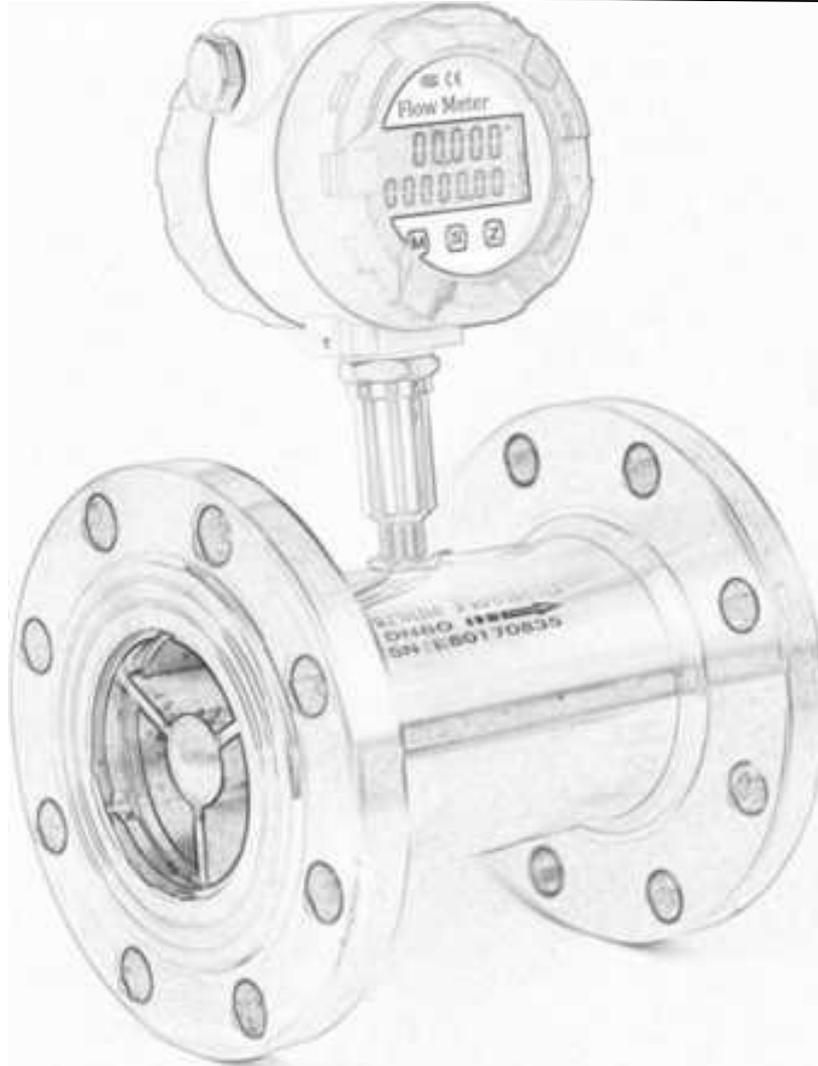


EC-LWGY liquid turbine flow meter user guide



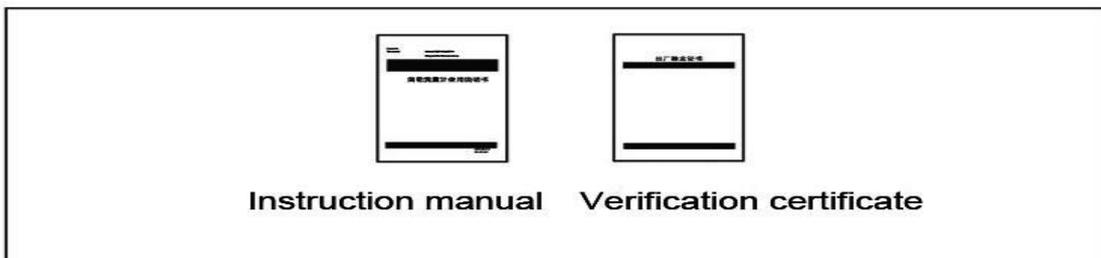
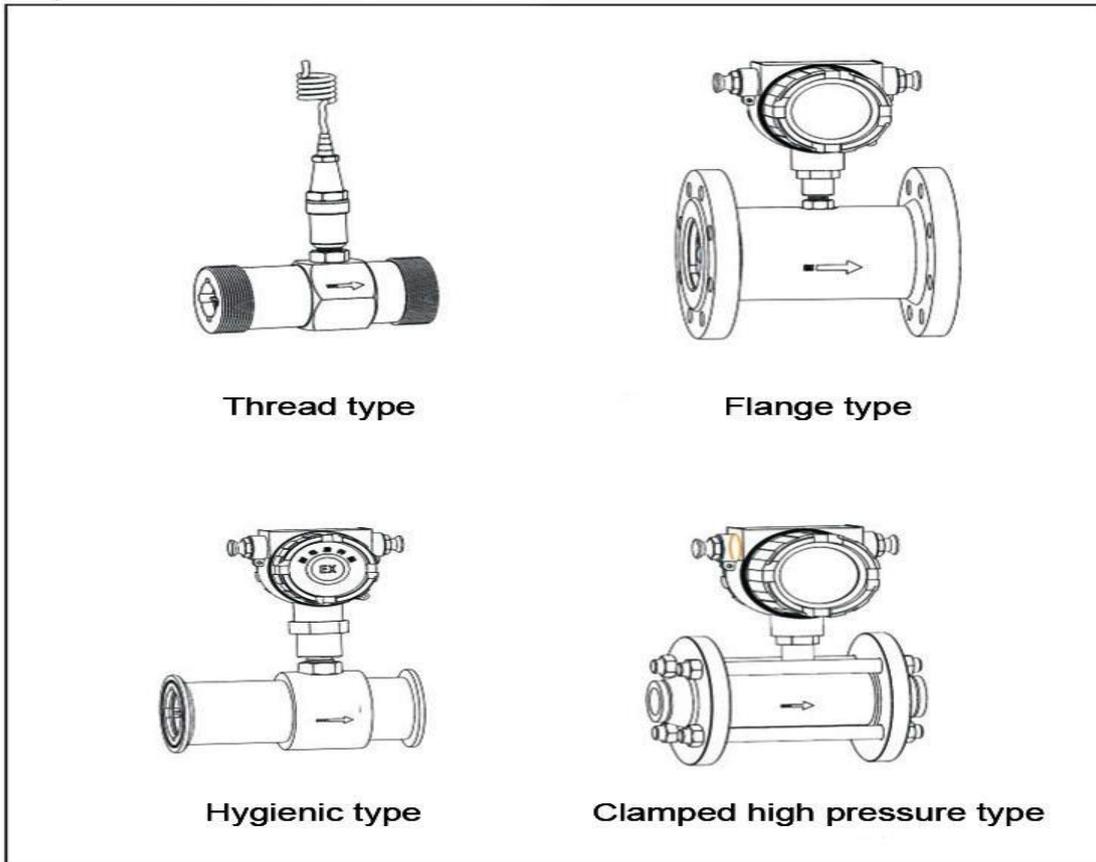
Chapter I safety guidance

Warning!

1. When measuring flammable media, take precautions against fire or explosion.
2. Follow proper operation steps when working in dangerous environment.
3. When the flow meter is dismantled, it may cause media splash. Please follow the fluid equipment manufacturer's safe operating rules to prevent splash.
4. Do not blow the flowmeter with compressed air.
5. Pay attention to the turbine blade inside the flowmeter, even a small scratch or notch will affect the accuracy.
