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We Measure

ELECTROMAGNETIC FLOWMETER

ETRANS -INS SERIES IMMERSION TYPE Datasheet

PULSE | FREQUENCY | RS485 MODBUS | 4...20MA (OPTIONAL HART)

ETRANS-INS-R

ETRANS-INS-C

ETRANS-INS-S

Precise Measurement, Ultimate Control

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PULSE | FREQUENCY | RS485 MODBUS | 4...20MA

ELECTROMAGNETIC FLOWMETER

1 TOUCHSCREEN CAPACITIVE KEY PANEL

2 BUTTERFLY VALVE

3 SENSOR

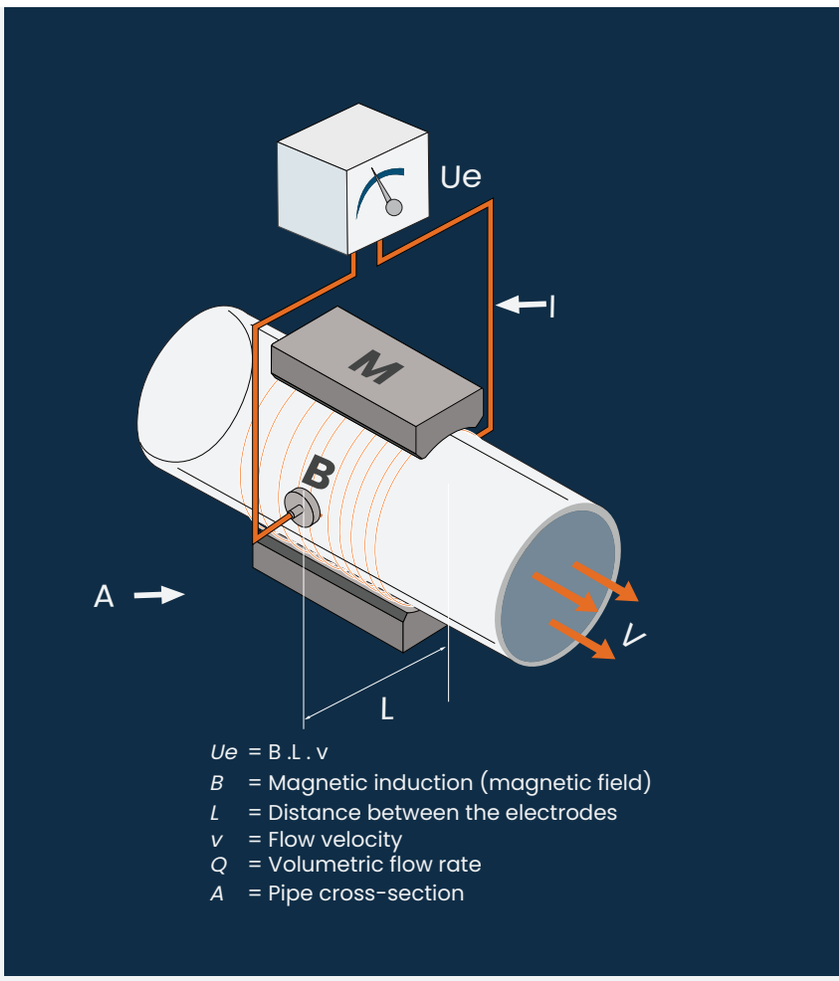
WORKING PRINCIPLE

Electromagnetic flow measurement: This is a flow measurement method based on the principle of the electromagnetic field.

The physical foundations of this principle are based on the discovery made by English physicist Michael Faraday in 1831, who found that an electric current could be generated with the help of a magnetic field. In 1941, Swiss scientist Bonaventura Thurlemann applied this knowledge to conductive liquids flowing through pipes and produced the world's first electromagnetic flowmeter.

The Etrans - INS Series electromagnetic flowmeter contains two coils. These coils, with the help of metal blocks placed on them, create a continuous magnetic field across the cross-sectional area of the measurement tube. Two electrodes that detect voltage are placed perpendicular to each other inside the measurement tube. The insulating material coated on the inner surface prevents the formation of short circuits between the conductive liquid and the metal measurement tube.

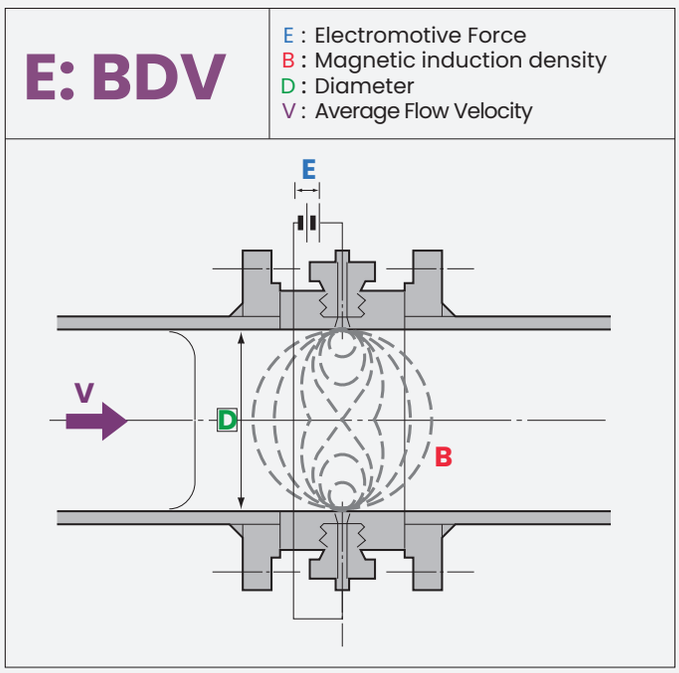
When there is no flow, no electrical voltage is generated between the two electrodes. In the conductive liquid, negatively and positively charged ions are present in equal amounts. When flow starts, the magnetic field applies a force to the charged ion particles in the liquid. As a result, the negatively and positively charged ions move apart and head toward opposite sides of the measurement tube. This leads to an electrical voltage detected by the electrodes.



