

## User's Manual

# Vortex flow meter

U-CLUGB-MYEN1





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## Preface

Thank you for purchasing vortex flow meter. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false 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.
- This product is forbidden to use in explosion-proof occasions.

### Version

U-CLUGB-MYEN1

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## 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 protection, safety and modification of this product

- To ensure safe use of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give 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.

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- 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 product or particular part in the operation manual.



- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- Do not use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a 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, 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 powers 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

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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.



- Do not use the instrument if it is found damaged or deformed at opening of 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, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment 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.

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## 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 or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

## Package contents

Number	Name	Quantity	Remarks
1	Vortex flow meter	1	
2	Manual	1	
3	Certificate	1	

Table 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.





## Chapter 1 Introduction

LUGB vortex flow meter is a kind of velocity flow meter, which is designed based on 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.

LUGB 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.

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 superheated 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.

## Chapter 2 Working Principle

Vortex flow meter work on the principle of generated vortex and relation between vortex and flow by theory of Karman and Strouhal, which specialize in measurement of steam, gas and liquid of lower viscosity. As shown in below illustration, medium flows through 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 numbers of vortices that is measured by sensor head, medium velocity is calculated, plus flow meter diameter, final volume flow come out.

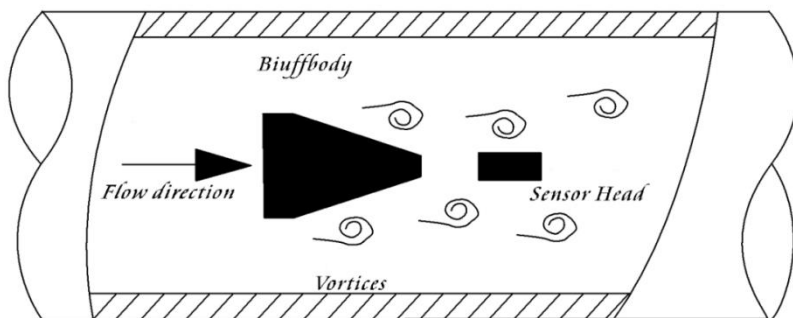


fig. 1

Computational formula as follows:

$$F = St \cdot V / md \quad \text{..... Formula 1}$$

$$Q = 3600 \cdot F / K \quad \text{..... Formula 2}$$

$$M = Q \cdot \rho \quad \text{..... Formula 3}$$

Among Formula:

F..... Fluid flow through bluff body generate 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 Lune Circulation area of bluff body at both sides and cross-sectional area ( Unit: zero dimension )

d..... Upstream face width of bluff body inside vortex flow meter ( Unit : m )

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

Q..... Instantaneous volume flow ( Unit :  $\text{m}^3 / \text{h}$  )

K..... Instrument coefficient of vortex flow meter ( Unit : pulses /  $\text{m}^3$  )

M..... Instantaneous mass flow ( Unit :  $\text{kg} / \text{h}$  )

$\rho$ ..... Fluid density ( Unit :  $\text{kg} / \text{m}^3$  )

Note: vortex flow meter "K" coefficient is corresponding 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 condition.

## Chapter 3 Technical parameters

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)	DN15-DN200 4.0(>4.0 Supply agreement), DN250-DN300 1.6(>1.6Supply agreement)
Use condition	Operational temperature: Std: -40~100℃, KST-M: -40~250℃, KST-HC: -40~330℃(Agreement order); Environmental trmperature: -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,
Rangeability	1: 6~1: 25
Supply voltage	Sensor: DC +24V; transducer: DC +24V; battery-powered: 3.6Vbattery
Output signal	Pluse output; 4~20mA current、RS485 (modbus- RTUagreement) and so on
Pressure loss factor	JB/T9249 standard Cd≤2.4

Ingress protection	IP65
Conduit entry	Inside thread M20*1.5 or other
Applicable medium	Gas, liquids, steam
Transmission distance	Three-wire pulse output: $\leq 300\text{m}$ , Two-wire standard current output ( $4\sim 20\text{mA}$ ) $\leq 1500\text{m}$ ; load resistance $\leq 500\Omega$ ; RS485 $\leq 1200\text{m}$ .

