

IMMERSION TYPE **VORTEX FLOWMETER**

ETRANS – V-D **Datasheet**



LIQUID



GAS



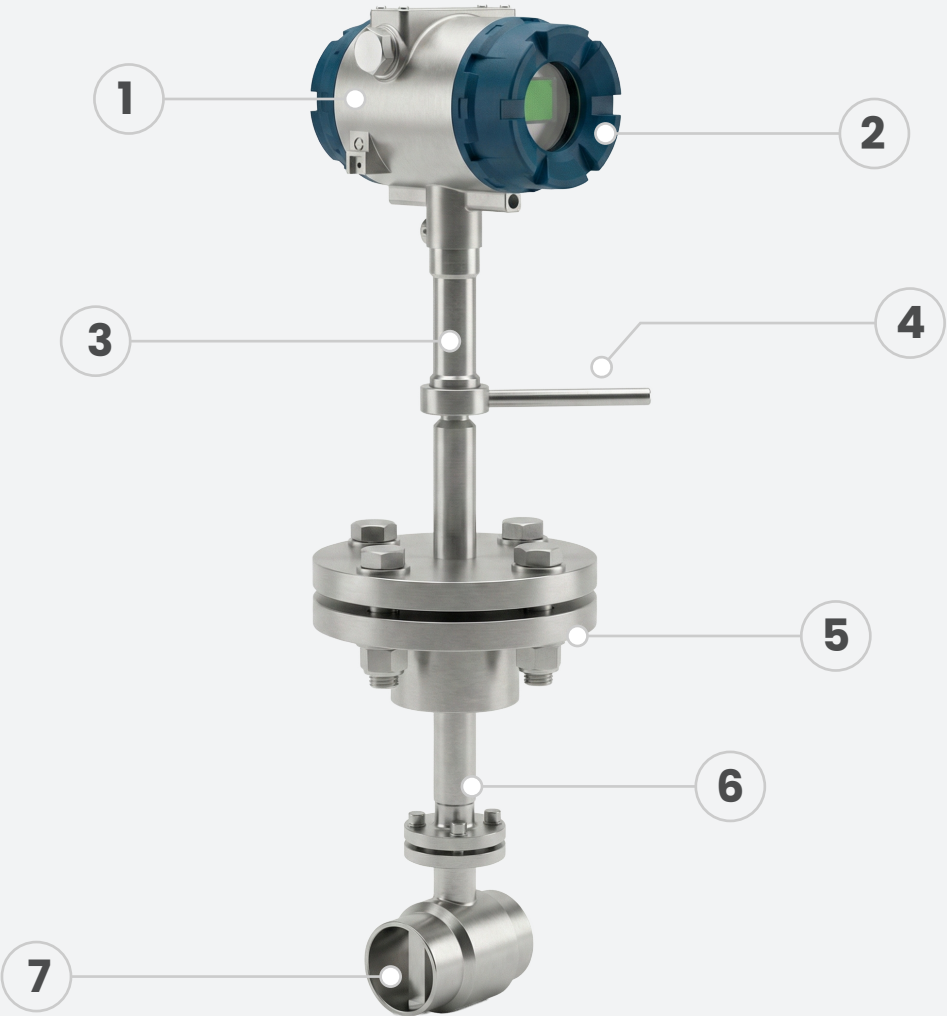
STEAM



Precise Measurement,
Ultimate Control

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VORTEX
FLOWMETER



- | | | | |
|---|------------------------------|---|---|
| 1 | TRANSMITTER | 5 | PROCESS FLANGE |
| 2 | KEY SET | 6 | STAINLESS STEEL BODY |
| 3 | PRESSURE SENSOR COOLING NECK | 7 | TEMPERATURE AND FLOW RATE MEASUREMENT POINT |
| 4 | FLOW DIRECTION BAR | | |

WORKING PRINCIPLE

The measurement principle of vortex flowmeters is based on the physical phenomenon known as the Kármán Vortex Street.

This principle is based on the fact that when a fluid (liquid or gas) passes around an obstacle (blow body), it creates regular vortices.

The operating principle of this type of vortex flowmeter is based on the analysis of the vortex shedding phenomenon created when a fluid passes over an obstacle. This is also known as the turbulence principle and occurs regardless of the shape of the object through which the flow passes.

The simplest way to understand this effect is with the example of a flagpole and a flag. Here, air is the fluid, and the pole acts as a solid obstacle. As air flows around the pole, vortices are formed, which can be observed as the flag fluttering.

The obstacle (bluff body) used in industry is usually cylindrical or prismatic in shape and is mounted perpendicular to the flow direction. The measurement is based on determining the frequency of the vortices that are formed.

Working Mechanism:

As the fluid passes around the body, it creates vortices.

- Each vortex passage creates a small change in pressure.
- These pressure changes are detected by a piezoelectric sensor or a capacitive sensor.
- The measured frequency signal is processed by the flowmeter's electronic unit.
- The volumetric flow rate (Q) is calculated based on the relationship between frequency and velocity:

$$Q = A \cdot V$$

Q = Volumetric flow rate (m³/s)

A = Pipe cross-sectional area (m²)

V = Flow velocity (m/s)

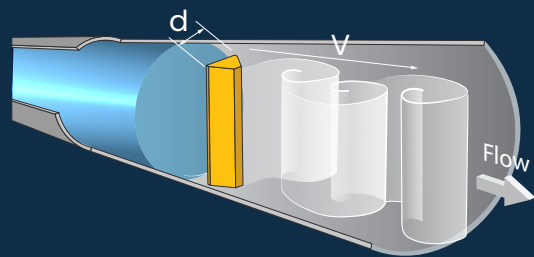
For vortex flow meters to provide accurate and reliable measurements, installation, process conditions, and environmental factors must be carefully evaluated.

