive: 4…20 mA, operating voltage V_S 18...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...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)

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...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...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...100 s),
full scale value selectable, temperature coefficient: typically 0.005% o.r./°C (o.r. = of reading),
resolution: 0.5 µA
- active: 0/4…20 mA, $R_L < 700\ \Omega$ (HART: $R_L \geq 250\ \Omega$)
- passive: 4…20 mA, operating voltage V_S 18...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...10000 Hz (f_{max} = 12500 Hz), EEx-ia: 2...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...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...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...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...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...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
- Adress range: 1...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...50 ms
  Auto-scan buffer (data range) = typically 3...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...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

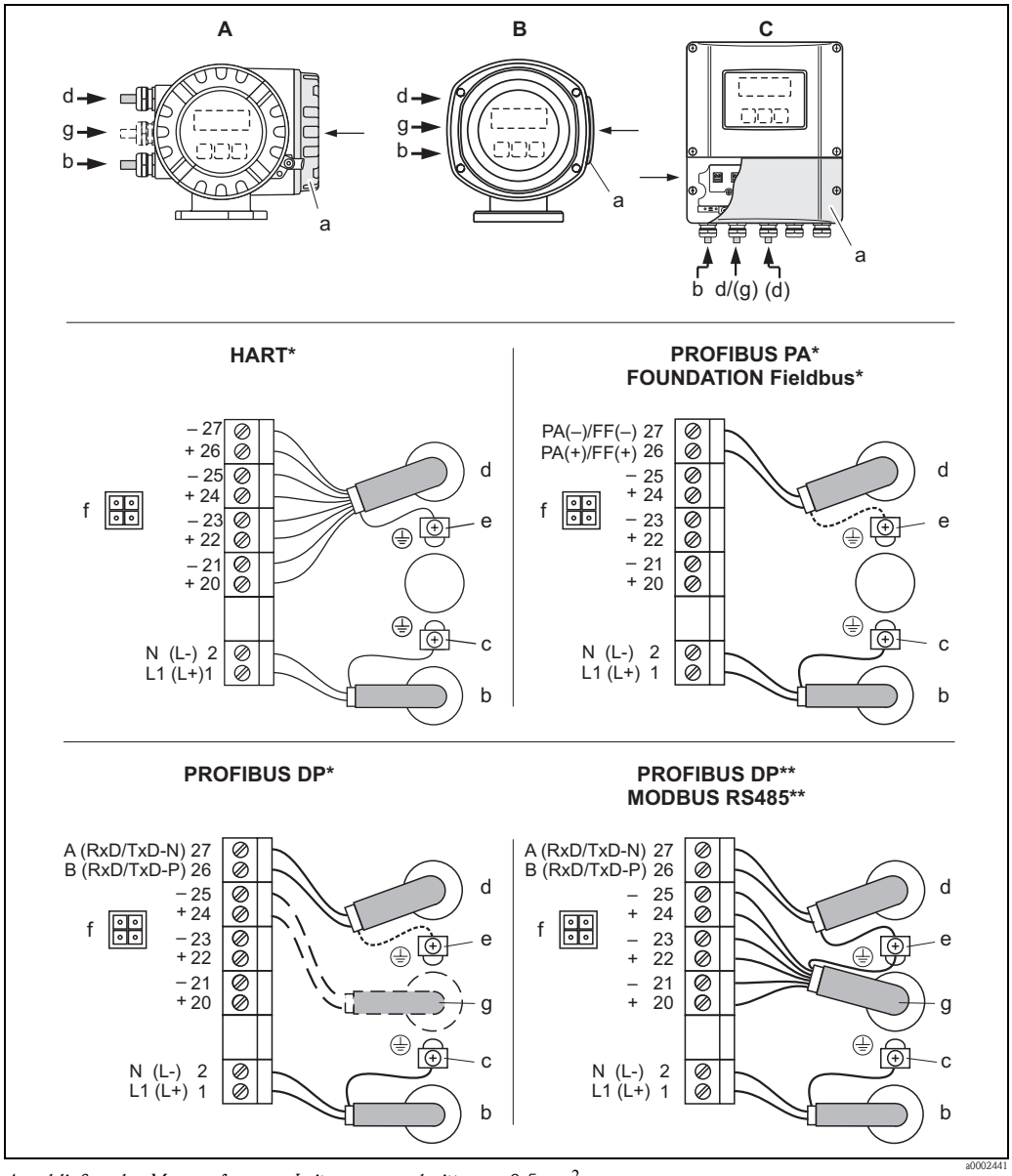
Switch points for low flow cutoff are selectable

Galvanic isolation

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

Power supply

Electrical connection
Measuring unit



Anschließen des Messumformers, Leitungsquerschnitt max. 2,5 mm²

AView A (field housing)
BView B (stainless steel field housing)
CView C (wall-mount housing)

**) not changeable communication board*
***) changeable communication board*
a Cover of the connection compartment
b Cable for power supply: 85...260 V AC, 20...55 V AC,16...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				

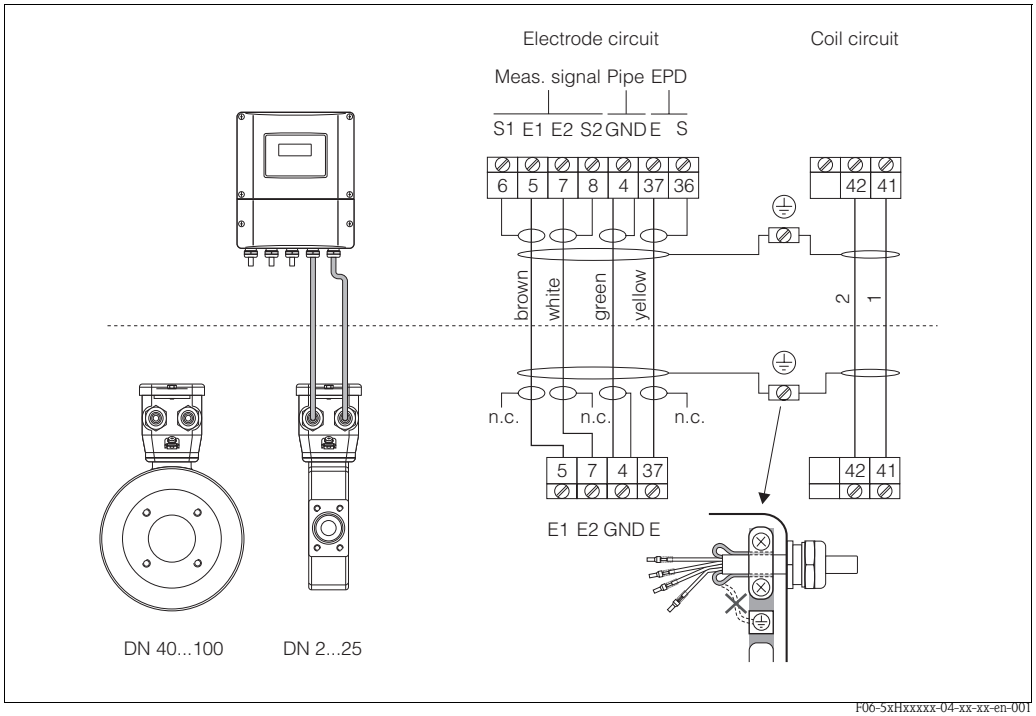
Terminal assignment, Promag 53

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 Ex i
53***-**********G	–	–	–	FOUNDATION Fieldbus, Ex i
53***-**********H	–	–	–	PROFIBUS PA
53***-**********J	–	–	–	PROFIBUS DP
53***-**********K	–	–	–	FOUNDATION Fieldbus
53***-**********Q	–	–	Status input	MODBUS RS485
53***-**********S	–	–	Frequency output Ex i	Current output Ex i active, HART
53***-**********T	–	–	Frequency output Ex i	Current output Ex i 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

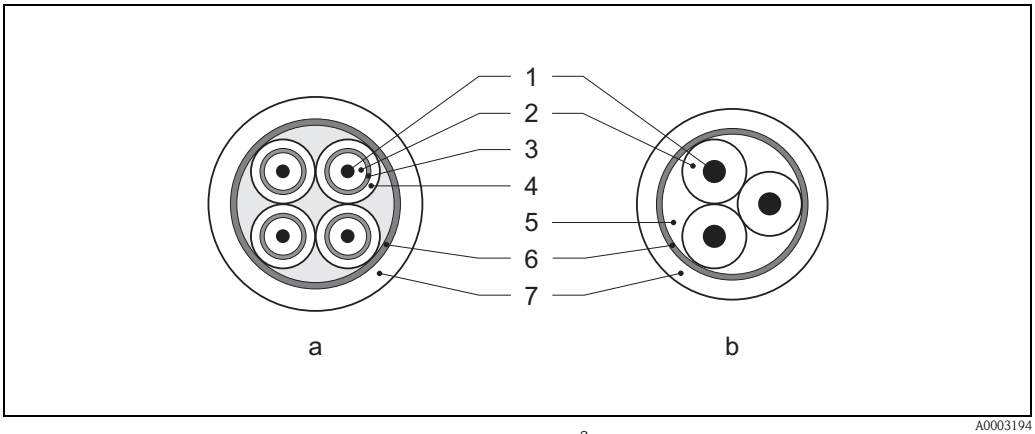
Power-supply and signal cables (inputs/outputs):
- Cable entry M20 x 1.5 (8…12 mm)
- Threads for cable entries 1/2" NPT, G 1/2"

Connecting cable for remote version:
- Cable entry M20 x 1.5 (8…12 mm)
- Threads for cable entries 1/2" NPT, G 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
- Cable cross-section: max. 2.5 mm^2

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
- Cable cross-section: max. 2.5 mm^2



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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, Endress+Hauser 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/A1, 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

PROFIBUS PA and FOUNDATION Fieldbus
Non-Ex: 9...32 V DC
Ex i: 9...24 V DC
Ex d: 9...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

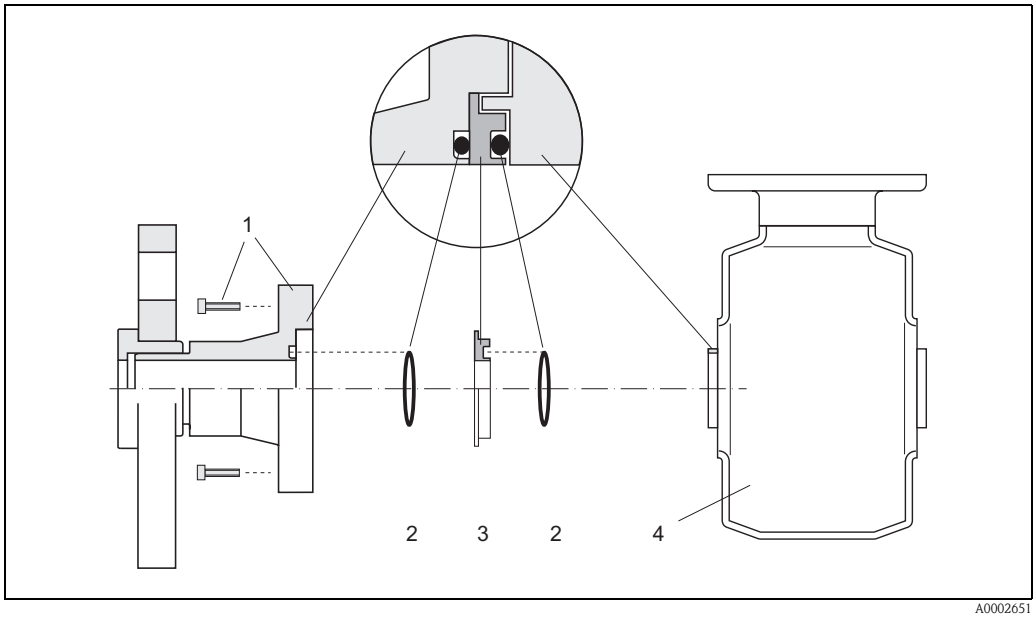
Lasting min. 1 power cycle:
- EEPROM or T-DAT (Promag 53 only) retain the measuring system data in the event of a power supply failure
- S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point, etc.)

Potential equalisation

Perfect measurement is only ensured when the medium and the sensor have the same electrical potential.

Metal process connections
Potential matching usually takes place over the metallic process connection in contact with medium process connections which are directly mounted on the measuring transmitter. This usually means that additional potential matching measures are unnecessary.

Plastic process connections
For plastic process connections, potential matching must be ensured between sensor and medium using additional ground rings. If these ground rings are missing, this can influence accuracy or destroy the measuring transmitter through the electrochemical decomposition of electrodes.



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1 Allen screw (process connection)
2 O-ring seals
3 Plastic washer (spacer) or ground ring
4 Sensor

When using ground rings, note the following points:
- Depending on the option ordered, plastic washers may be installed at the process connections instead of ground rings. These plastic washers serve only as spacers and have no potential equalization function. In addition, they provide a sealing function at the interface between the sensor and process connection. For this reason, with process connections without ground rings, these plastic washers/seals must not be removed, or must always be installed.
- Ground rings can be ordered separately from Endress+Hauser as an accessory.
  Also make sure that the ground rings are compatible with the electrode material. Otherwise the danger exists that the electrodes could be destroyed by electrochemical corrosion. You can find material data on Page 38 ff.
- Ground rings, incl. seals, are mounted inside the process connection.
  This has no influence on the installation length. You can find the dimensions of ground rings on Page 33.