6. In order to achieve the best effect, the calibration period of the instrument shall not exceed 1 year.

Chapter ii instrument description

Liquid turbine flow sensor structure



2.1 measurement principle

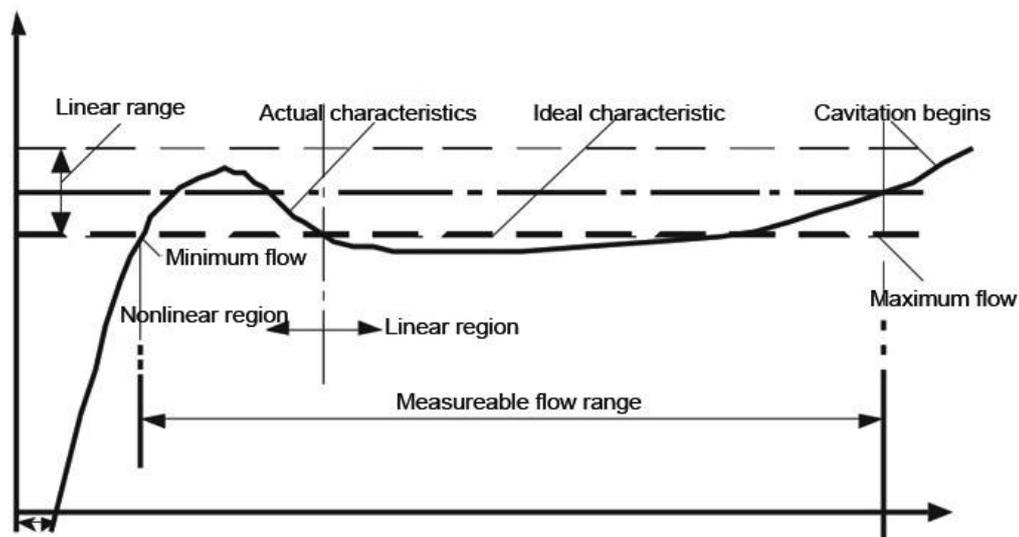
When the measured liquid flows through the sensor, the impeller is forced to rotate under the action of the fluid, and its rotation speed is proportional to the average flow velocity of the pipeline. The rotation of the impeller periodically changes the magnetic resistance value of the magnetic circuit, and the magnetic flux in the detection coil changes periodically, generating an induced electromotive force having the same frequency as the blade rotation frequency, and after being amplified, is converted and processed.

