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Handbook

ABDT-LUGB/LUB Vortex Flowmeter

Weifang AOBO Instrument Technology Development Co.,Ltd

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Summary

The LUGB series vortex flow meter is a fluid vibration flow detection instrument made of piezoelectric ceramics as the sensitive elements according to the principle of Karman vortex and uses the stress detection method.

The sensor is simple and motion-free. It has high stability and reliability. It has unique medium versatility and its instrument coefficient is universal for different medium.

The flow measurement system composed of the sensor is simple, easy to install and maintain, small pressure loss, large measurement range and good economy. In the environment with inflammability and explosive gas, explosion-proof products should be selected, explosion-proof grade :ExdIICT6Gb, explosion-proof number: SYEx19.12246.

The LUGB series of vortex flow sensors produced by our company strictly implement national and industrial standards, and conduct real flow calibration stage by stage. The core component —— detection probe adopts seismic design, which effectively improves the seismic performance; the test part external sensor, sensitive element on the surface, and the temperature of measurable fluid medium reaches 400℃.

LUGB series vortex flowmeters are widely used in petroleum, chemical, metallurgy, thermal, textile, paper and other industries, suitable for the measurement and detection control of over thermal steam, saturated steam, compressed air and general gas (oxygen, nitrogen, hydrogen, natural gas, gas, etc.), liquid (water, gasoline, alcohol, benzene, etc.).

Measurement Instrument Type Standard Certificate No.: PA 2019F766-37;

Product Execution Standard: JB / T 9249-2015 Vortex Flow meter.

Product Implementation Code: JJG 1029-2007 Code for Verification of Vortex Flow meter.

I. Working Principle and Main Technical Indicators

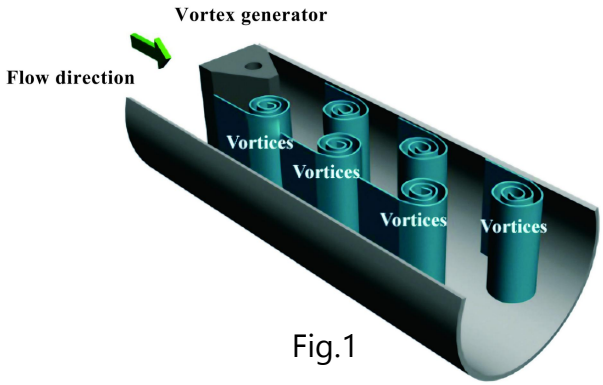


Fig.1

1. Working principle

The vortex flow meter is a fluid vibration instrument developed based on the principle of "Karman vortex (Karman)". The non-streamlined vortex generator is placed in the fluid, separating the vortex alternately and releasing two columns of regular staggered rows (Fig.1).

2. Main technical indicators of commonly used sensors

(1) Accuracy: 1.0; 1.5; insert type: 2.5;

(2) Repeatability error: ≤1/3 accuracy grade value;

(3) Pressure drop coefficient: Cd≤2.4;

(4) Measurement range: 8:1～20:1;

(5) Nominal pressure (MPa): 1.6; 2.5; (2.5 above order indicated)；

(6) Measurement medium temperature(℃): －40～160；250; 350; 400;

(7) Power supply:(12～24)V DC， Lithium battery 3.6V DC;

(8) Output signal:

① Voltage pulse: low level ≤0.5V, high level ≥6V;

② Standard signal: (4～20) mA DC;

(9) Service environment:

① Temperature: -40℃~55℃ (explosion-proof type and field display type is-20℃~40℃);

② Relative humidity: (5～95)%RH;

③ Atmospheric pressure: 86KPa～106KPa;

(10) Levels of protection: IP68;

(11) Explosion-proof grade :ExdIICT6Gb, explosion-proof number: SYEx19.12246.

