

## Application

Cooling and heating energy meter can perform bidirectional flow measurement of liquids, the minimum conductivity of the measured liquid should be  $\geq 5 \mu\text{S/cm}$ :

- Drinking water
- Sewage
- Sludge
- Flow measurement up to 110,000 m<sup>3</sup>/h (484,315 gal/min)
- Fluid temperature up to +250 °C (+482°F)
- Process pressures up to 40 bar (580 psi)
- Assembly lengths according to DVGW/ISO standards

## Advantages

Series 100 energy meters are an economical energy measurement solution for high-accuracy measurements under a wide variety of process conditions.

Series 100 transmitters have the following benefits:

- Adopt self-adhesive high-temperature coil technology, fully plastic-sealed and moisture-resistant.
- Batch control, electrode cleaning and pulsatile flow measurement software optional.
- High reliability and high measurement stability.
- Measurable range, turndown ratio up to 200:1
- New high-definition backlight, square screen design, more comprehensive display content, status display and faults such as accumulated heat, accumulated flow, instantaneous heat, instantaneous flow, inlet water temperature, outlet water temperature, and temperature difference code display.
- New optical button adjustment, equipped with remote control to assist remote operation, the distance can reach 5 meters, giving users a new operating experience, suitable for adjusting parameters in explosion-proof places.

## Design Features

1. Using 16-bit single-chip microcomputer for data calculation, platinum thermal resistance for temperature measurement, and electromagnetic flowmeter for flow measurement, it has high measurement accuracy, stable and reliable operation, and excellent performance.
2. Measurement accuracy is not affected by changes in parameters such as heat transfer fluid viscosity, density, pressure and conductivity, and fluid distribution.
3. There are no resistance parts in the measuring tube, no pressure loss, and is not affected by bad water quality.
4. The measurement flow range is wide, and the flow velocity can be arbitrarily set within the range of 1m/s ~ 10m/s.
5. The large-screen LCD backlight has a full Chinese display mode, which can be clearly read in strong light and no light.
6. It has cumulative heat, cumulative flow, instantaneous heat, instantaneous flow, inlet water temperature, outlet water temperature, temperature difference, etc.
7. Data display function at the same time, can query and display parameters such as flow rate, power failure record and so on.
8. The enthalpy heat correction method of random temperature change is adopted to ensure accurate measurement at different water temperatures.
9. It has a unified DC signal and frequency signal output function, and this function can be switched between heat and flow parameters.



10. It has the functions of batch processing (quantitative output), equivalent pulse output, and direct clearing by keying.
11. The RS-485 (RS-232, M-BUS and HART optional) digital communication output is convenient to realize remote communication.
12. With password protection function, the working parameters can not be modified without password.

## Technical data

### 1. Overview of hot water / cooling water electromagnetic flow meter

FT100 hot water / cooling water electromagnetic flow meter is a measuring device that measures the heat released by the heat transfer fluid in the heat conversion system. It uses a high-precision, high-reliability electromagnetic flowmeter for flow measurement, and uses a high-precision, high-stability platinum thermal resistance for temperature measurement, which lead to a good measurement performance. It can be widely used in residential districts, office buildings or central heating and air conditioning.

### 2. Technical parameters of hot water / cooling water electromagnetic flow meter

(1) Technical parameters of converter for hot water / cooling water electromagnetic flow meter:

Power supply: 220V AC (110VAC ~ 245VAC), 24VDC

Power consumption: ≤20W (matching power consumption)

Accuracy level: level 1 or level 2 (matching accuracy)

Protection level: IP65

Ambient temperature: Class A

Temperature resolution: 0.01 °C

Optional temperature measurement range: -30 °C to 180 °C

Temperature difference measurement range: 1 °C ~ 90 °C

Maximum flow reading (m<sup>3</sup>): 999999999 (ten digits)

Maximum heat reading (Mwh): 999999999 (ten digits)

Thermal unit: kJ, MJ, GJ, kWh, Mwh optional

Analog output: 4 to 20mA DC / 600 load resistance (can be switched between heat and flow parameters)

Pulse output: maximum frequency of 5000Hz, pulse width of 0.1ms to 999.9ms (can switch between heat and flow parameters)

Communication: RS-485 (optional RS-232, M-BUS, HART, etc.)

