Megitech
AUTOMATION

FLOW METER

Electromagnetic Flow Meter catalogue

Flow Management
Based on **German Technology**

Megitech AUTOMATION

Electromagnetic Flow Measuring System
Flow measurement of liquids in water or wastewater applications

Application

Electromagnetic flowmeter for bidirectional measurement of liquids with a minimum conductivity of ≥ 10 μS/cm:

- Drinking water
- Wastewater
- Pulp, paper, Pharma, Food & Beverage
- Utility sub meter
- Sewage sludge
- Effluent Water
- Chemical Process Water

- Flow measurement up to 2500 m³/h (11007 gal/min)
- Fluid temperature up to +90 °C for Hard Rubber and up to **+160 °C** for PTFE / Teflon
- Process pressures up to 16 Bar (232 psi) Regular & **Up to 60 Bar (870 psi) (Optional**)
- Sensor Protection:IP67

Material of construction

Lining - Hard Rubber (5mm +/-1mm thick) / PTFE / Teflon (3mm +/-1mm thick)
Flange - CS / MS / SS
Electrode - SS 316L / Hastalloy C / Platinum
Coil Housing - MS / SS 304

Power Consumption : < 10 VA
Isolation : 1.4 KV between Input, Output & Power Supply
Response Time : < 1 sec
Transmitter Enclosure : Die cast Aluminium IP 67, flow tube IP 68
Process Connections : ANSI 150 flanged, as per table B 16.5
Regular & **ANSI B16.5 Class 900 Flanges (Optional**)
Mounting : In-Line Horizontal (Vertical on request)

- Exceptional long-term stability and accuracy
- Fully vacuum-resistant with high-tech liner

Power Supply
Option 1 : 24 V DC
Option 2 : 90 - 260 V AC, 50 Hz

Input
Measuring ranges : Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy
Operable flow range : Over 1000 : 1

Output
Output signal
Current output
• Galvanically isolated
• Active: 4 to 20 mA
• RS485 Modbus Communication (optional)
• Full scale value adjustable
• Temperature coefficient: typ. 2 µA/°C, resolution: 1.5 µA Pulse/status output (optional)
• Galvanically isolated
• Passive: 30 V DC / 250 mA
• Open collector
• Can be configured as:
– Pulse output: Pulse value and pulse polarity can be selected, max. pulse width adjustable (5 to 2000 ms), pulse frequency max. 100 Hz
– Status output: for example, can be configured for error messages, empty pipe detection, flow recognition, limit value