Advantages:

- No moving parts → low maintenance requirements
- Wide measurement range (stable in flows with Reynolds numbers above 10,000)
- Suitable for liquid, gas, and steam measurements
- Pressure and temperature compensation ensures high accuracy

Basic Relationship (Formula):

$$f = St \cdot \frac{V}{d}$$



f = Vortex formation frequency (Hz)

St = Strouhal number (dimensionless constant, typically between 0.17–0.25)

V = Flow velocity (m/s)

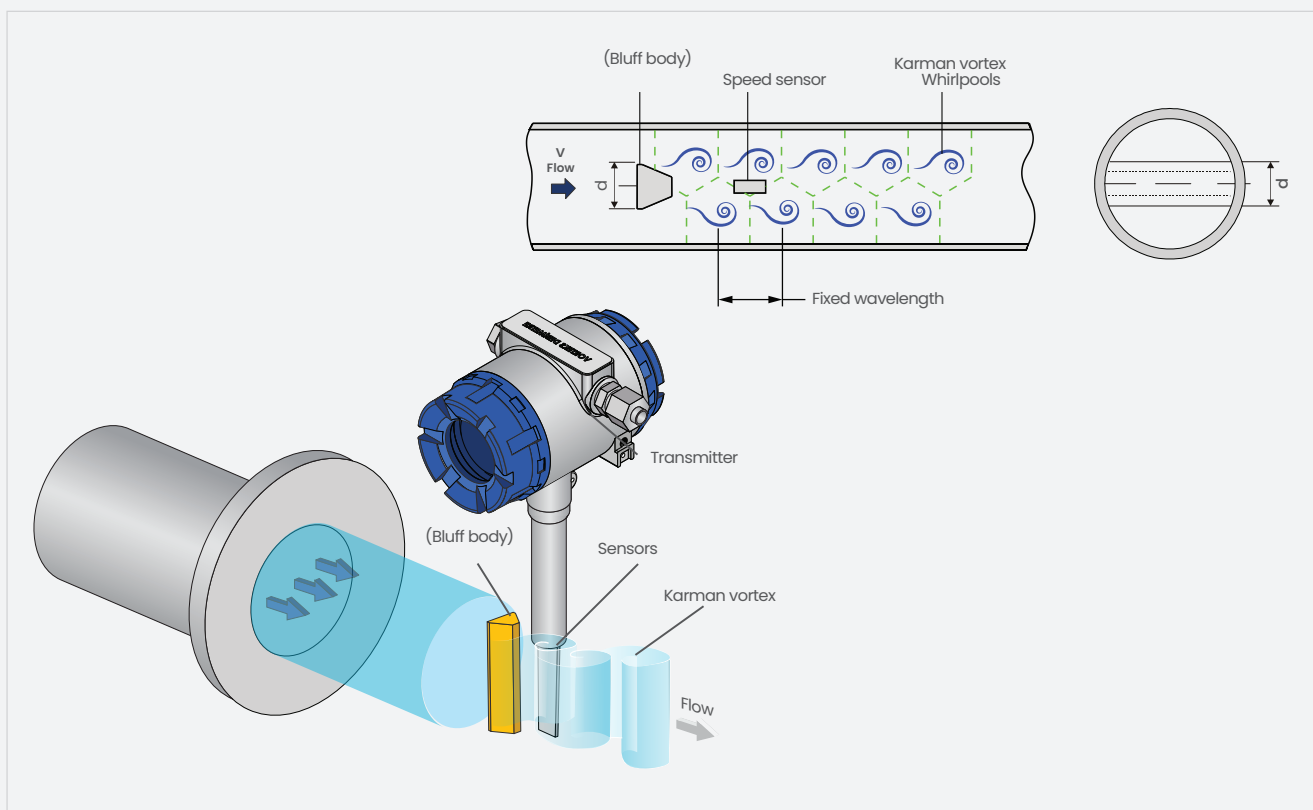
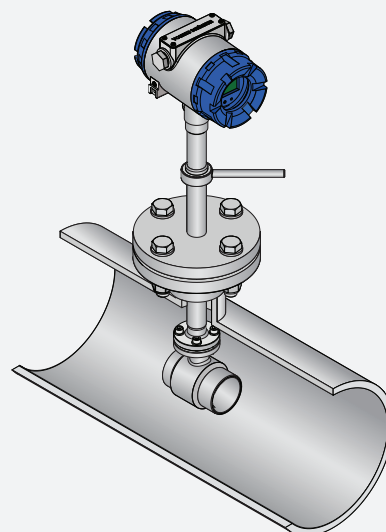
d = Obstacle width (blow) (m)

STRUCTURE OF VORTEX FLOWMETERS

The vortex flowmeter consists of an obstacle (bluff body) that generates Kármán vortices, a sensor that detects these vortices, and a transmitter that processes the signals received from the sensor.

When the fluid alternately generates Kármán vortices on both sides of the bluff body, an alternating stress (mechanical strain) is created on the sensor. This stress is detected by a piezoceramic element; the signal is then amplified and shaped by the transmitter.

The result is a pulse output that is proportional to the flow velocity.



Flowing part:

This is the part of the flowmeter through which the fluid passes and is usually mounted directly onto the pipe.

Bluff body:

This is a solid part placed perpendicular to the flow direction. As the flow passes around this part, it creates vortices. It can be cylindrical, square, triangular, or polyhedral in shape.

Sensors:

Detect turbulence and pressure changes.

Transmitter:

Analyzes signals received from sensors and converts them into electrical output.

Additionally, auxiliary devices such as a calculator or a normalizing converter can be integrated into the system.

APPLICATION AREAS



Chemical Industry

- Chemical Industry: Offers reliable and accurate flow measurement of gases, liquids, and steam, ensuring efficiency in complex chemical processing.