The practical flow equation for a turbine flowmeter is:

$$Q_v = f / K$$

- Q_v Volume flow m^3/s ;
 f Output frequency Hz;
 K Meter factor $1/\text{m}^3$;

The relationship between the coefficient of the flowmeter and the flow rate (or Reynolds number) is shown in Figure 1.1. As can be seen from the figure, the meter factor is divided into two segments, a linear segment and a nonlinear segment. The linear segment is approximately two-thirds of its working segment and its characteristics are related to sensor structure size and fluid viscosity. The nonlinear segment characteristics are greatly affected by bearing friction and fluid viscous drag. When the flow rate is below the sensor flow lower limit, the meter factor changes rapidly with the flow rate. Take care to prevent cavitation when the flow exceeds the upper flow limit.



1.1 Turbine flowmeter characteristic curve

2.2 Application range

The turbine flow sensor (hereinafter referred to as the sensor) is based on the principle of torque balance and belongs to the speed flow meter. The sensor has the characteristics of simple structure, light weight, high precision, good reproducibility, sensitive response, convenient installation and maintenance, etc. It is widely used in petroleum, chemical, metallurgy, water supply, papermaking and other industries, and is suitable for measuring closed pipes and stainless steel 1Cr18Ni9Ti, 2Cr13 and corundum Al_2O_3 , hard alloys do not corrode, and there are no impurities such as fibers, particles and other liquids.

If it is matched with a display instrument with special functions, it can also perform

quantitative control, over-alarmed, and so on. Use this product's explosion-proof version (ExdIICT6 Gb) for use in potentially explosive atmospheres. The sensor is suitable for medium with viscosity less than $5 \times 10^{-6} \text{m}^2/\text{S}$ at working temperature. For liquids with viscosity greater than $5 \times 10^{-6} \text{m}^2/\text{S}$, the sensor should be used after liquid calibration.

Chapter III Installation

3.1 Storage

- Store the meter in a dry, dust-free place;
- Please avoid prolonged exposure to direct sunlight;
- The meter should be stored in the original box

3.2 Installation Tips

- To ensure reliable installation, the following measures must be taken.
- Keep enough space on the side;
- Do not subject the flowmeter to severe vibrations

3.3 piping design

Consideration should be given to the piping design:

(1) Installation environment

- The flow meter should be installed indoors. If it is to be installed outdoors, measures should be taken to avoid direct sunlight and prevent rain.
- The flow meter should be installed in a place with high temperature, heat radiation from the equipment or corrosive gas. If it is necessary to install, it must be insulated and ventilated.

(2) Avoid magnetic interference

- The turbine flow sensor cannot be installed near motors, transformers, or other power sources that are prone to electromagnetic interference.
- Don't install the turbine flow sensor near the inverter or from the inverter power distribution cabinet to avoid interference.

(3) Maintenance space

- It is not easy to install, maintain and maintain. It needs ample installation space around the turbine flow meter.

(4) Support of the flow meter

- The turbine flow sensor should be installed on pipes with mechanical vibration. If it is necessary to install, damping measures must be taken, hose extensions can be added, or pipe fixing points can be added at the 2DN downstream of the flowmeter and a shock pad can be added.
- The flow meter should be avoided to be installed on the long overhead pipeline. The leakage of the pipeline between the flow meter and the flange is easy due to the drooping of the pipeline. If it is necessary to install, the pipe support points must be set separately at the upstream and downstream 2D of the flowmeter.