(2) Technical parameters of sensor for hot water / cooling water electromagnetic flow meter:

Nominal diameter: DN50 ~ DN1200mm

Nominal pressure: 0.6MPa to 4MPa

Lining material: high temperature resistant rubber, PTFE, PFA

Electrode material: Molybdenum-containing stainless steel, Hastelloy B, Hastelloy C, titanium, platinum / iridium alloy, tantalum

Structural form: split type, integrated type

Medium temperature: -30 °C to 180 °C

Connection method: flange type

Note: Select different flow sensors according to different media

(3) Technical parameters of temperature sensor for hot water / cooling water electromagnetic flow meter:

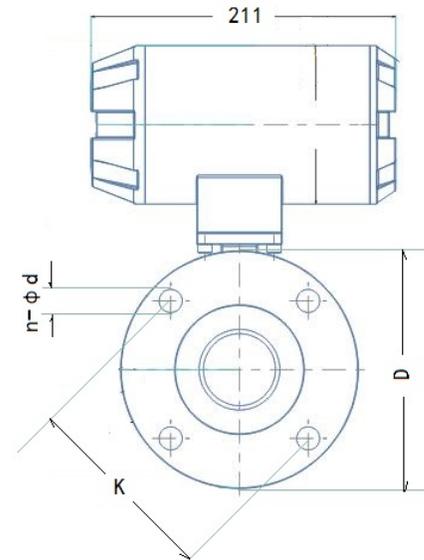
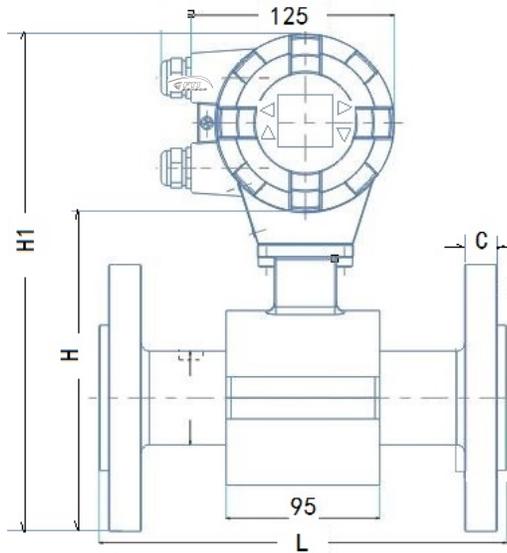
Sensor type: PT1000