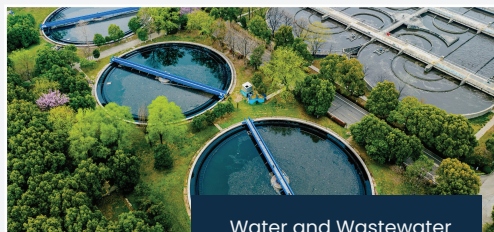
Power Plants

- Power Plants: Highly effective for monitoring high-temperature steam and cooling water flows that are critical to energy production and plant efficiency.



Food Industry

- Food Industry: Provides precise flow measurement for utility fluids like steam, compressed air, and clean gases used during food processing and sterilization.



Water and Wastewater

- Water and Wastewater: Easily used for volumetric flow measurements of aeration gases and treated water in municipal and industrial treatment facilities.



Petrochemicals

- Petrochemicals: Delivers robust and stable flow measurement solutions for hydrocarbons, process gases, and high-pressure steam in demanding refinery environments.

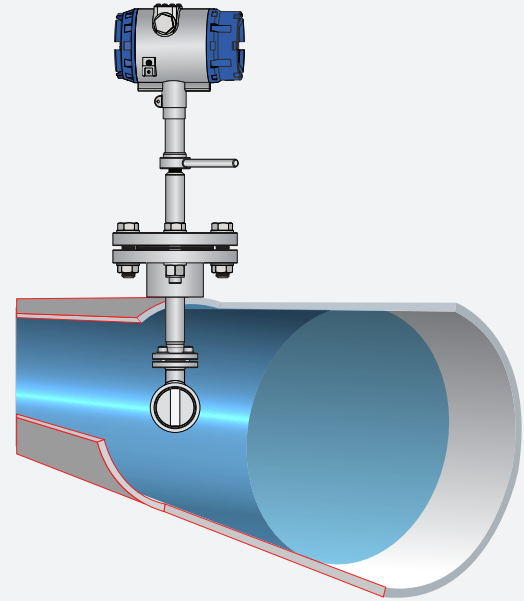
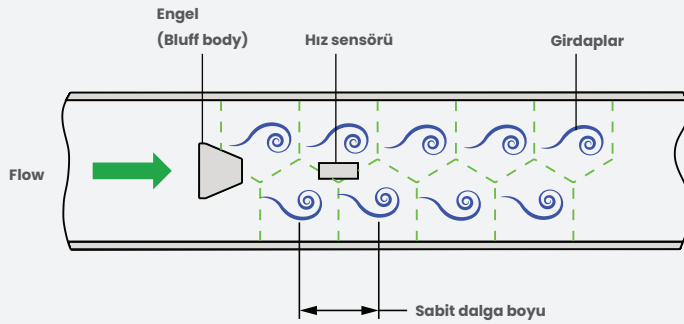


Pharmaceutical Industry

- Pharmaceutical Industry: Ensures high-accuracy measurement of pure steam and clean utilities, meeting the strict hygienic standards required in pharmaceutical manufacturing.

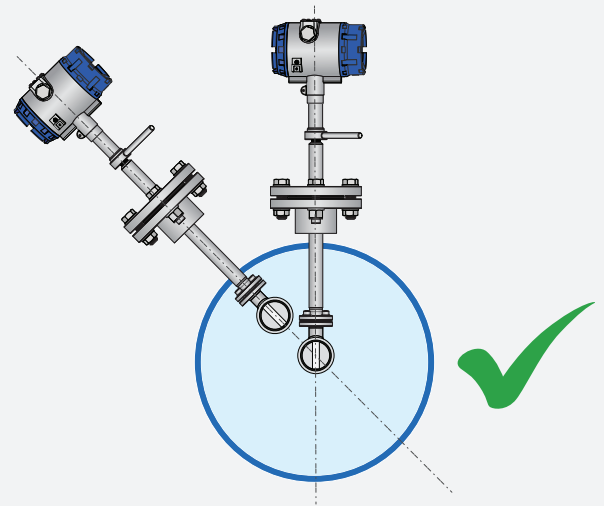
INSTALLATION RECOMMENDATIONS

For accurate measurements when installing insertion-type vortex flow meters, flow line conditions, installation direction, and sensor position are critical. The sensor is typically mounted perpendicular to the pipe axis. The flow direction must match the flow direction arrow on the device.



Pre-Installation Warnings

1. Since the immersion-type vortex flowmeter is directly immersed in the flow on the pipeline, misalignment or improper orientation during installation may cause damage to the device.
2. The flow direction must be checked before installation and must be consistent with the direction indicator on the device.
3. If there is a risk of vibration or impact on the line where the device is installed, it must be secured with appropriate clamps or supports.
4. Process pressure and temperature must not exceed the device's technical limits.
5. The immersion depth is generally recommended to be approximately 1/3 of the pipe diameter into the flow (it should be located close to the centerline of the pipe).



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Warning – Safety and Health Precautions



This device should only be installed, commissioned, and maintained by authorized and trained personnel.

The device's power must be completely disconnected during installation and maintenance.

Before working on pressurized lines, the fluid and pressure in the system must be completely drained.

When making electrical connections, the risk of sparks in explosive environments must be taken into account.

All connections must be made in accordance with local occupational safety regulations (e.g., Regulation on Health and Safety Conditions in the Use of Work Equipment).

