Vortex flowmeter

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Preface

Thank you for purchasing a vortex flowmeter. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by wrong operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- The content of this manual is strictly prohibited from reprinting or copying.

Version

U-SUP-LUGB-C-EN3

Safety Precautions

In order to use this product safely, be sure to follow the safety precautions described.

About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

Precautions for the protection, safety, and modification of this product

- Please read the operation manual carefully before putting it into operation to avoid unnecessary losses due to wrong operation. Ensure the safe use of the product and its control function, and understand the correct application methods. If the instrument is operated in other ways not described in the manual, the protections that the instrument gives may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety. Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment, and medical equipment. If applied, it is the responsibility of the user to use additional equipment or systems to ensure personal safety.

- Do not modify this product.
- The following safety signs are used in this manual:

Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage, or major property damage.

Warning: Pay special attention to the important information linked to the product or particular part of the operation manual.

- Confirm if the supply voltage is consistent with the rated voltage before operation.
- Don't use the instrument in a flammable and combustible or steam area.
- To prevent electric shock and operation mistakes, good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-electric level, shielded, wires shall be located rationally, and SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.
- Cut off electric power before making any checks, to avoid electric shock.
- Check the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify, or repair the product without authorization, otherwise, it may cause abnormal operation, electric shock, or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine, or other organic solvents. Prevent all kinds of liquid from splashing on the product. If the product falls into the water, please cut off the power immediately, otherwise, there will be leakage, electric shock, or even a

fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life, and fire.
- Please strictly follow the instructions in this manual, otherwise, the product's protective device may be damaged.

- Don’t use the instrument if it is found damaged or deformed at the opening of the package.
- Prevent dust, wire end, iron fines, or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, modifying the configuration, signal output, startup, stop, and operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and control equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-term use.
- The product shall be scrapped as industrial waste, to prevent environmental pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Name	Quantity	Note
1	Vortex flowmeter	1	
2	Manual	1	
3	Certificate	1	

After opening the box, please confirm the package contents before starting the operation. If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

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1 Introduction

The vortex flomweter is a kind of velocity flow meter, which is designed based on the Karman vortex principle. It is mainly used for flow measurement of medium and fluid in industrial pipelines, such as flow control and measurement of gas, steam or liquid, and other media.

This vortex flow meter can achieve the following functions according to the selection: measuring the temperature, pressure, instantaneous flow, and cumulative flow of medium fluid in industrial pipelines, and has pulse output, 4-20mA analog signal output, RS485 communication (Modbus RTU protocol), GPRS of Internet and other functions.

The vortex flow meter is widely used in heat supply, gas supply, chemical industry, environmental protection, metallurgy, textile, steel, pharmaceutical, paper making, drainage, and other corporations to superheat steam and saturated steam, compressed air and gas (oxygen, nitrogen, hydrogen, etc.), water and liquid (such as water, alcohol, stupid class, etc.) of the measurement and control.

2 Working principle

The vortex flow meter works on the principle of the generated vortex and the relation between vortex and flow by the theory of Karman and Strouhal, which specializes in the measurement of steam, gas, and liquid of lower viscosity. As shown in the below illustration, the medium flows through the bluff body, and then vortex is generated, vortices are alternately formed on both sides with opposite directions of rotation, Vortices frequency is directly proportional to medium velocity. Through the number of vortices that are measured by the sensor head, medium velocity is calculated, plus flow meter diameter and the final volume flow comes out.

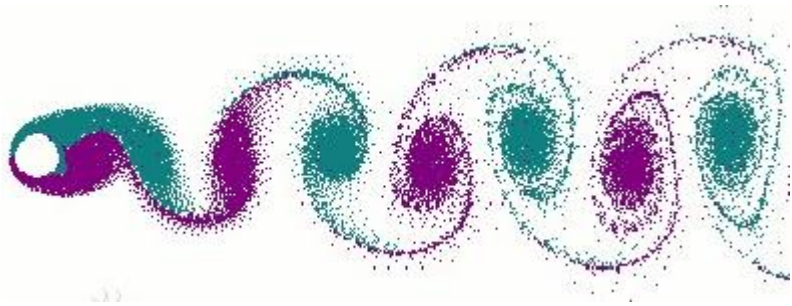


fig. 1

Computational formula is as follows:

F=St*V/md …… Formula 1

Q=3600*F/K …… Formula 2

M=Q*ρ …… Formula 3

Among Formula:

F…… Fluid flow through the bluff body generates the frequency of vortex (Unit: Hz)

St… Strouhal constant (zero dimension)

V……Mean velocity of fluid inside the pipeline (Unit: m/s)

m……The ratio between the Lune Circulation area of the bluff body at both sides and cross-sectional area (Unit: zero dimension)

d…… The upstream face width of the bluff body inside the vortex flow meter

Unit: m)

D…… Inside diameter (ID) of vortex flow meter (Unit: m)

Q…… Instantaneous volume flow (Unit: m 3 / h)

K…… Instrument coefficient of vortex flow meter (Unit: pulses / m 3)

M…… Instantaneous mass flow (Unit: kg/ h)

ρ……. Fluid density (Unit: kg/ m 3)

Note: vortex flow meter "K" coefficient corresponds with one diameter, the exact "K" value

should be calibrated in practice. Viz. one cubic meter fluid through sensor output numbers of pulse under working conditions.