3. Major technical indicators of digital intelligence type product

(1) Flow input signal: a piezoelectric sensor

(2)Temperature input signal (compensation signal): Pt100 or Pt1000 platinum resistance;

(3) Pressure input signal (compensation signal): Diffused silicon sensor;

(4) Output signal:

① Three-line system voltage pulse:VoL<1.8V，VoH>4.5V;

② Two-line system current simulation quantity (4～20) mA DC;

③ HART@(4～20) mA DC;

④ RS485 Modbus-RTU

(5) Measurement accuracy: the simulation quantity is better than 0.2% and the frequency is better than 0.1%;

(6) Operation accuracy: IEEE754 double-precision floating-point operation；

(7) Communication function:

① HART@(4～20)mA DC;

② RS485 Modbus-RTU Lightning protection;

(8) Display function

Double-line liquid crystal display can display cumulative flow, instantaneous flow, frequency and temperature;

(9) Data protection function

Using the latest generation of storage technology, the results of the machine and user set data are recorded at any time and will not be lost when power failure.

(10) Working power supply :

(12-32)V DC (External power supply)；

(16.5-24)V DC (4～20)mA D C@HART；

3.6V DC (Battery power supply field display type).

(11) The inlet thread of explosion-proof cable entry device is metric M20 × 1.5; If the on-site display vortex flowmeter needs to be connected to a cable, the sealing component at the inlet thread should be replaced with a stuffing box or explosion-proof joint.

Note: It is strictly prohibited to open the explosion-proof converter cover and sealing parts with electricity.

II. Flowmeter Specifications and Models

1. Sensor nominal diameter mark (Tab.1)

Tab.1

Nominal diameter(mm)	20	25	32	40	50	65	80	100	125	150	200
Mark	20	25	32	40	50	65	80	100	125	150	200
Nominal diameter(mm)	250	300	350	400	450	500	600	700	800		
Mark	250	300	350	400	450	500	600	700	800		

2. Mark of the measured medium (Tab.2)

Vortex Flowmeter Specification Model

ABDT - LUGB	a	b	c	d	e	f	g	h	i	j	k	l

Series		LUGB	Vortex Flow Sensor
		LUB	Vortex Flowmeter
a	Connection	1	Flange Connection
		2	Wafer Connection
		3	Plug-in
b	Measured Medium	2	Liquid
		3	Gas (Steam)
c	Nominal Diameter(mm)	15	DN15
		20	DN20
		25	DN25
		32	DN32
		40	DN40
		50	DN50
		65	DN65
		80	DN80
		100	DN100
		125	DN125
		150	DN150
		200	DN200
		250	DN250
		300	DN300
		350	DN350
		400	DN400
		500	DN500
		600	DN600
		700	DN700
d	Nominal Pressure	16	1.6MPa
		25	2.5MPa
		40	4.0MPa
e	Temperature	A	(-195）℃-0℃
		B	0℃-160℃
		C	0℃-250℃
		D	0℃-300℃
		E	0℃-350℃
		F	0℃-400℃
		G	0℃-420℃
f	Accuracy Class	0	1.0 Class
		1	1.5 Class
g	Output Signal	F	Pulse Output
		M	Pulse Output + (4-20)mA
h	Compensation Type	0	Without Temperature & Pressure Compensation
		1	Integrated Temperature & Pressure Compensation
		2	Integrated Pressure Compensation
		3	Integrated Temperature Compensation
i	Shell Protection	1	IP65
		2	IP68
		3	Other
j	Explosion-proof	0	None
		1	Flameproof
		2	Intrinsically Safe Explosion-proof
k	Communication	0	None
		1	RS485 MODBUS RTU Protocol
		2	HART Protocol
		3	Other
l	Power Supply	1	DC12V
		2	DC24V
		3	DC3.6V
		4	Dual Power Supply（DC24V & DC3.6V）

III. Outline Dimension and Installation

1. Structural form and installation dimensions

1.1 Common structure form of vortex instrument

The sensor is composed of two parts of the detection meter and the detection amplifier and the connecting rod (Fig.2 and Fig.3)