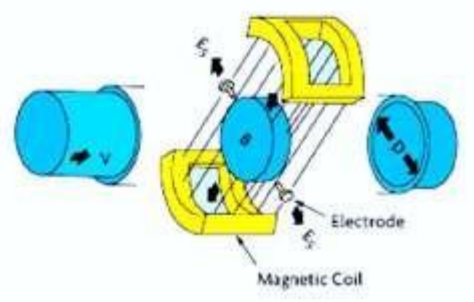
Installation & Commissioning

DOs and DONTs

1) Before connecting the mains supply to the amplifier first check its label for the specified mains supply. It may be 110 V AC or 230 V AC or 24 V DC. Apply specified mains supply.
2) Do not disturb any trim pot inside the amplifier / transmitter. This will disturb the calibration of the amplifier.
3) In case of remote amplifier / transmitter if flow indicated on the display is negative interchange the wires from Pin 9 and Pin 10 of TS2 connector inside the head mounted Terminal Box on Flow Tube.
4) Always ensure proper earthing to Primary flow tube (Measuring Earth), and also to amplifier / transmitter (Protection Earth). Earth resistance should be < 10 Ω.
5) In case of remote transmitter do not install the amplifier/ transmitter exposed to direct sunlight or at a place subjected to intense vibrations. Install the transmitter at a place where no vibrations are present.
6) While installing the Flow Meter Tube (Integral or Remote Transmitter) make sure that no vibrations are present at the location of installation.
7) In case of remote transmitter, while connecting the shielded cables do not ignore shield connections. The cables should be as far away as possible from any power cables or switch gear cables [min. distance between signal cables and power cables should be greater than 12 inches.]
8) Use proper snubber circuits across the coils of the switchgear assemblies near to the transmitter.
9) The earthing of the primary flow tube must be separate from normal electrical " earth grid " used in the plant.
10) The installation of the primary flow tube and transmitter should be as away as possible from heavy electrical loads.
11) Verify the polarity of the load connected across the output.
12) Ensure the load connected across the output terminals is within specifications.
13) If UPS output is used to drive the Flow Transmitter, ensure that the output of the UPS is Sinusoidal waveform and not square wave or quasi-square wave output.
14) If there are fluctuations in supply voltage use of CVT is recommended.
15) Ensure that the transmitter mounting screws and the lid screws for the transmitter and the head mounted terminal box on the flow tube (if remote transmitter) are always tightened properly to maintain the IP65 class protection.
16) Do not expose the amplifier / transmitter (Integral / Remote) to direct impact of sun and rain.
17) Ensure that no vibrations are present at the location of installation of Flow tube and transmitter.
18) Ensure that the cable glands are sealed (tightened) properly to maintain the IP65 Class protection.
19) Ensure that there are no leakages on the inlet side or outlet of the installed flow meter. Due to leakages on the inlet side of the Flow Tube air gets mixed with the fluid under measurement and causes measurement errors. The Electromagnetic Flow meter does not measure Bi-Phase flow.

Measuring principle and system design

Following Faraday's law of magnetic induction, a voltage is induced in a conductor moving through a magnetic field.
In the electromagnetic measuring principle, the flowing medium is the moving conductor.
The voltage induced is proportional to the flow velocity and is supplied to the amplifier by means of two measuring electrodes. The flow volume is calculated by means of the pipe cross-sectional area.
The DC magnetic field is created through a switched direct current of alternating polarity.



E = Induced Voltage
B = Magnetic Field Strength
D = Inner Diameter of Pipe
V = Average Velocity
C = Constant

E = BDV/C
C is a constant to take care of the engineering proper units

Measuring Accuracy

Reference conditions
Medium: water & waste water
Temperature: 40°C
Inlet section: 10 DN
Outlet section: 5 DN
Flow velocity: > 1 m/s / > 3 ft/s
Operating pressure: 1 bar / 14.5 psig
Valve closing time variation: < 1 ms
Wet calibrated on EN 17025 accredited calibration rig by direct volume comparison

Maximum measuring error
Related to volume flow (MV = Measured Value)
These values are related to the pulse / frequency output
The additional typical measuring deviation for the current output is ±10 μA
With IFC 100 converter:
DN15...300: ± 0.3% of MV + 1 mm/s
With IFC 300 converter:
DN15...100: ± 0.15% of MV + 1 mm/s
DN150..300: ± 0.2% of MV + 1 mm/s