3 Technical parameters

Table 1

Executive standard	《JB/T9249-2015 Vortex flow meter 》…
Nominal diameter(mm)	15、20、25，32，40，50，65，80，100，125，150，200，250，300，(300～1000plug-in)
Nominal Pressure (MPa)	Clamping flange connection: DN15~DN50，≤4.0MPa; DN65~DN100，≤2.5MPa DN125 or above, ≤1.6MPa Flange connection: DN15~DN50，≤2.5MPa; DN65~DN300，≤1.6MPa
Use condition	Operational temperature： Std：-40～100℃，KST-M：-40～250℃，KST-HC：-40～330℃(Agreement order)；Environmental temperature：-20℃～55℃，Relative humidity：5%～90%，Atmospheric pressure：86～106kPa
Material	Body：304(Other materials are supplied by agreement) Integrator housing: Die Casting Aluminum.
Allowable vibration acceleration	Piezoelectric type:0.2g
Accuracy	±1%R，±1.5%R；Plug-in：±2.5%R，
Range ability	1：6～1：25
Supply voltage	Sensor：DC +24V；transducer：DC +24V；battery-powered：3.6Vbattery
Output signal	Pulse output；4～20mA current、RS485（modbus- RTU agreement）and so on
Pressure loss factor	JB/T9249 standard Cd≤2.4

3.1 Vortex flowmeter accuracy class

Table 2

Accuracy class		1	1.5	2	2.5
Maximum impact error	qt≤q < qmax	±1.0%	±1.5%	±2.0%	±2.5%
	qmin≤q < qt	±2.0%	±3.0%	±4.0%	±5.0%
Note： The bounded flow is 0.2qmax					

3.2 Range of measurement

The measuring flow range of different calibre instruments will be different, the instrument selection process must be in accordance with the flow range to choose the instrument, the most taboo is to choose the instrument according to the thickness of the pipeline. The biggest disadvantage of selecting an instrument according to the pipeline is that it is easy to cause measurement errors due to insufficient flow.

The determination of the flow range of the vortex flowmeter is based on the flow rate in

operating conditions. Therefore, the flow rate is converted into the flow rate in operating conditions and the flow range table is compared to make the commonly used flow rate in the middle range measured by the instrument as far as possible.

3.2.1 reference condition

1. Gas: Normal pressure and temperature air, t=20℃, P=101.325kPa（AP），.
2. Liquid: Normal temperature water,t=20℃，

Table 3 Reference range of vortex flow sensor under reference condition

Meter diameter (mm)	Liquid		Gas		
	Range of measurement (m^3/h)	Range of output frequency(Hz)	Range of flow(m^3/h)	Range of output frequency (Hz)	Extended range (m^3/h)
15	0.5～5	35～600	3～10	300～	3～13
20	0.6～10	29～420	6～24	220～	6～30

Meter diameter (mm)	Liquid		Gas		
	Range of measurement (m^3/h)	Range of output frequency(Hz)	Range of flow(m^3/h)	Range of output frequency (Hz)	Extended range (m^3/h)
25	1.2~12	21～210	9～48	190～	8.8～52
32	1.5～15	15～150	10～100	156～	10～170
40	2.5～25	13～130	27～150	140～	27～205
50	3.5～45	9～119	40～320	94～1020	35～380
65	5.5~75	6.7~91	60～480	94～910	60～700
80	8.5～110	5.3～68	90～720	55～690	86～1100
100	16～180	5.2～58	150～	42～536	133～1700
125	25~270	4.3~49	200～	38～475	150～2800
150	35～350	3.3～33	350～	33～380	347～4000
200	65～650	2.6～26	600～	22～315	560～8000
250	95～950	1.9～19	900～	18～221	890～
300	150～1500	1.8～18	1400～	16～213	1360～
(300)	150～1500	5.5～87		85～880	1560～
(400)	180～3000	5.6～87		85～880	2750～
(500)	300～4500	5.6～88		85～880	4300～
(600)	450～6500	5.7～89		85～880	6100～
(800)	750～10000	5.7～88		85～880	11000～
(1000)	1200～17000	5.8～88		85～880	17000～
>(1000)	Agreement				Agreement

Note：In Chart(300)～(1000)diameter is plug-in.

Working condition of traffic: Refers to the measurement of the current volume of medium passing through the pipeline, Is the medium in the working state, For example, gas can be compressed. When there is pressure in the pipeline, the volume of compressed gas is the flow rate under the working conditions. The flow

rate will change as the working environment changes.

Standard of flow: Refers to the volume of the medium at standard atmospheric pressure and 0℃ (or 25℃) standard, when compressed gas is released into the standard environment. The flow rate will change as the working environment changes.

The Vortex flowmeter measures the working volume, and only after temperature and pressure compensation can the standard volume be obtained. Generally, when it is used for trade measurement, the volume of gas shall prevail, and the quality of steam shall prevail.

$$Q_{\text{standard}} = Q_{\text{work}} \times \frac{0.101325}{P_{\text{gauge}} + 0.101325} \times \frac{273.15 + T_{\text{work}}}{293.15}$$ (Operating condition and standard state conversion formula)

4 Product dimension

4.1 Product classification

4.1.1 Classified by function:

1. A common on-site display vortex flowmeter integrates a vortex flow sensor and flow integrator, and its main performance index reaches the leading level in China. It is an ideal instrument for petroleum, chemical, electrical, light industry, power heating, and other industries.
2. A vortex flowmeter of temperature and pressure compensation type, which integrates the vortex flow sensor and flow integrator, has the function of temperature and pressure compensation, and its main performance index reaches the leading level in China.