Performance characteristics

Reference operating conditions

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

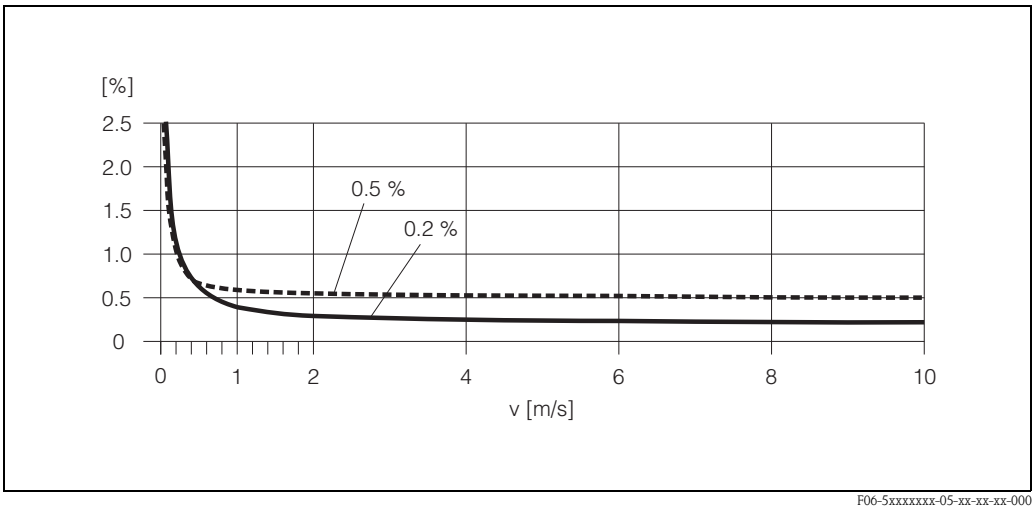
Installation:
- Inlet run >10 x DN
- Outlet run > 5 x DN
- Sensor and transmitter grounded.
- Sensor centered relative to the pipe.

Maximum measured error

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

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

Supply voltage fluctuations have no effect within the specified range.



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Max. measured error in % of reading

Repeatability

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

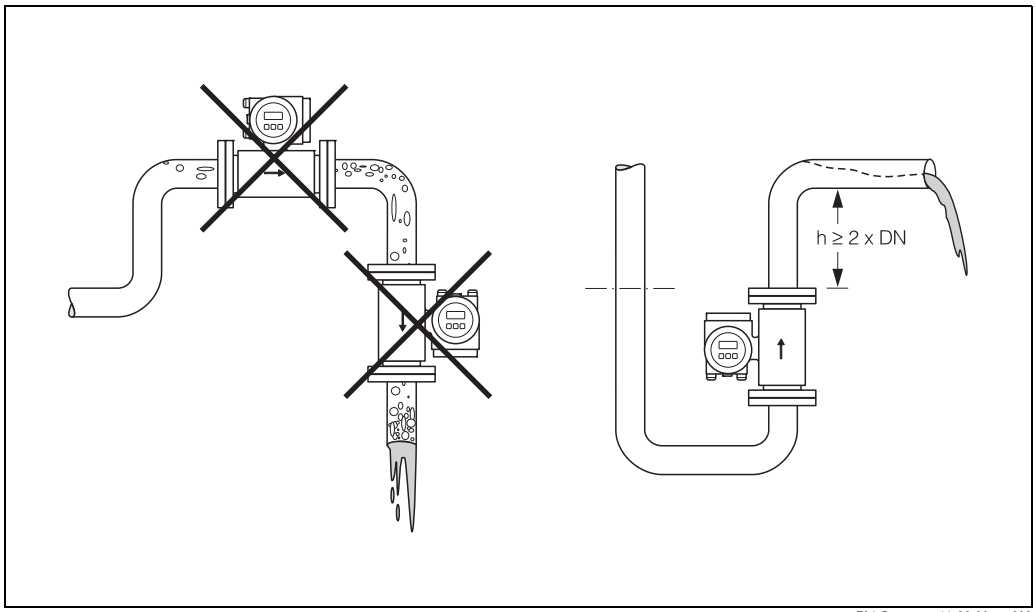
Operating conditions

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.



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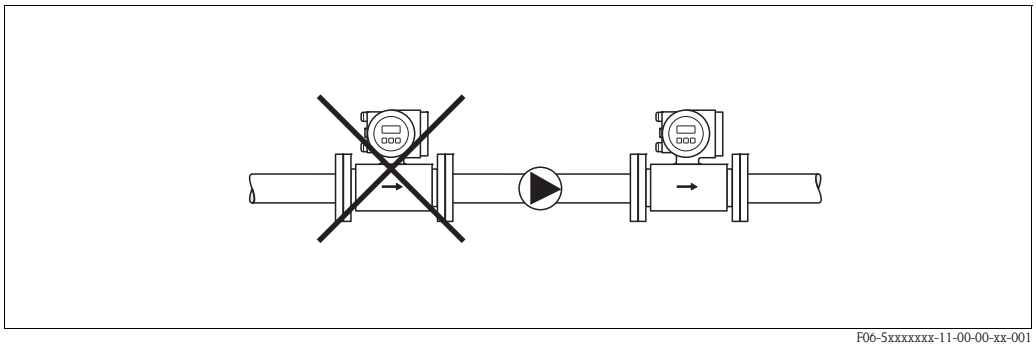
Installation of pumps

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 18.
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 17.



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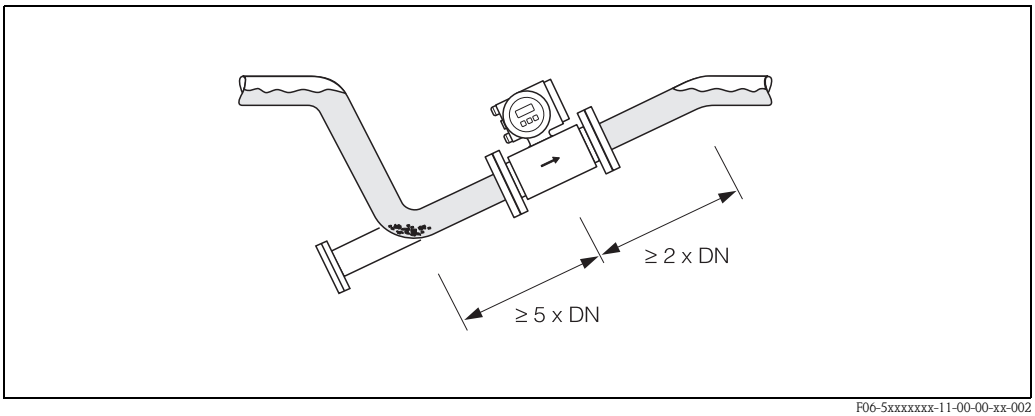
Partially filled pipes
Partially filled pipes with gradients necessitate a drain-type configuration. The Empty Pipe Detection (EPD) function offers additional protection by detecting empty or partially filled pipes.

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.



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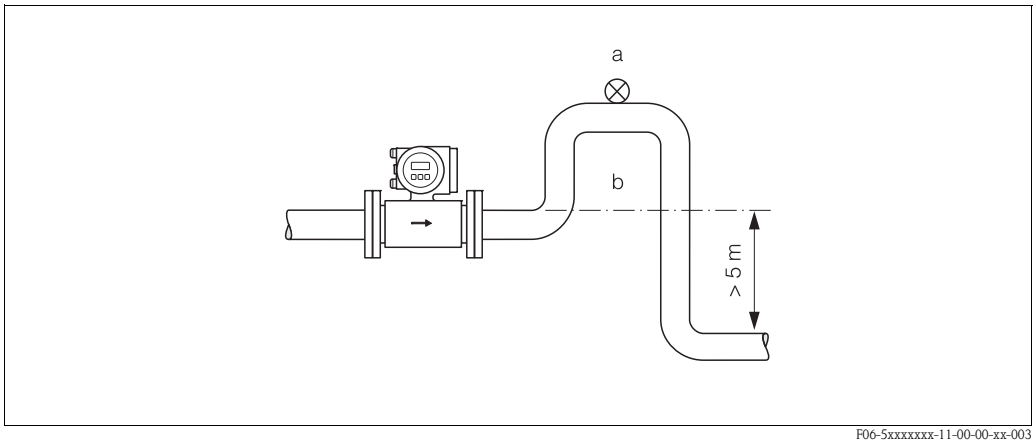
Vertical pipes
Install a siphon (b) or a vent valve (a) downstream of the sensor in vertical pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. These measures also prevent the system losing prime, which could cause air inclusions. Information on the lining's resistance to partial vacuum can be found on Page 18.



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a = vent valve, b = siphon

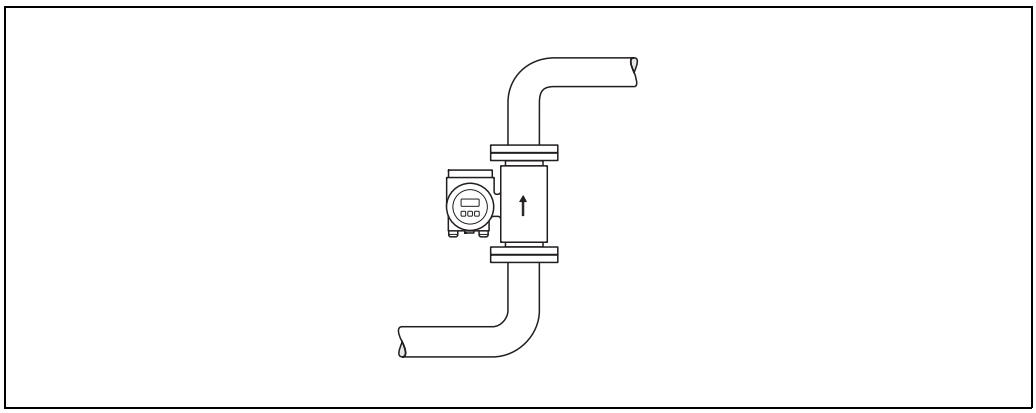
Orientation

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 (only for DN 15...100).

Vertical orientation:

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



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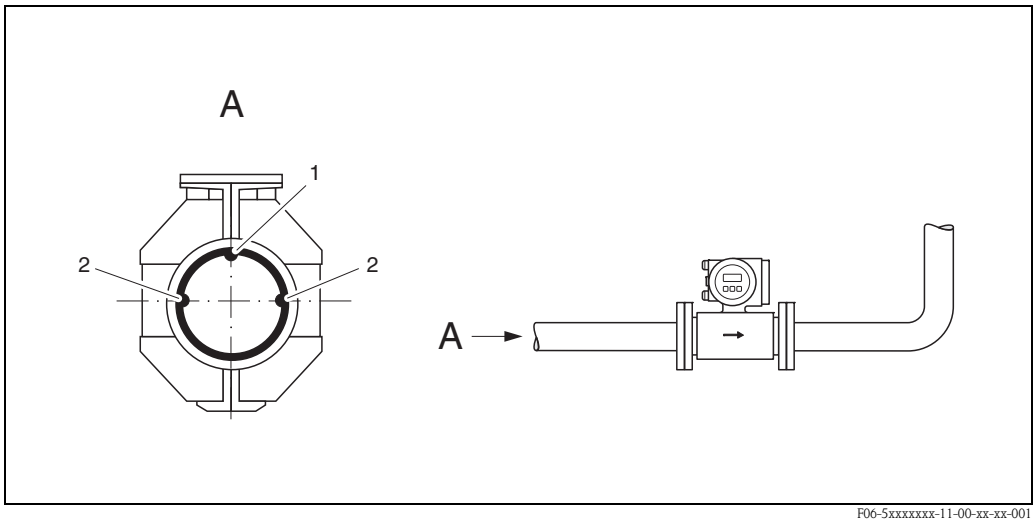
Horizontal orientation:

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.



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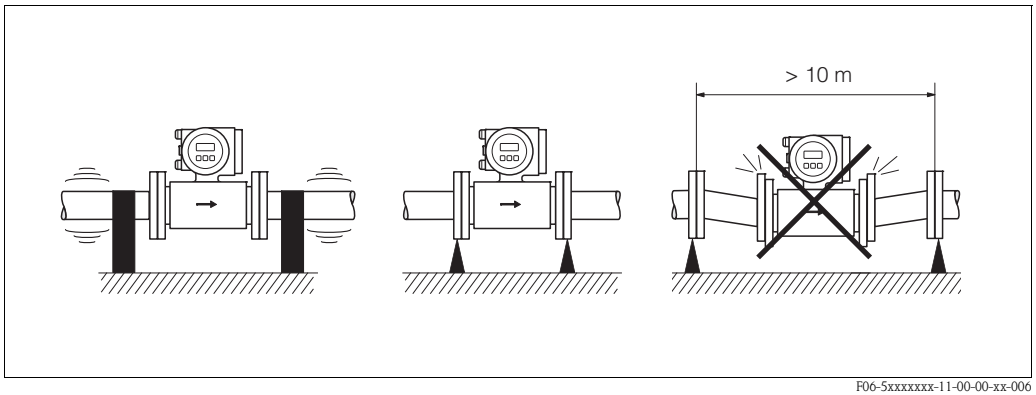
1 = EPD electrode (Empty Pipe Detection) except for Promag H / DN 2, 4
2 = Measuring electrodes (signal detection)

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

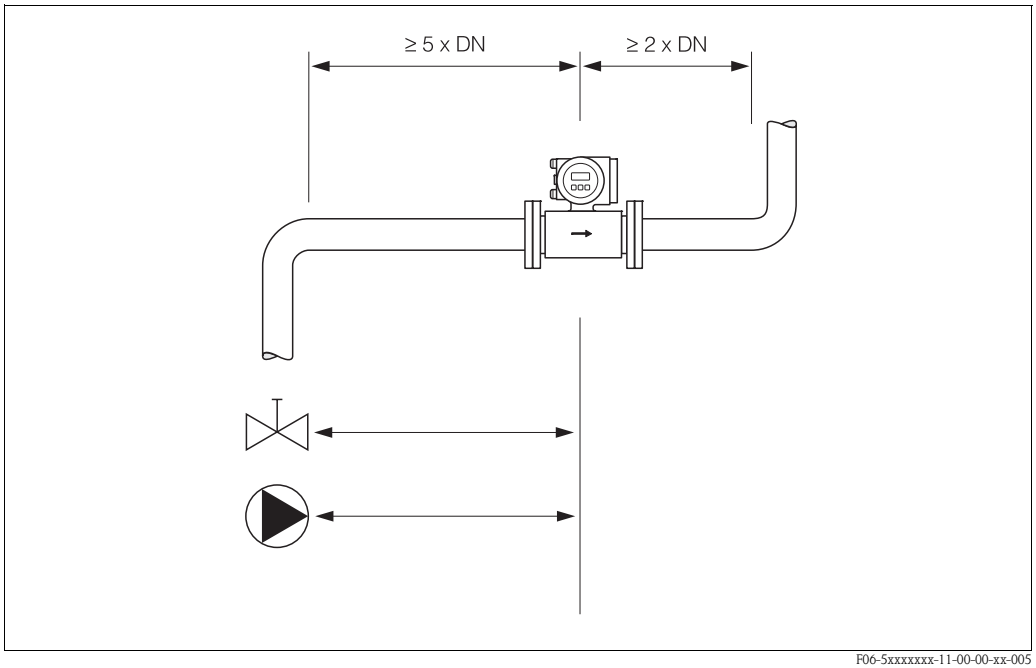
Caution!
- It is advisable to install sensor and transmitter separately if vibration is excessively severe. Information on resistance to vibration and shock can be found on Page 17.
- The sensor might require support or additional attachments, depending on the application and the length of the piping run. When plastic process connections are used, the sensor must be additionally supported mechanically. A wall-mounting kit can be ordered separately from Endress+Hauser as an accessory.