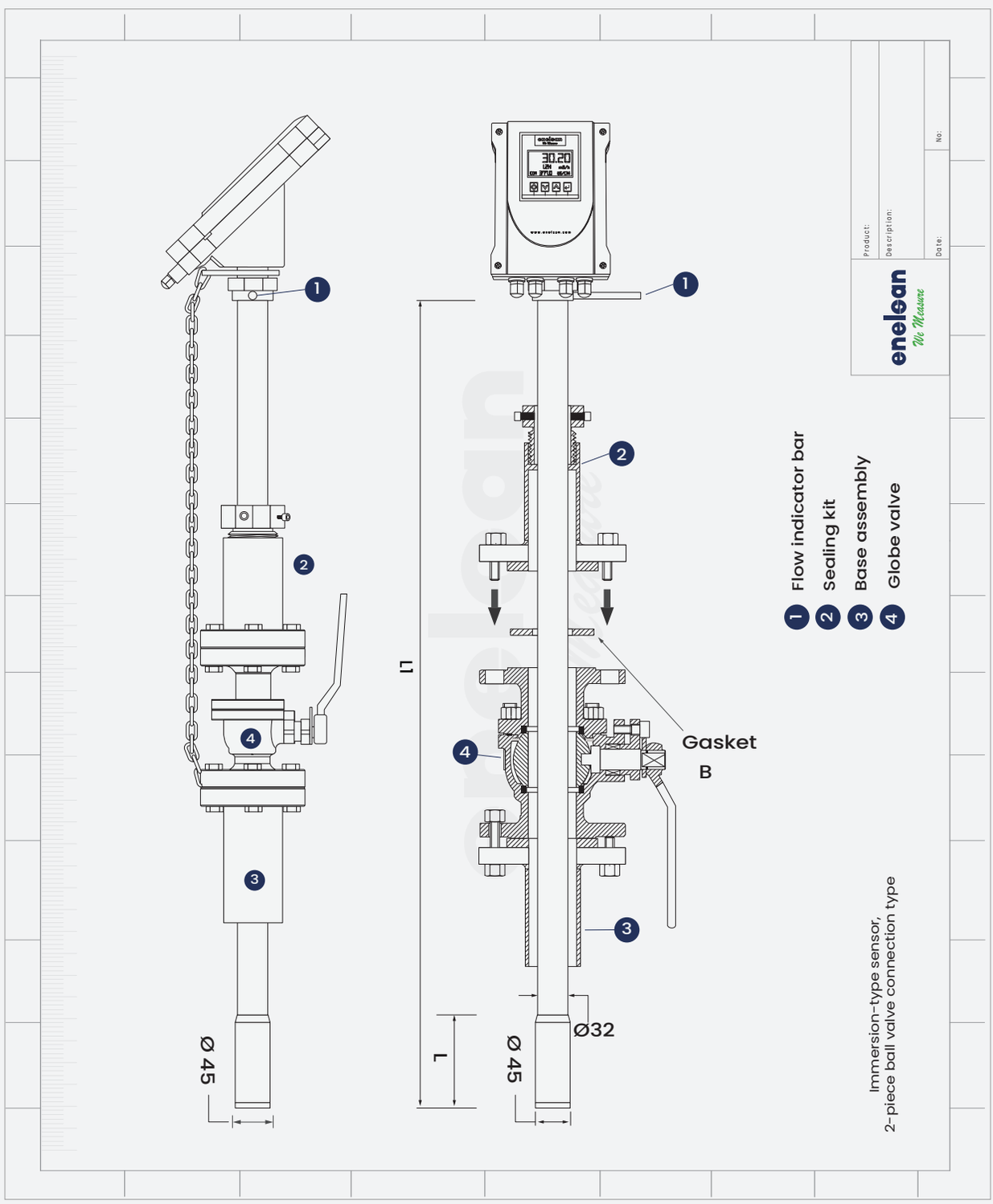
This voltage is directly proportional to the flow rate within the pipe. With the known volume and speed information of the measurement tube, the instantaneous flow rate can be calculated. As the flow rate increases, the separation of charged particles also increases, and thus, the voltage between the electrodes will rise.

The measurement electrodes may sometimes detect magnetic noise present in the environment. It is essential to differentiate this noise signal from the actual measurement signal. To achieve this, the magnetic field must be generated with pulsed direct current. With pulsed direct current, the positions of the charged ions between the electrodes are continuously shifted, eliminating the effect of magnetic noise, allowing for precise and stable flow measurement.