### 3.1 Basic parameter

### 3.2 Vortex flowmeter accuracy class

Accuracy class		1	1.5	2	2.5
Maximum impact error	$q_t \leq q < q_{\max}$	$\pm 1.0\%$	$\pm 1.5\%$	$\pm 2.0\%$	$\pm 2.5\%$
	$q_{\min} \leq q < q_t$	$\pm 2.0\%$	$\pm 3.0\%$	$\pm 4.0\%$	$\pm 5.0\%$
Note: The bounded flow is $0.2q_{\max}$					

### 3.3 Range of measurement

The measuring flow range of different calibre instrument 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 instrument according to pipeline is that it is easy to cause measurement error due to insufficient flow.

The determination of the flow range of 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.

### 3.3.1 reference condition

1. Gas : Normal pressure and temperature air,  $t=20^{\circ}\text{C}$ ,  $P=101.325\text{kPa}$  (AP) , .

2. Liquid: Normal temperature water,  $t=20^{\circ}\text{C}$ ,

Reference range of vortex flow sensor under reference condition

Meter diameter (mm)	Liquid		Gas		
	Range of measurement (m3/h)	Range of output frequency (Hz)	Range of flow(m3/h)	Range of output frequency (Hz)	Extended range (m3/h)
15	0.5~5	35~600	3~10	300~1240	3~13
20	0.6~10	29~420	6~24	220~1250	6~30
25	1.2~12	21~210	9~48	190~1140	8.8~52
32	1.5~15	15~150	10~100	156~1080	10~170
40	2.5~25	13~130	27~150	140~1040	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	150~1050	42~536	133~1700
125	25~270	4.3~49	200~2200	38~475	150~2800
150	35~350	3.3~33	350~2500	33~380	347~4000
200	65~650	2.6~26	600~4000	22~315	560~8000
250	95~950	1.9~19	900~7000	18~221	890~11000
300	150~1500	1.8~18	1400~11000	16~213	1360~18000
(300)	150~1500	5.5~87		85~880	1560~15600
(400)	180~3000	5.6~87		85~880	2750~27000
(500)	300~4500	5.6~88		85~880	4300~43000
(600)	450~6500	5.7~89		85~880	6100~61000

(800)	750~10000	5.7~88		85~880	11000~110000
(1000)	1200~17000	5.8~88		85~880	17000~170000
>(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 condition.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°C (or 25°C) standard, when compressed gas is released into the standard environment..The flow rate will change as the working environment changes.

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.

$$Q_{\text{Working condition of the volume}} = Q_{\text{volume}} \times \frac{0.101325}{P_{\text{gage pressure}} + 0.101325} \times \frac{273.15 + T_{\text{temperature}}}{293.15} \quad (\text{Operating condition and standard state conversion formula})$$

## Chapter 4 Product Dimension

### 4.1 Product classification

#### 4.1.1 Classified by function:

1.Common on-site display vortex flowmeter integrates 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.

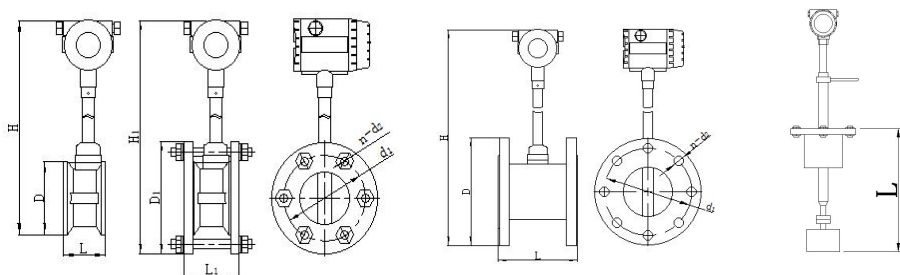
2.Vortex flowmeter of temperature and pressure compensation type, which integrates vortex flow sensor and flow integrator, has the function of temperature and pressure compensation, and its main performance index reaches the leading level in China.

3.The split-type vortex flowmeter is installed separately from vortex flow sensor and flow integrator, with the function of split-type display, which can realize high-altitude installation and low-altitude display, providing convenience for meter reading in high-altitude installation.