Installation: protective sleeve

Temperature measurement range: -50 °C to 200 °C

Wire length: 0.6m to 15m

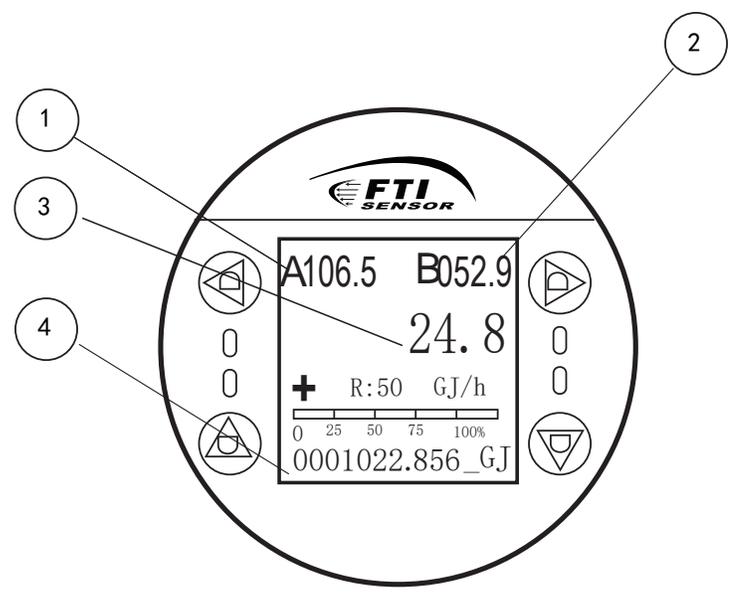
Dimension Drawing



DN	L (mm)	H	H1	H2	D	K	n-φd	C	(Mpa)	(kg)
10	160	120	260	202	90	60	4-φ 14	14	4.0	4.6
15	160	125	265	207	95	65	4-φ 14	14		5.5
20	160	135	275	217	105	75	4-φ 14	16		5.8
25	160	145	285	227	115	85	4-φ 14	16		6.2
32	160	165	305	247	140	100	4-φ 18	18		7.2
40	200	175	315	257	150	110	4-φ 18	18		8.3
50	200	190	330	272	165	125	4-φ 18	20	10	
65	200	210	350	292	185	145	4-φ 18	20	1.6	10.5
80	200	225	365	307	200	160	8-φ 18	20		11.4
100	250	252	392	334	235	180	8-φ 18	22		14.5
125	250	275	415	357	250	210	8-φ 18	22		17.5
150	300	310	450	392	285	240	8-φ 22	24		23
200	350	362	502	444	340	295	12-φ 22	26		32
250	400	420	560	502	395	350	12-φ 22	26	1.0	44
300	500	470	610	552	445	400	12-φ 22	28		56
350	500	525	665	607	500	460	16-φ 22	30		71
400	600	590	730	672	565	515	16-φ 26	32		94
450	600	635	775	717	615	565	20-φ 26	35		106
500	600	690	830	772	670	620	20-φ 26	38		129
600	600	717	937	879	780	725	20-φ 30	42	203	
700	700	912	962	994	895	840	24-φ 30	30	320	
800	800	995	1045	1077	1010	950	24-φ 34	32	450	
900	900	1125	1175	1207	1110	1050	28-φ 34	34	580	
1000	1000	1135	1185	1217	1220	1160	28-φ 36	34	700	
1200	1200	1417	1467	1499	1405	1340	32-φ 33	60	0.6	900
1400	1400	1640	1690	1722	1630	1560	36-φ 36	68		1150
1600	1600	1840	1890	1922	1830	1760	40-φ 36	76		1450
1800	1800	2055	2105	2137	2045	1970	44-φ 39	84		1780

**Equipment versions**

- 1. Inlet / high temperature
- 2. Outlet/Cryogenic
- 3. Instantaneous energy/flow
- 4. Cumulative energy/flow



## Specification - general

### Reference conditions

#### According to EN 29104

<b>Fluid temperature</b>	20 °C (68 °F) ± 2 K
<b>Ambient temperature</b>	20 °C (68 °F) ± 2 K
<b>Supply power</b>	Nominal voltage acc. to name plate $U_n \pm 1 \%$ , frequency $f \pm 1 \%$
<b>Installation conditions</b>	- Upstream >10 x DN, straight section - Downstream >5 x DN, straight section
<b>Warm-up phase</b>	30 min.

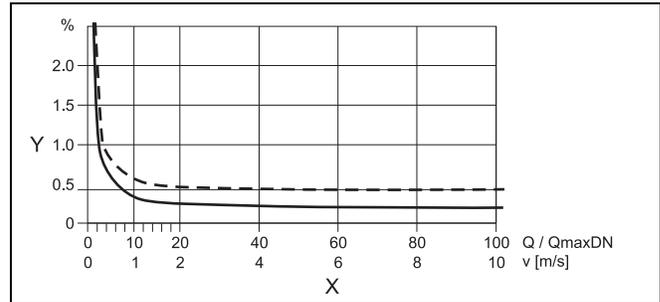


Fig. 1

Y Accuracy ± of measured value in [%]  
X Flow velocity v in [m/s], Q / Qmax<sub>DN</sub> [%]

### Maximum measuring error

#### Impulse output

- Standard calibration:  
± 0.4 % of measured value,  
± 0.02 % Qmax<sub>DN</sub> (DN 3 ... 2000)
- Optional calibration:  
± 0.2 % of measured value,  
± 0.02 % Qmax<sub>DN</sub> (DN 10 ... 600, 800)

### Nominal width and measuring range

The measuring range end value can be configured between 0.02xQ<sub>max</sub>DN and 2xQ<sub>max</sub>DN.