F06-5xxxxxxx-11-00-00-xx-006

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

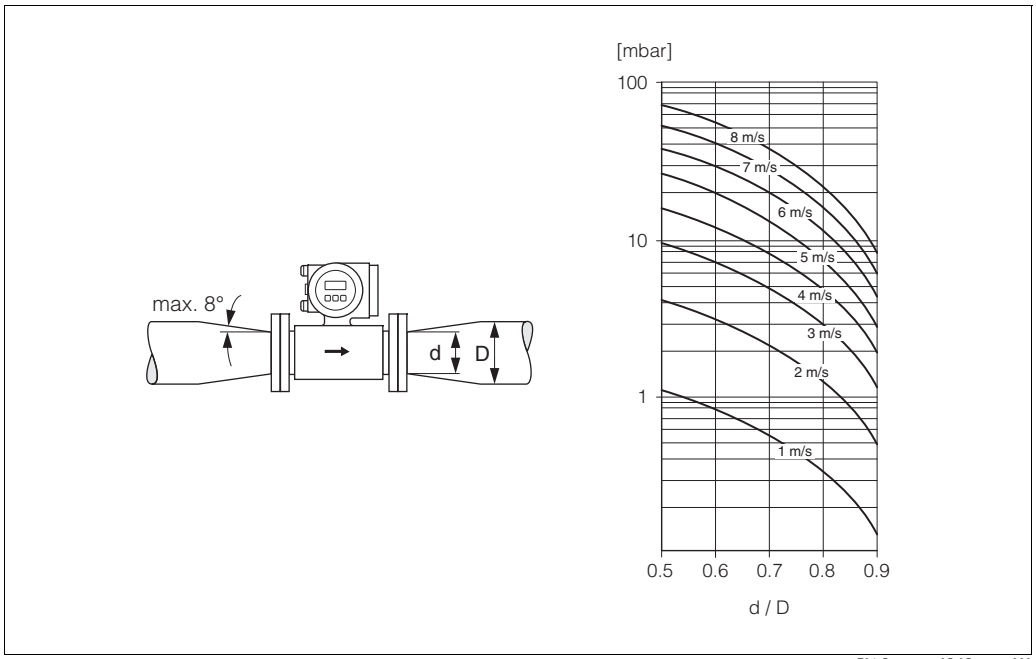


F06-5xxxxxxx-11-00-00-xx-005

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.

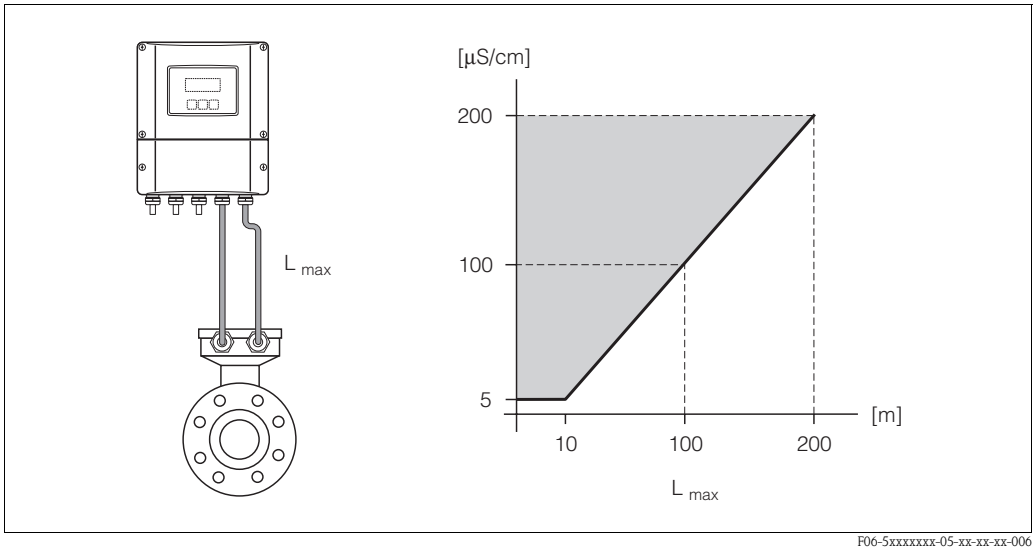
1. Calculate the ratio of the diameters d/D.
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



F06-5xxxxxxx-05-05-xx-xx-000

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.



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

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

Transmitter:
- Standard: –20...+60 °C
- Optional: –40...+60 °C

Note!
At ambient temperatures below –20 °C the readability of the display may be impaired.

Sensor:
- Flange material carbon steel: –10...+60 °C
- Flange material stainless steel: –40...+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”).

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.

Degree of protection

IP 67 (NEMA 4X) for transmitter and sensor

Shock and vibration resistance

Acceleration up to 2 g by analogy with IEC 60068-2-6

CIP cleaning

Possible

SIP cleaning

Possible

Electromagnetic compatibility (EMC)

To EN 61326/A1 and NAMUR recommendation NE 21

Process conditions

Medium temperature range

The permissible medium temperature depends on the sensor and the sealing material:

Sensor:
- DN 2…100: –20...+150 °C

Seal:
- EPDM: –20…+130 °C
- Silicon: –20…+150 °C
- Viton: –20…+150 °C
- Kalrez: –20…+150 °C

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)

The permissible nominal pressure depends on the process connection and seal:
- 40 bar: flange, weld nipple (with O-ring seal)
- 16 bar: all other process connections

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	80 °C	100 °C	130 °C	150 °C	180 °C
2…100	1/12…4"	PFA	0	0	0	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 media forming coatings, e.g. in full-fat milk, etc.

Flow characteristics (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)
2	1/12"	0.06…1.8 dm^3/min	0.5 dm^3/min	0.005 dm^3	0.01 dm^3/min
4	5/32"	0.25…7 dm^3/min	2 dm^3/min	0.025 dm^3	0.05 dm^3/min
8	5/16"	1…30 dm^3/min	8 dm^3/min	0.10 dm^3	0.1 dm^3/min
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
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

Flow characteristics (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)
1/12"	2	0.015…0.5 gal/min	0.1 gal/min	0.001 gal	0.002 gal/min
5/32"	4	0.07…2 gal/min	0.5 gal/min	0.005 gal	0.008 gal/min
5/16"	8	0.25…8 gal/min	2 gal/min	0.02 gal	0.025 gal/min
1/2"	15	1.0…27 gal/min	6 gal/min	0.05 gal	0.10 gal/min
1"	22	2.5…65 gal/min	18 gal/min	0.20 gal	0.25 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

Pressure loss

- With DN 8...100 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 16.

Measuring-tube specifications

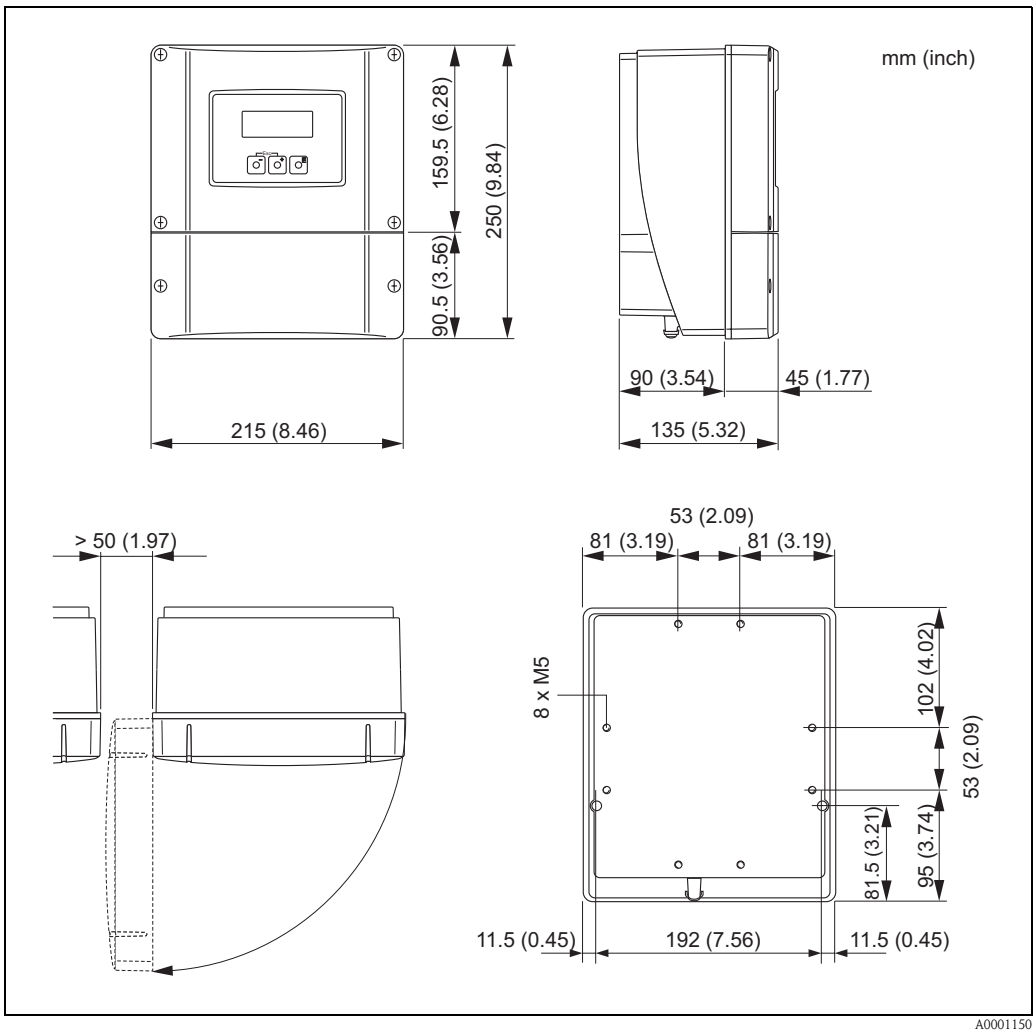
Nominal Diameter		**Pressure rating ***	**Inside diameter of measuring tube ****
[mm]	[inch]	EN (DIN) [bar]	PFA [mm]
2	1/12"	PN 16 / PN 40	2.25
4	5/32"	PN 16 / PN 40	4.5
8	5/16"	PN 16 / PN 40	9.0
15	1/2"	PN 16 / PN 40	16.0
–	1"	PN 16 / PN 40	22.6
25	–	PN 16 / PN 40	26.0
40	1 1/2"	PN 16	35.3
50	2"	PN 16	48.1
65	2 1/2"	PN 16	59.9
80	3"	PN 16	72.6
100	4"	PN 16	97.5

* The pressure rating depends on the process connections and the seals (s. Page 18).
** Inside diameters of process connections → Page 26 ff.