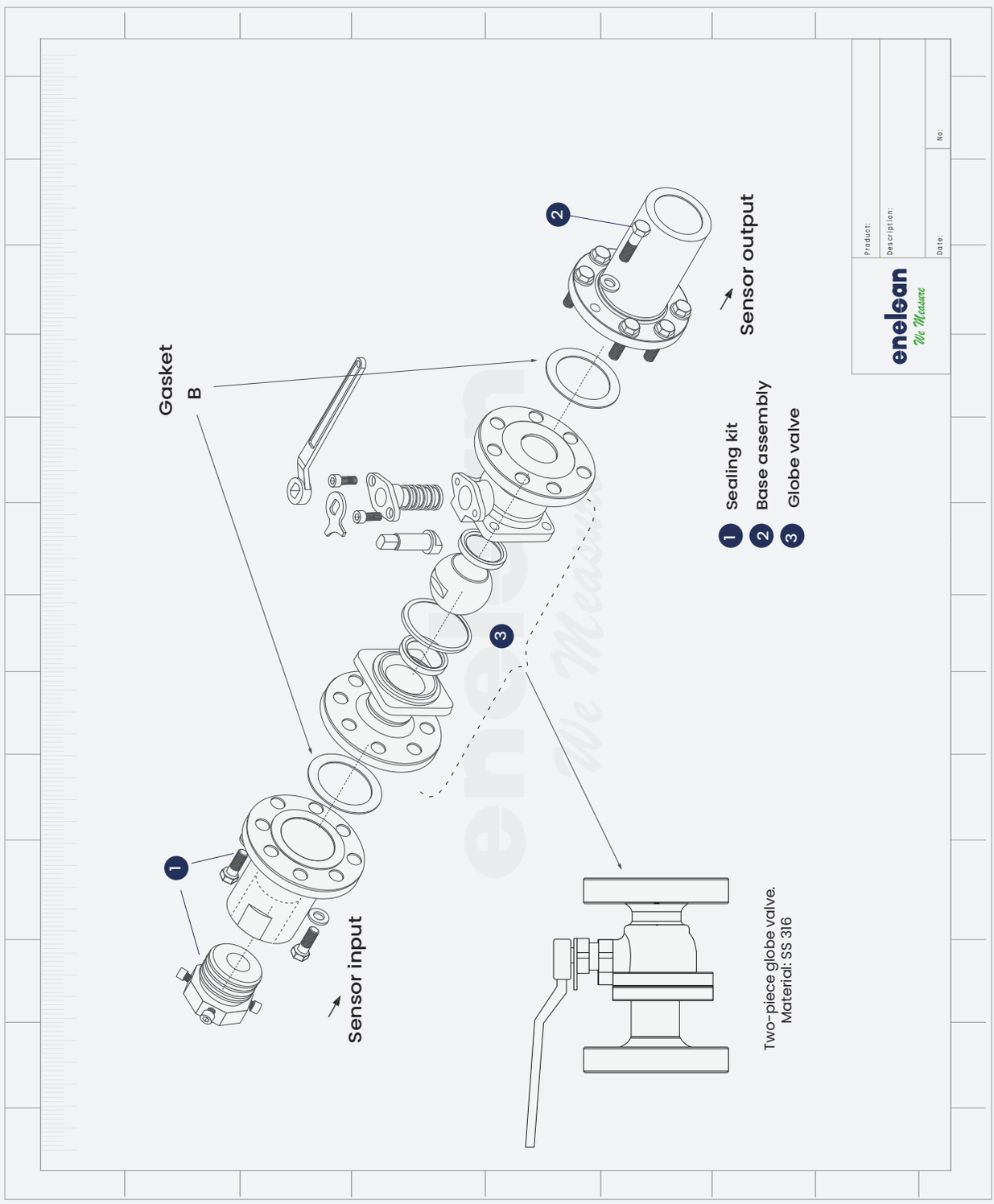
Flow rate information with the electromagnetic measurementprinciple is calculated using the simplified formula below.



TECHNICAL DRAWING



POSITION OF FLANGE GASKETS



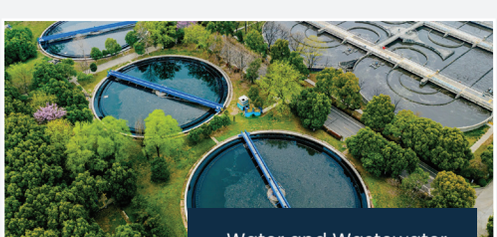
APPLICATION AREAS

- Chemical Industry: Offers reliable solutions for the volumetric flow measurement of acids, alkalis, and corrosive chemicals, supported by a wide range of internal coating and electrode material options.

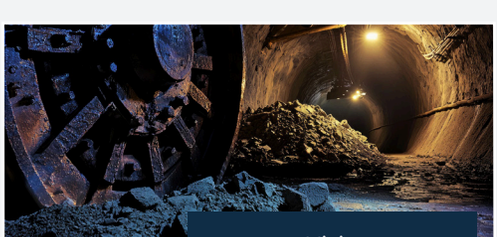
- Agriculture: Suitable for measuring water-based and conductive liquids in agricultural processes and irrigation systems.

- Paper Industry: Highly effective for the volumetric flow measurement of specific products such as pastes and pulps.

- Food & Beverages: Reliable for the volumetric flow measurement of conductive and water-based liquids used in food processing.