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TECHNICAL SPECIFICATIONS

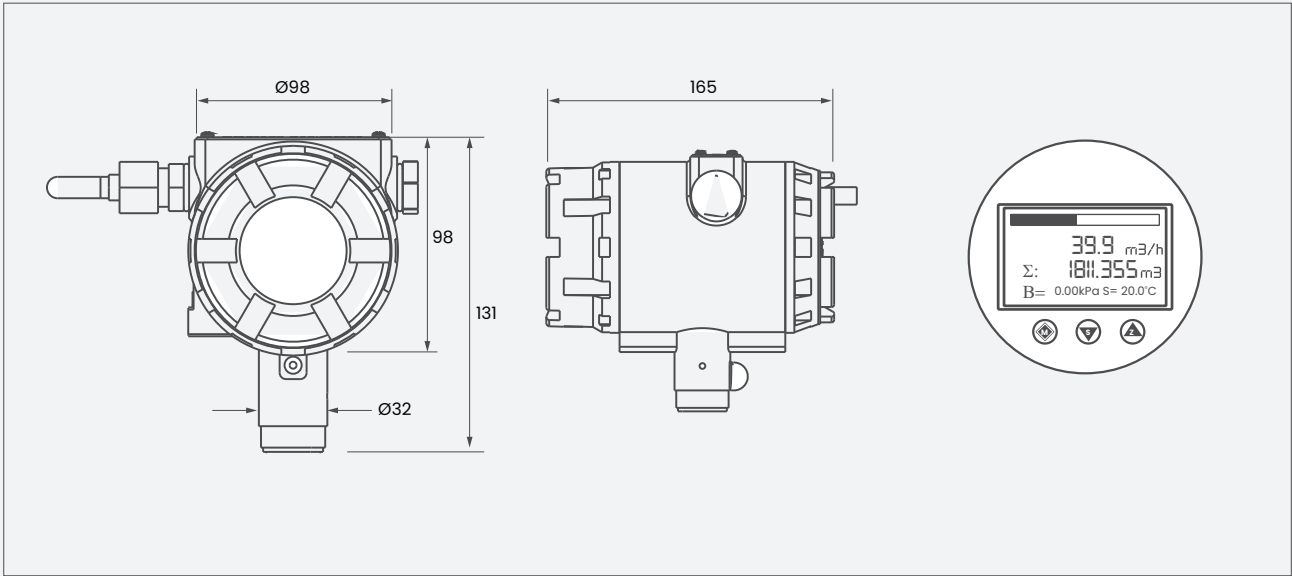
Standard Body

Measurement Range	Liquid: 0.25 ft/s to 9.5 ft/s Gas: 4 ft/s to 78 ft/s Vapor: 3 ft/s to 78 ft/s
Measurable Fluids	Liquid, gas, vapor
Average Pressure	1.0MPa, 1.6MPa, 2.5MPa Standard (Optional 4.0 MPa DN15...up to DN 80)
Special range	Customer Pressure information according to DN15-DN300
True Error Rate Full Type	liquid: ± 0.5%, gas and vapor ± 1.0%, ± 1.5%
Ratio Scale	1:10, 1:20, 1:30, 1:40
Friction Coefficient Full Type	Cd < 2.4
Vibration	Max. 2g
Process Temperature	Normal Environment -40°C ~ +250°C; Optional 40°C ~ +350°C;
Material	316 SS / 304 SS

Transmitter

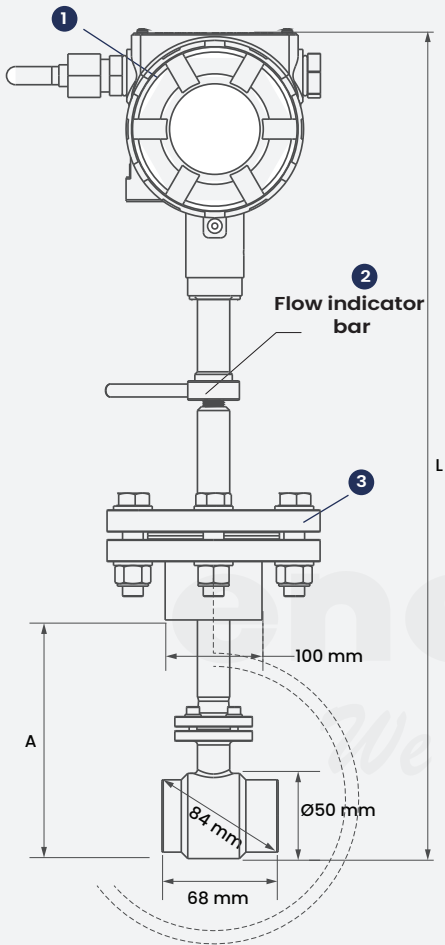
Body Material	Cast Aluminum	
Installation Method	Cylindrical Compact	
Supply Voltage	12...32VDC	
Local Screen	Backlit LCD Display 64x128	
Display Languages	English	
Output Signals	Standard (4-20 mA, Frequency, Pulse)	
Process Temperature	-20 ... +70 °C (Depending on process temperature) -40 to +85 °C (Separate model)	
Communication	RS485 MODBUS (Standard)	HART optional
Protection Class	IP67	