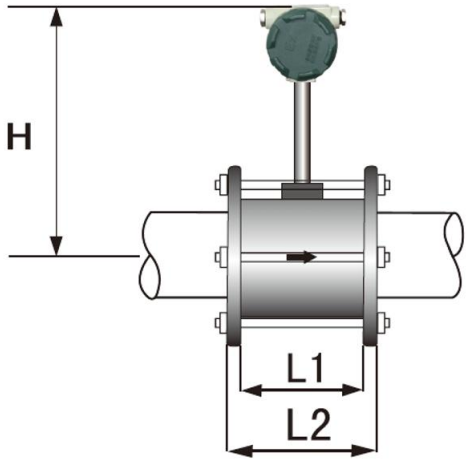


Fig.2 Installation diagram of wafer type

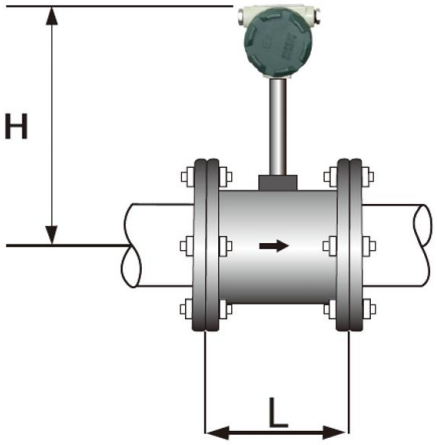


Fig.3 Installation diagram of flange type

1.2 Installation and structural dimensions (Fig.2 and Fig.3)

Outline dimension table of wafer type(Unit:mm, Tab.3)

Tab.3

DN Diameter	15	20	25	32	40	50	65	80	100
L1	65	65	65	70	75	75	75	84	90
L2	97	97	97	106	111	113	119	128	134
H	387	385	382	386	389	395	403	411	421
DN Diameter	125	150	200	250	300	350	400	450	500
L1	100	120	150	160	160	200	220	240	240
L2	148	172	202	212	214	278	302	320	320
H	434	447	472	498	523	548	573	598	623

Outline dimension table of flange type(Unit:mm, Tab.4)

Tab.4

DN Diameter	15	20	25	32	40	50	65	80	100	125	150
L	200	200	200	200	200	200	200	200	250	250	300
H	390	390	394	394	398	402	411	417	430	443	457
DN Diameter	200	250	250	350	400	450	500	600	800	800	
L	350	450	500	500	600	600	600	600	600	600	
H	482	510	535	561	586	613	638	688	733	783	

2. Installation

2.1 Environment and conditions for installation

1. The sensor can be installed indoors and outdoors and the environmental conditions should meet the requirements of Item 2.9 of Part I.

2. The sensor can be mounted on vertical, inclined, horizontal pipes, but must be filled with medium as measured. For gas (vapor) medium, there is no any requirements for the vertical pipe flow direction. For liquid medium, the flow direction of vertical pipe must be bottom-up (Fig. 4). For gas (vapor) medium, the sensor should be installed higher in the pipeline to avoid the impact of fluid accumulation (Fig.5). For liquid medium, the sensors shall be installed lower in the horizontal pipeline to avoid the effects of air bubbles (Fig.4).