Nominal width		Minimum measuring range end value	Q <sub>max</sub> DN	Maximum measuring range end value
DN	Inch "	0.02xQ <sub>max</sub> DN (≈ 0.2 m/s)	0 to ≈ 10 m/s	2xQ <sub>max</sub> DN (≈ 20 m/s)
10	3/8	0.9 l/min (0.24 US gal/min)	45 l/min (11.9 US gal/min)	90 l/min (23.78 US gal/min)
15	1/2	2 l/min (0.53 US gal/min)	100 l/min (26.4 US gal/min)	200 l/min (52.8 US gal/min)
20	3/4	3 l/min (0.79 US gal/min)	150 l/min (39.6 US gal/min)	300 l/min (79.3 US gal/min)
25	1	4 l/min (1.06 US gal/min)	200 l/min (52.8 US gal/min)	400 l/min (106 US gal/min)
32	1 1/4	8 l/min (2.11 US gal/min)	400 l/min (106 US gal/min)	800 l/min (211 US gal/min)
40	1 1/2	12 l/min (3.17 US gal/min)	600 l/min (159 US gal/min)	1200 l/min (317 US gal/min)
50	2	1.2 m <sup>3</sup> /h (5.28 US gal/min)	60 m <sup>3</sup> /h (264 US gal/min)	120 m <sup>3</sup> /h (528 US gal/min)
65	2 1/2	2.4 m <sup>3</sup> /h (10.57 US gal/min)	120 m <sup>3</sup> /h (528 US gal/min)	240 m <sup>3</sup> /h (1057 US gal/min)
80	3	3.6 m <sup>3</sup> /h (15.9 US gal/min)	180 m <sup>3</sup> /h (793 US gal/min)	360 m <sup>3</sup> /h (1585 US gal/min)
100	4	4.8 m <sup>3</sup> /h (21.1 US gal/min)	240 m <sup>3</sup> /h (1057 US gal/min)	480 m <sup>3</sup> /h (2113 US gal/min)
125	5	8.4 m <sup>3</sup> /h (37 US gal/min)	420 m <sup>3</sup> /h (1849 US gal/min)	840 m <sup>3</sup> /h (3698 US gal/min)
150	6	12 m <sup>3</sup> /h (52.8 US gal/min)	600 m <sup>3</sup> /h (2642 US gal/min)	1200 m <sup>3</sup> /h (5283 US gal/min)
200	8	21.6 m <sup>3</sup> /h (95.1 US gal/min)	1080 m <sup>3</sup> /h (4755 US gal/min)	2160 m <sup>3</sup> /h (9510 US gal/min)
250	10	36 m <sup>3</sup> /h (159 US gal/min)	1800 m <sup>3</sup> /h (7925 US gal/min)	3600 m <sup>3</sup> /h (15850 US gal/min)
300	12	48 m <sup>3</sup> /h (211 US gal/min)	2400 m <sup>3</sup> /h (10567 US gal/min)	4800 m <sup>3</sup> /h (21134 US gal/min)

## Sensor

### Temperatures

The temperature range of the device depends on various factors. These factors include the medium temperature, the ambient temperature, the operating pressure, the lining material, and the approvals for the Ex-protection.

### Storage temperature

-40 to +70 °C (-40 to +158 °F)

### Minimum admissible pressure depending on the medium temperature

#### Sensor housing made of aluminum (shell housing)

Lining	Nominal width	Poperatingabs	at Toperating <sup>a</sup>
Hard rubber	DN 15 to 300 (1/2 to 12")	0 mbar	< 90 °C (194 °F)
PTFE	DN 10 to 300 (3/8 to 12")	270 mbar	< 20 °C (68 °F)
		400 mbar	< 100 °C (212 °F)
		500 mbar	< 130 °C (266 °F)

<sup>a</sup> Higher temperatures are admissible for CIP/SIP cleaning for a limited time (see table „Maximum admissible cleaning temperature“, page 9).

#### Sensor housing made of steel

Lining	Nominal width	Poperatingabs	at Toperating <sup>a</sup>
Hard rubber	DN 40 to 300 (1 1/2 to 12")	600 mbar	< 80 °C (176 °F)
PTFE	DN 25 to 300 (1 to 12")	270 mbar	< 20 °C (68 °F)
		400 mbar	< 100 °C (212 °F)
		500 mbar	< 130 °C (266 °F)

<sup>a</sup> Higher temperatures are admissible for CIP/SIP cleaning for a limited time (see table „Maximum admissible cleaning temperature“, page 9).

### Maximum admissible cleaning temperature

CIP cleaning	Lining Sensor	T <sub>max</sub>	T <sub>max</sub> minutes	T <sub>Amb</sub>
Steam cleaning	PTFE	150 °C (302 °F)	60	25 °C (77 °F)
Liquids	PTFE	140 °C (284 °F)	60	25 °C (77 °F)

If the ambient temperature is > 25 °C, the difference must be subtracted from the max. cleaning temperature.  $T_{max} - \Delta$  °C.