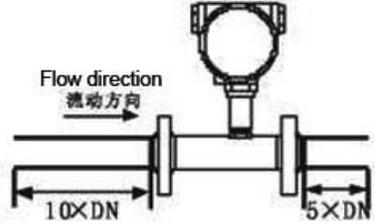
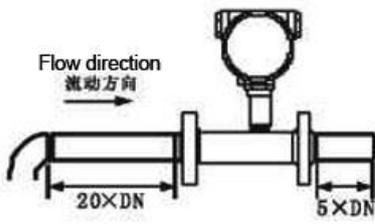
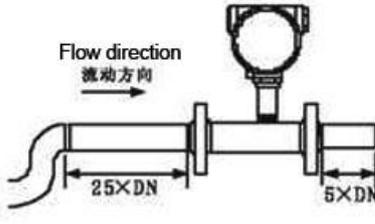
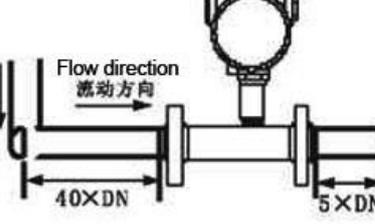
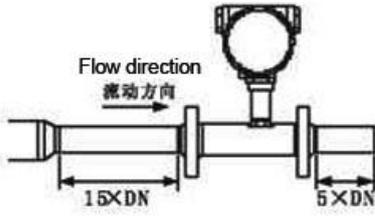
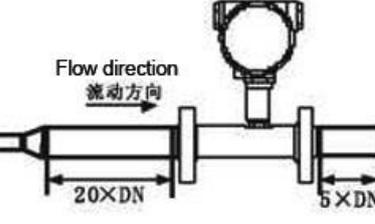
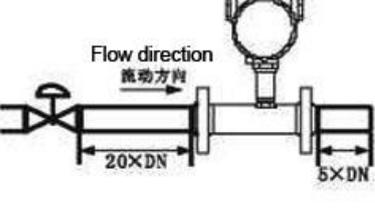
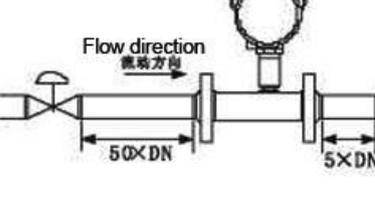
(5) Requirements for piping

- Horizontal installation of the sensor requires that the pipe should not have a visually detectable tilt (typically within 5°), and the vertical deviation of the vertically mounted sensor pipe should be less than 5° .

■ The pipe must be filled with liquid. If the liquid to be tested contains gas, the air eliminator should be installed on the upstream side of the sensor. The drain and air vents of the filter and getter should lead to a safe place.

(6) Straight pipe length

The turbine flow meter is sensitive to the distortion of the flow velocity distribution in the pipeline and the swirling flow. The entering sensor should be fully developed for turbulence. Therefore, it is necessary to equip the straight pipe section or rectifier according to the type of the upstream side of the sensor, and the straight section of the inlet section and the outlet section are required. The length is shown in the table below.

Inlet section choke type	Installation conditions			Installation conditions	
	Entrance section	Exit segment		Entrance section	Exit segment
General situation			Two 90° elbows in the same plane		
Two 90° elbows in the same plane			Two 90° elbows in different planes		
Shrink tube			Expansion		
Full open valve			Half open valve		

The dimensions shown in the above table are the minimum required straight pipe lengths to ensure accuracy. If the length of the straight pipe is doubled, the accuracy can be improved.

Upstream: The minimum allowable straight pipe length is at least 10 times the pipe diameter.

Downstream: The minimum allowable straight pipe length is at least 5 times the pipe diameter.

3.4 Mechanical installation

Instrument operation instructions

(1) Be careful when unpacking, do not damage the meter

It is best not to unpack the box before transporting it to the installation site to avoid damage to the instrument. Use the mounting ring when lifting the meter. Never use a rod or string to lift the meter through the sensor measuring tube.

(2) Prevent the instrument from being shaken

Prevent heavy falls and heavy pressure on the instrument. In particular, the surface of the flange should not be stressed and may damage the sealing surface.

(3) Protection of the sensor flange face

Pay attention to the protection of the flange after unpacking the instrument. Do not place the flange on the unpadded floor or other uneven surface.

(4) The meter is not used for a long time

After the instrument is installed, it should be avoided for a long time. If you do not use it for a long period of time, you must take the following measures for the meter.

A Check the end cover and the sealing of the wiring port to ensure that moisture and water do not enter the inside of the instrument. Regular inspections, inspections of the various measures and junction boxes mentioned above, at least once a year.

B When there is a possibility of water immersion into the instrument (such as after heavy rain or after lightning), the instrument should be inspected immediately.

1. The installation of the pipeline

■ Before installing the flowmeter, the pipeline should be calibrated to ensure that the diameter of the instrument has good concentricity with the user's pipeline. Therefore, the flow meter needs to be grounded in many occasions. Its function is to form a shielded external interference through the grounding of the flowmeter casing. The internal space thus improves measurement accuracy.

■ Newly installed pipelines generally have foreign matter (such as welding slag). The flowmeter should be cleaned before installation. This can not only damage the liner but also prevent measurement errors caused by foreign matter passing through the measuring tube during measurement. .

■ Open the pipe according to the size of the opening, and make the position of the opening meet the requirements of the straight pipe section. Place the entire flowmeter connected to the upper flange into the pipe that is open.

■ Spot welding positioning of flanges and pipes. After spot welding, the flowmeter should be removed and cannot be welded with a flowmeter. Remove the flowmeter, weld the flange as required, and clean all protruding parts of the pipe.