4.1.2 Classified by installation mode:

1. Flange clamp type (clamping type) vortex flow meter
2. Flange-connected vortex flowmeter

4.2 Product structure

The basic structure of the vortex flowmeter is shown in Figure 2. It mainly consists of the housing, vortex generator, flow sensor, temperature sensor, pressure sensor, shielding rod, flow integrator, and other key components.

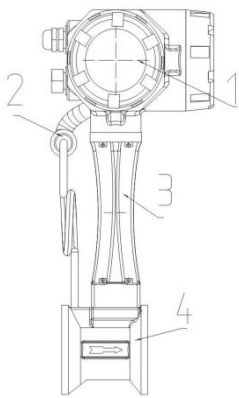
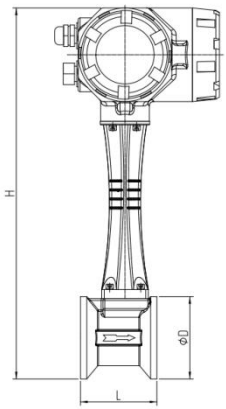


Fig. 2

4.3 Product dimension

4.3.1 Flange clamp type (clamping type) vortex flow meter

Table 4 Flange clamp type common field display dimension

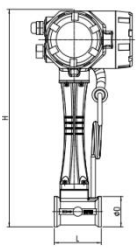


Nominal diameter	L（mm)	ΦD（mm)	H（mm)
DN15	70	55	386
DN20	70	55	386
DN25	70	55	386
DN32	70	55	386
DN40	85	80	398
DN50	85	90	407
DN65	85	105	422
DN80	85	120	437
DN100	85	140	457
DN125	85	168	482
DN150	100	194	509
DN200	100	248	561
DN250	115	300	612
DN300	130	350	662

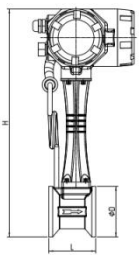
Connection Flange: Carbon steel clamping flange or 304SS clamping flange

4.3.2 Flange clamp type vortex flow meter with temperature and pressure compensation

Table 5 Flange clamp type with temperature and pressure common field display dimension



DN15～DN32



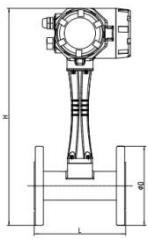
DN40～DN300

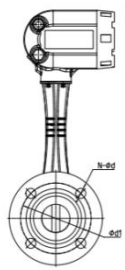
Nominal diameter	L（mm)	ΦD（mm)	H（mm)
DN15	85	55	386
DN20	85	55	386
DN25	85	55	386
DN32	85	55	386
DN40	85	80	398
DN50	85	90	407
DN65	85	105	422
DN80	85	120	437
DN100	85	140	457
DN125	85	168	482
DN150	100	194	509
DN200	100	248	561
DN250	115	300	612
DN300	130	350	662

Connection Flange: Carbon steel clamping flange or 304SS clamping flange

4.3.3 Flange-connected vortex flowmeter

Table 6 Fange-connected common field display dimension



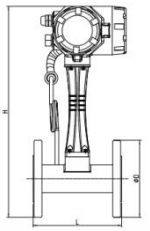


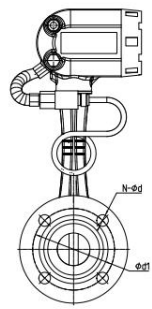
Nominal diameter	L (mm)	ΦD (mm)	H (mm)	Φd1 (mm)	N (mm)	Φd (mm)
DN15	170	95	417	65	4	14
DN20	170	105	422	75	4	14
DN25	170	115	427	85	4	14
DN32	170	140	440	100	4	18
DN40	170	150	445	110	4	18
DN50	170	165	452	125	4	18
DN65	190	185	475	145	8	18
DN80	190	200	490	160	8	18
DN100	200	220	510	180	8	18
DN125	200	250	540	210	8	18
DN150	200	285	570	240	8	22
DN200	200	340	625	295	12	22
DN250	240	405	685	355	12	26
DN300	240	460	735	410	12	26
DN350	300	520	795	470	16	26
DN400	320	580	850	525	16	30

Connection Flange: HG/T 20592

4.3.4 Flange-connected vortex flowmeter with temperature and pressure compensation

Table 7 Flange-connected with temperature and pressure common field display dimension



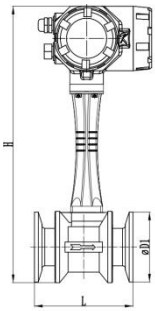


Nominal diameter	L (mm)	ΦD (mm)	H (mm)	Φd1 (mm)	N (mm)	Φd (mm)
DN15	170	95	417	65	4	14
DN20	170	105	422	75	4	14
DN25	170	115	427	85	4	14
DN32	170	140	440	100	4	18
DN40	170	150	445	110	4	18
DN50	170	165	452	125	4	18
DN65	190	185	475	145	8	18
DN80	190	200	490	160	8	18
DN100	200	220	510	180	8	18
DN125	200	250	540	210	8	18
DN150	200	285	570	240	8	22
DN200	200	340	625	295	12	22
DN250	240	405	685	355	12	26
DN300	240	460	735	410	12	26
DN350	300	520	795	470	16	26
DN400	320	580	850	525	16	30