#### 4.1.2 Classified by installation mode:

1. Flange clamp type (clamping type) vortex flow meter
2. Flange-connected vortex flowmeter
3. Simple insert vortex flowmeter
4. Ball valve insert vortex flowmeter
5. Other special structures can be customized through communication with suppliers

### 4.2 Product size and pressure rating



LUGB flange mounting diagram

LUGB flange connection diagram

Simple insertion diagram

Ball valve insertion diagram



Flange mounting common field display dimension Table 1

Nominal diameter	Pressure rating MPa	L mm	L1 mm	D mm	D1 mm	H mm	H1 mm	d1 mm	d2 mm	n hole count
DN15	4	70	95	55	100	393	420	78	14	3
DN20		70	95	55	100	393	420	78	14	3
DN25		70	95	55	100	393	420	78	14	3
DN32		70	95	55	100	393	420	78	14	3
DN40		85	113	80	140	405	440	105	18	4
DN50		85	113	90	145	414	445	115	18	4
DN65	1.6	85	113	105	165	429	465	130	18	4
DN80		85	113	120	180	444	480	145	18	6
DN100		85	113	140	210	464	505	175	18	6
DN125		85	119	165	235	489	530	200	18	8
DN150		100	132	194	270	516	56	230	22	8
DN200		100	132	248	325	568	615	285	22	8
DN250		115	151	300	375	619	665	330	24	10
DN300		130	166	350	425	669	715	380	24	10

Note:①The length L1/L in the table is the size of the ordinary on-site display type below 250℃, the temperature and pressure compensation size DN15-DN32 L1/L2 is increased by 15mm, and the other sizes are unchanged ②The height H/H1 common field display type in the table is below 250℃, the temperature is 250~330℃ and the temperature and pressure compensation type height H/H1 increases by 60mm±0.5.

Flange connection common field display dimension

Table 2

Nominal diameter (mm)	Pressure rating (MPa)	L mm	D mm	H mm	k mm	d2 mm	n hole count
DN15		170	95	413	65	14	4

DN20	1.6	170	105	418	75	14	4
DN25		170	115	423	85	14	4
DN32		170	140	435	100	18	4
DN40		170	150	438	110	18	4
DN50		170	165	455	125	18	4
DN65		190	185	473	145	18	8
DN80		190	200	490	160	18	8
DN100		200	220	509	180	18	8
DN125		200	250	537	210	18	8
DN150		200	285	569	240	22	8
DN200	1.6	200	340	622	295	22	12
DN250		240	405	681	355	26	12
DN300		240	460	735	410	26	12

Note: The height H in the table is the size of the ordinary on-site display type, and the height H of the temperature and pressure compensation type increases by  $60\text{mm} \pm 0.5$ .

Insert general field display dimension

Table 3

Nominal diameter mm	Dielectric strength level MPa	Ball valve insert L mm	Simple insertion L mm
DN250	1.6	680	255
DN300		705	280
DN400		755	330
DN500		805	380
DN600		855	430
DN800-2000		905~1555	530~1130