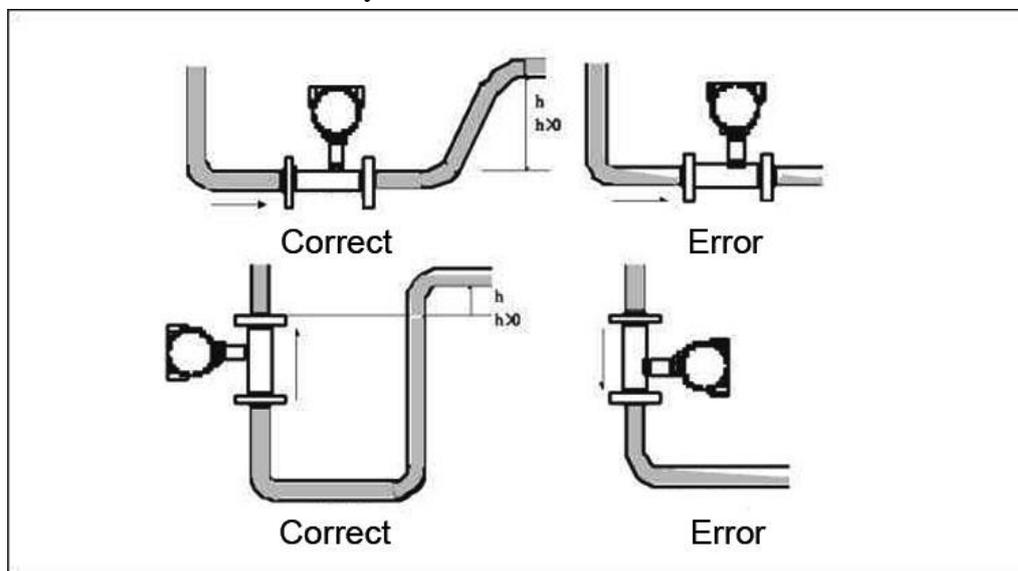
■ Install a gasket with the same diameter as the pipe in the inner groove of the flange. Install the flowmeter into the flange. The flow direction of the flowmeter should be the same as the fluid direction, and then tightened with the bolt.

2. Installation of pipeline flowmeter

- Installation direction, the flow direction of the measured fluid should be consistent with the flow direction flow direction mark.
- Flange gaskets installed between flanges should have good corrosion resistance. The gaskets should not protrude into the pipe.
- When installing on site, use bolts to connect the flange on the sensor to the flange on the pipe. The bolts and nuts that fasten the instrument should be intact and well lubricated. At the same time, it should be matched with flat washers and spring washers. It is conditional to tighten the tightening bolts with a torque wrench depending on the flange size and torque. In daily use, tighten the bolts regularly to prevent the bolts from loosening.

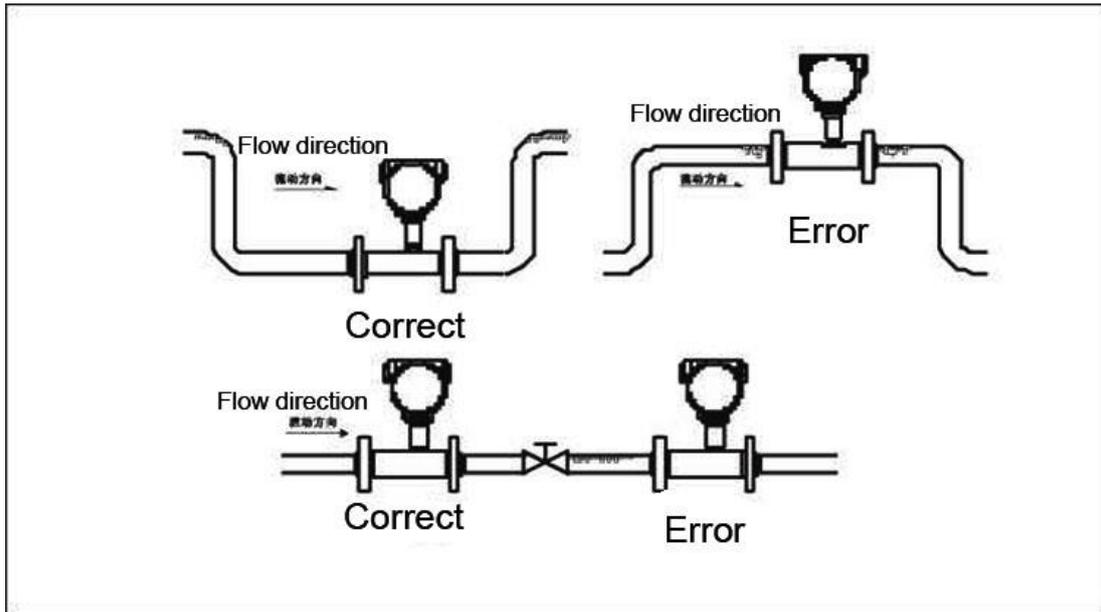
3. The position of the flow meter

The pipe must be completely filled with liquid. It is important to keep the pipe completely filled with liquid at any time, otherwise the flow display will be affected and measurement errors may result.