Connection Flange: HG/T 20592

4.3.5 Clamp connection type vortex flowmeter

Table 8 Clamp connection type vortex flowmeter common field display dimension

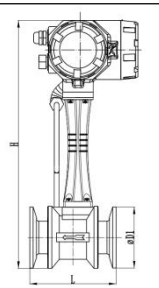


Nominal diameter	L (mm)	ΦD1 (mm)	H (mm)
DN15	110±1	50.5	386±10
DN20	110±1	50.5	386±10
DN25	110±1	50.5	386±10
DN32	110±1	50.5	386±10
DN40	125±1	64	398±10
DN50	125±1	77.5	407±10

Connection Clamp: ISO 2852 clamp

4.3.6 Clamp connection type vortex flowmeter with temperature and pressure

Table 9 Clamp connection type vortex flowmeter with temperature and pressure common field display dimension



Nominal diameter	L (mm)	ΦD1 (mm)	H (mm)
DN15	125±1	50.5	386±10
DN20	125±1	50.5	386±10
DN25	125±1	50.5	386±10
DN32	125±1	50.5	386±10
DN40	125±1	64	398±10
DN50	125±1	77.5	407±10

Connection Clamp: ISO 2852 clamp

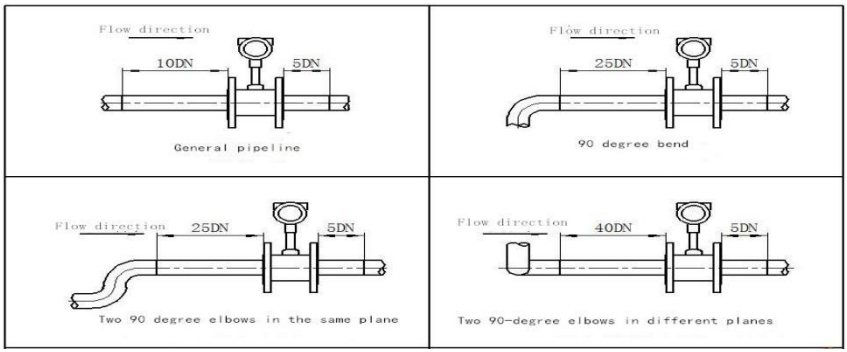
5 Installation Instruction

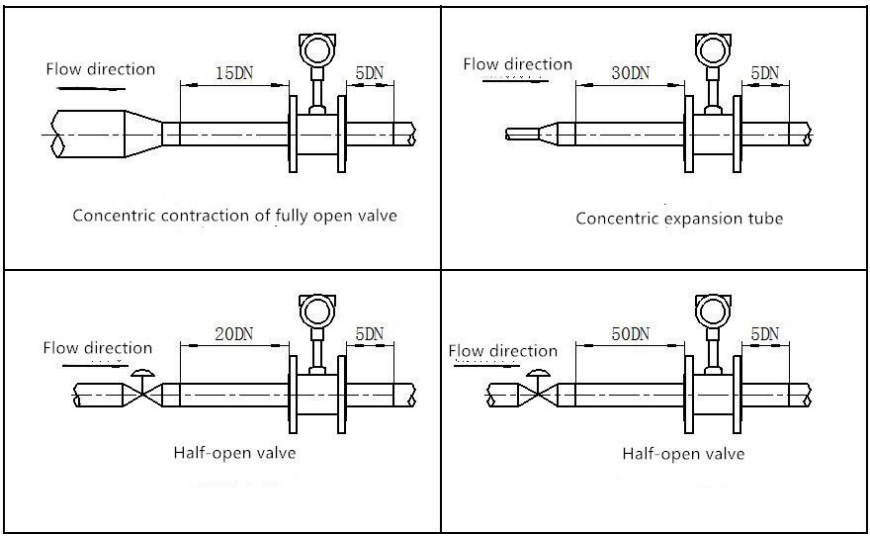
5.1 Instrument installation environment requirements

1. Flowmeter should be installed indoors, if installed outdoors, there should be cover above, in order to prevent rain invasion and sun exposure and affect the service life of the flowmeter (flow meter wiring shielding wire to make a u-shaped, finally into the case when the line is from the bottom up, avoid rain along the road into the case);
2. The flow meter shall not be surrounded by strong external magnetic field interference, strong electrical equipment, high-frequency equipment, and avoid sharing power with these equipment;
3. Do not share power with the inverter, welding machine, and other polluting power equipment, and install purification power when necessary;
4. Avoid high-temperature, cold, corrosive, or extremely humid environments. If installation is necessary, protection of the flow meter must be done;
5. The flowmeter should not be installed on the pipe with strong vibration. If it must be installed, pipe fastening device should be installed at 2D upstream and downstream, and an anti-vibration pad should be added to enhance the anti-vibration effect.
6. Ample space should be left around the instrument installation point for installation wiring and regular maintenance.

5.2 Installation requirements for instrument piping

The vortex flow meter has certain requirements on the upstream and downstream straight pipe section of the installation point, otherwise, it will affect the flow field of the medium in the pipeline and affect the measuring accuracy of the meter. The length of the upstream and downstream straight pipe section of the instrument is required as shown in FIG. DN is the nominal diameter unit of the instrument: mm.