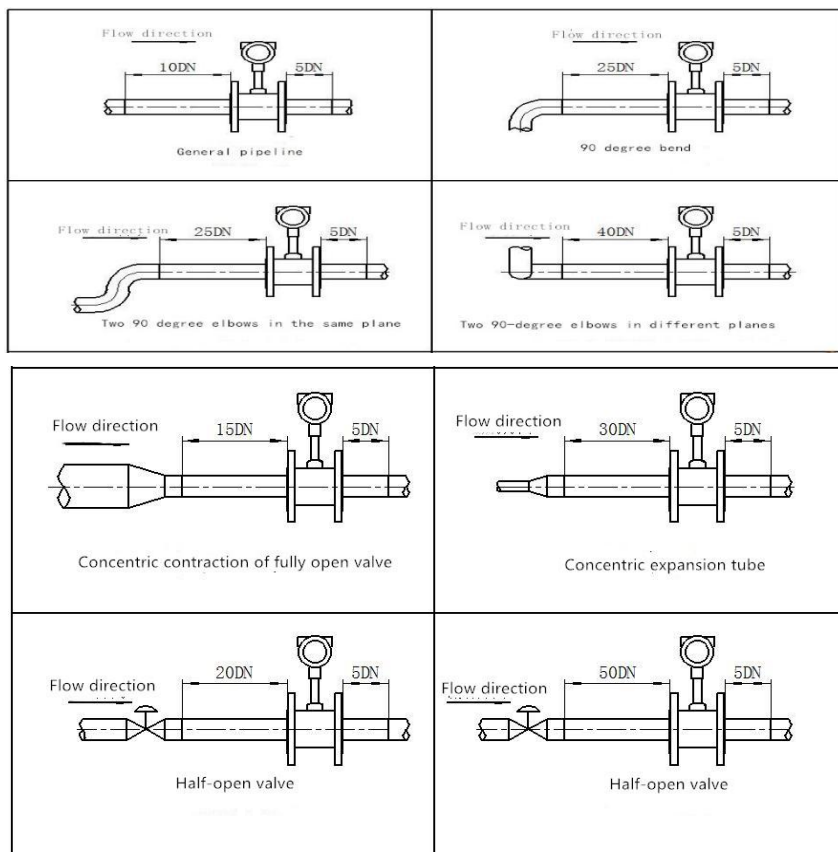
## **Chapter 6 Installation Instruction**

### **6.1 Instrument installation environment requirements**

- 1.Flowmeter should be installed in the indoor, if installed in the outdoor, there should be cover above, in order to prevent rain invasion and the 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 inverter, welding machine and other polluting power equipment, and install purification power when necessary;
- 4.Avoid high temperature, cold, corrosive or extremely humid environment. If installation is necessary, protection of 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 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.

### **6.2 Installation requirements for instrument piping**

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 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 in the upstream of vortex street flow meter, but should be installed 10D beyond the downstream of vortex flow meter.
- 2、Inner diameters of upper and lower piping shall be the same. If there is any difference, the relationship between piping inner diameter  $D_p$  and vortex street flow meter inner diameter  $D_b$  should meet the following requirements:  $0.98 D_b \leq D_p \leq 1.05 D_b$ ;
- 3、The upstream and downstream piping should be concentric with the internal diameter of 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;

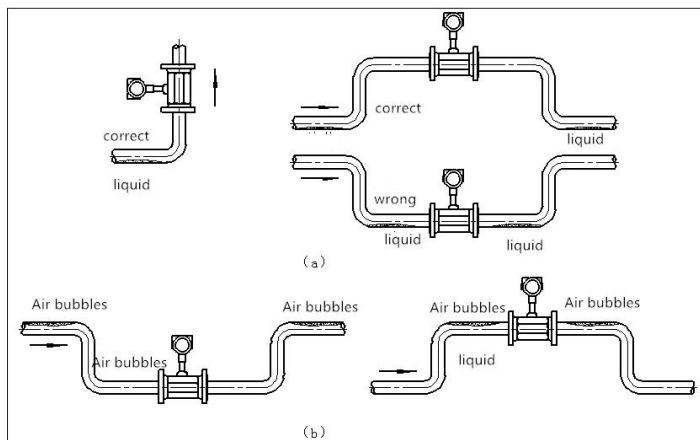
5、Installation design of pressure hole and temperature hole. When temperature and pressure transmitters need to be installed in the measured pipeline, the pressure measuring hole should be set at the downstream 3-5d and the temperature measuring hole should be set at the downstream 6-8d. D is the nominal 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.