( $\Delta$  °C =  $T_{Amb} - 25$  °C)

## Maximum ambient temperature depending on the medium temperature

Compact design					
Lining	Flange material	Ambient temperature		Medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
			45 °C (113 °F)		130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	90 °C (194 °F)
			45 °C (113 °F)		130 °C (266 °F)

Remote mount design					
Lining	Nominal width	Ambient temperature		Medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

## Protection type according to EN 60529

Compact design (internal transmitter)	IP65, IP67
Remote mount design (external transmitter)	IP65, IP67

## Pipeline vibration according to EN 60068-2-6

Valid for:

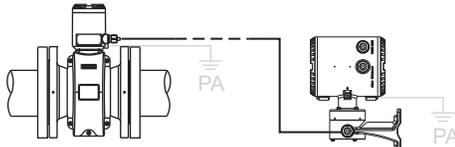
Compact design (With aluminum transmitter housing)	In the range 10 to 58 Hz max. 0.15 mm (0.006") amplitude
	In the range 58 to 150 Hz max. 2 g acceleration
Remote mount design (Sensor)	In the range 10 to 58 Hz max. 0.15 mm (0.006") amplitude
	In the range 58 to 150 Hz max. 2 g acceleration

## Insertion length

The flanged devices comply with the insertion lengths specified according to VDI/VDE 2641, ISO 13359 or according to DVGW (work sheet W420, design WP, ISO 4064 short).

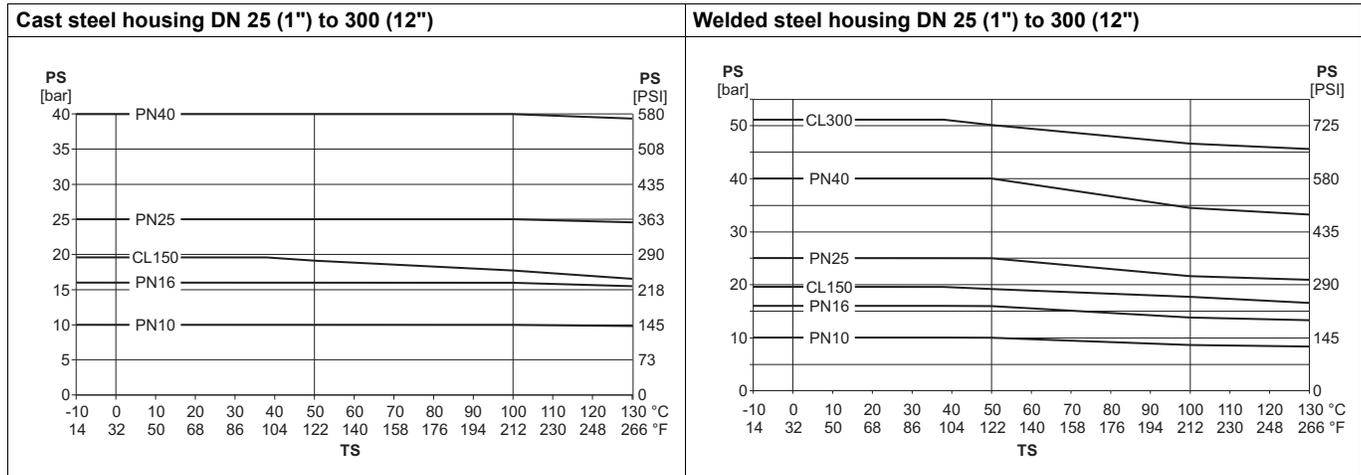
## Signal cable length and preamplifier

For devices in the remote mount design, the electrical connection between the transmitter and sensor is made via a signal cable.

<b>Transmitter housing design</b>	Dual-compartment housing	
<b>Maximum signal cable length</b>	10 m (164 ft)	
Without preamplifier	10 m (164 ft)	
With preamplifier	-	
<b>Scope of delivery</b>	10 m (32.8 ft) permanently installed	

## Material load – sensor housing (steel)

Limits for the admissible fluid temperature (TS) and admissible pressure (PS) are determined by the used liner and flange materials of the device (see device nameplate).