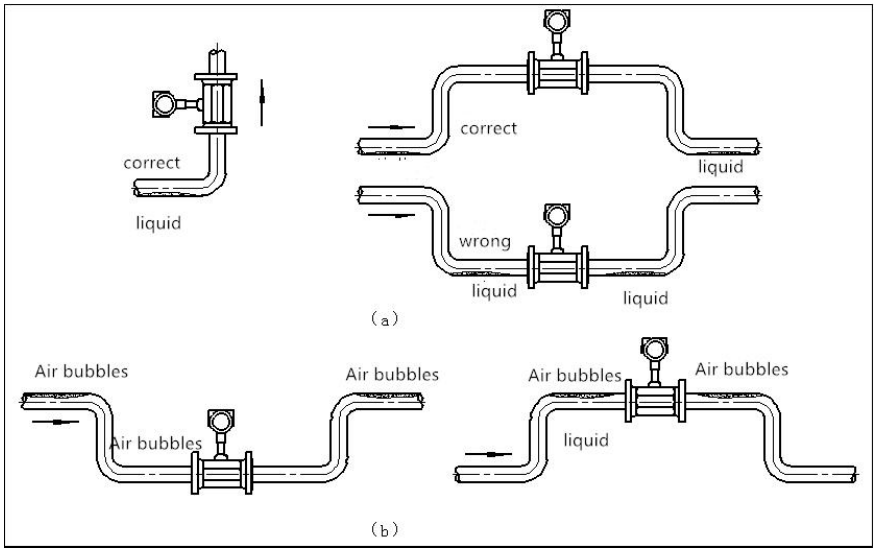


Note:

1. As far as possible, the regulating valve should not be installed the upstream of vortex street flow meter but should be installed 10D beyond the downstream of the vortex flow meter.
2. The inner diameters of the upper and lower piping shall be the same. If there is any difference, the relationship between piping inner diameter Dp and vortex street meter inner diameter Db should meet the following requirements:0.98 Db Dp or less or less 1.05 Db;
3. The upstream and downstream piping should be concentric with the internal diameter of the flow meter, and the coaxiality between them should be less

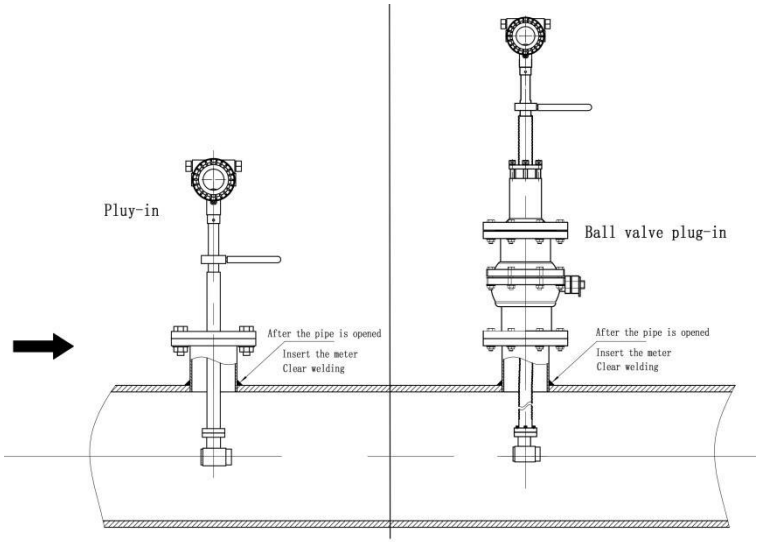
than 0.05Db;

4. The sealing gasket between the meter and flange cannot be protruded into the pipe during installation, and its inner diameter should be 1-2mm larger than the inner diameter of the meter;
5. Installation design of pressure hole and temperature hole. When temperature and pressure transmitters need to be installed in the measured pipeline, the pressure measuring hole should be set at the downstream 3-5d and the temperature measuring hole should be set at the downstream 6-8d. D is the nominal diameter of the instrument, unit: mm;
6. The meter may be installed horizontally, vertically, or diagonally on the pipe.
7. When measuring gas, install the instrument in the vertical pipe with unlimited gas flow direction. However, if the pipe contains a small amount of liquid, in order to prevent the liquid from entering the gauge pipe, the airflow should flow from the bottom up, as shown in FIG. (iv) a;
8. When measuring liquid, in order to ensure that the tube is filled with liquid, the direction of liquid flow should be ensured from the bottom up when installing the instrument in the vertical or inclined pipeline. If there is a small amount of gas in the pipe, the instrument should be installed at the lower part of the pipe to prevent the gas from entering the measuring pipe, As shown in FIG. (iv) b.
9. Heat preservation measures should be paid attention to when measuring high-temperature and low-temperature media. The high temperature inside the converter (inside the watch headshell) should not exceed 70℃ generally; Low temperature may cause condensation inside the converter, reduce the insulation impedance of the circuit board, and affect the normal operation of the meter.



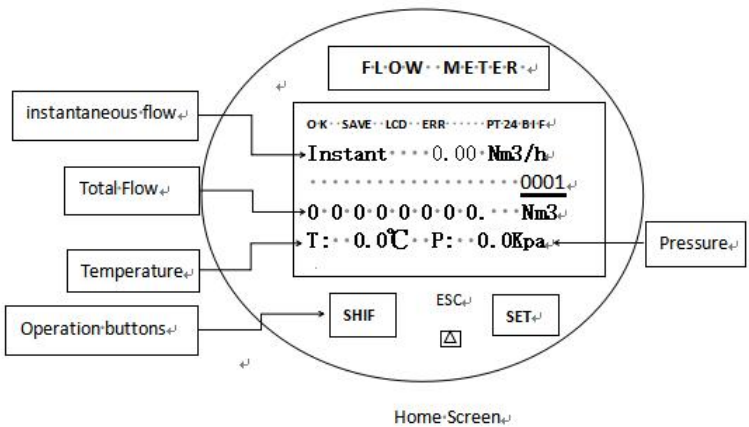
5.3 Installation procedure of plug-in vortex street flow meter