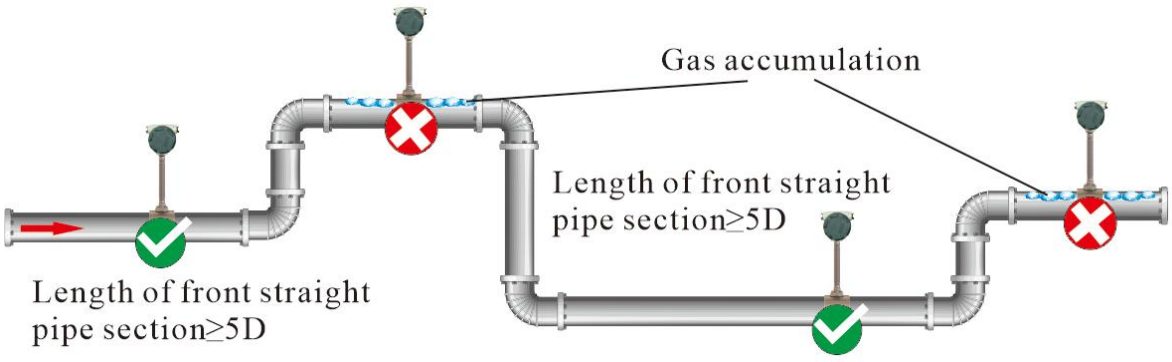


Fig.4 Liquid measurement

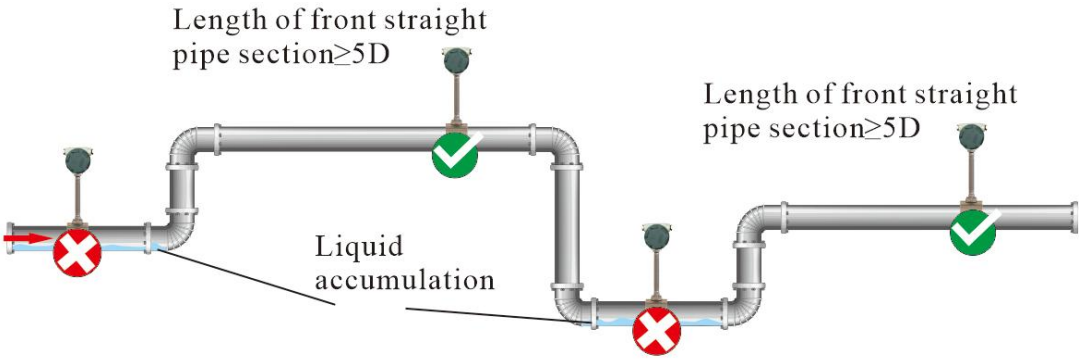


Fig.5 Gas measurement

3. The sensor shall be installed on the pipe without mechanical vibration as far as possible. When the vibration is unavoidable, it shall be considered to add a fixed support frame 2D from the front(Fig.6) and rear of the sensor or connect it with hose (if the soft connection is rubber, the meter shall be grounded).

Fig.6 Schematic diagram of sensor shock absorption support

4. Sensors shall be avoided with strong electromagnetic magnetic field interference, small space, high temperature and inconvenient maintenance.

5. When installing the sensor, the pipe inner diameter must be the same as the sensor inner diameter.If it is not identical, use the pipeline with a 3% difference from the sensor diameter size, and no more than 5mm.

6. There shall be sufficient straight pipe sections on the upstream and downstream sides of the sensor. Please install them as required in Tab. 5 and Fig. 7 (The adjustment valve shall be installed downstream of the sensor as far as possible).

7. When the measured fluid contains more impurities, the filter shall be added beyond the straight pipe section upstream length of the sensor.

Tab.5

The upstream pipeline condition of the sensor	The length of the front straight pipe section	The length of the rear straight pipe section
Concentric reduction diameter	⩾50D	5D
Concentric expansion diameter	⩾30D	
One 90^0 bend	⩾20D	
Two 90^0 bends in the same plane	⩾25D	
Two 90^0 bends in the different planes	⩾40D	
Adjustment valve or the semi-open valve	⩾50D	