## Transmitter

### Electrical properties

Voltage supply	AC 220 to 230 V (-15 %/+10 %) DC 24 V (-10 %/+10 %)
Supply frequency	47 to 64 Hz
Excitation frequency	6.25 HZ, 7.5 Hz, 12.5 Hz, 15 Hz, 25 Hz, 30 Hz (50/60 Hz voltage supply)
Power consumption	Sensor including transmitter AC S ≤ 20 VA (switch-on current 8.8 A at AC 230 V) DC P ≤ 20 W (switch-on current 5.6 A)
Electrical connection	Screw terminals (maximum 2.5 mm <sup>2</sup> – AWG 14)

### Galvanic isolation

Current output, digital output (DO1 and DO2), and digital input are galvanically isolated from the sensor input circuit and each other. The same applies for the signal outputs of the versions with PROFIBUS-PA.

### Empty pipe detection

#### Requirements for the function:

- Conductivity of the medium to be measured of ≥ 20 μS/cm
- Signal cable length of ≤ 50 m (164 ft)
- Sensor without preamplifier
- Nominal width DN ≥ DN 10

## Mechanical features

Compact design	
Housing	Aluminum casting, painted
Paint	Paint coat $\geq 80 \mu\text{m}$ thick
Cable fitting	Polyamide
Remote mount design	
Housing	Aluminum casting, painted
Paint	Paint coat $\geq 80 \mu\text{m}$ thick
Cable fitting	Polyamide
Weight	4.5 kg (9.92 lb)

## Temperatures

Storage temperature	-40 to +70 °C (-40 to +158 °F)
Ambient temperature	-20 to +60 °C (-4 to +140 °F)

## Protection type

Transmitter housing	IP65, IP67
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## Vibration according to EN 60068-2

Valid for:

Remote mount design (Transmitter)	In the range 10 to 58 Hz max. 0.15 mm (0.006") amplitude <sup>a</sup>
	In the range 58 to 150 Hz max. 2 g acceleration <sup>a</sup>

<sup>a</sup> = Peak load

## Mounting

### Grounding

The grounding of the sensor is important both for safety reasons and for the electromagnetic flowmeter to function properly. The grounding screws of the sensor should be connected to protection conductor potential. For measurement reasons, this should be identical to the medium potential as far as possible.

For plastic lines or pipelines with insulating lining, the grounding is via a grounding plate or grounding electrode. If the pipe section is not free from external interference voltages, it is recommended that one grounding plate is fitted in front of the sensor and one is fitted behind the sensor.

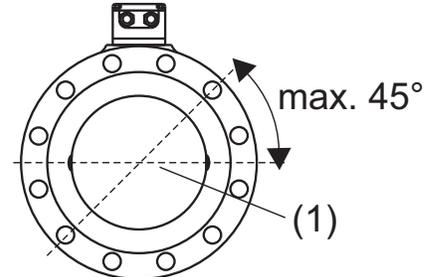
### Installation

#### General information

- The measuring pipe must always be full.
- The flow direction must match the identification marking
- The maximum torque for all flange screws must be observed. These must be selected according to factors including temperature, pressure, screw and seal material, and the relevant regulations in each case.
- Install the devices without any mechanical tension (torsion, bending).
- Fit flange devices with plane-parallel counterflanges only using the appropriate seals.
- Use a flange seal made from a material that is compatible with the medium and the medium temperature.
- Seals may not extend into the flow area, since any turbulence affects the device accuracy.
- The pipeline must not exert any inadmissible forces or torque on the device.
- Only remove the sealing plugs in the cable fittings when installing the electrical cables.
- Install remote mount transmitters at a location that is largely free of vibration.
- Do not expose the transmitter to direct sunlight; provide sun protection if necessary.

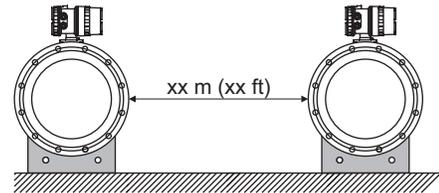
### Electrode axis

- Electrode axis (1) horizontal if possible or rotated max. 45°.



### Minimum clearance

- Maintain a minimum clearance of 0.7 m (2.3 ft) between the devices to prevent any mutually interference.



### Inlet section, outlet section

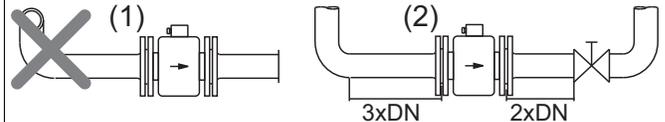
The measuring principle is independent of the flow profile as long as turbulence does not extend into the measurement zone, e.g. downstream from double elbows (1), in case of tangential inflow or where gate valves are partially open upstream of the sensor.