Mechanical construction

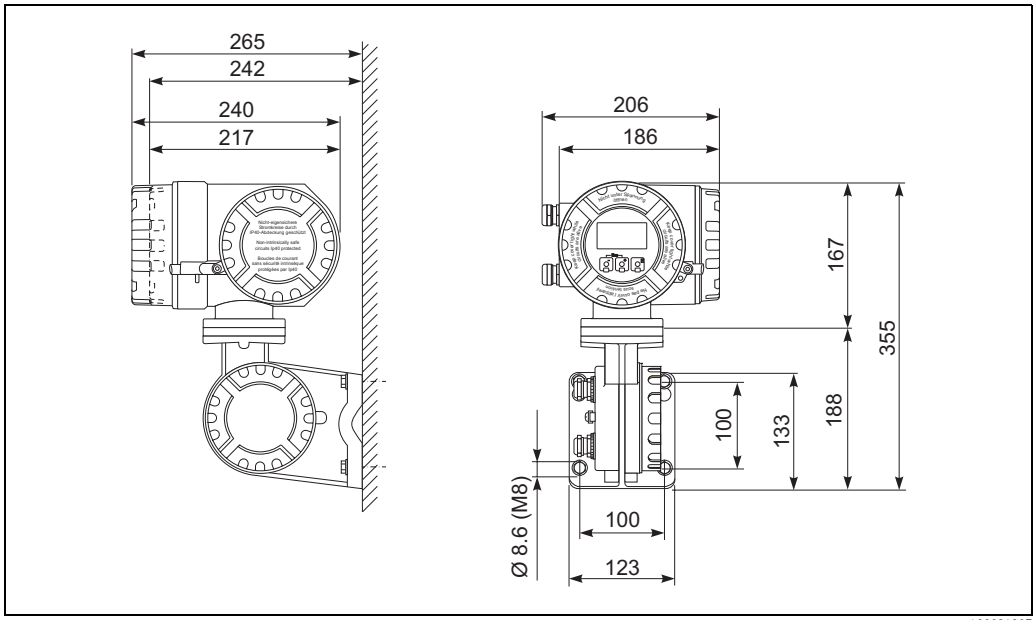
Design / dimensions

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



A0001150

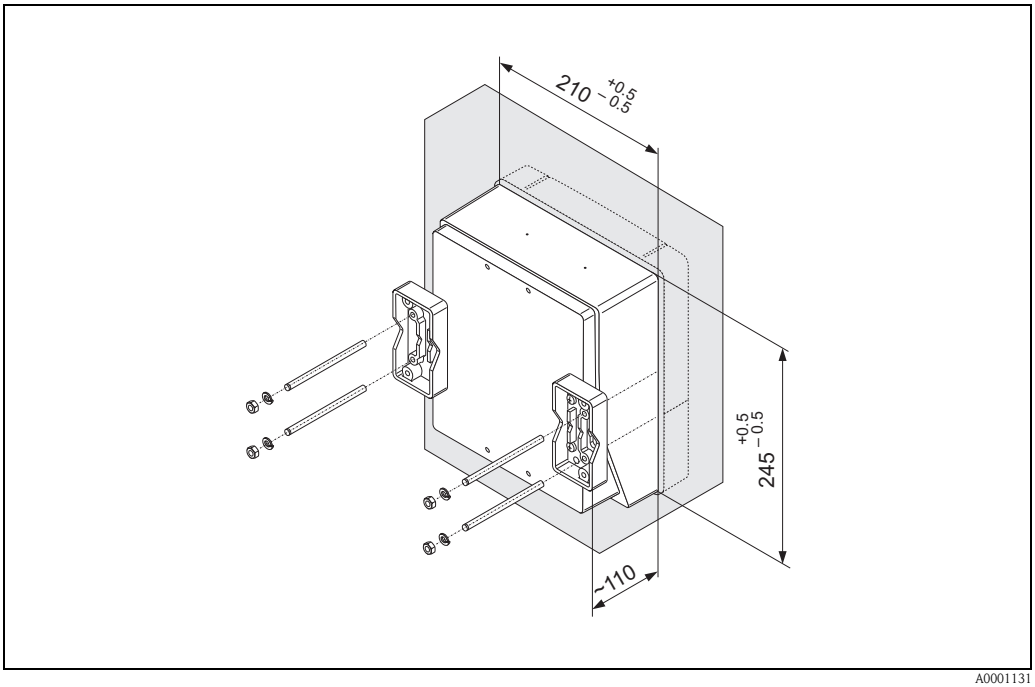
Dimensions: Remote field housing (II2GD / zone 1)



A00021287

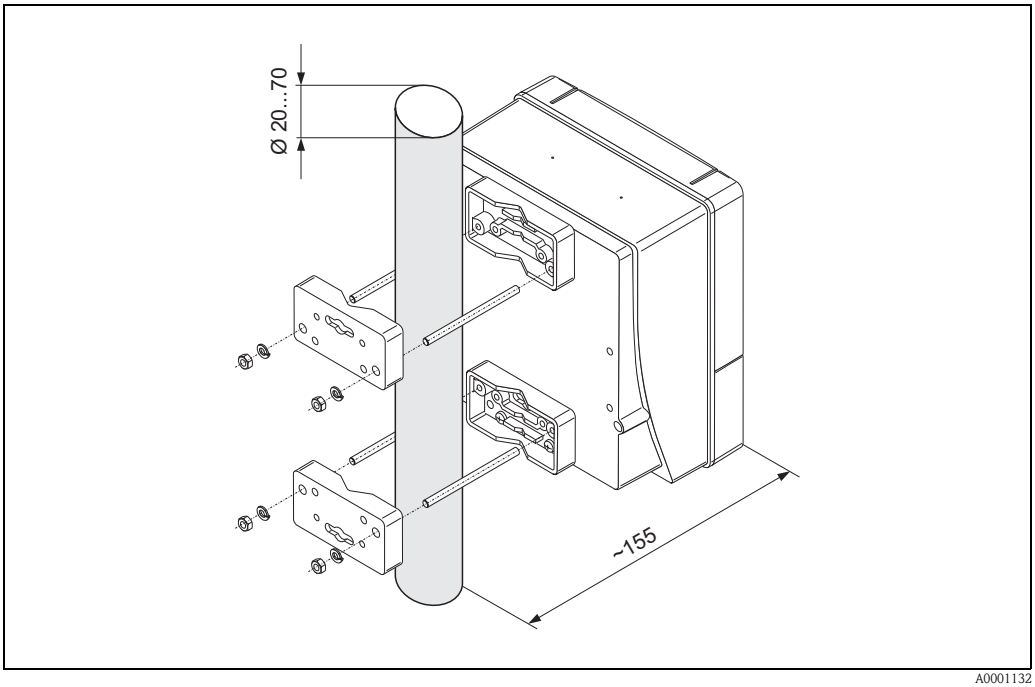
There is a separate mounting kit for the wall-mounted housing. It can be ordered from Endress+Hauser as an accessory. The following installation variants are possible:
- Panel-mounted installation
- Pipe mounting

Panel-mounted installation



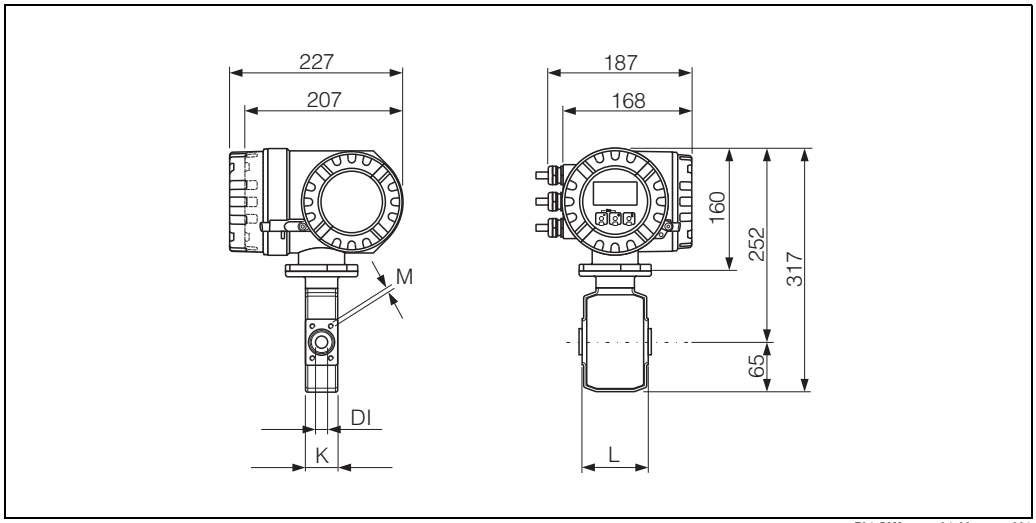
A0001131

Pipe mounting



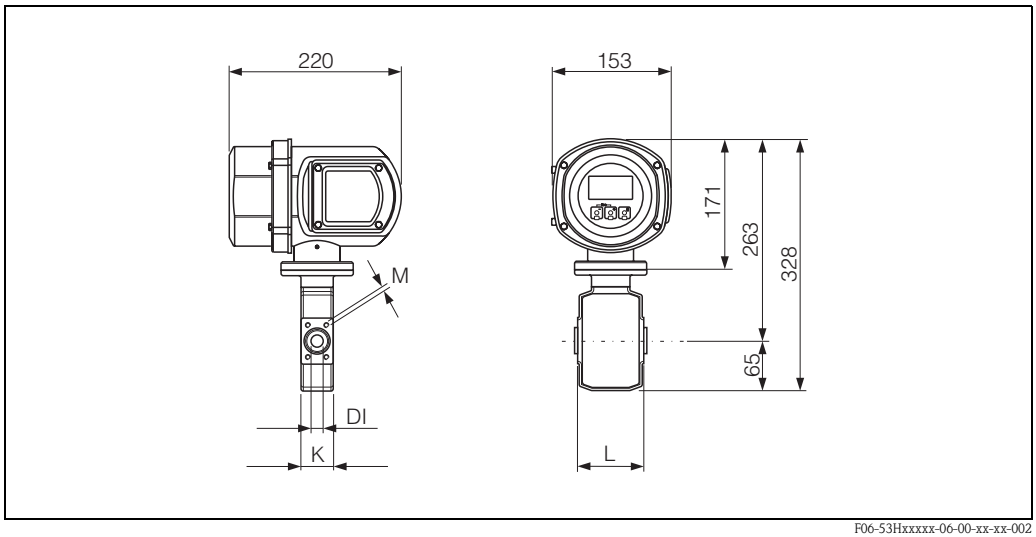
A0001132

Compact version, aluminum field housing DN 2…25



F06-53Hxxxxx-06-00-xx-xx-001

Compact version, stainless-steel field housing DN 2...25



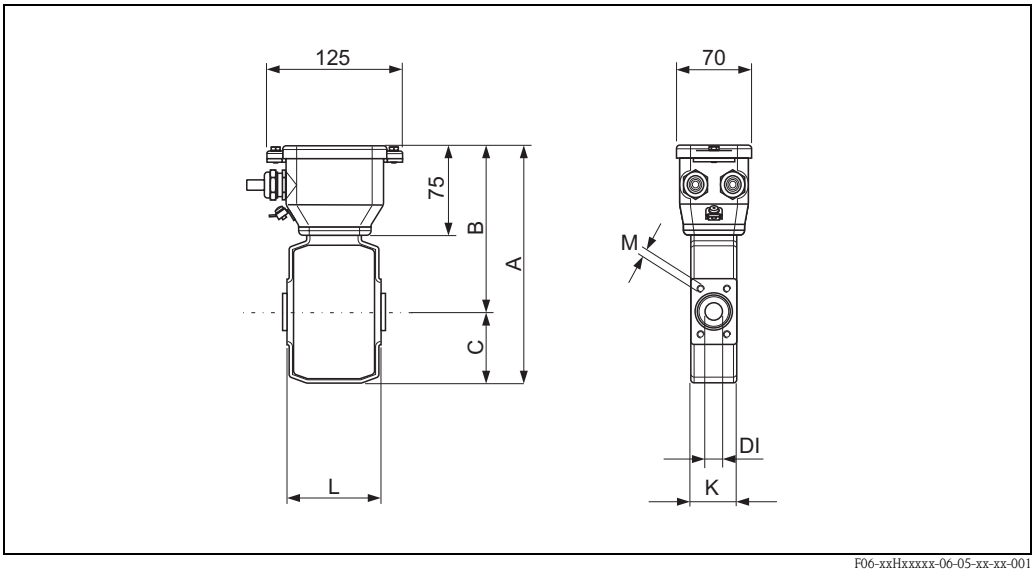
F06-53Hxxxxx-06-00-xx-xx-002

DN		PN **	DI	L	K	M
[mm]	[inch]	[bar]	[mm]	[mm]	[mm]	[mm]
2	–	16/40	2.25	86	43	M 6x4
4	–	16/40	4.5	86	43	M 6x4
8	–	16/40	9.0	86	43	M 6x4
15	–	16/40	16.0	86	43	M 6x4
–	1"	16/40	22.6	86	53	M 6x4
25	–	16/40	26.0	86	53	M 6x4

Fitting length depends on process connections → Page 27 ff.