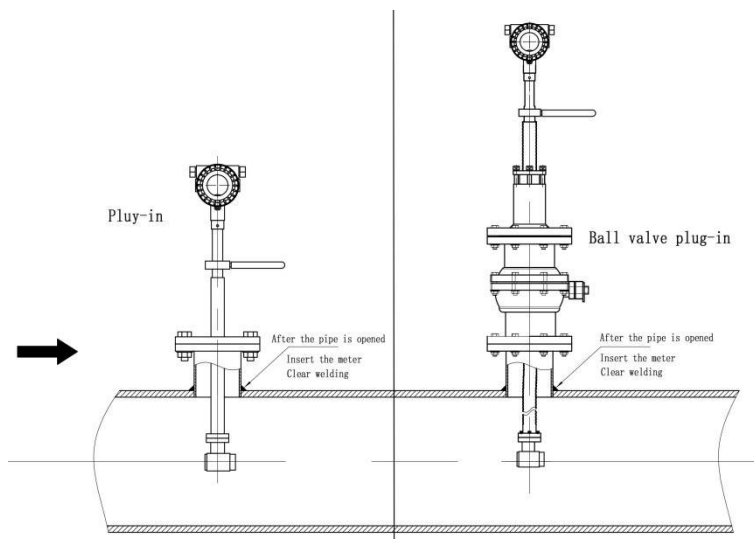
9、Heat preservation measures should be paid attention to when measuring high temperature and low temperature media. The high temperature inside the converter (inside the watch head shell) should not exceed 70℃ generally; Low temperature may cause condensation inside the converter, reduce the insulation impedance of the circuit board, and affect the normal operation of the meter.



draw (IV)

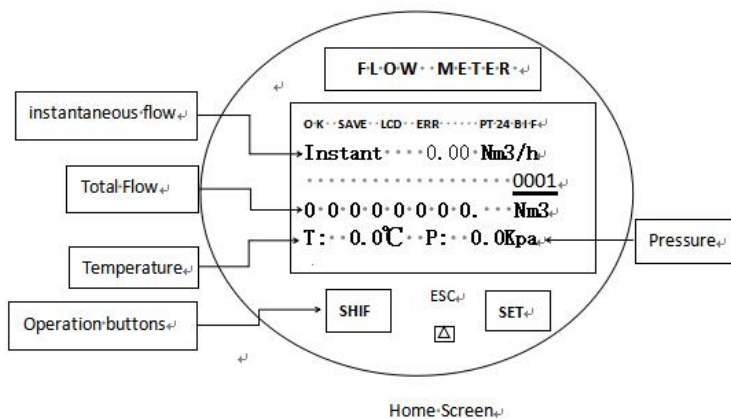
### 6.3 Installation procedure of plug - in vortex street flow meter

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 rotating 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, 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.

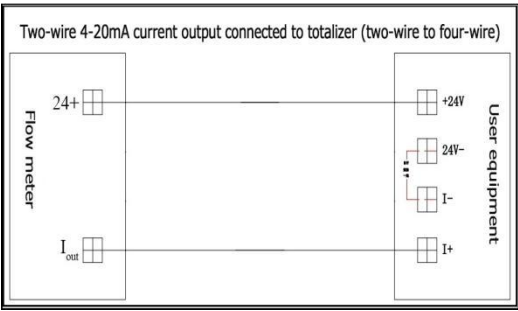
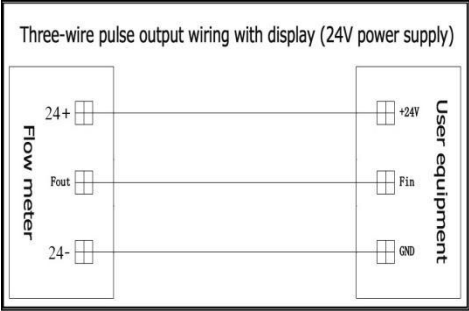
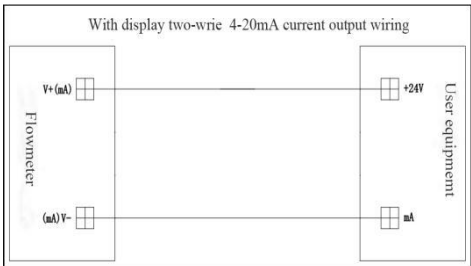
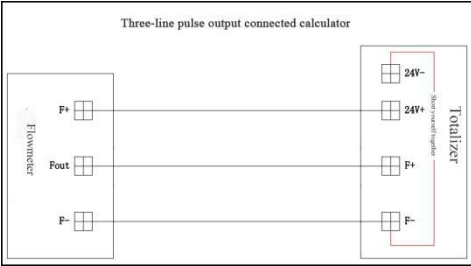
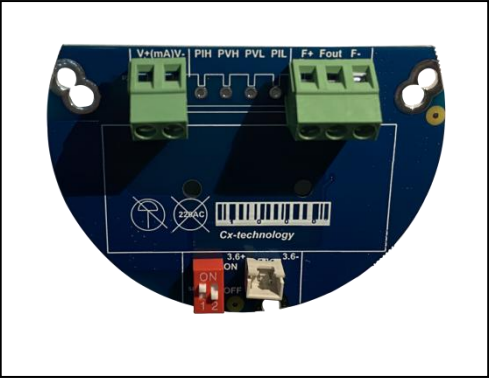