D is the instrument nominal diameter, unit: mm

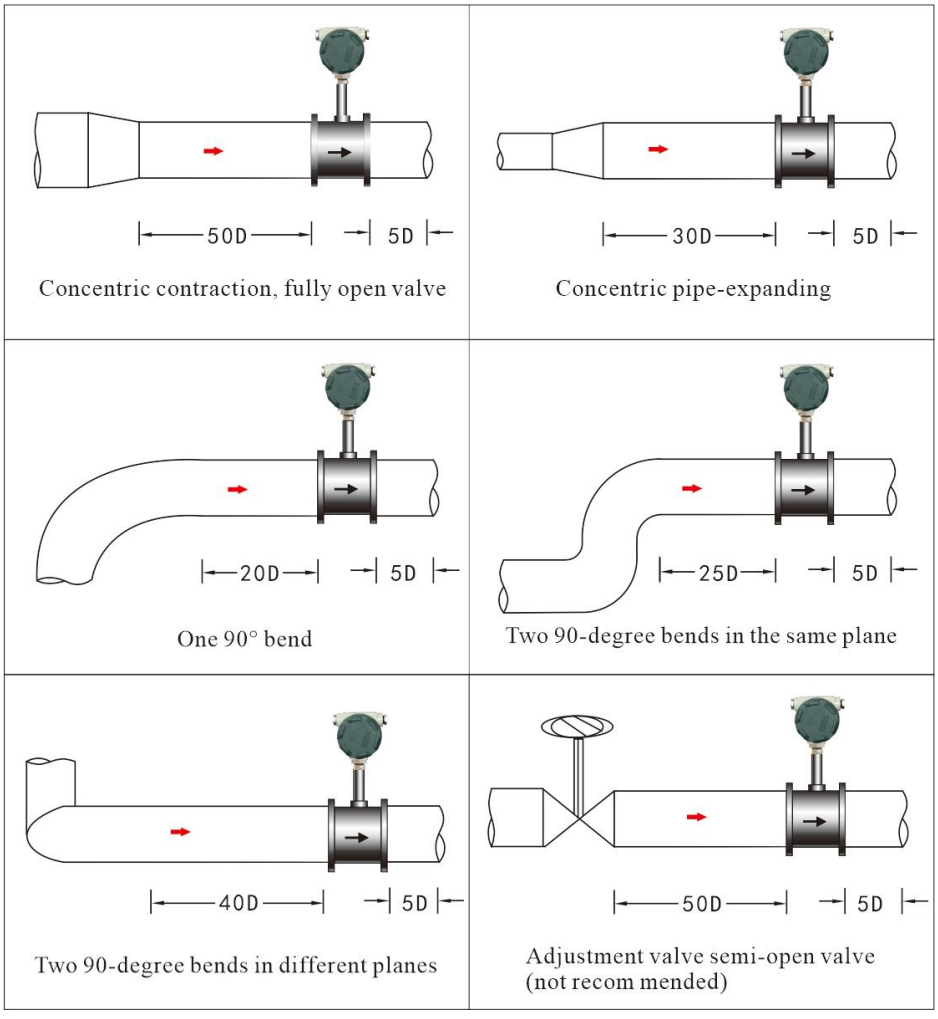


Fig.7 Reserved straight section diagram

2.2 Installation steps

1. The equipped special flange shall be welded to the upper and downstream straight pipe sections respectively, so that the inner diameter of the special flange and straight pipe sections is strictly vertical and concentric.

2. Attach the sensor on the upper and downstream straight pipe sections welded with special flange and bolt the upstream and downstream sections coaxial with the sensor.

3. Assemble the upper and downstream straight pipe sections of the sensor to the pipe.

2.3 Installation precautions

1. The sensor shall be removed before welding between the special flange and the straight pipe sections and cannot be welded with the sensor.**Cross-meter welding is strictly prohibited!**

2. When temperature and pressure compensation is required, the pressure measurement point shall be at the downstream side of the sensor (3-5) D, and the temperature measurement point is at the downstream side (6-8) D of the sensor (Fig. 8)