** The permissible nominal pressure depends on the process connection and seal:
– 40 bar: flange EN 1092-1 (DIN 2501), welded nipples for DIN EN ISO 1127 pipes and ODT (with O-ring seal)
– 16 bar: all other process connections

Remote version DN 2...25



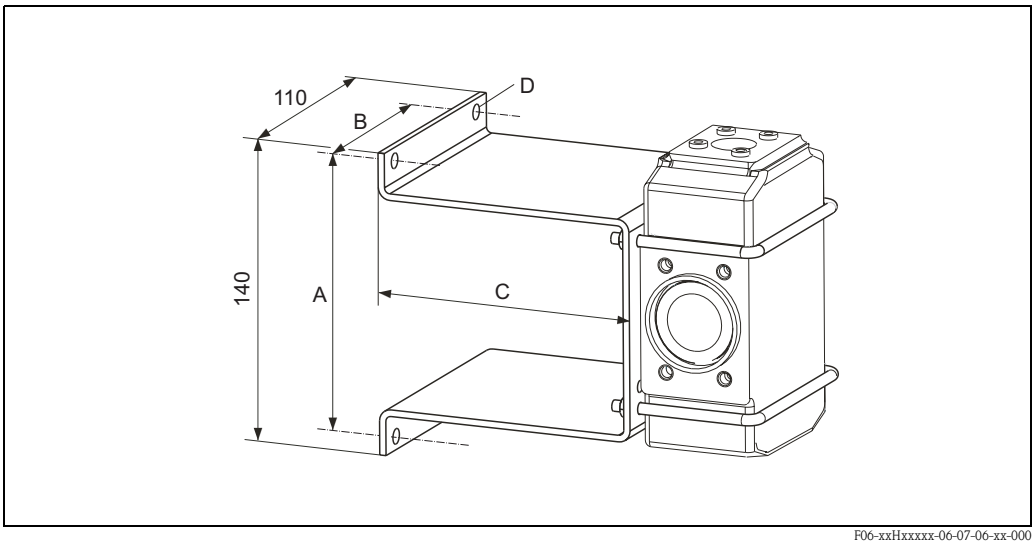
F06-xxHxxxxx-06-05-xx-xx-001

DN		PN *	DI	L	A	B	C	K	M
[mm]	[inch]	[bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
2	–	16/40	2.25	86	213	148	65	43	M 6x4
4	–	16/40	4.5	86	213	148	65	43	M 6x4
8	–	16/40	9.0	86	213	148	65	43	M 6x4
15	–	16/40	16.0	86	213	148	65	43	M 6x4
–	1"	16/40	22.6	86	213	148	65	53	M 6x4
25	–	16/40	26.0	86	213	148	65	53	M 6x4

Fitting length depends on process connections → Page 27 ff.
Dimensions wall-mounted housing → Page 20

* The permissible nominal pressure depends on the process connection and seal:
– 40 bar: flange EN 1092-1 (DIN 2501), welded nipples for DIN EN ISO 1127 pipes and ODT (with O-ring seal)
– 16 bar: all other process connections

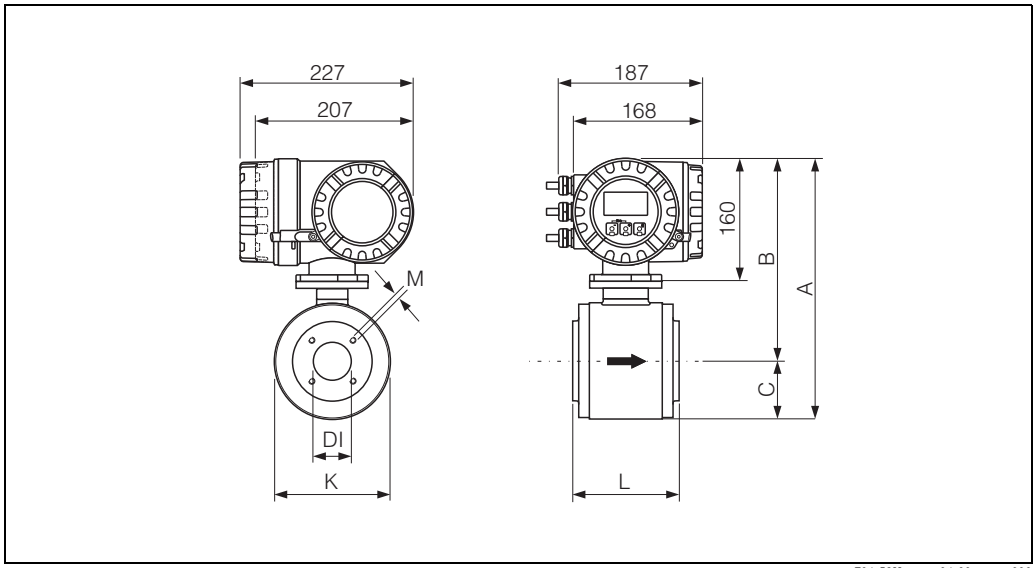
Wall-mounting kit



F06-xxHxxxxx-06-07-06-xx-000

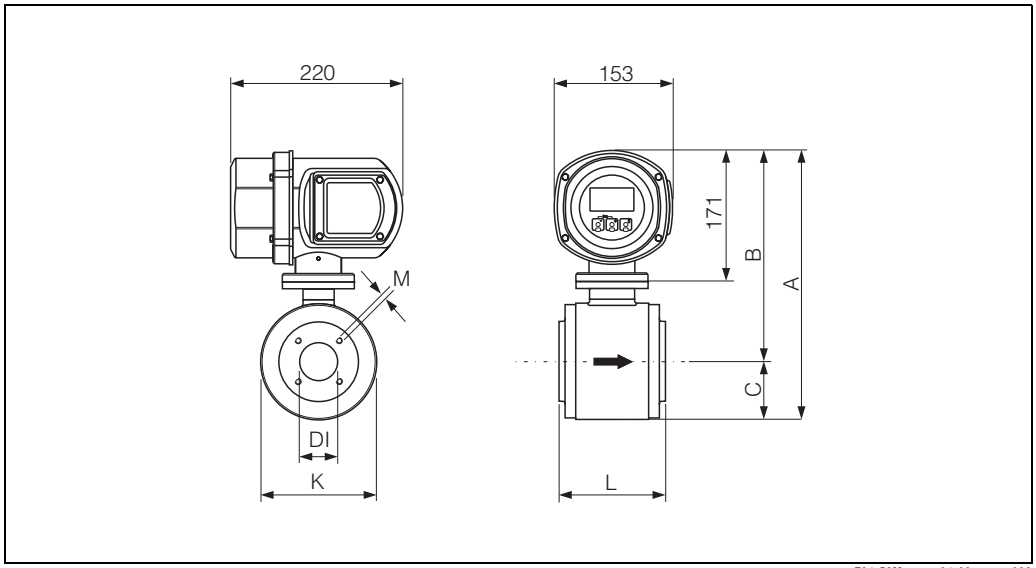
A = 125 mm, B = 88 mm, C = 120 mm, D = Ø 7 mm

Compact version, aluminum field housing DN 40...100



F06-53Hxxxxx-06-00-xx-xx-000

Compact version, stainless-steel field housing DN 40...100

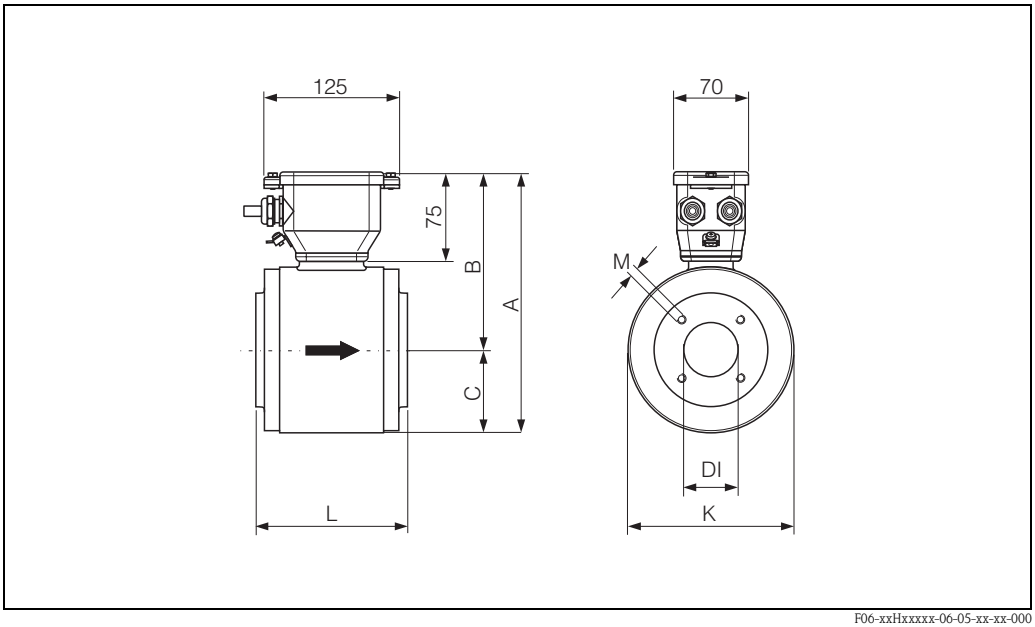


F06-53Hxxxxx-06-00-xx-xx-003

DN		PN	DI	L	A *	B *	C	K	M
[mm]	[inch]	[bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	mm]
40	1 1/2"	16	35.3	140	319 (330)	255 (266)	64	128	M 8x4
50	2"	16	48.1	140	344 (355)	267 (278)	77	153	M 8x4
65	2 1/2"	16	59.9	140	344 (355)	267 (278)	77	153	M 8x4
80	3"	16	72.6	200	394 (405)	292 (303)	102	203	M 12x4
100	4"	16	97.5	200	394 (405)	292 (303)	102	203	M 12x4

Fitting length depends on process connections → Page 27 ff.
* () = Dimensions stainless-steel field housing

Remote version DN 40...100

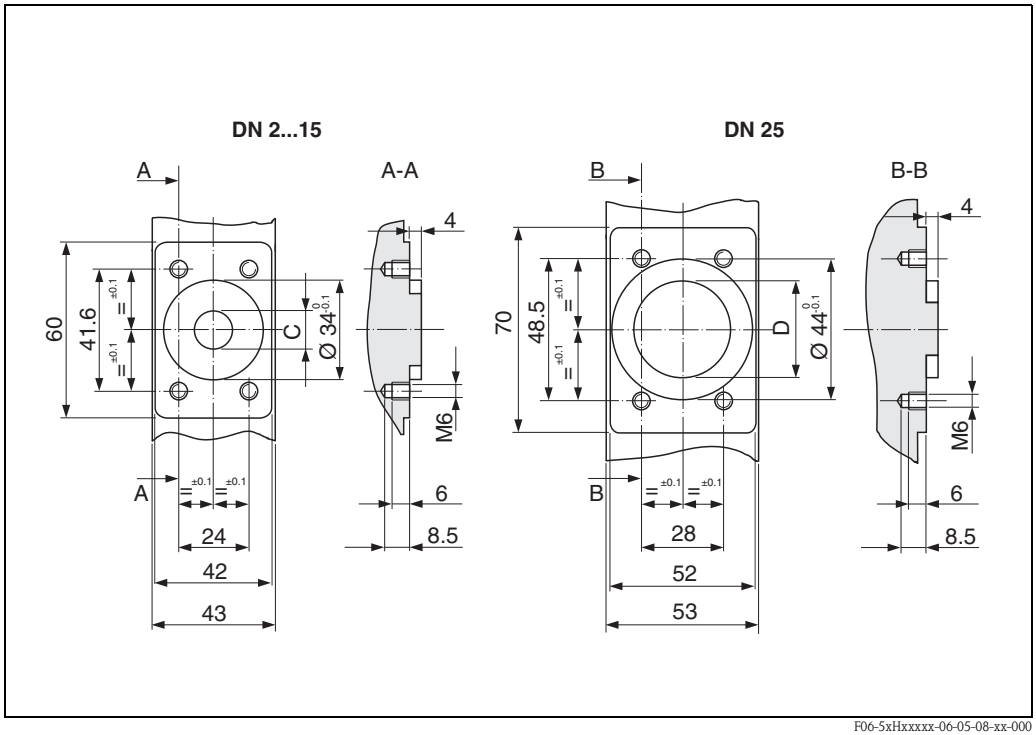


F06-xxHxxxxx-06-05-xx-xx-000

DN		PN	DI	L	A	B	C	K	M
[mm]	[inch]	[bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
40	1 1/2"	16	35.3	140	216	151.5	64.5	128	M 8x4
50	2"	16	48.1	140	241	164.0	77.0	153	M 8x4
65	2 1/2"	16	59.9	140	241	164.0	77.0	153	M 8x4
80	3"	16	72.6	200	290	188.5	101.5	203	M 12x4
100	4"	16	97.5	200	290	188.5	101.5	203	M 12x4

Fitting length depends on process connections → Page 27 ff.
Dimensions wall-mounted housing → Page 20

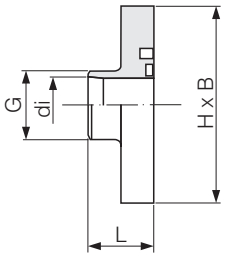
Front view DN 2...25 (without process connection)

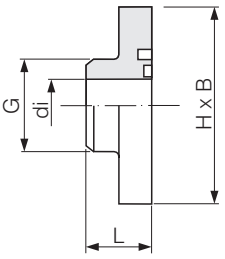


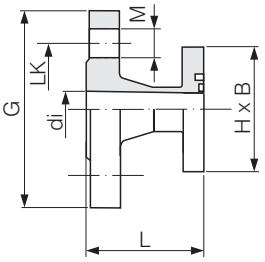
F06-5xHxxxxx-06-05-08-xx-000

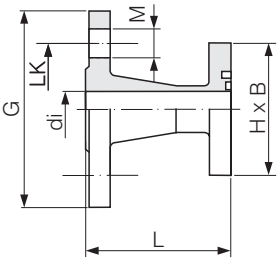
DN [mm]	C [mm]	D (DIN) [mm]	D (ANSI) [mm]
2…8	9	–	–
15	16	–	–
25 (DIN)	–	26	–
25 (1" ANSI)	–	–	22.6

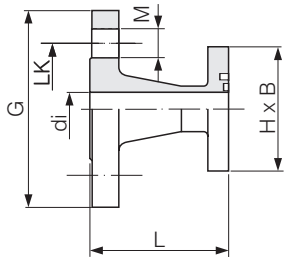
Process connections with O-ring seals (DN 2…25)