1. A circular hole slightly smaller than 100mm with gas welding on the pipe. And the round hole around the burr clean, to ensure that the probe rotates smoothly;
2. Weld the flange provided by the manufacturer at the round hole of the pipe. The flange axis is required to be perpendicular to the pipe axis.
3. Install the ball valve and sensor on the welded flange;
4. Adjust the lead screw to make the insertion depth meet the requirements(ensure that the central axis of the probe and the central axis of the pipeline coincide), the flow direction of the fluid must be consistent with the direction indicated by the arrow;
5. Tighten the screws on the gland evenly. (note: the tightness of the gland determines the sealing degree of the instrument and whether the lead screw can rotate);
6. Check whether all links are completed, and slowly open the valve to observe whether there is leakage(Special attention should be paid to personal safety). Repeat steps 5 and 6 if there is leakage.



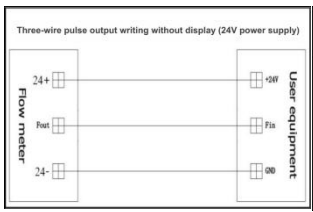
5.4 Operation instructions of the integrator

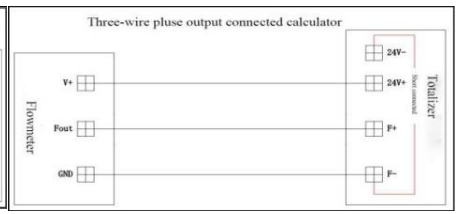
1. Display interface description



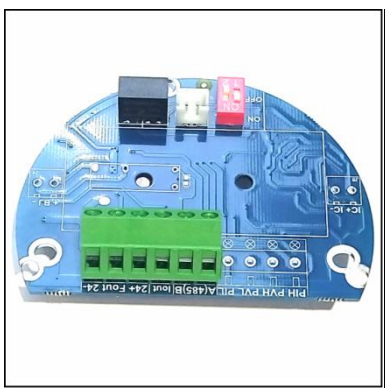
2. Wiring diagram

2.1 Non-display type



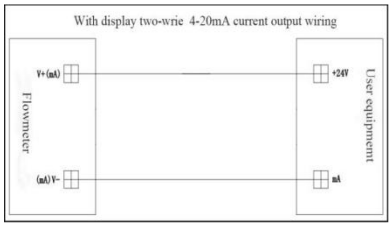


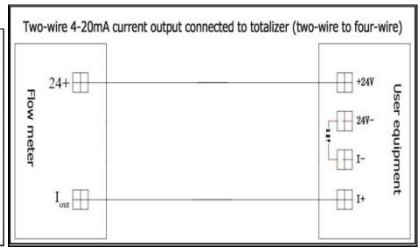
2.2 Display type

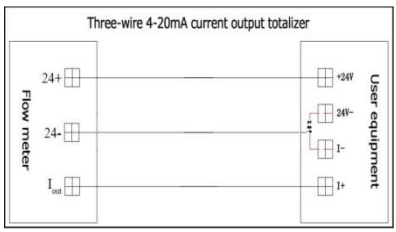


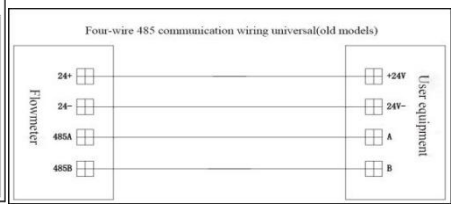
Without Compensation

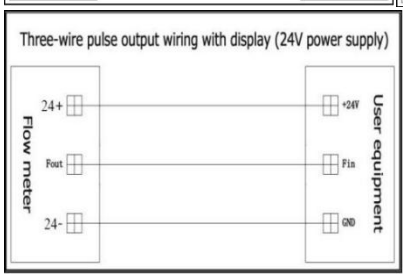
Temperature and Pressure Compensation

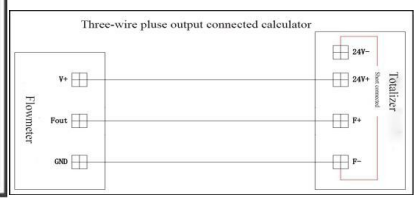


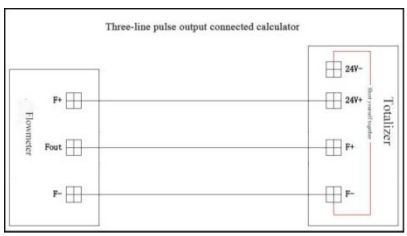


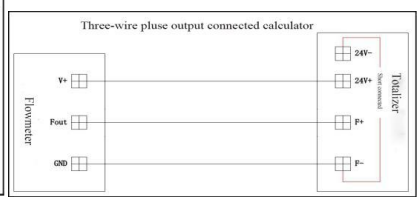






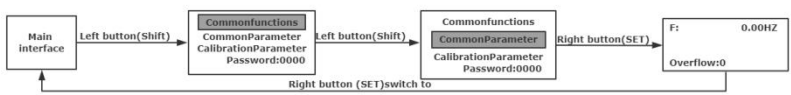




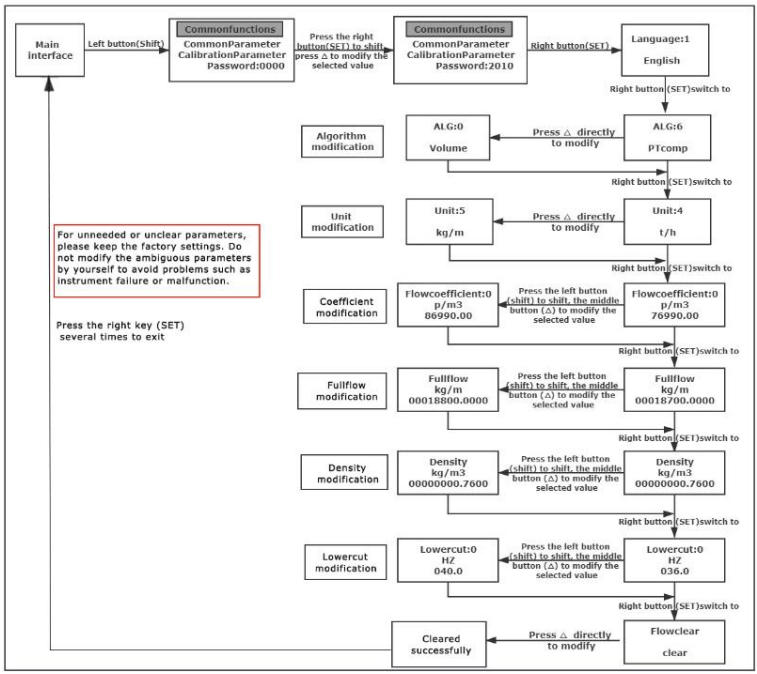


3. Instructions

①View frequency steps



②Steps to change the unit, algorithm, coefficient, density, fullness and lower limit


Main interface
Left button(Shift)
Commonfunctions
CommonParameter
CalibrationParameter
Password:0000
Press the right button(SET) to shift, press △ to modify the selected value
Commonfunctions
CommonParameter
CalibrationParameter
Password:2010
Right button(SET)
Language:1
English
Right button(SET)switch to
Algorithm modification
ALG:0
Volume
Press △ directly to modify
ALG:6
PTcomp
Right button(SET)switch to
Unit modification
Unit:5
kg/m
Press △ directly to modify
Unit:4
t/h
Right button(SET)switch to
Coefficient modification
Flowcoefficient:0
p/m3
80990.00
Press the left button (shift) to shift, the middle button (△) to modify the selected value
Flowcoefficient:0
p/m3
70990.00
Right button(SET)switch to
Fullflow modification
Fullflow
kg/m
00018800.0000
Press the left button (shift) to shift, the middle button (△) to modify the selected value
Fullflow
kg/m
00018700.0000
Right button(SET)switch to
Density modification
Density
kg/m3
00000000.7600
Press the left button (shift) to shift, the middle button (△) to modify the selected value
Density
kg/m3
00000000.7600
Right button(SET)switch to
Lowercut modification
Lowercut:0
HZ
040.0
Press the left button (shift) to shift, the middle button (△) to modify the selected value
Lowercut:0
HZ
036.0