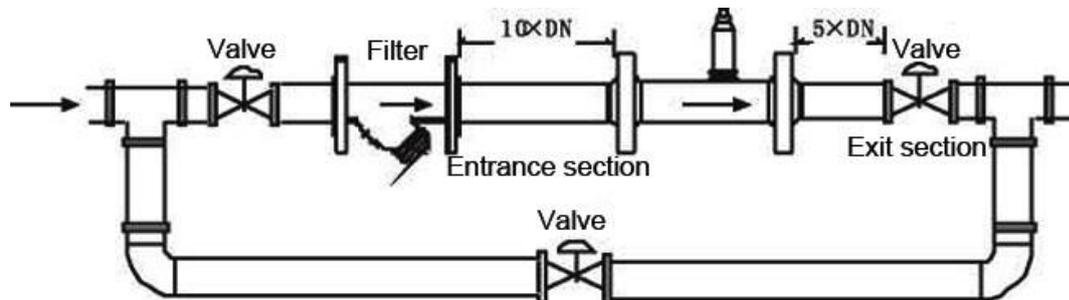


Avoid air bubbles. If bubbles enter the measuring tube, the flow display may be affected and may be affected.

Lead to measurement error.



4. Turbine flow sensor typical installation pipeline form

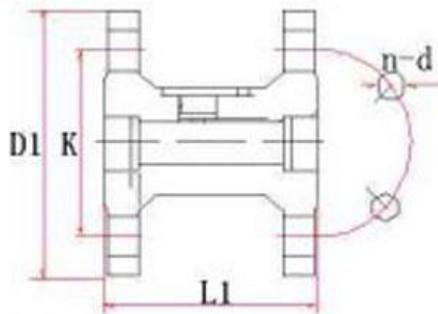


The sensor should be installed in a place where it is easy to maintain, no vibration of the pipeline, no strong electromagnetic interference and thermal radiation.

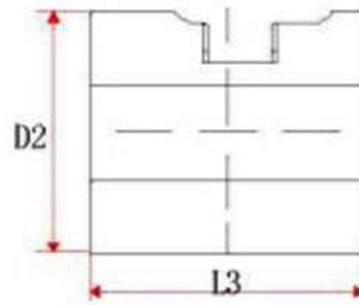
□ In places where it is not possible to stop, a bypass pipe and a reliable shut-off valve (see above) should be installed. Make sure that the bypass pipe is leak-free during the measurement.

□ First connect a short tube to replace the sensor in the position where the newly installed pipe is installed. After the “sweeping” work is completed, confirm that the pipe is cleaned and then officially access the sensor. When installing the sensor outdoors, there should be measures to avoid direct sunlight and prevent rain.

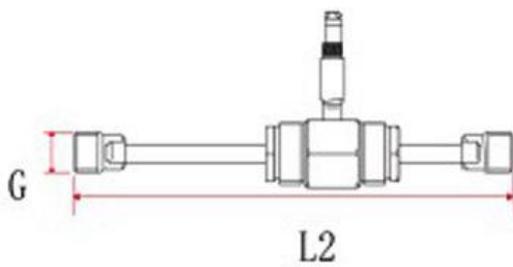
3.5 Installation Dimensions



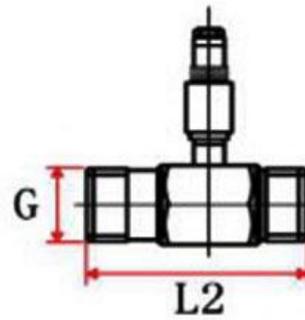
DN15~DN200 flange connection type



DN4~DN200 flange clamp type



DN4~DN10 threaded type



DN15~DN50 threaded type

Turbine flow sensor installation dimension table

Nominal diameter	Flange connection					Threaded connection		Clamp connection	
	L1	D1	K	d	(n)	L2	(G)	L3	D2
4						225	G1/2	50	38
6						225	G1/2	50	38
10						345	G1/2	50	38
15	75	95	65	14	4	75	G1	55	47
20	80	105	75	14	4	80	G1	60	54
25	100	115	85	14	4	100	G5/4	60	57
32	140	140	100	14	4	140	G2	70	66
40	140	150	110	18	4	140	G2	70	72
50	150	165	125	18	4	150	G5/2	70	92
65	170	185	145	18	4			80	100
80	200	200	160	18	8			90	112
100	220	220	180	18	8			100	137
125	250	250	210	18	8			120	165
150	300	285	240	22	8			150	190
200	360	340	295	22	12			150	243

Note:

- (1) The above-mentioned flange clamp type turbine flow sensor with a pressure rating of 1.6 MPa.