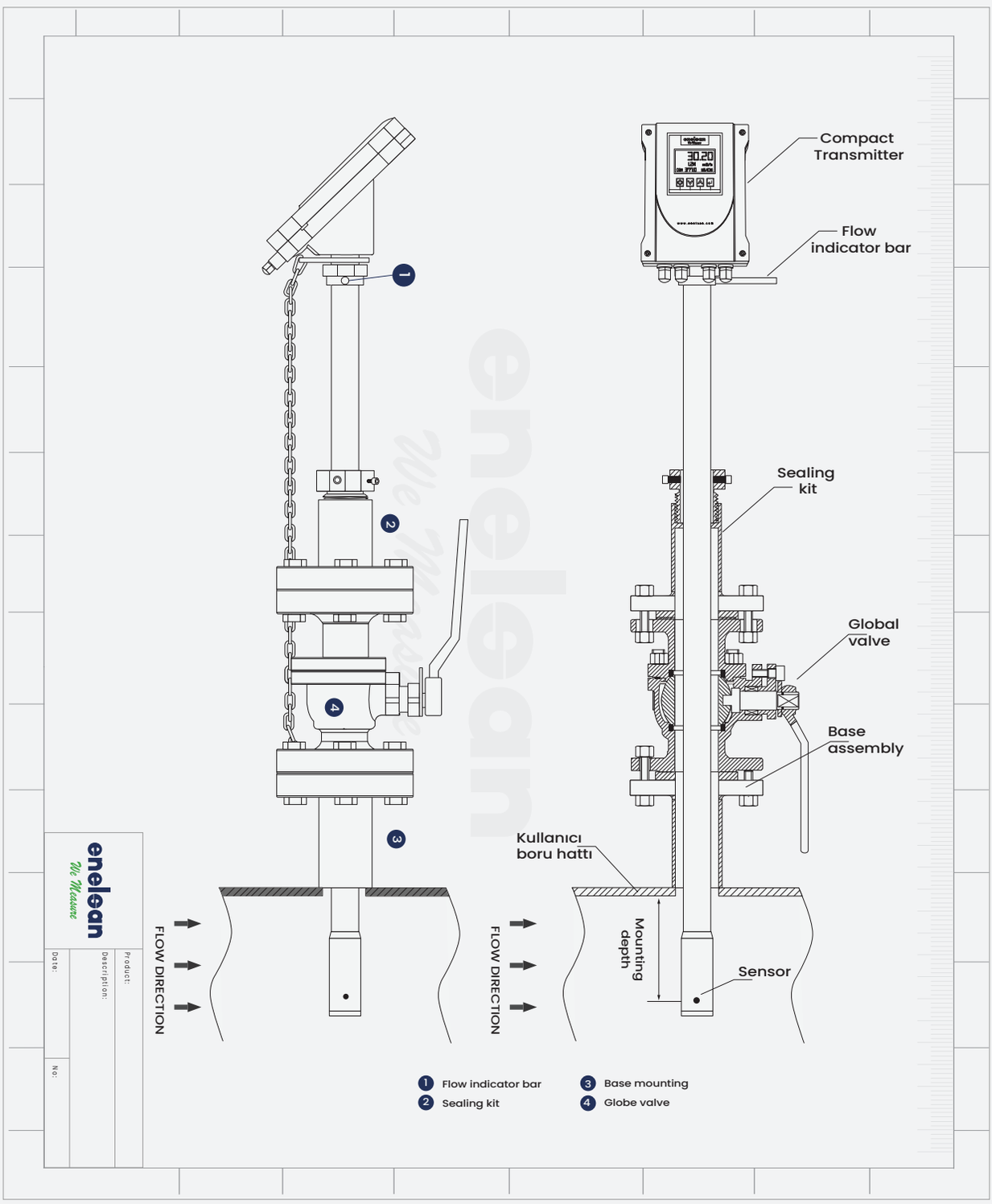


- Water and Wastewater: Easily used for volumetric flow measurements of water and wastewater applications, as well as any water-based or conductive liquids.



- Mining: Widely used for volumetric flow measurements of special, challenging products like ores, sludges, and slurries.

SENSOR STRUCTURE



TECHNICAL SPECIFICATIONS

BODY

Meas. pipe diameter range	200 ~ 2000 mm
Flow rate measurement range	0 to 10 m/s; the full-scale operating range can be continuously adjusted between 1 and 10 m/s.
Measurement accuracy	When the full-scale flow rate is > 1 m/s, ±1.5%
Conductivity of the measured medium	It must be greater than 50 μS/cm.
Working pressure	1.6 MPa
Electrode materials	Molybdenum-containing stainless steel (0Cr18Ni12Mo2Ti), Hastelloy C-276, Titanium

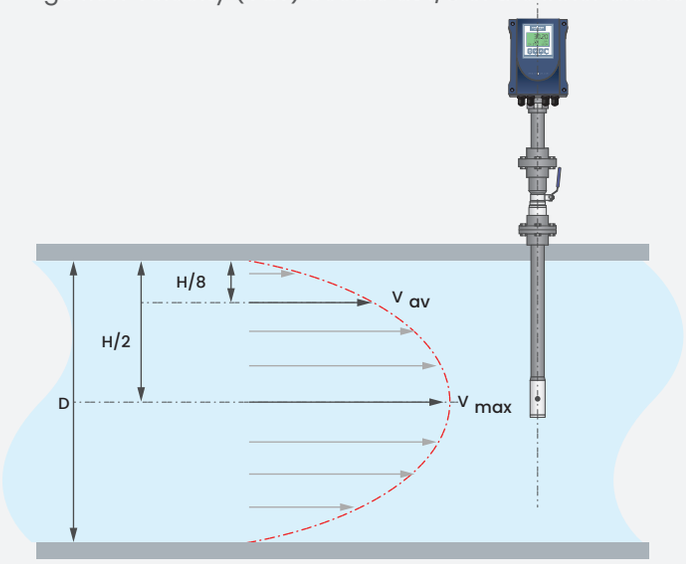
Meas. tube (cap) material	ABS	
Maximum temperature of the measured environment	60°C for ABS	
Body protection class	IP68 in accordance with GB 08 84 standard	
Sensor output signal	0.209 mVpp / 1 m/s	
Maximum signal transmission distance between the sensor and the converter	50 meters (for special requirements, please contact the manufacturer)	
Flowmeter output signals	Direct current: 0 ~ 10 mA, load resistance 0 ~ 1kΩ	
	4 to 20 mA, load resistance 0 to 500Ω	
	Frequency: 1 ~ 5 kHz, load resistance 250 ~ 1.2kΩ	
Connection	2" G Thread	