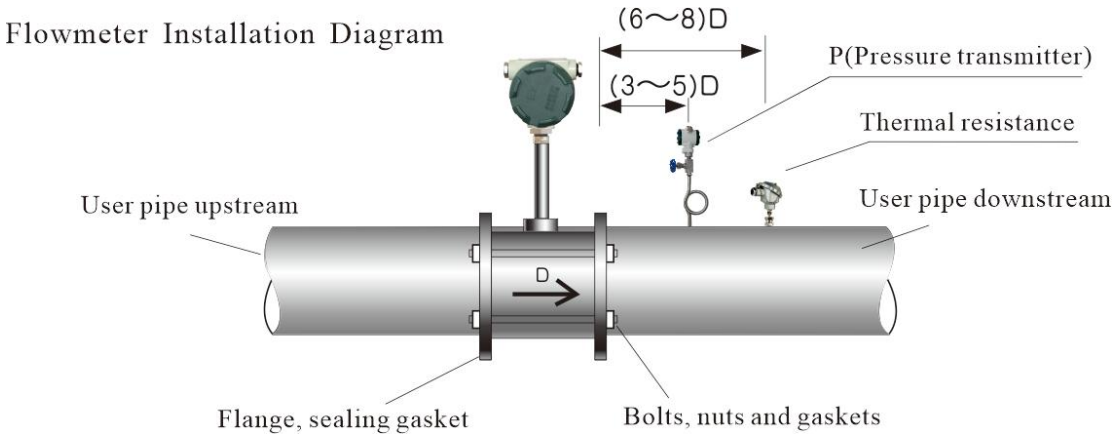


Fig.8 Outline drawing of wafer type

3. The seals on both sides of the sensor shall be concentric with the sensor and not protruding into the pipe. The inner diameter shall be slightly greater than the inner diameter.

4. Impact of sensor shall be avoided during installation.

5. The sensor flow sign shall be directed in the same fluid direction during installation.

6. The high temperature fluid piping sensor shall be mounted horizontally or tilted upwards (with the amplifier pointing).

3. Insert type vortex flow sensor installation

The insert type vortex flow sensor is a sensor that inserts a special DN50 vortex measuring head into a specific part of the large-caliber pipe to measure the local flow velocity in the pipe and calculate the pipe flow.It has the advantages of small size, light weight, convenient installation and disassembly, small pressure loss.A standard sensor can be suitable for a variety of pipe diameter.It can be dismantled and installed under continuous flow.

The sensor is composed of vortex measuring head, drive rod, mounting base, sealing components, meter head assembly, etc.Continuous flow disassembly, drive rod with thread, but also need to be equipped with a DN100/PN16 ball valve.

Tab. 6

DN (mm)	Detachable type without media cut-off		Detachable type with media cut-off	
	H_1	H	H_1	H
250-600	$0.5D_0$	1100	$0.5D_0$	820
7600-1200	$0.5D_0$	1400	$0.5D_0$	1120
1200-6000	$0.5D_0$	1600	$0.5D_0$	1320