- (2) The length of the installation length L0 plus the pair of mounting flanges. The mounting flange is a special flange, which is already equipped at the factory. The standard for the mounting flange is the enterprise standard and is recommended.
- (3) The above dimensions are for reference only when designing and selecting. The actual size is subject to confirmation at the time of shipment or order.
- (4) The dimensions of the high-temperature type and high-pressure type are subject to confirmation at the time of shipment or order.
- (5) The flowmeter installation flange adopts the enterprise standard, and can also adopt other national departments or industry standards according to user needs, or adopt other national standards (American standard, German standard, Japanese standard, etc.). If special standards are required, please note when ordering.

Chapter IV Electrical Connection

4.1 Safety Tips

1. All work on electrical connections must be made with the power off. Please pay attention to the power supply data on the nameplate.
2. Please strictly observe local occupational health and safety regulations. Only properly trained personnel are allowed to work on electrical equipment

4.2 Electrical cable for instrumentation

Signal cable tips

With a double-shielded signal cable and effective grounding of the shield, the interference to the measured value transmission process can be greatly reduced.

Please note the following tips:

Please lay the signal cable firmly.

Allow the signal cable to be laid in water or soil.

In line with EN5062, IEC60322-1 and other related standards, the insulation material should be flame retardant.

The signal wires do not contain a sleeping or plasticizer and are flexible at low temperatures.

The internal shield is connected by a multi-strand drain wire.

The "RVVP" shielded cable is recommended for electrical connection cables. The 24V power cable is connected from one side of the hole, and the 4 ~ 20mA signal line is connected from the other side of the wire.

The shielded cable connected to the flowmeter should be kept away from strong electromagnetic fields and must not be laid with the high voltage cable. The shielded wire should be as short as possible and should not be coiled to reduce the distributed inductance. The maximum length is less than 500 meters.

4.3 Connecting electrical cables

1. Signal and power leads are only allowed to be connected with the power off
2. The instrument must be connected to the protective earthing terminal as required to protect the operator from electric shock.
3. For those instruments that are used in areas with explosion hazards, you also need to pay attention to the safety tips given in the special explosion-proof instructions.
4. Please strictly observe local occupational health and safety regulations. Only

properly trained personnel are allowed to work on electrical equipment.

5. The voltage difference between the measuring sensor and the protective earth of the converter or converter is not allowed.

The measuring sensor must be completely grounded. Refer to the grounding requirements of the relevant standard (HVT20513-2014 Instrument System Grounding System Design Specification).

The grounding conductor should not transmit any interference voltage.

It is not allowed to connect other electrical equipment to the grounding conductor at the same time.

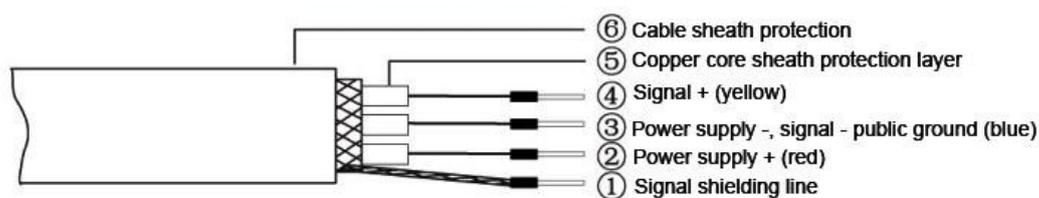
4.4 Electrical wiring

Installation materials and tools are not included in the scope of supply. Use installation materials and tools that meet occupational health and safety regulations.

N type (basic pulse) terminal diagram and wiring description Signal cable structure

The signal cable is a shielded cable that transmits the signals from the turbine flow meter.

Bending radius $>50\text{mm}/2''$



4.5 connected to the power supply

1. The instrument must be connected to the protective earthing terminal as required to protect the operator from electric shock.
2. Included in the allowable range: 12VDC/24VDC or lithium battery powered

Chapter V Startup, Operation

5.1 Turn on the power

Check that the meter is installed correctly before turning on the power, including: The flow meter must be installed in a safe and compliant manner.

The connection of the power supply should be carried out in accordance with the regulations.

Cover the protective cover of the electrical connection chamber and tighten the cover. Please check if the electrical connection of the power supply is correct.