SQUARE TRANSMITTER

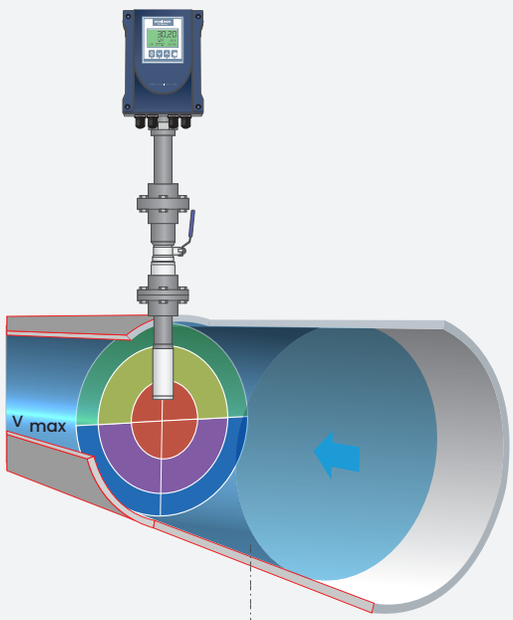
Body Material	Die-cast Aluminum	
Mounting Type	Compact	
Supply Voltage	220 VAC / 24 VDC (one can be selected)	Battery (optional)
Local Display	Backlight LCD Display 64x128	
Display Languages	Turkish, English, German, Spanish (2 languages can be selected)	
Output Signals	Standard (4-20 mA, 0-10V, Frequency, Pulse) Alarm/Status = 2 x Relay Output	
Digital Input	Start/stop flow reading / Clear errors / Reset total flow	
Temperature	-20 ... +60 °C (Depending on process temperature)	
Communications	RS485 MODBUS (Standard) Wifi, Bluetooth, (Standard)	
Data Logging	Pulse, Frequency, RS485 MODBUS, 4...20mA, (Opsiyonel HART)	
Protection Class	IP67	

INSTALLATION RECOMMENDATIONS

Under fully developed laminar flow conditions (the rules in the user manual must be followed to achieve this condition), the flow profile will be parabolic according to the ISO 7145:1982 standard. In this case, the maximum flow velocity (Vmax) occurs at the center of the pipe (at ½ the pipe diameter), while the average flow velocity (Vav) occurs at 1/8 of the inner diameter.



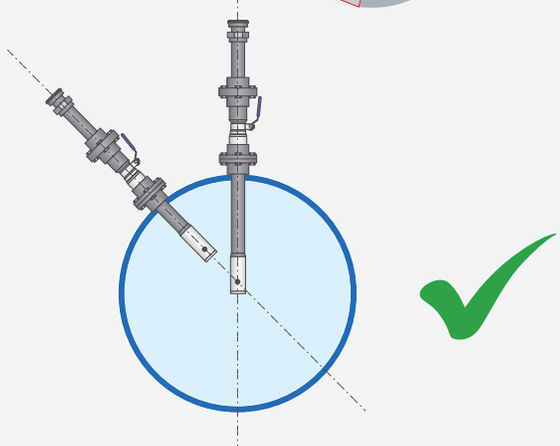
D≤ 400mm, H= 1/2 D
D> 400mm, H= 1/4 D

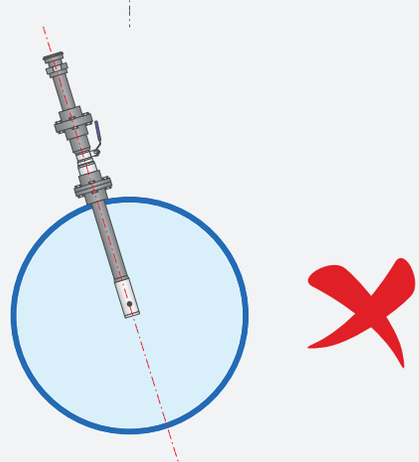


Enelsan's immersion-type electromagnetic flowmeter will accurately calculate volumetric flow if the “insertion factor” is correctly set as described in the device's Installation and User Manual.

The probe (measuring rod) must be mounted aligned with the pipe diameter (centerline). Although vertical mounting is not mandatory due to physical space constraints, it must not be mounted along an arc outside the diameter.

If the height at the top of the pipe is limited, the probe can also be placed at the ⅞ point of the pipe diameter.