In these cases, measures must be taken to normalize the flow profile.

- Do not install fittings, elbows or valves, etc. directly upstream of the sensor (1).
- Flaps must be installed so that the flap blade does not extend into the sensor.
- Valves or other shut-off devices should be mounted in the outlet section (2).

Experience has shown that a straight inlet section of  $3 \times \text{DN}$  and a straight outlet section of  $2 \times \text{DN}$  is sufficient in most cases (DN = nominal width of the transmitter – see the adjacent figure).

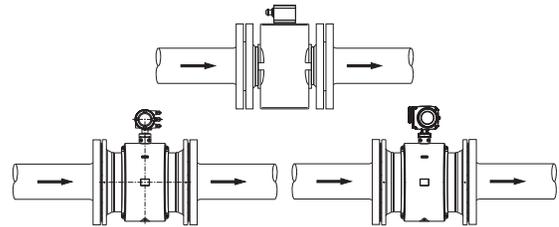
For test stands, the reference conditions of  $10 \times \text{DN}$  for the straight inlet and  $5 \times \text{DN}$  for the straight outlet must be provided according to EN 29104/ISO 9104.



### Flow direction

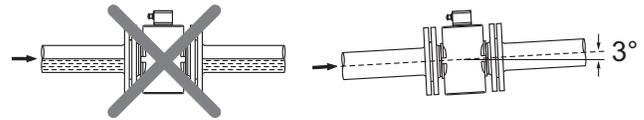
The device records the flow in both directions.  
 Default setting: forward flow direction  
 Identification marking:

- Arrow direction on the device
- Alignment of the sensor housing during initial startup (default setting) as displayed in the adjacent figures



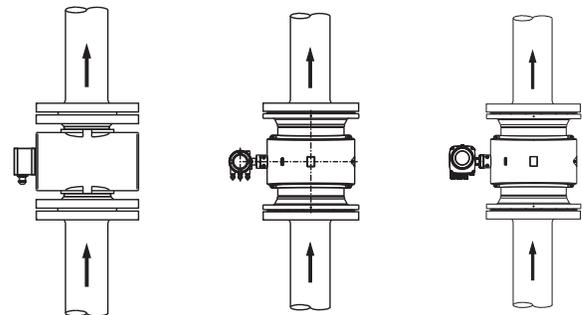
### Horizontal flow direction

- Measuring pipe must always be full.
- Ensure the line is slightly inclined for degassing.



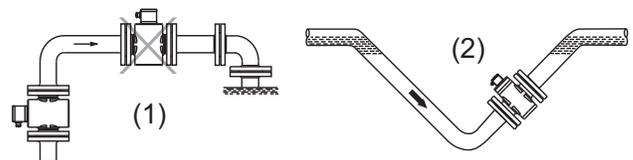
### Vertical flow direction

- Vertical installation for measuring abrasive substances, the preferred flow direction is from bottom to top.



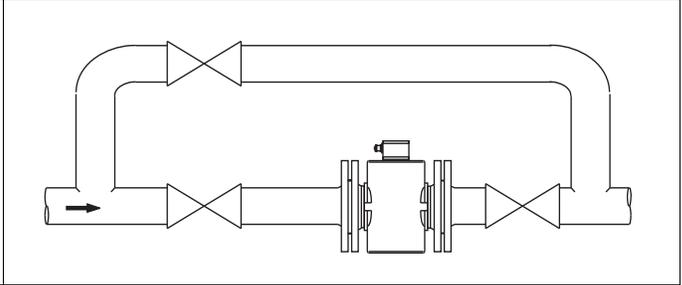
### Free inlet, free outlet

- For a free outlet, do not install the measuring device at the highest point or in the draining side of the pipeline, as the measuring pipe runs empty or air bubbles can form (1).
- For free inlets or outlets, provide a culvert (downward routing of the pipe) so that the pipeline is always full (2).



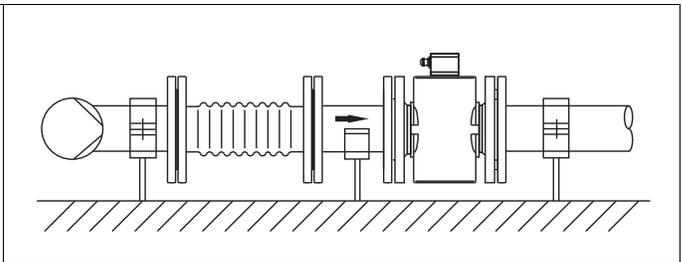
### Heavily contaminated measurement media

- We recommend a bypass connection, according to the figure, for heavily contaminated media so that the system can continue operating without any interruptions during mechanical cleaning.