Chapter VI Technical Parameters

6.1 General technical indicators

Measured medium	No impurity, low viscosity, no corrosive liquid
Executive	Turbine flow sensor (JB/T9246-1999)

standard				
Testing procedure	Turbine flow meter (JJG1037-2008)			
Instrument diameter and connection method	Flange connection	DN15~DN200		
	Threaded type	DN4~DN50		
	Clamped connection type	DN4~DN200		
Flange standard	Conventional standard	GB/T9113-2000		
	Other standards	International pipe flange Standard	Such as German standard DIN, American standard ANSI, Japanese standard JIS	
		China Pipe Flange Standard	Such as the Ministry of Chemical Industry, Ministry of Machinery Standard	
Thread specification	Conventional standard	Inch pipe thread (external thread)		
	Other standards	Internal thread, spherical thread, NPT thread, etc.		
Accuracy level and corresponding repeatability	Accuracy level	±0.1%R	±0.5%R	±0.2%R (custom made)
	Linearity	≤0.15%	≤0.1%	≤0.03%
Range ratio	1:10 ; 1:15; 1:20			
Test condition	Calibration device	Standard table method liquid flow verification device		
	Environmental conditions	Ambient temperature	20°C	
		environment humidity	65%	
Conditions of Use	Medium temperature	T1	-20~+80°C	
		T2	-20~+120°C	
		T3	-20~+150°C	
	Ambient temperature	-20~+60°C	Relative humidity	5%~90%
	Atmospheric pressure	86Kpa~106Kpa		

6.2 Electrical technical index

Output function	Signal output	Pulse signal, 4~20mA signal
	Communication output	RS485 communication, HART protocol

Working power supply	External power supply	+24VDC, suitable for 4~20mA output, pulse output, RS485, etc.	
	Built-in power supply	S1\B\C series	1 set of 3.6V 9AH lithium battery
Signal line interface	N type	Hosman connector DIN43650 or aviation plug CX165P	
	N type S1\A\B\C series	Metal waterproof buckle internal thread M20*1.5	
Explosion-pro of grade	ExdIICT4 or ExdIIBT6		
Protection level	IP65 or higher		

6.3 flow range

Instrument flow rate (mm)	Normal flow rate range (m ³ /h)	Extended flow rate range (m ³ /h)
DN 4	0.04~0.25	0.04~0.4
DN 6	0.1~0.6	0.06~0.6
DN 10	0.2~1.2	0.15~1.5
DN 15	0.6~6	0.4~8
DN 20	0.8~8	0.45~9
DN 25	1~10	0.5~10
DN 32	1.5~15	0.8~15
DN 40	2~20	1~20
DN 50	4~40	2~40
DN 65	7~70	4~70
DN 80	10~100	5~100
DN 100	20~200	10~200
DN 125	25~250	13~250
DN 150	30~300	15~300
DN 200	80~800	40~800

Typical meter factor and frequency band

Instrument diameter (mm)	Meter factor (time / L)	Frequency band (Hz)
DN 4	16000	177.8-1111
DN 6	8200	227.8-1366
DN 10	1800	100.0-600
DN 15	830	138.3-1383
DN 20	600	133.3-1333
DN 25	212	58.9-588
DN 32	150	62.5-625
DN 40	77	42.8-427
DN 50	27	30.0-300
DN 65	12.1	23.5-235
DN 80	6.1	16.9-169
DN 100	4.3	23.8-238
DN 125	3.1	21.5-215
DN 150	2.2	18.3-183
DN 200	1.2	26.7-266

6.4 Common troubleshooting

Serial number	Fault phenomenon	Failure analysis and solution
1	There is flow, the instrument instantaneous flow is zero	(1) Wiring error, check instrument wiring (2) The internal parameters of the instrument are modified. Verify instrument parameters according to the certificate (3) The signal acquisition coil is damaged, affecting the signal transmission, and the signal cannot be transmitted to the converter even if there is flow, and the signal acquisition coil is slid with a magnetic screwdriver.

		(4) The impeller is stuck and the impeller is inspected.
2	When the meter passes no flow, the meter has an instantaneous flow display.	<p>(1) There is severe vibration in the pipeline, and it is recommended to add shock absorption measures.</p> <p>(2) Whether the meter is grounded, check the instrument ground</p> <p>(3) There is magnetic field interference at the site, such as inverter, motor, solenoid valve, etc. (electromagnetic interference of 50Hz power frequency on site. It can affect the use of instrument to a certain extent, calculation of power frequency interference $Q=3600f/k$, $f=50\text{Hz}$, k = meter factor) Through calculation, it can be judged whether the meter has power frequency interference. Recommended replacement location</p> <p>(4) The shut-off valve of the instrument pipeline is not completely closed, check the valve</p>
3	The meter is measured normally and the measured value is not accurate.	<p>(1) There is a problem with the internal parameters of the instrument, and the instrument parameters are checked according to the identification certificate.</p> <p>(2) The on-site pipeline does not meet the requirements, contains gas or the viscosity is too high, and strictly operates according to the installation instructions and precautions of the manual.</p> <p>(3) The problem of the movement of the instrument, the instrument is removed and the impeller is blown normally. If it is damaged, contact the manufacturer</p>
4	For EC-LWGY series instruments, the meter is normally measured, the liquid crystal display is normal, and the meter current output is incorrect.	<p>(1) Check the fourth screen of the instrument parameters to see if the meter range is the same as the range limit indicated on the meter nameplate.</p> <p>(2) The chip output current of the chip is damaged.</p>