Repeatability
±0.1% of MV, minimum 1 mm/s

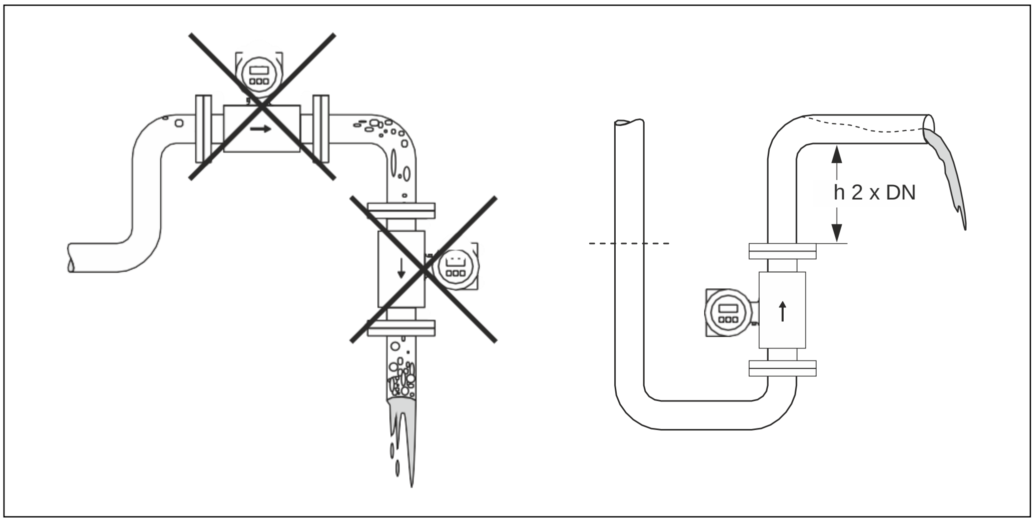
Long term stability
±0.1% of MV

Installation instructions

Mounting location

Entrained air or gas bubble formation in the measuring tube can result in an increase in measuring errors.
Avoid the following installation locations in the pipe:

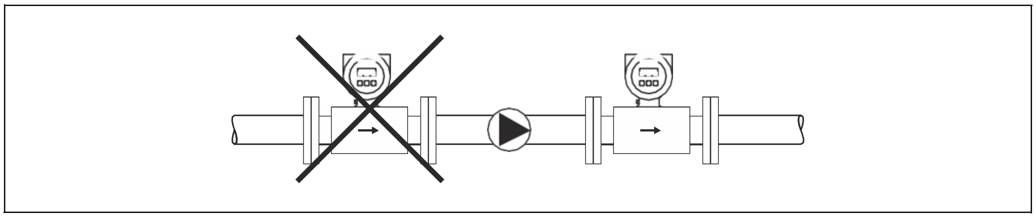
- Highest point of a pipeline. Risk of air accumulating!
- Directly upstream from a free pipe outlet in a vertical pipeline.



Mounting location

Installation of pumps

Sensors may not be installed on the pump suction side. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the pressure tightness of the measuring tube lining → ä 16, Section "Pressure tightness".
Pulsation dampers may be needed when using piston pumps, piston diaphragm pumps or hose pumps. Information on the shock and vibration resistance of the measuring system → 15, Section "Shock and vibration resistance".

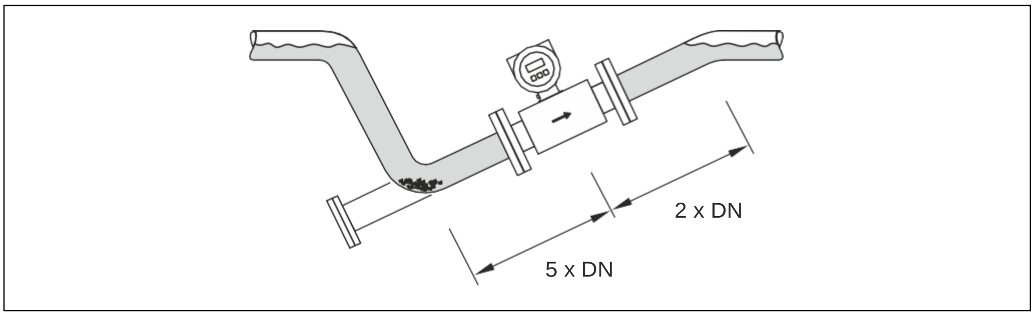


Installation of pumps

Partially filled pipes

Partially filled pipes with gradients necessitate a drain-type configuration.
The empty pipe detection function (EPD) provides additional security in detecting empty or partially filled pipes.

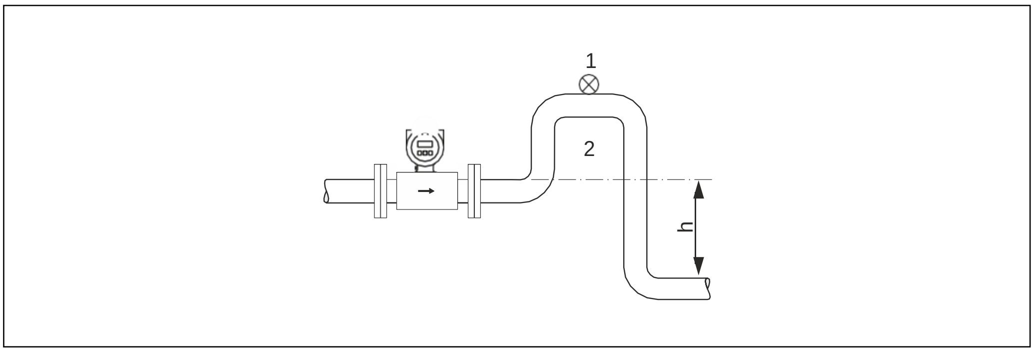
Caution!
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.