## 6.4 Operation instructions of integrator

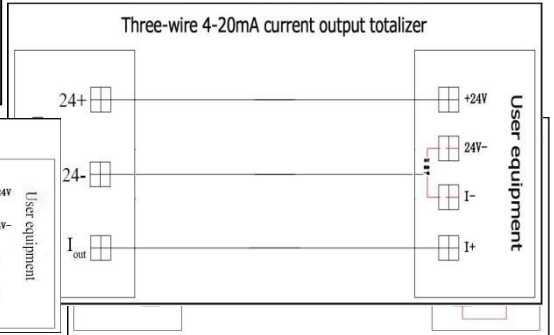
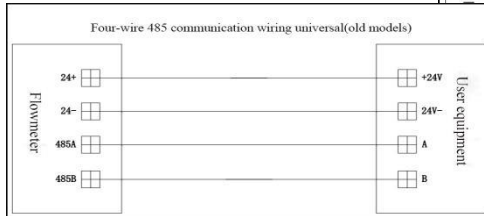
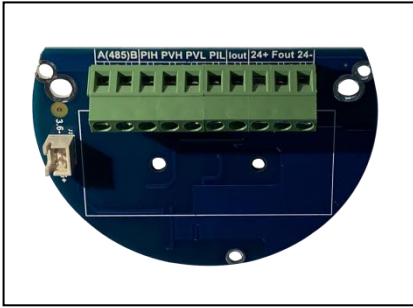
### 1. Display interface description