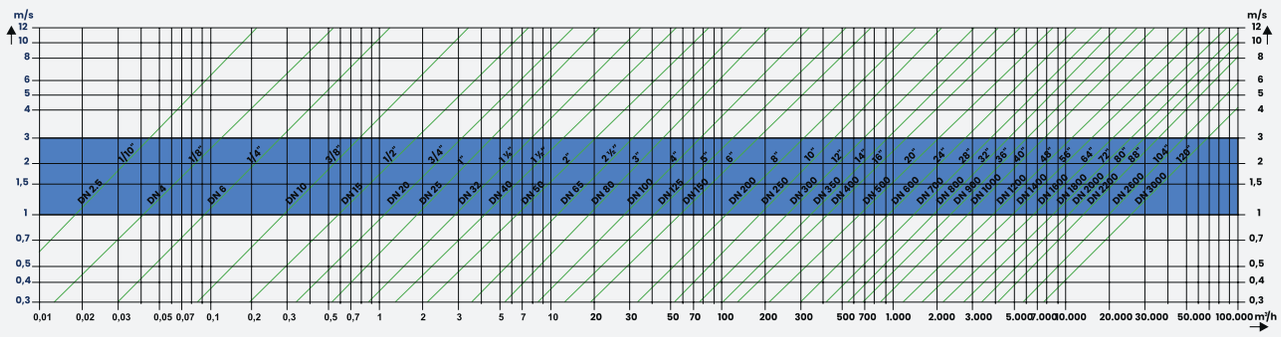


Warning – Safety and Health Precautions

The installation and use of this product may expose you to hazardous working conditions that could result in serious or fatal injury. Take all necessary safety precautions before entering the work area.

Use appropriate personal protective equipment. The installation and operation of the product must be carried out in accordance with all applicable occupational health and safety regulations and local legislation.

FLOW RATE / DIAMETER / VELOCITY TABLE



1- The appropriate product diameters can be selected based on the flow rate information.
2- The appropriate product diameters can be selected based on the velocity information.
3- The flow measurement range can be determined based on the diameter information.
4- The most stable range for measurement should be considered as 1-3 m/s.

IMMERSION TYPE MAGNETIC FLOWMETER FLOW RANGE

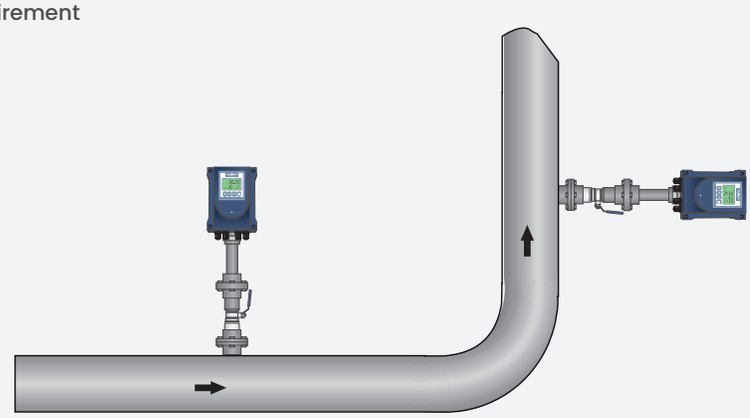
Pipe Diameter (mm)	Flow Rate Range and Flow Rate Table							
	0.1m/s	0.2m/s	0.5m/s	1m/s	4m/s	10m/s	12m/s	15m/s
100	2.83	5.65	14.13	28.26	113.04	282.60	339.10	423.90
125	4.42	8.83	22.08	44.16	176.63	441.56	529.90	662.34
150	6.36	12.72	31.79	63.59	254.34	635.85	763.00	953.78
200	11.30	22.61	56.52	113.04	452.16	1130.40	1356.00	1696.00
250	17.66	35.33	88.31	176.53	706.50	1766.25	2120.00	2649.00
300	25.43	50.87	127.20	254.34	1017.00	2543.40	3052.00	3815.00
350	34.62	69.24	173.10	346.19	1385.00	3461.85	4154.00	5193.00
400	45.00	90.00	226.10	452.00	1809.00	4522.00	5426.00	6782.00
450	57.00	114.00	286.10	572.00	2289.00	5723.00	6867.00	8584.00
500	71.00	141.00	353.30	707.00	2826.00	7065.00	8478.00	10598.00
600	102.00	203.00	508.70	1017.00	4069.00	10174.00	12208.00	15260.00
700	138.00	277.00	692.40	1385.00	5539.00	13847.00	16617.00	20771.00
800	181.00	362.00	904.30	1809.00	7235.00	18086.00	21704.00	27130.00
900	229.00	458.00	1145.00	2289.00	9156.00	22891.00	27469.00	34336.00
1000	283.00	565.00	1413.00	2826.00	11304.00	28260.00	33912.00	42390.00
1200	407.00	814.00	2035.00	4069.00	16278.00	40694.00	48833.00	61042.00
1400	554.00	1108.00	2769.00	5539.00	22156.00	55390.00	66468.00	83084.00
1600	723.00	1447.00	3617.00	7235.00	28938.00	72346.00	86815.00	108518.00
1800	916.00	1831.00	4578.00	9156.00	36625.00	91562.00	109875.00	137344.00
2000	1130.00	2261.00	5652.00	11304.00	45216.00	113040.00	135648.00	169560.00
2200	1368.00	2736.00	6839.00	13678.00	54711.00	136778.00	164134.00	205168.00
2400	1628.00	3256.00	8139.00	16278.00	65111.00	162778.00	195333.00	244166.00
2600	1910.00	3821.00	9552.00	19104.00	76415.00	191038.00	229245.00	286556.00
2800	2216.00	4431.00	11078.00	22156.00	88623.00	221558.00	265870.00	332338.00
3000	2543.00	5087.00	12717.00	25434.00	101736.00	254340.00	305208.00	381510.00

INSTALLATION OF IMMERSION-TYPE MAGNETIC FLOW METERS

TERMS OF USE

1. The pipe line connected to the flow meter must be completely filled with water.
2. At the flow meter installation point, a straight pipe distance of at least 10D upstream and at least 5D downstream must be left.
3. The flow direction must be the same as the arrow direction on the flow meter.
4. There should be no strong magnetic fields or radio frequency (RF) interference around the flow meter.
5. To prevent vacuum or negative pressure formation, the flow meter should not be mounted on the suction side of the pump.
6. If there is vibration around the flow meter, the device should be secured.