Installation with partially filled pipes

Down pipes

Install a siphon or a vent valve downstream of the sensor in down pipes h≥5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. This measure also prevents the liquid current stopping in the pipe which could cause air locks. Information on the pressure tightness of the measuring tube lining → 16, Section "Pressure tightness".



Installation measures for vertical pipes

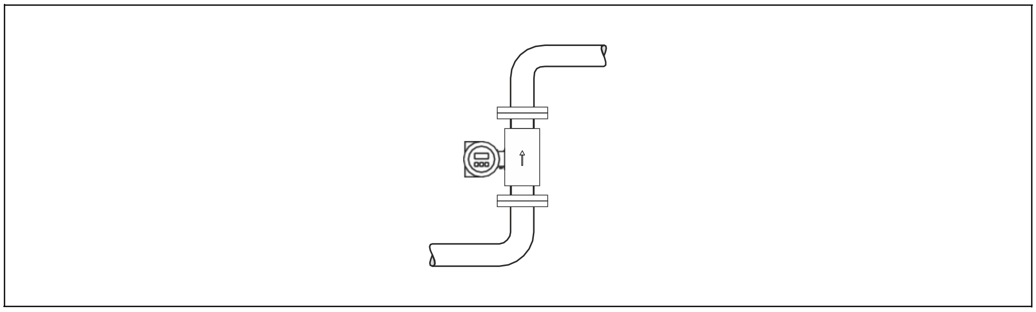
1 Vent valve
2 Pipe siphon
h Length of the down pipe

Orientation

An optimum orientation helps avoid gas and air accumulations and deposits in the measuring tube. However, the measuring device also offers the additional function of empty pipe detection (EPD) for detecting partially filled measuring tubes or if outgassing fluids or fluctuating operating pressures are present.

Vertical orientation

This is the ideal orientation for self-emptying piping systems and for use in conjunction with empty pipe detection.



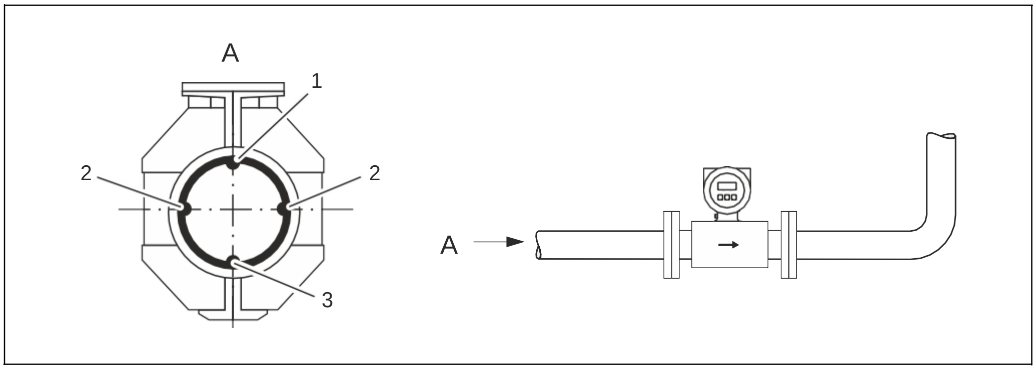
Vertical orientation

Horizontal orientation

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

Caution!

Empty pipe detection only works correctly with horizontal orientation if the transmitter housing is facing upwards. Otherwise there is no guarantee that empty pipe detection will respond if the measuring tube is only partially filled or empty.