Right button(SET)switch to
Cleared successfully
Press △ directly to modify
Flowclear
clear
For unneeded or unclear parameters, please keep the factory settings. Do not modify the ambiguous parameters by yourself to avoid problems such as instrument failure or malfunction.
Press the right key (SET) several times to exit

.

6 Routine maintenance

The vortex flowmeter is a high-precision measuring instrument, and there are always some wrong ways to reduce its service life during use. Nowadays, many users only know the use of the device, but they don't know that the device is the same as the person. It is very important to maintain it while using it. Our company has its own unique insights and rich experience in the daily maintenance of vortex flowmeters. In the spirit of high responsibility to customers, customers can enjoy the guidance and maintenance of expert after-sales service after purchase, so that customers have no worries. I propose the following routine maintenance recommendations for vortex flowmeters for your reference:

1. Regularly clean, inspect, and re-calibrate the vortex flowmeter. According to the national metrological verification regulations ≤ JJG1029-2007 vortex flow meter ≥, the calibration period of the vortex flowmeter is two years.
2. Check the display meter, evaluate the meter reading, and check for any abnormalities.
3. Keep the filter unobstructed. The filter is blocked by impurities, and it can be judged from the increase of the difference in the pressure gauge reading at the inlet and the outlet, and the blockage is promptly eliminated, otherwise, the flow will be seriously reduced.
4. When servicing the vortex flowmeter, the vortex generator and the probe body should be specially protected. When the fault is not clarified, it should not be dismantled at will, so as not to damage the probe body or damage the sealing performance, resulting in sensor leakage. If you encounter a fault that cannot be solved, you should contact the manufacturer for assistance.

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7 Product FAQs and handling

1. The amount of field instrument frequency change is large, and the elimination method is as follows:

2. A: First check whether the straight pipe section meets the requirements, and the gas can be relaxed to ensure the straight pipe section of the front 10D and the rear 5D.The straight pipe section does not meet the requirements, and the straight pipe section is not long enough. It is recommended to change the installation position. There may be electromagnetic interference at the scene. Method: Enhance the filtering function and lower the sensitivity by dialing the code switch.C. The on-site flow is too small, below the lower limit of the meter. For example, the 300-gauge plug-in gas has a lower limit of 1500 m3/h, but the field indicates an instantaneous flow of about 500 m3. Since the flow rate is at the lower limit, the value does not change linearly. The flow rate can be increased by changing the meter factor (not recommended).D. A similar situation can occur when measuring the pulsating flow of a liquid.