### 2. Circuit wiring diagram

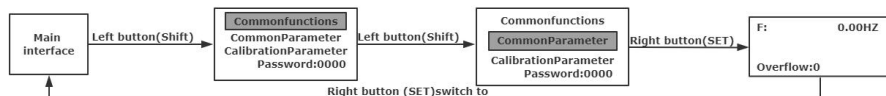




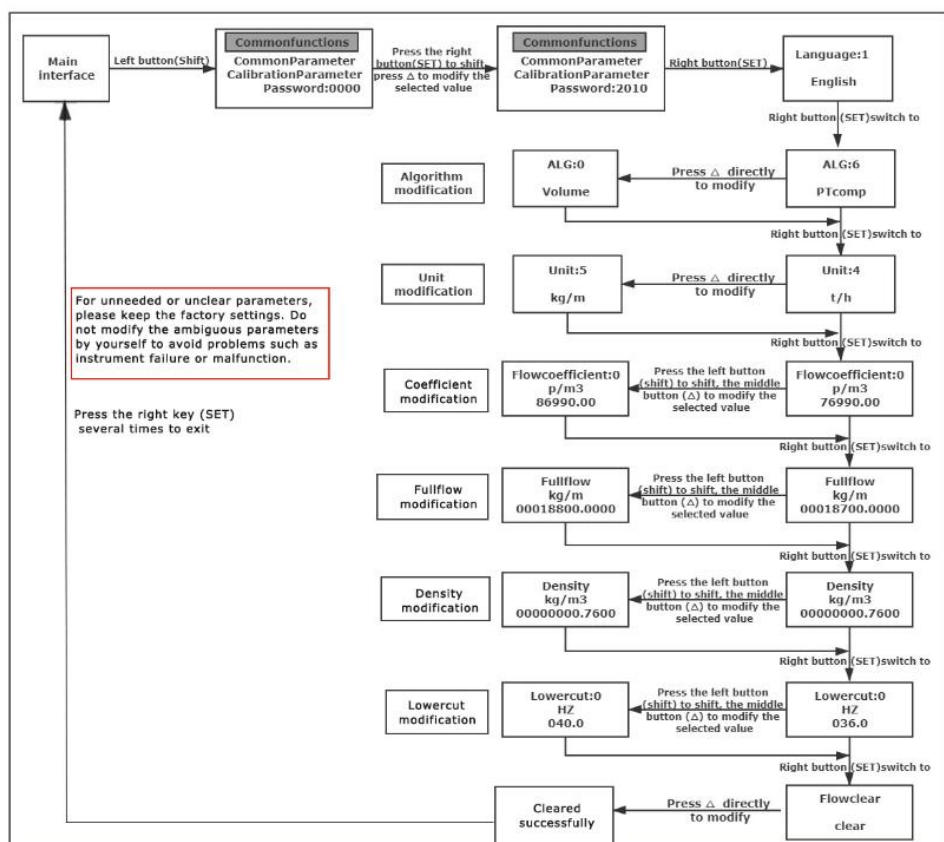


## 3. Instructions

## ① View frequency steps



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



## Chapter 7 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 experts after the after-sales service after purchase, so that customers have no any 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  $\leq$  JJG1029-2007 vortex flow meter  $\geq$ , 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 of 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.

## Chapter 8 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

3. 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 m<sup>3</sup>/h, but the field indicates an instantaneous flow of about 500 m<sup>3</sup>. 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.
4. There is 50HZ interference at the site, generally the shielded cable is not grounded.
5. No flow signal at the scene. A. The instrument small signal cut is too large, 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.
6. The actual flow rate increases, but the meter display decreases, checking the cause of the site conditions (such as pipeline process, etc.).
7. 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.
8. 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.
9. 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.
10. 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.
11. Most of the static flow of the instrument is caused by 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 =  $1234 \times 100 + 87.89 = 123487.89$ ;

40013—14: Current instantaneous flow usage unit(0: m<sup>3</sup>/h, 1: L/m, 2:Nm<sup>3</sup>/h, 3:NL/m, 4:T/h, 5:Kg/m, 6:m<sup>3</sup>/m, 7:L/h, 8:Nm<sup>3</sup>/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 $O_2$	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 CH <sub>4</sub>	0.715	29	Hydrogen H <sub>2</sub>	0.0899	48	Phosphorus oxychloride POCl <sub>3</sub>	6.845
11	Ethylene C <sub>2</sub> H <sub>4</sub>	1.251	30	Hydrogen bromide HBr	3.61	49	Silicon tetrachloride SiCl <sub>4</sub>	7.5847
12	Ethane C <sub>2</sub> H <sub>6</sub>	1.342	31	Hydrogen chloride HCl	1.627	50	Silicon tetrafluoride SiF <sub>4</sub>	4.643
13	Propyne C <sub>3</sub> H <sub>4</sub>	1.787	32	Hydrogen fluoride HF	0.893	51	Silane SiH <sub>4</sub>	1.433
14	Propylene C <sub>3</sub> H <sub>6</sub>	1.877	33	Hydrogen iodide HI	5.707	52	Dichlorosilane SiH <sub>2</sub> Cl <sub>2</sub>	4.506
15	Propane C <sub>3</sub> H <sub>8</sub>	1.967	34	Hydrogen sulfide H <sub>2</sub> S	1.52	53	Trichlorosilane SiHCl <sub>3</sub>	6.043
16	Butyne C <sub>4</sub> H <sub>6</sub>	2.413	35	Helium He	0.1786	54	sulfur hexafluoride SF <sub>6</sub>	6.516
17	Butene C <sub>4</sub> H <sub>8</sub>	2.503	36	Krypton Kr	3.739	55	sulfur dioxide SO <sub>2</sub>	2.858
18	Butane C <sub>4</sub> H <sub>10</sub>	2.593	37	Nitrogen N <sub>2</sub>	1.25	56	Titanium tetrachloride TiCl <sub>4</sub>	8.465
19	Pentane C <sub>5</sub> H <sub>12</sub>	3.219	38	Xenon Xe	5.858	57	Tungsten hexafluoride WF <sub>6</sub>	13.29