Transmitter

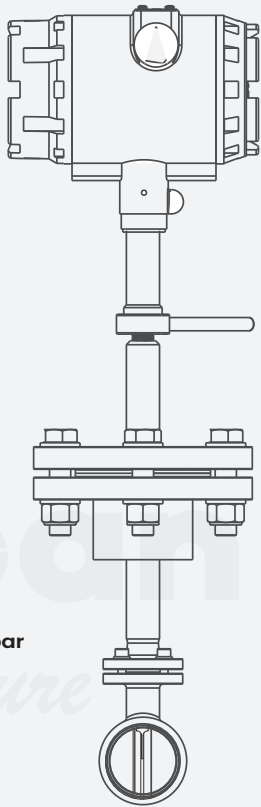


TECHNICAL DRAWING

FRONT VIEW OF THE SENSOR

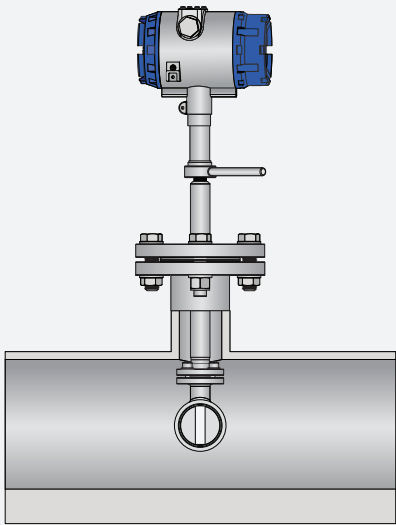


SENSOR'S SIDE VIEW

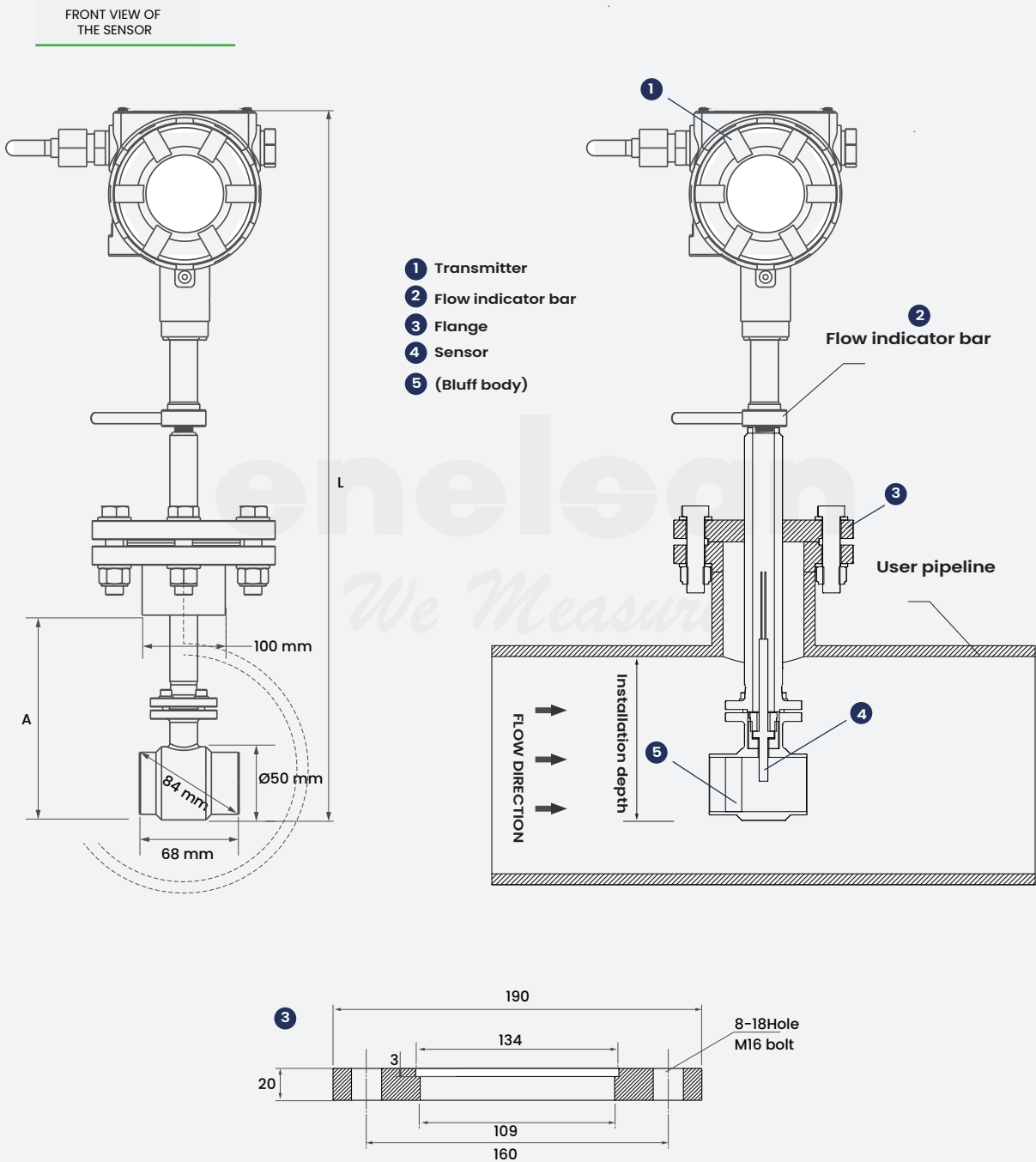


- 1 Transmitter
- 2 Flow indicator bar