Installation Position Requirement

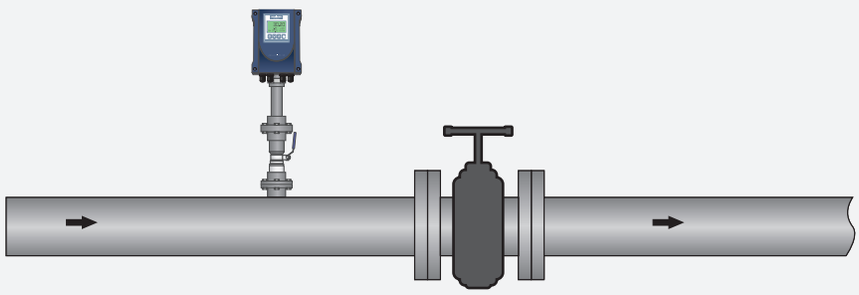


90° Dirsek

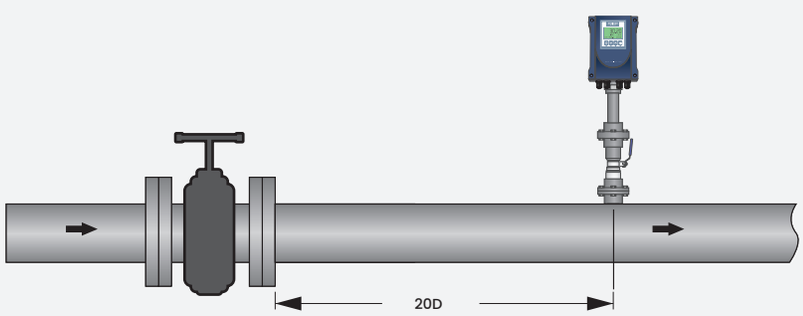
1. The fluid must completely fill the pipe.
2. The line between the electrodes must be perpendicular (90°) to the direction of fluid flow.
3. If the flowmeter is mounted on a horizontal pipe, the device must be mounted vertically upward or at an angle of no more than 45° to the vertical.

INSTALLATION OF IMMERSION-TYPE MAGNETIC FLOW METERS

Installation when there is a valve nearby

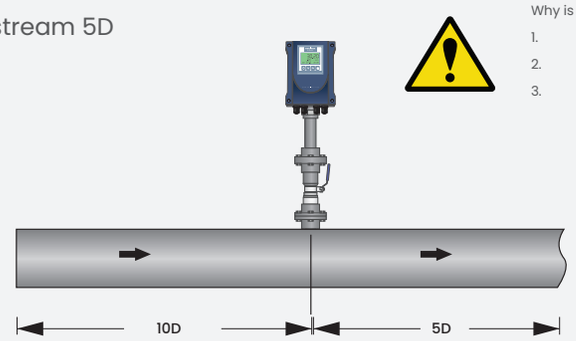


1. If the valve is close to the flow meter, it is preferable to install the valve after the flow meter.
2. If the valve is to be positioned before the flow meter, a minimum distance of 20D must be left between the valve and the flow meter.



Straight Pipe Line Requirement

Upstream 10D, downstream 5D



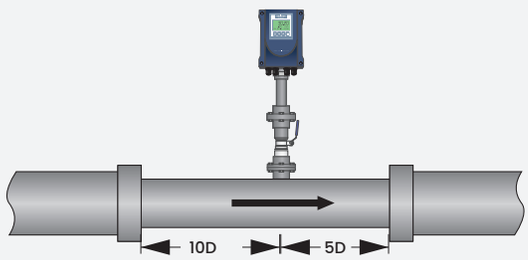
Why is it important?

1. It reduces turbulence.
2. It ensures that the electrodes receive the correct signal.
3. It increases measurement accuracy and repeatability.

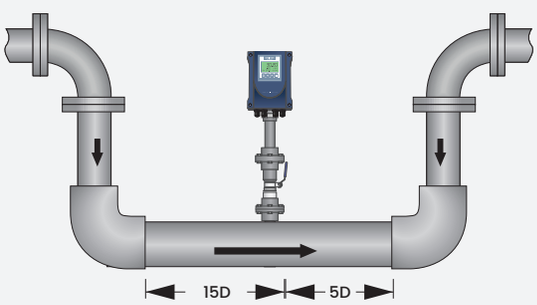
1. For flow meters to measure accurately, there must be a straight pipe section (without elbows, valves, or constrictions) of a specific length before and after the device.
2. For the flow meter to function correctly, a minimum straight pipe distance of 10D must be left upstream of the installation location and a minimum of 5D downstream.