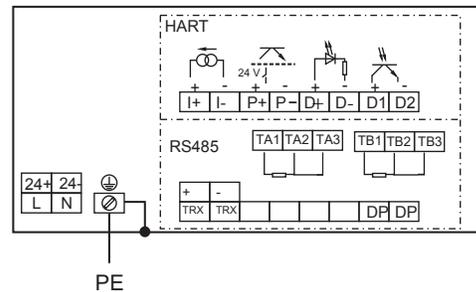


### Installation near pumps

- We recommend using mechanical vibration compensators for sensors that are installed near pumps or other equipment generating vibrations.



### Electrical connection



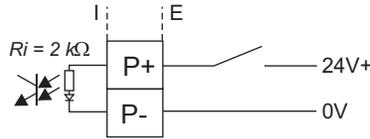
#### Voltage supply

Alternating voltage (AC)		Direct voltage (DC)	
Terminal	Function	Terminal	Function
L	Phase	24V+	+
N	Neutral conductor	24V-	-
PE	Protection conductor (PE)	PE	Protection conductor (PE)

#### Input and output connection

Terminal	Function
I+/I-	<b>Current/HART output</b> - The current output is available in "active" or "passive" mode.
TRX-/+	RS485-/+
P+/P-	<b>Digital output DO1 active/passive</b> - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Pulse output".
D+/D-	Switch output
D1/D2	<b>Digital output DO2 passive</b> - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Binary output", flow direction signaling.
PE	<b>Functional ground</b>
TA1/TA2/TA3	Inlet / high temperature (Connect-RED \BLACK\BLACK)
TB1/TB2/TB3	Outlet/Cryogenic (Connect-RED \BLACK\BLACK)

### Digital input DI1



Data of the optocoupler |  $16\text{ V} \leq U \leq 30\text{ V}$ ,  $R_i = 2\text{ k}\Omega$

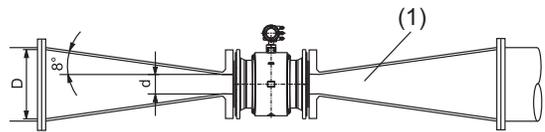
E.g. for external output switch-off or external totalizer reset

I = internal, E = external

### Installation in pipelines with larger nominal widths

Determine the resulting pressure loss when using reducers (1):

1. Determine the diameter ratio  $d/D$
2. Refer to the flow nomograph for the flow velocity (adjacent figure).
3. Read the pressure loss on the Y-axis in the flow nomogram.



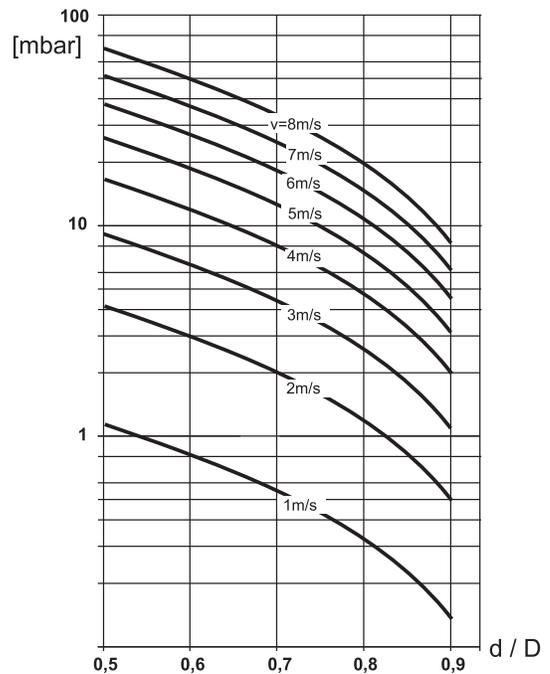
(1) Flange transition piece

(d) Inner diameter of the flowmeter

(D) Inner diameter of the pipeline

### Nomograph for pressure loss calculations

For flange transition piece with  $\alpha/2 = 8^\circ$



(V) Flow velocity [m/s]

( $\Delta p$ ) Pressure loss [mbar]