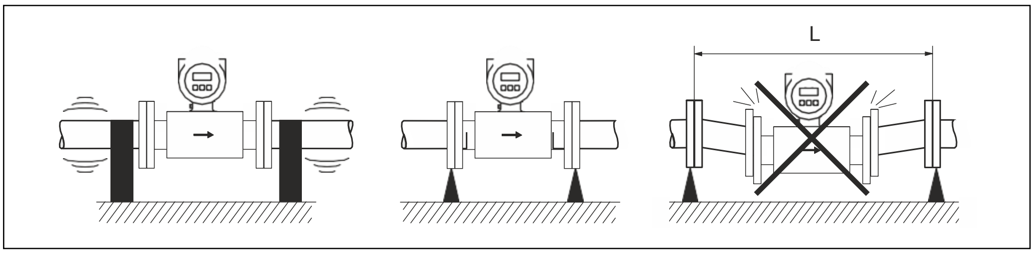


Horizontal orientation

1 EPD electrode for empty pipe detection
2 Measuring electrodes for signal detection
3 Reference electrode for potential equalization

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

Caution!
If vibrations are too severe, we recommend the sensor and transmitter be mounted separately. Information on the permitted shock and vibration resistance → 15, Section "Shock and vibration resistance".



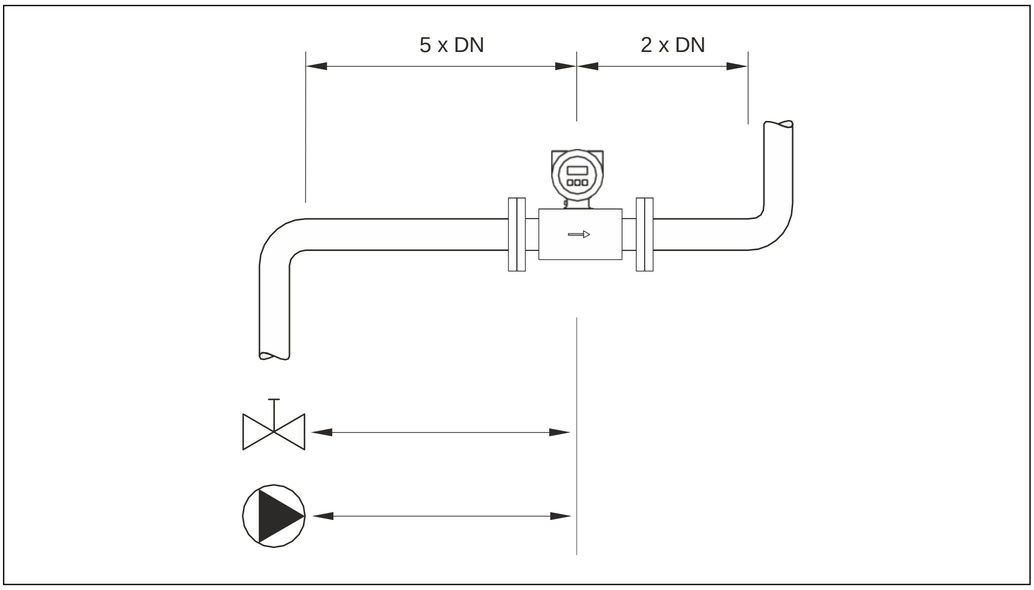
Measures to prevent vibration of the measuring device

L > 10 m (33 ft)

Inlet and outlet run

If possible, install the sensor well clear of assemblies such as valves, T-pieces, elbows etc.

Note the following inlet and outlet runs to comply with measuring accuracy specifications:
- Inlet run: ≥ 5 × DN
- Outlet run: ≥ 2 × DN