- 3 Flange

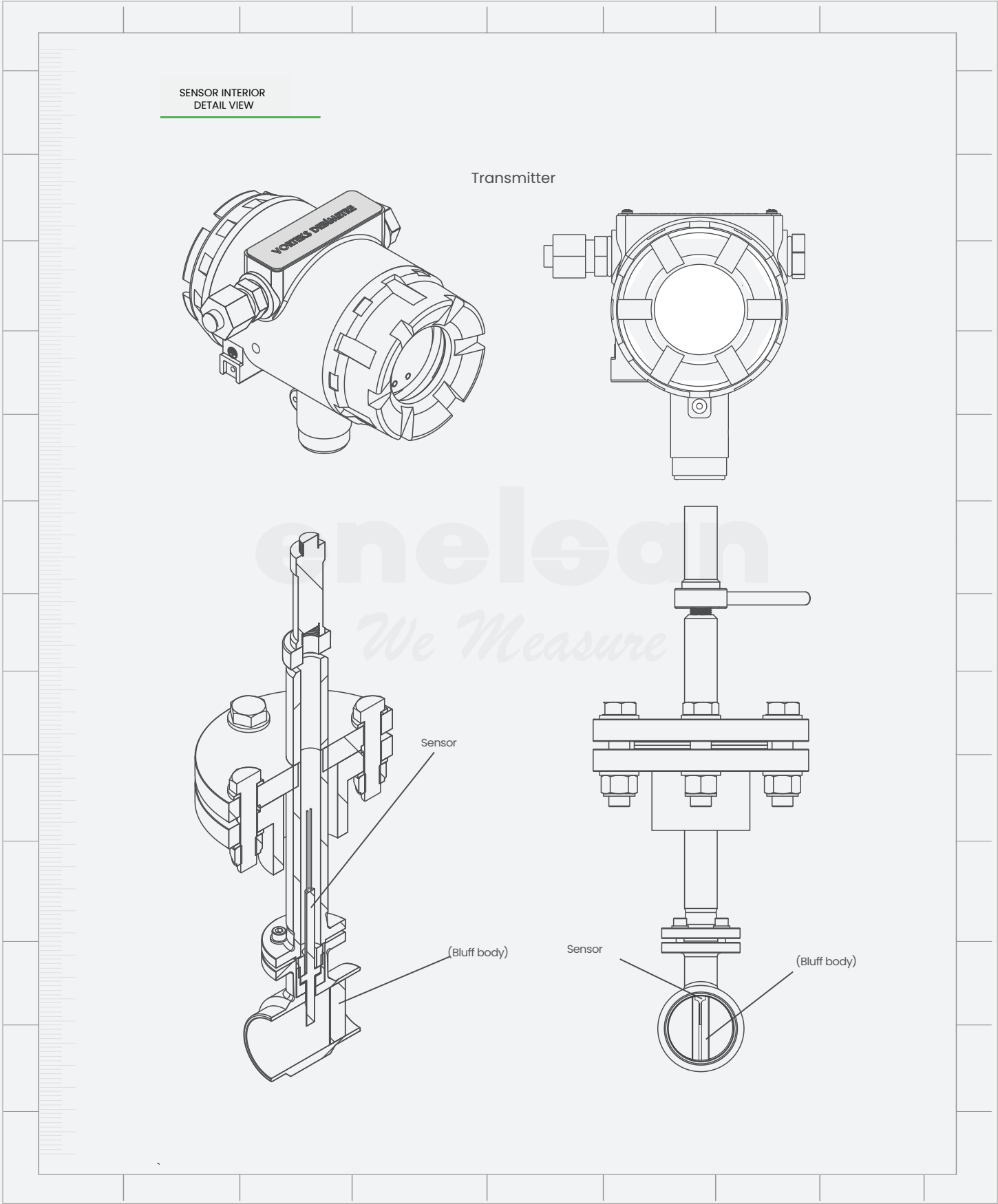
DN (mm)	A	L
DN150	103	498
DN200	128	523
DN250	153	548
DN300	178	573
DN400	228	623
DN500	278	673
DN600	328	723
DN700	399	794
DN800	428	823
DN1000	528	923
DN1500	778	1173