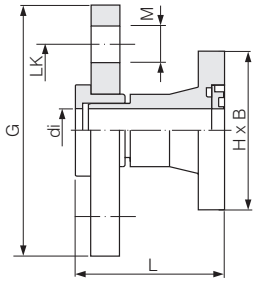
Weld nipples for DIN 1.4404 / 316L 5*H**-B**********	Sensor DN [mm]	Fits to Piping DIN EN ISO 1127	di [mm]	G [mm]	L [mm]	H x B [mm]
 F06-xxHxxxxx-06-09-07-xx-010	2…8	13.5 x 1.6	10.3	13.5	20.3	60 x 42
	15	21.3 x 1.6	18.1	21.3	20.3	60 x 42
	25 (DIN)	33.7 x 2	29.7	33.7	20.3	70 x 52
	Fitting length = (2 x L) + 86 mm					

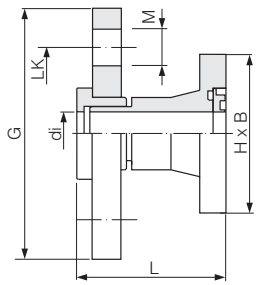
Weld nipples for IPS/SMS pipe 1.4404 / 316L 5*H**-C**********	Sensor DN [mm]	Fits to Piping OD/SMS	di [mm]	G [mm]	L [mm]	H x B [mm]
 F06-xxHxxxxx-06-09-07-xx-012	2…8	13.5 x 2.3	9.0	13.5	20.3	60 x 42
	15	21.3 x 2.65	16.0	21.3	20.3	60 x 42
	25 (1" ANSI)	33.7 x 3.25	27.2	33.7	22.3	70 x 52
	Fitting length = (2 x L) + 86 mm					

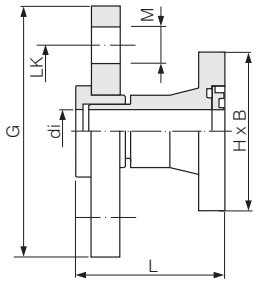
Flange PN 40 EN 1092-1 (DIN 2501), Form B 1.4404 / 316L 5*H**-D**********	Sensor DN [mm]	Fits to Flange EN1092-1 (DIN 2501)	di [mm]	G [mm]	L [mm]	LK [mm]	M [mm]	H x B [mm]
 F06-xxHxxxxx-06-09-07-xx-014	2…8	DN 15	17.3	95	56.2	65	14	60 x 42
	15	DN 15	17.3	95	56.2	65	14	60 x 42
	25 (DIN)	DN 25	28.5	115	56.2	85	14	70 x 52
	Fitting length = (2 x L) + 86 mm Fitting length to DVGW (200 mm)							

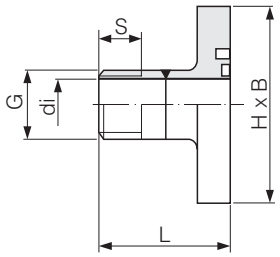
Flange CI 150 / ANSI B16.5 1.4404 / 316L 5*H**-E**********	Sensor DN [mm]	Fits to Flange ANSI B16.5	di [mm]	G [mm]	L [mm]	LK [mm]	M [mm]	H x B [mm]
 F06-xxHxxxxx-06-09-07-xx-015	2…8	1/2"	15.7	89	66.0	60.5	15.7	60 x 42
	15	1/2"	16.0	89	66.0	60.5	15.7	60 x 42
	25 (1" ANSI)	1"	26.7	108	71.8	79.2	15.7	70 x 52
	Fitting length = (2 x L) + 86 mm							

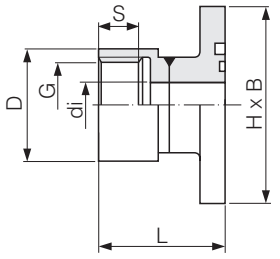
Flange 20 K / JIS B2238 **1.4404 / 316L** 5*H**-F**********	**Sensor** DN [mm]	**Fits to** Flange B2238	**di** [mm]	**G** [mm]	**L** [mm]	**LK** [mm]	**M** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-016	2…8	ND 15	15	95	67	70	15	60 x 42
	15	ND 15	16	95	67	70	15	60 x 42
	25 (DIN)	ND 25	26	125	67	95	19	70 x 52
	Fitting length = (2 x L) + 86 mm							

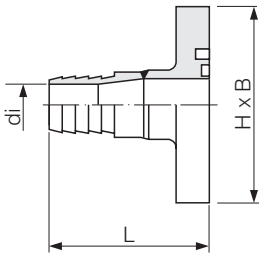
Flange PN 16 / EN 1092-1 **(DIN 2501)** **PVDF** 5*H**-G**********	**Sensor** DN [mm]	**Fits to** Flange EN1092-1 (DIN 2501)	**di** [mm]	**G** [mm]	**L** [mm]	**M** [mm]	**LK** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-029	2…8	DN 15	15.7	95	57	14	65	60 x 42
	15	DN 15	15.7	95	57	14	65	60 x 42
	25 (DIN)	DN 25	27.3	115	57	14	85	70 x 52
	– Fitting length = (2 x L) + 86 mm – Fitting length to DVGW (200 mm) – The requisite ground rings can be ordered as accessories (Order No. DK5HR-****)							

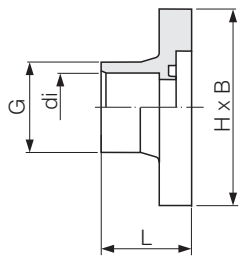
Flange CI 150 / ANSI B16.5 **PVDF** 5*H**-H**********	**Sensor** DN [mm]	**Fits to** Flange ANSI B16.5	**di** [mm]	**G** [mm]	**L** [mm]	**M** [mm]	**LK** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-029	2…8	1/2"	15.7	95	57	16	60	60 x 42
	15	1/2"	15.7	95	57	16	60	60 x 42
	25 (1" ANSI)	1"	27.3	115	57	16	79	70 x 52
	– Fitting length = (2 x L) + 86 mm – The requisite ground rings can be ordered as accessories (Order No. DK5HR-****)							

Flange 10K / JIS B2238 **PVDF** 5*H**-J**********	**Sensor** DN [mm]	**Fits to** Flange B2238	**di** [mm]	**G** [mm]	**L** [mm]	**M** [mm]	**LK** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-029	2…8	ND 15	15.7	95	57	15	70	60 x 42
	15	ND 15	15.7	95	57	15	70	60 x 42
	25 (DIN)	ND 25	27.3	125	57	19	90	70 x 52
	– Fitting length = (2 x L) + 86 mm – The requisite ground rings can be ordered as accessories (Order No. DK5HR-****)							

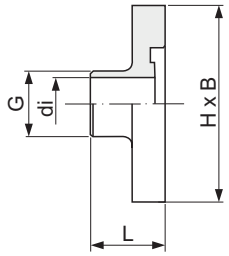
External pipe thread ISO 228 / DIN 2999 **1.4404 / 316L** 5*H**-K**********	**Sensor** DN [mm]	**Fits to** Internal thread [inch]	**di** [mm]	**G** [inch]	**L** [mm]	**S** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-025	2…8	R 3/8"	10	3/8"	40	10.1	60 x 42
	15	R 1/2"	16	1/2"	40	13.2	60 x 42
	25 (1" ANSI)	R 1"	25	1"	42	16.5	70 x 52
	Fitting length = (2 x L) + 86 mm						

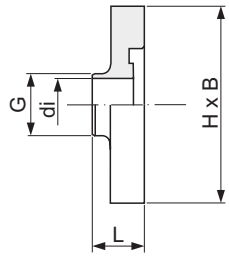
Internal pipe thread ISO 228 / DIN 2999, 1.4404 / 316L 5*H**-L**********	**Sensor** DN [mm]	**Fits to** External thread [inch]	**di** [mm]	**G** [inch]	**D** [mm]	**L** [mm]	**S** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-027	2…8	Rp 3/8"	9.0	3/8"	22	45	13	60 x 42
	15	Rp 1/2"	16.0	1/2"	27	45	14	60 x 42
	25 (1" ANSI)	Rp 1"	27.2	1"	40	51	17	70 x 52
	Fitting length = (2 x L) + 86 mm							

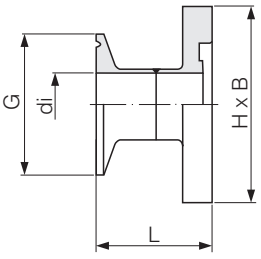
Hose connection **1.4404 / 316L** 5*H**-M/N/P**********	**Sensor** DN [mm]	**Fits to** Inside diameter [mm]	**di** [mm]	**LW** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-024	2…8	13	10.0	13	49	60 x 42
	15	16	12.6	16	49	60 x 42
	15	19	16.0	19	49	60 x 42
	Fitting length = (2 x L) + 86 mm					

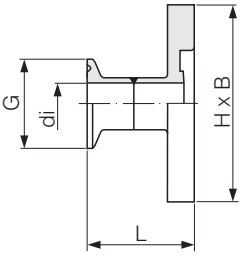
Adhesive fitting **PVC** 5*H**-R/S**********	**Sensor** DN [mm]	**Fits to** pipe	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-028	2…8	1/2" [inch]	21.5	27.3	38.5	60 x 42
	2...8	20 x 2 [mm] (DIN 8062)	20.2	27.0	38.5	60 x 42
	15	20 x 2 [mm] (DIN 8062)	20.2	27.0	28.0	60 x 42
	– Fitting length = (2 x L) + 86 mm – The requisite ground rings can be ordered as accessories (Order No. DK5HR-****)					

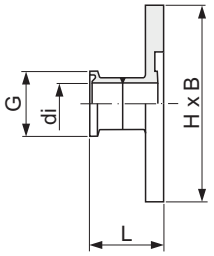
Process connections with aseptic gasket seal (DN 2…25)

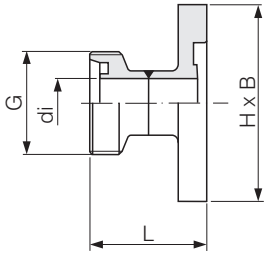
Weld nipple for DIN 1.4404 / 316L 5*H**-U**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 A0003870	2…8	14 x 2	9	14	23.3	60 x 42
	15	20 x 2	16	20	23.3	60 x 42
	25 (DIN)	30 x 2	26	30	23.3	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

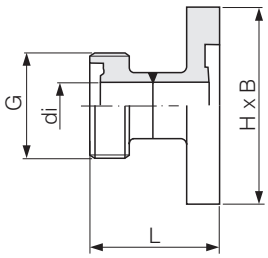
Weld nipples for ODT/SMS 1.4404 / 316L 5*H**-V**********	**Sensor** DN [mm]	**Fits to** Piping OD/SMS	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 A0003871	2…8	12.7 x 1.65	9.0	12.7	16.1	60 x 42
	15	19.1 x 1.65	16.0	19.1	16.1	60 x 42
	25 (1" ANSI)	24.5 x 1.65	22.6	25.4	16.1	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

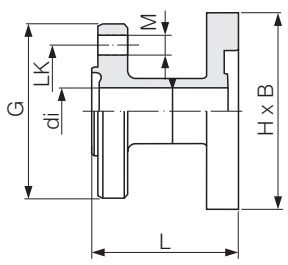
Clamp ISO 2852, Fig. 2 1.4404 / 316L 5*H**-W**********	**Sensor** DN [inch]	**Fits to** Piping ISO 2037 / BS 4825-1	**Clamp ISO 2852** Diameter [mm]	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-023	25 (1" ANSI)	Tube 25.4 x 1.65	25	22.6	50.5	44.3	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.						

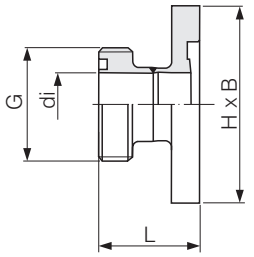
Clamp DIN 32676 1.4404 / 316L 5*H**-0**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-019	2…8	Tube 14 x 2 (DN 10)	10	34.0	41.0	60 x 42
	15	Tube 20 x 2 (DN 15)	16	34.0	41.0	60 x 42
	25 (DIN)	Tube 30 x 2 (DN 25)	26	50.5	44.5	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

Tri-clamp L14 AM7 **1.4404 / 316L** 5*H**-1**********	**Sensor** DN [mm]	**Fits to** Piping OD	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 A0003872	2…8	Tube 12.7 x 1.65 (ODT 1/2")	9.4	25.0	28.5	60 x 42
	15	Tube 19.1 x 1.65 (ODT 3/4")	15.8	25.0	28.5	60 x 42
	25 (1" ANSI)	Tube 25.5 x 1.65 (ODT 1")	22.1	50.4	28.5	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

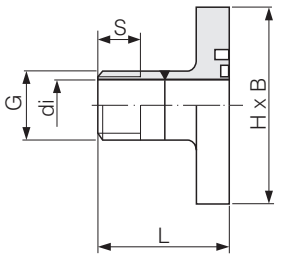
Coupling SC DIN 11851 **Threaded adapter** **1.4404 / 316L** 5*H**-2**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-017	2…8	Tube 12 x 1 (DN 10)	10	Rd 28 x 1/8"	44	60 x 42
	15	Tube 18 x 1 or 1.5 (DN 15)	16	Rd 34 x 1/8"	44	60 x 42
	25 (DIN)	Tube 28 x 1 or 1.5 (DN 25)	26	Rd 52 x 1/6"	52	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

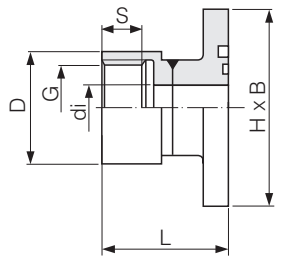
Coupling DIN 11864-1 **Aseptic threaded adapter, Form A** **1.4404 / 316L** 5*H**-3**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-021	2…8	Tube 13 x 1.5 (DN 10)	10	Rd 28 x 1/8"	42	60 x 42
	15	Tune 19 x 1.5 (DN 15)	16	Rd 34 x 1/8"	42	60 x 42
	25 (DIN)	Tube 29 x 1.5 (DN 25)	26	Rd 52 x 1/6"	49	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

Flange DIN 11864-2 **Aseptic grooved flange, Form A** **1.4404 / 316L** 5*H**-4**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**L** [mm]	**LK** [mm]	**M** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-022	2…8	Tube 13 x 1.5 (DN 10)	10	54	48.5	37	9	60 x 42
	15	Tube 19 x 1.5 (DN 15)	16	59	48.5	42	9	60 x 42
	25 (DIN)	Tube 29 x 1.5 (DN 25)	26	70	48.5	53	9	70 x 52
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.							