3. There is 50HZ interference at the site, generally, the shielded cable is not grounded.

4. No flow signal at the scene. A. The instrument's small signal cut is too large, and can be modified in the parameter setting; B. The power supply is not connected, no power; C. The flow rate is very low and the signal trigger point is not reached; the D.4-20mA output table is not set before leaving the factory.

5. The actual flow rate increases, but the meter display decreases, checking the cause of the site conditions (such as pipeline process, etc.).

6. The actual flow is reduced, but the meter display is increased, most of which is pipe vibration or the gasket is not at the center of the pipe during installation. The instrument should be reinstalled.

7. The meter display of the same working condition is inconsistent, and the difference is large. A. The customer's experience value is wrong, or the working conditions are different, such as the problem of the pipeline, the problem of the straight pipe, the problem of vibration, etc.; B. The parameters

have been modified by the customer; C. The flow rate is too low, the lower limit is not linear; D. The temperature and pressure compensation table, the temperature pressure is faulty.

8. The instrument with 4-20mA output is inconsistent with the system display. A. The unit of parameter setting is inconsistent, or the range is not consistent; B.4-20mA output cable is too long (more than 1000 meters), and the loss is large.
9. The flow displayed by the meter differs greatly from the actual one, and most of the reason is the problem of the parameter setting unit.
10. Most of the static flow of the instrument is caused by the vibration of the pipeline in the field. Damping measures or reducing the sensitivity of the instrument can be alleviated or eliminated.

Appendix1 485 Communication protocol

The vortex circuit adopts the MODBUS-RTU protocol and only supports the 03th read command and does not support the write operation. The baud rate is 9600 and does not support other baud rates.

Mod bus Poll software RTU connection：

Display Option－Floating Pt （Data display format-floating point）；

Command 03: HOLDING REGISTER (read holding register)；

Device id： Internal address of the instrument；

Address： The starting address of the instrument parameter, from 1-14；

Length： Data length Length＋Address < =14。

Parameter address：40001－2： Medium temperature, liquid turbine, and thermal gas flow meter read this part is always 0；

40003－4：Instantaneous flow；

40005－6：Pressure (Mpa greater than 1000Kpa displayed on the LCD screen of the instrument, 485 communication unit is always Kpa)；

40007－8： frequency；

40009－10：More than one hundred cumulative flow（1234）；

40011－12：Cumulative flow below the hundredth （87.89）；

Cumulative flow ＝ 1234 × 100 ＋ 87.89 = 123487.89；

40013－14： Current instantaneous flow usage unit(0: m3/h,1: L/m, 2:Nm3/h, 3:NL/m, 4:T/h, 5:Kg/m, 6:m3/m, 7:L/h, 8:Nm3/m, 9:Kg/h);

Appendix 2 General Gas Density

	Gas	Density (g /liter 0°C)		Gas	Density (g / liter 0 °C)		Gas	Density (g /liter 0°C)
0	Air	1.2048	20	Trichloroethane $C_3H_3Cl_3$	5.95	39	Helium Ne	0.9
1	Argon Ar	1.6605	21	Carbon monoxide CO	1.25	40	Ammonia NH_3	0.76
2	Arsine AsH_3	3.478	22	Carbon dioxide CO_2	1.964	41	Nitric oxide NO	1.339
3	Boron tribromide BBr_3	11.18	23	Cyanide C_2N_2	2.322	42	Nitrogen dioxide NO_2	2.052
4	Boron trichloride BCl_3	5.227	24	Chlorine gas Cl_2	3.163	43	Nitrous oxide N_2O	1.964
5	Boron trifluoride BF_3	3.025	25	Helium D_2	0.1798	44	oxygen O2	1.427
6	Borane B_2H_6	1.235	26	Fluorine gas F_2	1.695	45	Phosphorus trichloride PCl_3	6.127
7	Carbon tetrachloride CCl_4	6.86	27	Antimony tetrachloride $GeCl_4$	9.565	46	Phosphatane PH_3	1.517
8	Carbon tetrafluoride CF_4	3.9636	28	Decane GeH_4	3.418	47	Phosphorus PF_5	5.62
9	Methane	0.715	29	Hydrogen	0.0899	48	Phosphorus	6.845

	Gas	Density (g /liter 0°C)		Gas	Density (g / liter 0 °C)		Gas	Density (g /liter 0°C)
	CH_4			H_2			oxychloride $POCl_3$	
11	Ethylene C_2H_4	1.251	30	Hydrogen bromide HBr	3.61	49	Silicon tetrachloride $SiCl_4$	7.5847
12	Ethane C_2H_6	1.342	31	Hydrogen chloride HCl	1.627	50	Silicon tetrafluoride SiF_4	4.643
13	Propyne C_3H_4	1.787	32	Hydrogen fluoride HF	0.893	51	Silane SiH_4	1.433
14	Propylene C_3H_6	1.877	33	Hydrogen iodide HI	5.707	52	Dichlorosilane SiH_2Cl_2	4.506
15	Propane C_3H_8	1.967	34	Hydrogen sulfide H_2S	1.52	53	Trichlorosilane $SiHCl_3$	6.043
16	Butyne C_4H_6	2.413	35	Helium He	0.1786	54	sulfur hexafluoride SF_6	6.516
17	Butene C_4H_8	2.503	36	Krypton Kr	3.739	55	sulfur dioxide SO_2	2.858
18	Butane C_4H_{10}	2.593	37	Nitrogen N_2	1.25	56	Titanium tetrachloride $TiCl_4$	8.465
19	Pentane C_5H_{12}	3.219	38	Xenon Xe	5.858	57	Tungsten hexafluoride WF_6	13.29