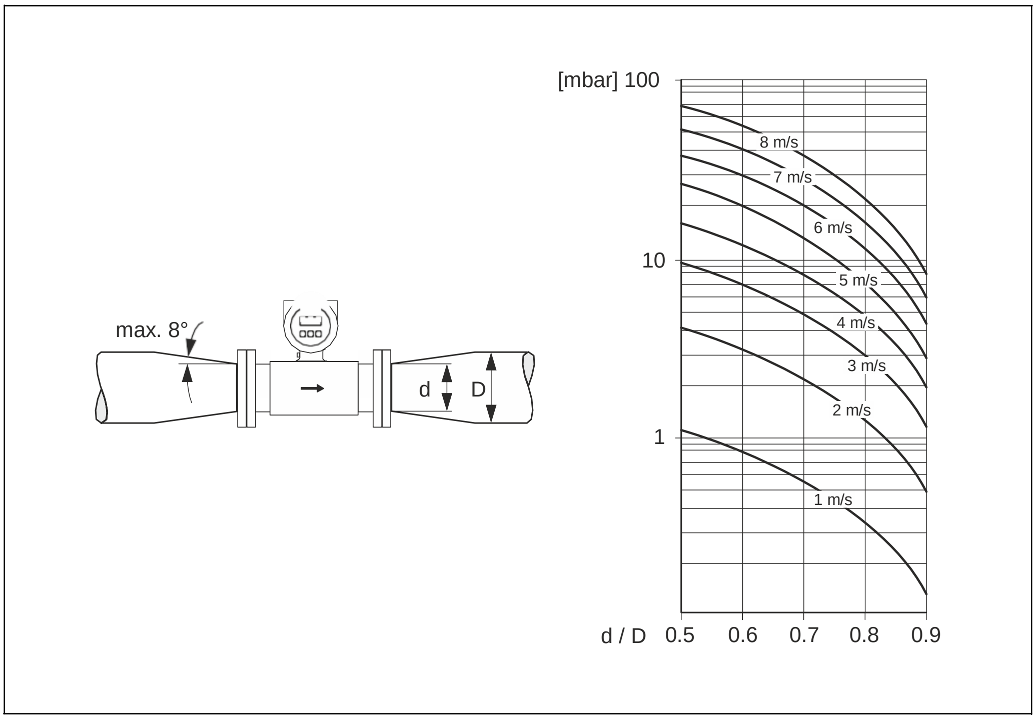
Inlet and outlet run

Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) 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.

Note!
The nomogram only applies to liquids 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.

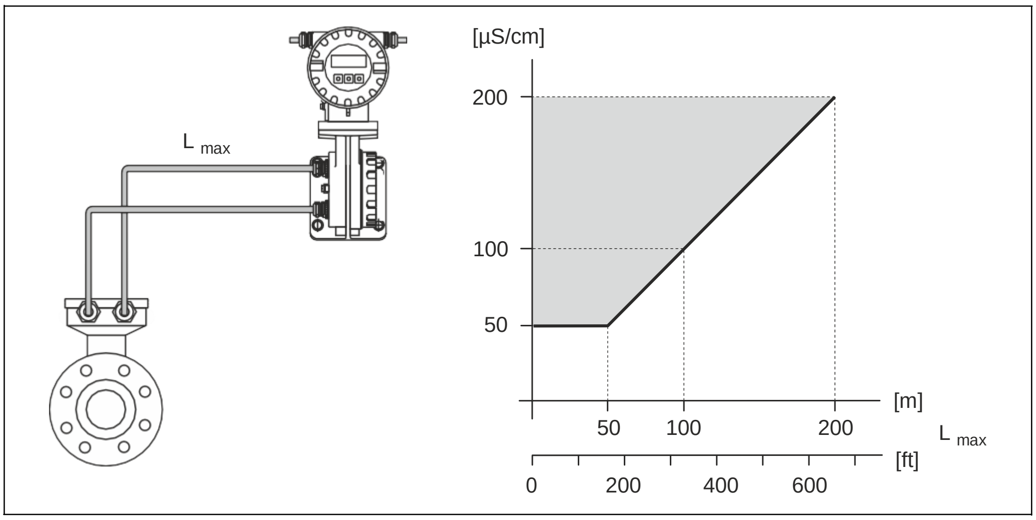


Pressure loss due to adapters

Length of connecting cable

When mounting the remote version, please note the following to achieve correct measuring results:

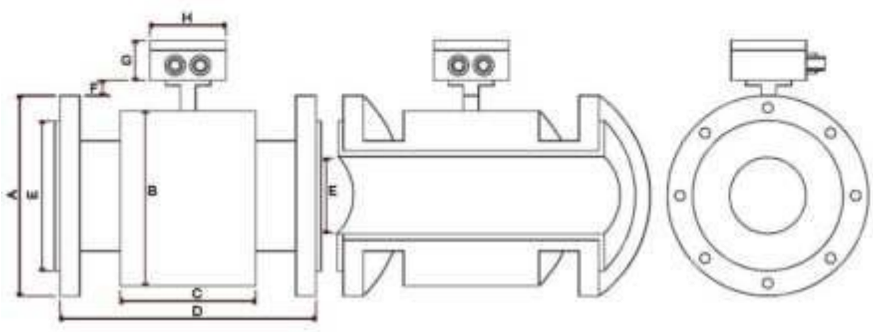
- Fix cable run or lay in armored conduit. Cable movements can falsify the measuring signal especially in the case of low fluid conductivities.
- Route the cable well clear of electrical machines and switching elements.
- If necessary, ensure potential equalization between sensor and transmitter.
- The permitted cable length L_{max} is determined by the fluid conductivity.
  A minimum conductivity of 50 μS/cm is needed for all fluids.
- When the empty pipe detection function is switched on (EPD),
  the maximum connecting cable length is 10 m (33 ft).

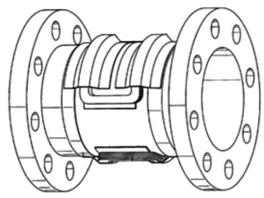


Permitted length of connecting cable for remote version
Area marked in gray = permitted range; L_{max} = length of connecting cable [m] ([ft]); fluid conductivity in [μS/cm]

Mechanical Construction

Product Range





Dimensions

Construction

DN SIZE	METER SIZE	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)
6	⅜"	89	40	35	65	80	35	45	50
10	⅜"	89	40	35	65	80	35	45	50
15	½"	89	40	35	65	80	50	45	50
20	¾"	98	45	35	65	80	50	45	50
25	1"	108	50	35	65	80	50	45	50
32	1¼"	117	60	35	65	80	70	45	50
40	1½"	127	60	35	65	80	73	45	50
50	2"	152	75	35	65	80	92	45	50
65	2½"	178	75	35	65	80	105	45	50
80	3"	190	100	35	65	80	127	45	50
100	4"	228	200	35	65	100	157	45	50
125	5"	254	200	35	65	100	186	45	50
150	6"	279	250	35	65	100	215	45	50
200	8"	343	300	35	65	150	270	45	50
250	10"	406	350	35	65	215	406	45	50
300	12"	483	450	35	65	250	482	45	50
350	14"	534	500	35	65	310	527	45	50
400	16"	597	500	35	65	350	577	45	50
450	18"	635	600	35	65	350	641	45	50
500	20"	698	600	35	65	350	705	45	50
600	24"	812	700	35	65	400	820	45	50
700	28"	925	800	35	65	510	925	45	50

Flow Rate Table

Flow rates at velocity						
METER SIZE		**Flow Rates (in m3 / hr) at different velocities**				
Inch	DN	1.00 m/s	1.25 m/s	2.50 m/s	5.00 m/s	10.00 m/s
0.5	15	0.636	0.795	1.59	3.18	6.36
0.75	20	1.131	1.41375	2.8275	5.655	11.31
1	25	1.767	2.20875	4.4175	8.835	17.67
1.25	32	2.895	3.61875	7.2375	14.475	28.95
1.5	40	11.95	14.9375	29.875	59.75	119.5
2	50	7.068	8.835	17.67	35.34	70.68
2.5	65	11.95	14.9375	29.875	59.75	119.5
3	80	18.907	23.63375	47.2675	94.535	189.07
4	100	28.2	35.25	70.5	141	282
5	125	44.18	55.225	110.45	220.9	441.8
6	150	63.62	79.525	159.05	318.1	636.2
8	200	113.1	141.375	282.75	565.5	1131
10	250	176.7	220.875	441.75	883.5	1767
12	300	254.5	318.125	636.25	1272.5	2545
14	350	346.4	433	866	1732	3464
16	400	452.4	565.5	1131	2262	4524
20	500	706.9	883.625	1767.25	3534.5	7069
24	600	1018	1272.5	2545	5090	10180
28	700	1385	1731.25	3462.5	6925	13850
32	800	1810	2262.5	4525	9050	18100
36	900	2290	2862.5	5725	11450	22900