SENSOR MOUNTING METHOD

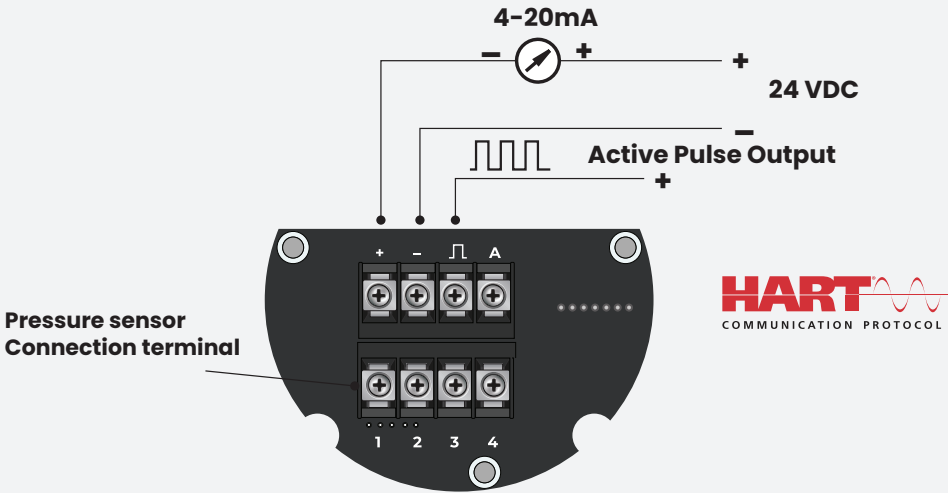


TECHNICAL DRAWING

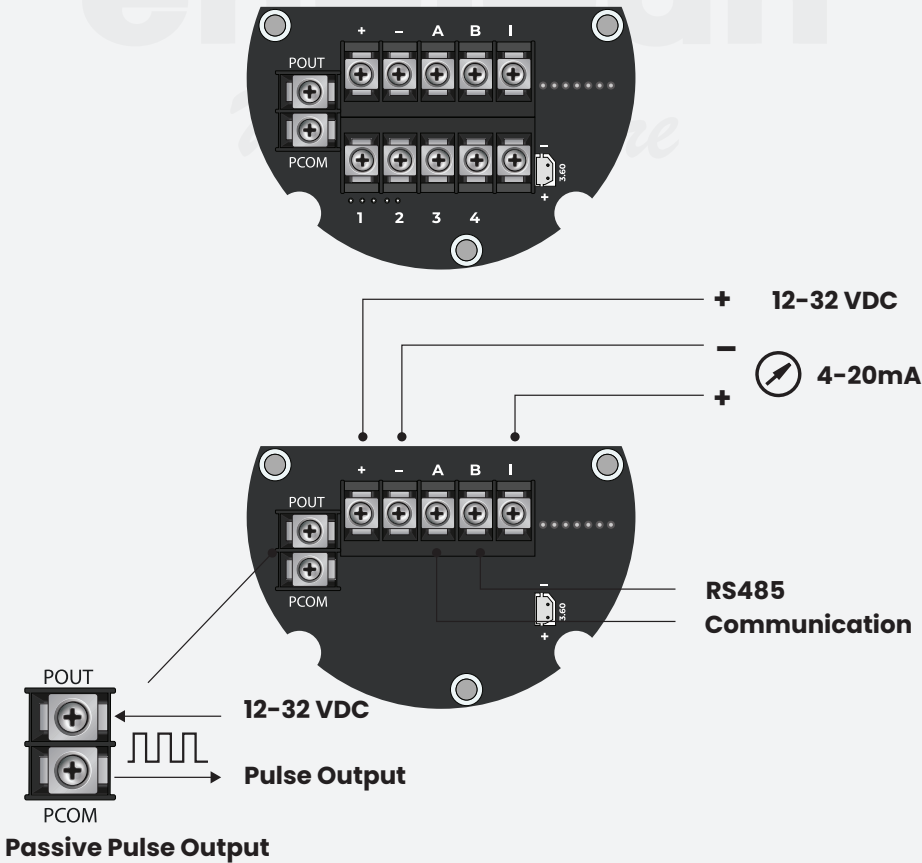


ELECTRONIC CARD CONNECTION

4~20mA Output and HART Communication Model



4~20mA - Pulse - RS485 Communication Model



TECHNICAL DRAWING

MEASURABLE FLOW RATES ACCORDING TO PRODUCT DIAMETERS AND FLUID TYPE

DN (mm)	K-Factor	Liquid (m3/h)	Frequency (HZ)	Gas (m3/h)	Frequency (HZ)	Steam (m3/h)	Frequency (HZ)
DN 15	350000	0.3-9	88-580	3-50	240-2350	4-50	260-2000
DN 20	148000	0.5-15	38-422	5-80	210-2132	7-80	210-1900
DN 25	74980.3	0.6-18	25-336	6-120	190-1140	10-80	210-1680
DN 32	30511	1-30	16-264	10-150	150-1100	12-120	156-1080
DN 40	17523.5	1.6-48	10-200	16-320	10-1040	25-180	126-910
DN 50	9451.2	5.5-75	8-160	25-500	94-1020	40-260	100-700
DN 65	4113	4-120	6.1-77.1	40-800	80.7-807	35-800	94-940
DN 80	2346	6-180	4.1-82	60-1250	55-690	100-800	63-500
DN 100	1153.5	10-300	4.7-69	100-2000	42-536	160-1100	50-350
DN 125	573.1	15-450	3.3-41.6	150-3000	38-416	150-2000	38-475
DN 150	334	22-660	2.8-43	200-4500	33-380	400-3500	38-350
DN 200	141.5	40-1200	2-31	300-8000	22-315	580-7000	23-270
DN 250	70.8	60-1800	1.5-25	500-12000	18-221	960-9600	20-200

SATURATED VAPOR PRESSURE-BASED FLOW RATE CHANGE TABLE

DN (mm)	Flow	Measurable Flow Rates (kg/h)								
		1 Bar	2 Bar	4 Bar	6 Bar	8 Bar	10 Bar	15 Bar	20 Bar	25 Bar
DN 15	Min	2,2	3,2	5,1	7,1	8,9	10,8	15,5	20,2	25,0
	Max	54,5	79,6	128,4	176,3	223,7	270,8	388,2	505,9	624,5
DN 20	Min	3,8	5,6	9,0	12,3	15,7	19,0	27,2	35,4	43,7
	Max	95,4	139,2	224,6	308,5	391,4	473,9	679,3	885,3	1092,9
DN 25	Min	6,1	8,9	14,4	19,8	25,2	30,5	43,7	56,9	70,3
	Max	153,4	223,7	361,0	495,7	629,1	761,6	1091,8	1422,8	1756,5
DN 32	Min	10,2	14,9	24,1	33,0	41,9	50,8	72,8	94,9	117,1
	Max	255,6	372,9	601,7	826,2	1048,4	1269,3	1819,7	2371,4	2927,5
DN 40	Min	15,7	22,9	36,9	50,7	64,3	77,9	111,6	145,4	179,6
	Max	392,0	571,8	922,6	1266,9	1607,6	1946,3	2790,1	3636,1	4488,8
DN 50	Min	23,9	34,8	56,2	77,1	97,9	118,5	169,8	221,3	273,2
	Max	596,5	870,1	1404,0	1927,8	2446,3	2961,8	4245,9	5533,2	6830,7
DN 65	Min	49,1	71,6	115,5	158,6	201,3	243,7	349,4	455,3	562,1
	Max	1227,0	1789,9	2888,2	3965,8	5032,5	6092,8	8734,4	11382,6	14051,8
DN 80	Min	61,4	89,5	144,4	198,3	251,6	304,6	436,7	569,1	702,6
	Max	1533,8	2237,4	3610,3	4957,3	6290,6	7616,0	10918,0	14228,2	17564,7
DN 100	Min	95,4	139,2	224,6	308,5	391,4	473,9	679,3	885,3	1092,9
	Max	2385,8	3480,4	5616,0	7711,3	9785,3	11847,1	16983,5	22132,8	27322,9
DN 125	Min	150,0	218,8	353,0	484,7	615,1	744,7	1067,5	1391,2	1717,4
	Max	3749,2	5469,3	8825,2	12117,8	15375,9	18616,8	26688,4	34780,1	42935,9
DN 150	Min	204,5	298,3	481,4	661,0	838,7	1015,5	1455,7	1897,1	2342,0
	Max	5112,5	7458,1	12034,3	16524,2	20968,5	25386,6	36393,2	47427,4	58549,0
DN 200	Min	374,9	546,9	882,5	1211,8	1537,7	1861,7	2668,8	3478,0	4293,6
	Max	9373,0	13673,2	22062,9	30294,4	38442,3	46542,0	66720,9	86950,3	107339,9
DN 250	Min	599,9	875,1	1412,0	1938,8	2460,3	2978,7	4270,1	5564,8	6869,8
	Max	14996,8	21877,1	35300,6	48471,0	61507,7	74467,3	106753,4	139120,4	171743,8
DN 300	Min	852,1	1243,0	2005,7	2754,0	3494,8	4231,1	6065,5	7904,6	9758,2
	Max	21302,2	31075,4	50142,9	68850,9	87368,9	105777,4	151638,4	197614,2	243954,2