INSTALLATION OF IMMERSION-TYPE MAGNETIC FLOW METERS

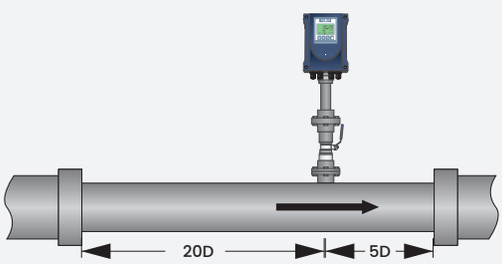
Reduced Pipe



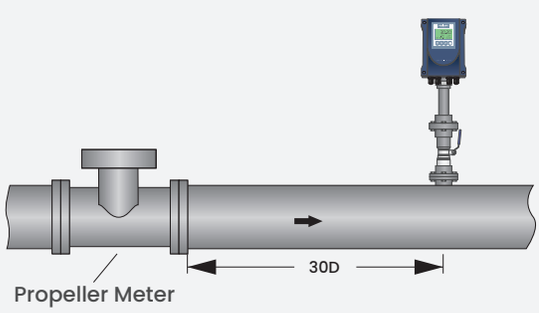
Two Elbow Connections on the Same Plane



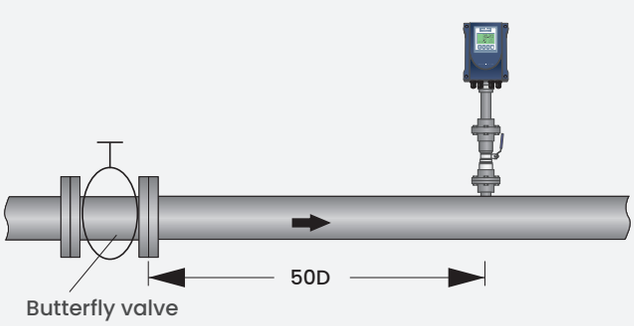
Expanded Pipe



Helical Flow



Turbulent Flow



DN100 (4'') / EN - PL - D16C - GE - MT - 023 - R3 - SI20 - DC - M2R - GSM

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

(1) Internal Lining Material

Ebonite	√	EN
EPDM (Soft Rubber)		SR
PTFE		PT
Black PTFE		BPT
Ceramic		CR

(2) Electrode Material

316 Stainless Steel		SS
Hastelloy C22		HC
Platinum Rhodium	√	PL
Tantalum		TA
Titanium		Ti

(3) Process Connection

PN40. EN1092-1 Flange, St37-2		D40C
PN25, EN1092-1 Flange, St37-2		D25C
PN16. EN1092-1 Flange, St37-2	√	D16C
PN10, EN1092-1 Flange, St37-2		D10C
PN6, EN1092-1 Flange,St37-2		D6C
Class 300 RF ANSI Flange, St37-2		A30C
Class 150 RF ANSI Flange, St37-2		A15C
PN40, EN1092-1 Flange, SS 316L		D40S
PN25, EN1092-1 Flange, SS 316L		D25S
PN16, EN1092-1 Flange, SS 316L		D16S
PN10, EN1092-1 Flange, SS 316L		D10S
PN6 EN1092-1 Flange, SS 316L		D6S
Class 300 RF ANSI Flange, SS 316L		A30S
Class 150 RF ANSI Flange, SS 316L		A15S
Tri-Clamp Connection, SS 316L		TRIS
DIN 11851 Hygienic Connection, 1.4404 (316L)		SANS

(4) Grounding

Standard 3. Electrode		XX
Grounding Ring	√	GE
316L Grounding Ring		GESS
Hastelloy C22		GEHC

(6) Calibration

Dry Calibration, standard		000
0,5%, 3-point factory calibrated		053
0,5%, 5-point factory calibrated		055
0,2%, 3-point TURKAK accredited calibration	√	023
0,2%, 5-point TURKAK accredited calibration		025

(7) Transmitter Type, Protection Class

Compact, IP67		C1
Compact,IP67 (Rectangle)		C2
Remote, IP67 (Rectangle))	√	R1

(8) Cable Length (for Separate Type)

None		XX
5-meter signal cable		5
10-meter signal cable		10
20-meter signal cable		20
30-meter signal cable		30
40-meter signal cable		40
Additional 1 meter signal cable		XX
LP-20 7 Pin S-0/P-E Nut-Type IP68 Plug and Play 5 meter signal cable		SI5
LP-20 7 Pin S-D/P-E Nut-Type IP68 Plug and Play 10 meter signal cable		SI10
LP-20 7 Pin S-0/P-E Nut-Type IP68 Plug and Play 20 meter signal cable	√	SI20
LP-20 7 Pin S-0/P-E Nut-Type IP68 Plug and Play 30-meter signal cable		SI30
LP-20 7 Pin S-0/P-E Nut-Type IP68 Plugand Play 40 meter signal cable		SI40

(9) Power Supply Voltage

Battery Supply		BT
80 ... 230 VAC (48 ... 60 Hz)		AC
8 ... 36VD C	√	DC

(10) Output Signal

4...20 mA, RS485 MODBUS, pulse, alarm, status	√	M2R
4...20 mA,HART, pulse, alarm, status		M2H
PROFIBUS (Only with rectangular transmitter)		M2P

(11) Option 1

No straight pipe required		MXD

Option 2

Stainless Steel Body		SSB
Stainless Steel Body + Stainless Steel Enclosure		SSBF
Stainless Steel Flange		SSPF

Option 3

Digital GSM Datalogger (Only with rectangular transmitter	√	GSM

Contact us

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