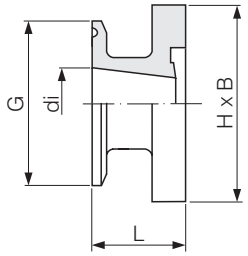
Coupling SMS 1145 **Threaded adapter** **1.4404 / 316L** 5*H**-5**********	**Sensor** DN [mm]	**Fits to** Piping OD	**SMS 1145** Diameter [mm]	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-026	25 (1" ANSI)	1"	25	22.6	Rd 40 x 1/6"	30.8	70 x 52
– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.							

Process connections orderable only as accessories (with O-ring seal, DN 2…25)

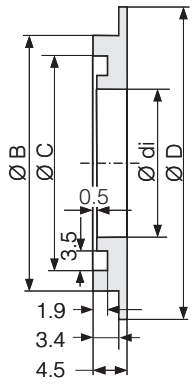
External pipe thread **1.4404 / 316L** DKH**-GD**	**Sensor** DN [mm]	**Fits to** NP internal thread	**di** [mm]	**G** [inch]	**L** [mm]	**S** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-025	2…8	NPT 3/8"	10	3/8"	50	15.5	60 x 42
	15	NPT 1/2"	16	1/2"	50	20.0	60 x 42
	25 (1" ANSI)	NPT 1"	25	1"	57	25.0	70 x 52
Fitting length = (2 x L) + 86 mm							

Internal pipe thread **1.4404 / 316L** DKH**-GC**	**Sensor** DN [mm]	**Fits to** NP external thread	**di** [mm]	**G** [inch]	**D** [mm]	**L** [mm]	**S** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-027	2…8	NPT 3/8"	8.9	3/8"	22	45	13	60 x 42
	15	NPT 1/2"	16.0	1/2"	27	45	14	60 x 42
	25 (1" ANSI)	NPT 1"	27.2	1"	40	51	17	70 x 52
Fitting length = (2 x L) + 86 mm								

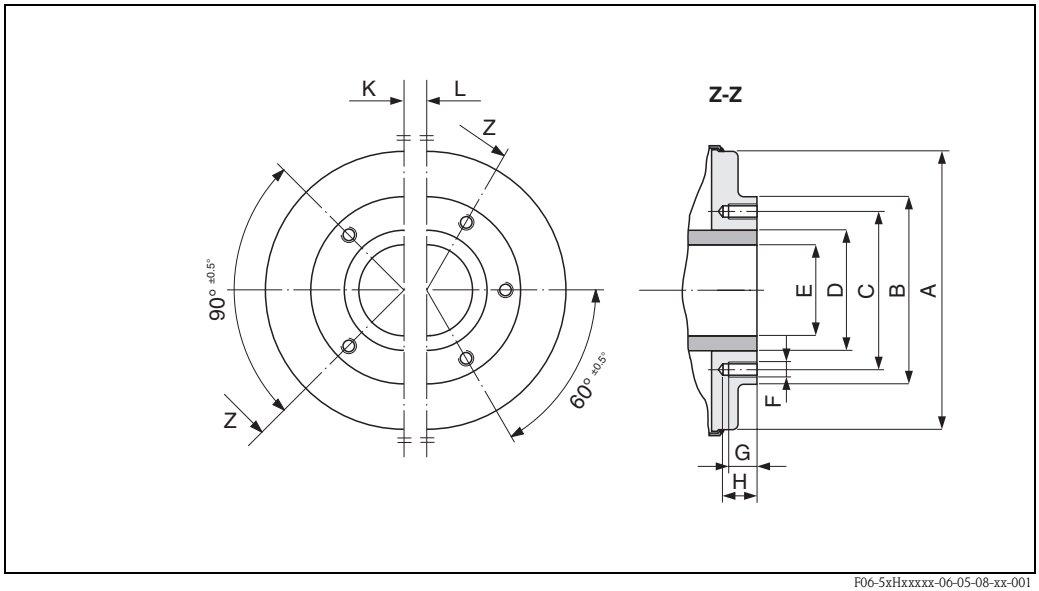
Process connections orderable only as accessories (with aseptic gasket seal)

Tri-Clamp L14 AM7 1.4404 / 316L DKH**-HF***	**Sensor** DN [mm]	**Fits to** Piping OD	**di** [mm]	**G** [mm]	**L** [mm]	**H x B** [mm]
 F06-xxHxxxxx-06-09-07-xx-018	15	Tube 25.4 x 1.5 (ODT; 1")	22.1	50.4	28.5	60 x 42
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 22) and process connection (di) into account.					

Ground rings (accessories for PVDF flanges / PVC adhesive fitting)

Ground ring 1.4435/316L, Alloy C-22, tantalum DK5HR – ****	**Sensor** DN [mm]	**di** [mm]	**D** [mm]	**B** [mm]	**C** [mm]
 F06-xxHxxxxx-06-09-07-xx-030	2…8	9.0	33.9	22.0	17.6
	15	16.0	33.9	29.0	24.6
	25 (1" ANSI)	22.6	43.9	36.5	31.2
	25 (DIN)	26.0	43.9	39.0	34.6

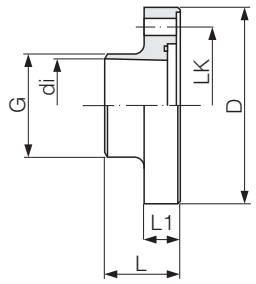
Front view DN 40...100 (without process connection)

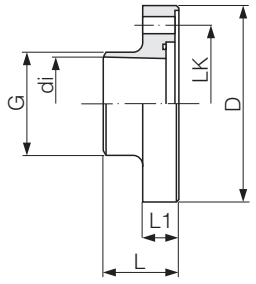


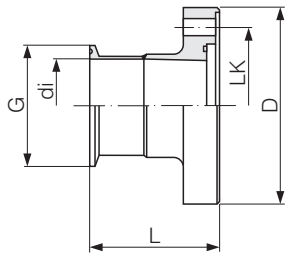
F06-5xHxxxxx-06-05-08-xx-001

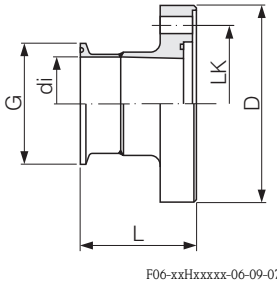
DN	A	B	C	D	E	F	G	H	L	K
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Thread holes	
40	122.0	86	71.0	51.0	35.3	M 8	15	18	–	4
50	147.0	99	83.5	63.5	48.1	M 8	15	18	–	4
65	147.0	115	100.0	76.1	59.9	M 8	15	18	6	–
80	197.0	141	121.0	88.9	72.6	M 12	15	20	–	4
100	197.0	162	141.5	114.3	97.5	M 12	15	20	6	–

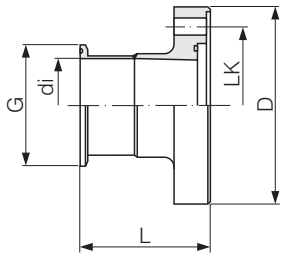
Process connections with gasket seal (DN 40…100)

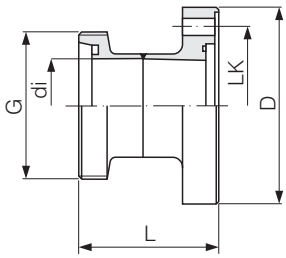
Weld nipples for DIN 1.4404 / 316L 5*H**-U**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**L1** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-00	40	42 x 2	38.0	43	92	42	19	71.0
	50	54 x 2	50.0	55	105	42	19	83.5
	65	70 x 2	66.0	72	121	42	21	100.0
	80	85 x 2	81.0	87	147	42	24	121.0
	100	104 x 2	100.0	106	168	42	24	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

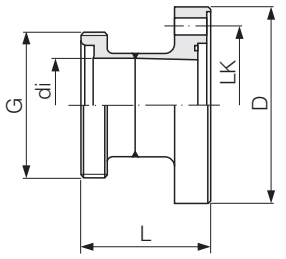
Weld nipples for ODT/SMS 1.4404 / 316L 5*H**-V**********	**Sensor** DN [mm]	**Fits to** Piping OD/SMS	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**L1** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-002	40	38.1 x 1.65	35.3	40	92	42	19	71.0
	50	50.8 x 1.65	48.1	55	105	42	19	83.5
	65	63.5 x 1.65	59.9	66	121	42	21	100.0
	80	76.2 x 1.65	72.6	79	147	42	24	121.0
	100	101.6 x 1.65	97.5	104	168	42	24	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

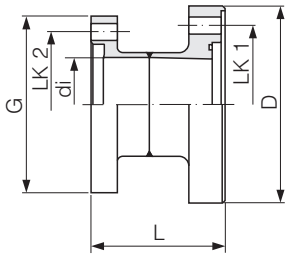
Clamp ISO 2852, Fig 2. 1.4404 / 316L 5*H**-W**********	**Sensor** DN [mm]	**Fits to** Piping ISO 2037 / BS 4825-1	**Clamp ISO 2852** Diameter [mm]	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-005	40	38.0 x 1.6	38.0	35.6	50.5	92	68.5	71.0
	50	51.0 x 1.6	51.0	48.6	64.0	105	68.5	83.5
	65	63.5 x 1.6	63.5	60.3	77.5	121	68.5	100.0
	80	76.1 x 1.6	76.1	72.9	91.0	147	68.5	121.0
	100	101.6 x 2.0	101.6	97.6	119.0	168	68.5	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

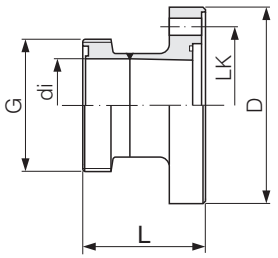
Clamp DIN 32676 1.4404 / 316L 5*H**-0**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-008	40	42 x 2	38	50.5	92	61.5	71.0
	50	54 x 2	50	64.0	105	61.5	83.5
	65	70 x 2	66	91.0	121	68.0	100.0
	80	85 x 2	81	106.0	147	68.0	121.0
	100	104 x 2	100	119.0	168	68.0	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.						

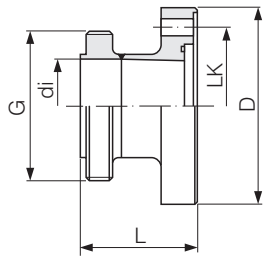
Tri-Clamp L14 AM7 **1.4404 / 316L** 5*H**-1**********	**Sensor**		**Fits to**	**di**	**G**	**D**	**L**	**LK**
	DN [mm]	DN [inch]	Piping OD	[mm]	[mm]	[mm]	[mm]	[mm]
 F06-xxHxxxxx-06-09-07-xx-004	40	1 1/2"	38.1 x 1.65	34.8	50.4	92	68.6	71.0
	50	2"	50.8 x 1.65	47.5	63.9	105	68.6	83.5
	65	–	63.5 x 1.65	60.2	77.4	121	68.6	100.0
	80	3"	76.2 x 1.65	72.9	90.9	147	68.6	121.0
	100	4"	101.6 x 1.65	97.4	118.9	168	68.6	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

Coupling SC DIN 11851 **Threaded adapter** **1.4404 / 316L** 5*H**-2**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-001	40	42 x 2	38	Rd 65 x 1/6"	92	72	71.0
	50	54 x 2	50	Rd 78 x 1/6"	105	74	83.5
	65	70 x 2	66	Rd 95 x 1/6"	121	78	100.0
	80	85 x 2	81	Rd 110 x 1/4"	147	83	121.0
	100	104 x 2	100	Rd 130 x 1/4"	168	92	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.						

Coupling DIN 11864-1 **Aseptic threaded adapter, Form A** **1.4404 / 316L** 5*H**-3**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-006	40	42 x 2	38	Rd 65 x 1/6"	92	71	71.0
	50	54 x 2	50	Rd 78 x 1/6"	105	71	83.5
	65	70 x 2	66	Rd 95 x 1/6"	121	76	100.0
	80	85 x 2	81	Rd 110 x 1/4"	147	82	121.0
	100	104 x 2	100	Rd 130 x 1/4"	168	90	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.						