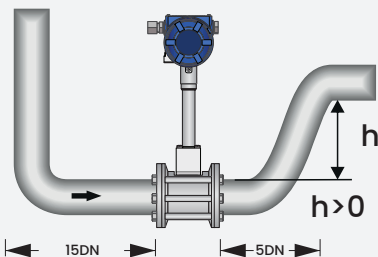
TERMS OF USE

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To ensure accurate and reliable measurements with vortex flow meters, the following conditions must be met:

- 1. The pipe must always be completely full. (only for liquids)
- 2. A straight pipe length of 10D at the inlet and 5D at the outlet must be maintained.
(only applies to liquids; varies for gas and steam applications)
- 3. The mounting direction must be the same as the flow direction.
- 4. A damper must be used in vibrating environments.
- 5. Cables must be protected and the device must be grounded.
- 6. A condensate trap must be used in steam lines.
- 7. Avoid sudden peak pressure changes.
- 8. In steam applications, the pipe line must be insulated along with the device.

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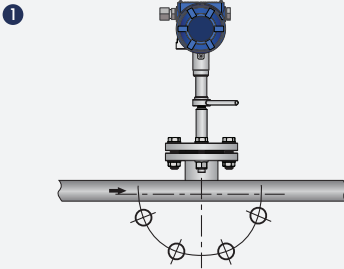
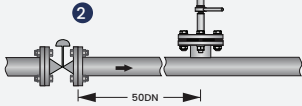
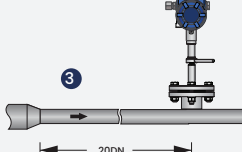
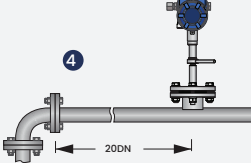
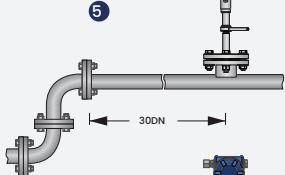
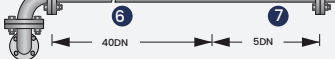
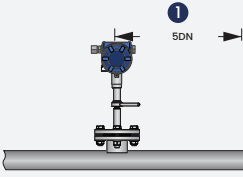
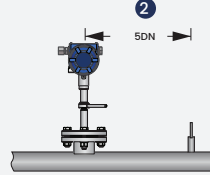
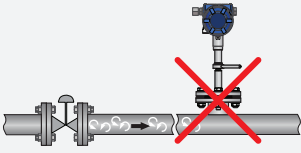
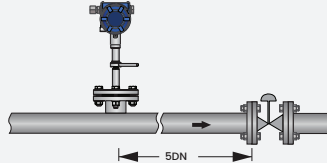


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- 1. DN (Nominal Diameter): Unit of pipe diameter (e.g., DN100 = 100 mm pipe diameter).
- 2. Upstream direction: The straight pipe length before the flow meter.
- 3. Downstream direction: The straight pipe length after the flow meter.
- 4. Example: “25DN” means that a straight pipe length equal to 25 times the pipe diameter must be present before the flow meter.

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MOUNTING TYPES

Minimum inlet direction pipe length	Minimum outlet direction pipe length
 1  2  3  4  5  6  7	 1  2 1. Pipe expanders, pipe elbows, control valves, etc., in the flow outlet direction ≥ 5 DN 2. Measurement points in the flow outlet direction ≥ 5 DN Control valve pipelines 
1. Without disrupting flow, general inlet direction pipe length ≥ 15 DN 2. After the control valve ≥ 50 DN 3. After pipe diameter reduction ≥ 20 DN 4. After a single 90° elbow ≥ 20 DN 5. After a double $2 \times 90^\circ$ elbow ≥ 30 DN 6. After two three-dimensional $2 \times 90^\circ$ elbows ≥ 40 DN 7. Outlet direction > 5 DN	

CODE

VTRANS (V) -

F

 -

100

 -

PT

 -

G

 -

H

 -

HT

 -

Pn10

1

2

3

4

5

6

7

1 Product Type / Connection	
Wafer-Type Vortex Flowmeter (sandwich)	☐ W
Flange-Type Vortex Flow Meter	☒ F
Separate Type Vortex Flowmeter	☐ R
Immersion Type Vortex Flowmeter	☐ D

2 DN - Ø	
Pipe Diameter - DN	☐ XXX

3 Model	
Temperature Pressure Comp.	☒ PT
No display / No computer	☐ D

4 Fluid	
Liquid	☐ S
Gas	☒ G
Saturated Steam	☐ BB
Superheated Steam	☐ KB

5 OPS Output	
None	☒ X
Hart Output	☐ H
Modbus Output	☐ RS485

6 OPS Temperature	
None	☒ X
High Temperature 350°C	☐ HT
Standard	☐ X

7 Pressure	
10Bar	☒ Pn10
16Bar	☐ Pn16
25Bar	☐ Pn25
40Bar	☐ Pn40
63Bar	☐ Pn63

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