Flange DIN 11864-2 **Aseptic flat flange, Form A** **1.4404/316L** 5*H**-4**********	**Sensor** DN [mm]	**Fits to** Piping DIN 11850	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK1** [mm]	**LK2** [mm]
 F06-xxHxxxxx-06-09-07-xx-007	40	42 x 2	38	82	92	64	71.0	65
	50	54 x 2	50	94	105	64	83.5	77
	65	70 x 2	66	113	121	64	100.0	95
	80	85 x 2	81	133	147	98	121.0	112
	100	104 x 2	100	159	168	98	141.5	137
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

Coupling SMS 1145 **Threaded adapter** **1.4404 / 316L** 5*H**-5**********	**Sensor** DN [mm]	**Fits to** Piping OD	**SMS 1145** Diameter [mm]	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-000	40	38.1 x 1.65	38.0	35.5	Rd 60 x 1/6"	92	63	71.0
	50	50.8 x 1.65	51.0	48.5	Rd 70 x 1/6"	105	65	83.5
	65	63.5 x 1.65	63.5	60.5	Rd 85 x 1/6"	121	70	100.0
	80	76.2 x 1.65	76.0	72.0	Rd 98 x 1/6"	147	75	121.0
	100	101.6 x 1.65	101.6	97.6	Rd 132 x 1/6"	168	70	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

Coupling ISO 2853 **Threaded adapter** **1.4404 / 316L** 5*H**-6**********	**Sensor** DN [mm]	**Fits to** Piping ISO 2037 / BS 4825-1	**ISO 2853** Diameter [mm]	**di** [mm]	**G** [mm]	**D** [mm]	**L** [mm]	**LK** [mm]
 F06-xxHxxxxx-06-09-07-xx-003	40	38.0 x 1.6	38.0	35.6	50.6	92	61.5	71.0
	50	51.0 x 1.6	51.0	48.6	64.1	105	61.5	83.5
	65	63.5 x 1.6	63.5	60.3	77.6	121	61.5	100.0
	80	76.1 x 1.6	76.1	72.9	91.1	147	61.5	121.0
	100	101.6 x 2.0	101.6	97.6	118.1	168	61.5	141.5
	– Fitting length = (2 x L) + 136 mm (DN 40…65) / + 196 mm (DN 80…100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 24) and process connection (di) into account.							

Weight

Weight data in [kg]

Nominal diameter		Compact version	Remote version (without cable)	
[mm]	[inch]		Sensor	Wall housing
2	1/12"	5.2	2.5	6.0
4	5/32"	5.2	2.5	6.0
8	5/16"	5.3	2.5	6.0
15	1/2"	5.4	2.6	6.0
25	1"	5.5	2.8	6.0
40	1 1/2"	6.5	4.5	6.0
50	2"	9.0	7.0	6.0
65	2 1/2"	9.5	7.5	6.0
80	3"	19.0	17.0	6.0
100	4"	18.5	16.5	6.0

Transmitter Promag (compact version): 3.4 kg
(Weight data valid for standard pressure ratings and without packaging material)

Materials

Transmitter housing:
- Compact housing: powder coated die-cast aluminium or stainless-steel field housing 1.4301/316L
- Wall-mounted housing: powder coated die-cast aluminium

Sensor housing: 1.4301
Wall mounting (holder panel): 1.4301

Measuring tube: stainless steel 1.4301 or 1.4306/304L

Flange:
- All connections 1.4404/316L
- Flanges (EN (DIN), ANSI, JIS) made of PVDF
- Adhesive fitting made of PVC

Ground disks (accessory): 1.4435/316L, Tantalum, Alloy C-22

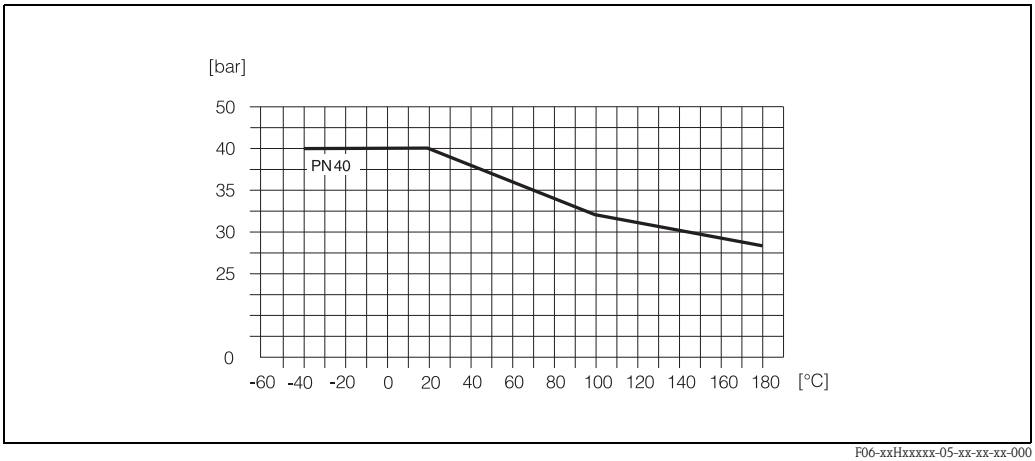
Electrodes:
Standard: 1.4435
Option: Alloy C-22, tantalum, platinum/rhodium 80/20 (up to DN 25 only)

Seals:
- DN 2...25: O-ring (EPDM, Viton, Kalrez) or gasket seal (EPDM, silicone, Viton)
- DN 40...100: gasket seal (EPDM, silicone)

Material load diagrams

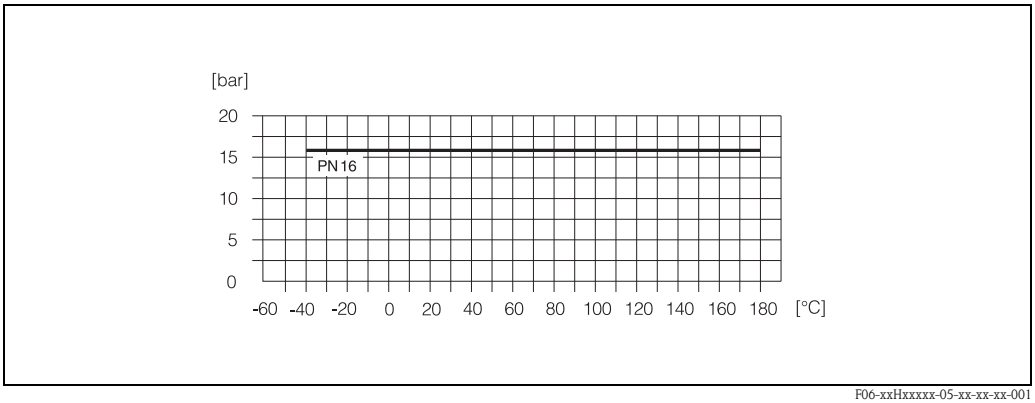
Caution!
The following diagrams contain material load curves (reference curves) for various process connections relating to the fluid temperature. But the maximal permissible fluid temperature always depends on the lining material of the sensor and/or the sealing material (s. Page 18).

Weld nipple to DIN EN ISO 1127, ODT / SMS, coupling to ISO 228 / DIN 2999
Weld nipple material: 1.4404 / 316L (with O-ring)



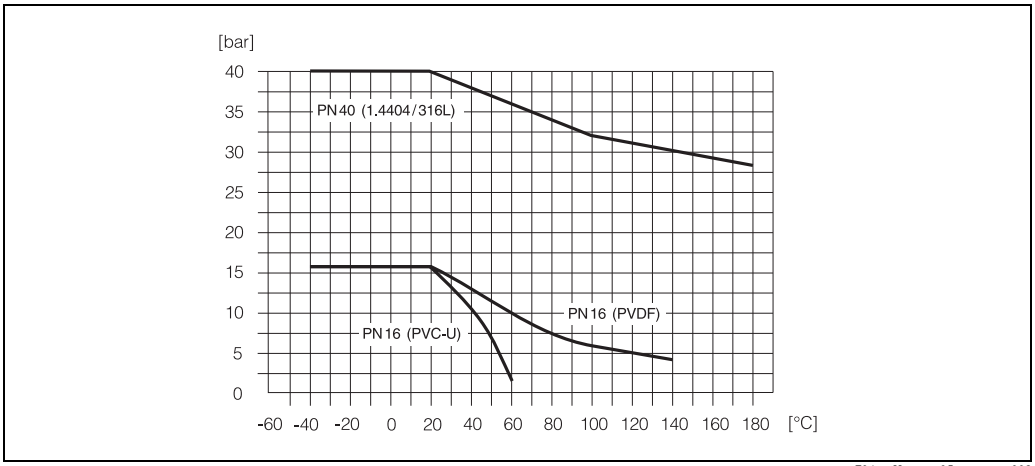
F06-xxHxxxxx-05-xx-xx-xx-000

Weld nipple to DIN 11850, ODT / SMS, Clamp (ODT, ISO 2852, DIN 32676, L14 AM7), coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145), flange DIN 11864-2
Weld nipple material: 1.4404 / 316L (with gasket seal)



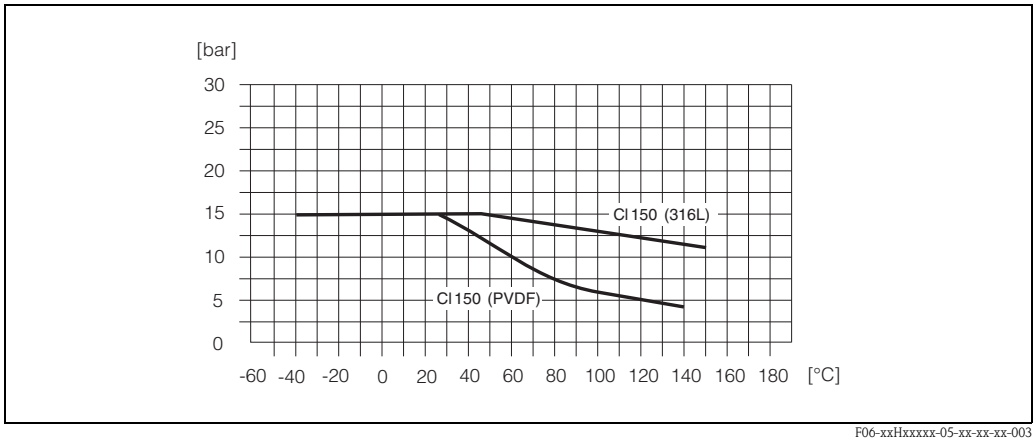
F06-xxHxxxxx-05-xx-xx-xx-001

Flange connection to EN 1092-1 (DIN 2501), adhesive fitting
Flange material: 1.4404 / 316L, PVDF, PVC-U



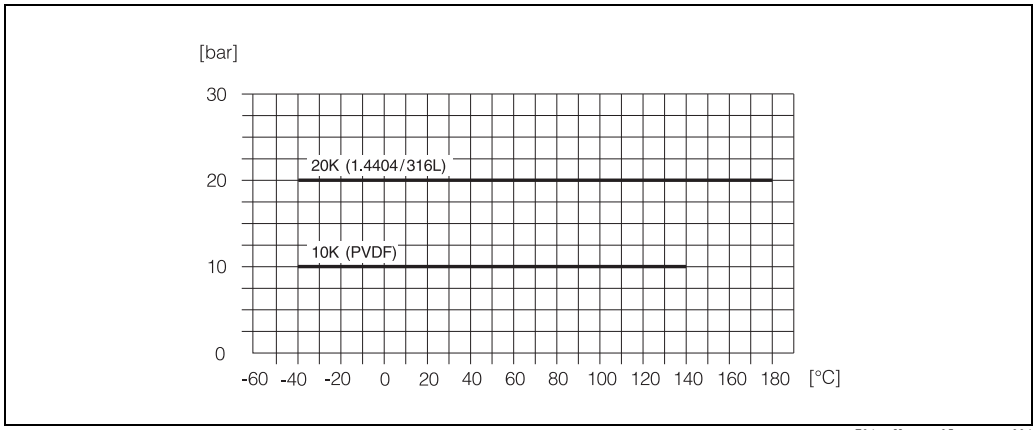
F06-xxHxxxxx-05-xx-xx-xx-002

Flange connection to ANSI B16.5
Flange material: 1.4404 / 316L, PVDF



F06-xxHxxxxx-05-xx-xx-xx-003

Flange connection to JIS B2238
Flange material: 1.4404 / 316L, PVDF



F06-xxHxxxxx-05-xx-xx-xx-004

Fitted electrodes

Measuring electrodes and EPD electrodes
- Standard with: 1.4435, Alloy C-22, tantalum, platinum/rhodium 80/20
- DN 2...4: without EPD electrode

Process connection

- With O-ring: welding nipples (DIN EN ISO 1127, ODT / SMS), flanges (EN (DIN), ANSI, JIS), PVDF flanges (EN (DIN), ANSI, JIS), external pipe thread, internal pipe thread, hose connection, PVC adhesive fittings
- With gasket seal: weld nipples (DIN 11850, ODT / SMS), clamps (ISO 2852, DIN 32676, L14 AM7), threaded fasteners (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145), flanges DIN 11864-2

Surface roughness

- PFA liner: ≤ 0.4 µm
- Electrodes:
  – 1.4435, Alloy C-22: 0.3...0.5 µm
  – Tantalum, platinum/rhodium: 0.3...0.5 µm
- Process connection: ≤ 0.8 µm

(all data relate to parts in contact with the medium)

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: 2 totalizers
  Promag 53: 3 totalizers

Operating elements

Unified control 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 Touch Control (–, +, E)
- Application-specific Quick Setup menus for straightforward commissioning

Language group

Language groups available for operation in different countries:

Promag 50, Promag 53:
- 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

Promag 53:
- China (CIN):
  English, Chinese

You can change the language group via the operating program “ToF Tool – Fieldtool Package.”

Remote operation

Promag 50: Remote control via HART, PROFIBUS DP/PA (DP in preparation)
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.

Sanitary compatibility

3A authorization and EHEDG-tested
Seals in conformity with FDA (except Kalrez seals)

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

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:

- 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

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:

- 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

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/A1 (IEC 6326):
Electromagnetic compatibility (EMC requirements)

NAMUR NE 21:
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.

NAMUR NE 43:
Standardisation of the signal level for the breakdown information of digital transmitters with analogue output signal.

NAMUR NE 53:
Software of field devices and signal-processing devices with digital electronics.

Ordering information

The Endress+Hauser 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 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
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MODBUS®
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Subject to modification

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