3.1 Structural form and installation dimension

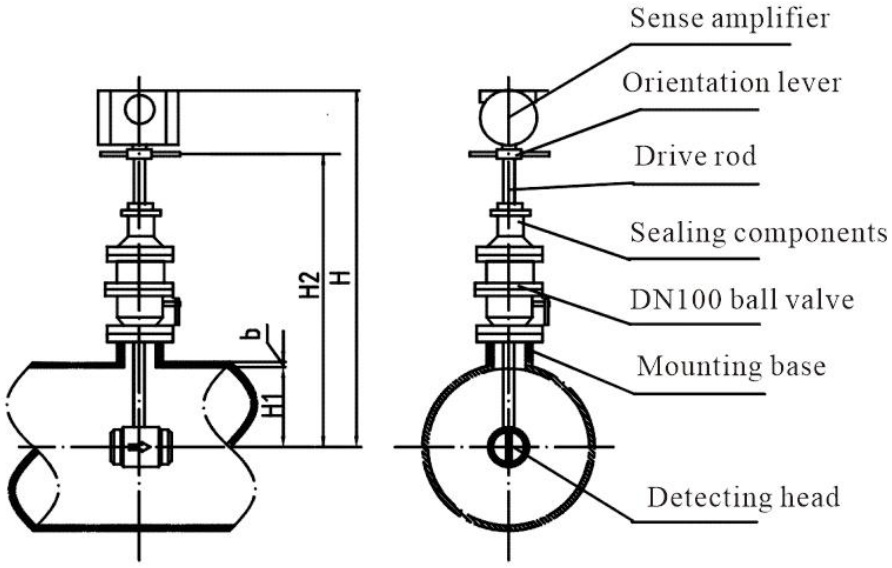


Fig.9

Installation Diagram of Insert Type Vortex Flowmeter Without Water Cut-Off

IV. Wiring and Commissioning

1. Wiring and commissioning of common sensor

1. Connecting terminals are located on the other side of the detection amplifier, and are visible after the spin cover is opened, as shown in Fig. 10

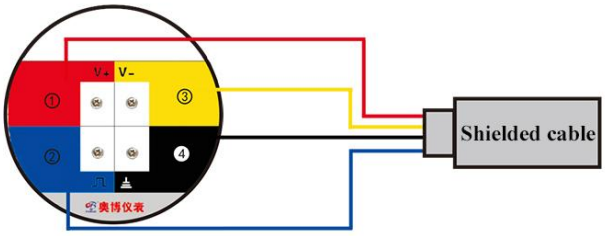


Fig. 10 Wiring terminal diagram

① Power supply V+, red line. ② Output pulse end, blue line.

③ Power supply V-, yellow line. ④ The shield layer is grounded.

2. Our sensors randomly with 10 meters RVVP3×0.5 three-core shielding cable, among which: red line is DC 12V+, connected to V + terminal.Blue line is signal line, connected to " ⎍ " terminal.Yellow line is DC12V-, connected to V- terminal and shielding layer is grounded;

3. The sensor shall be well grounded, with a ground resistance of less than 10 Ω;

4. The sensor has been debugged and verified before leaving the factory, and correctly installed according to the instructions. After wiring, when the power is on, it can work normally. Commissioning is performed in the secondary instrument.

2. Wiring and commissioning of LUGB-K intelligent vortex converter

2.1 Wiring instructions for single power supply (DC12V~32V)

1. Connect to external power supply DC12V~32V, 4-20mA DC output+HART (Fig. 11)

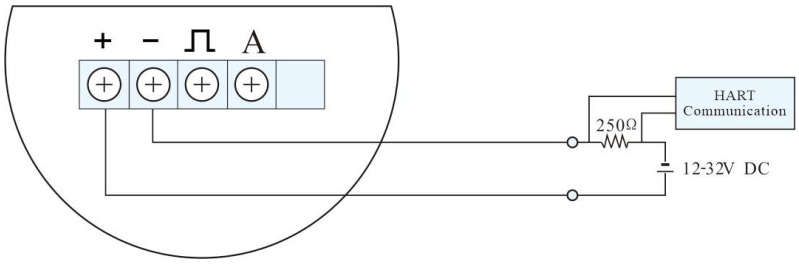


Fig. 11

2. Connect to external power supply DC12V~32V, pulse output (Fig. 12)

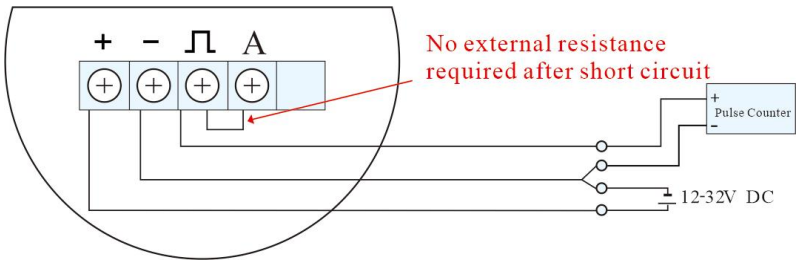


Fig. 12

3. Connect external power supply DC12V~32V, pulse output+pressure sensor (Fig.13).

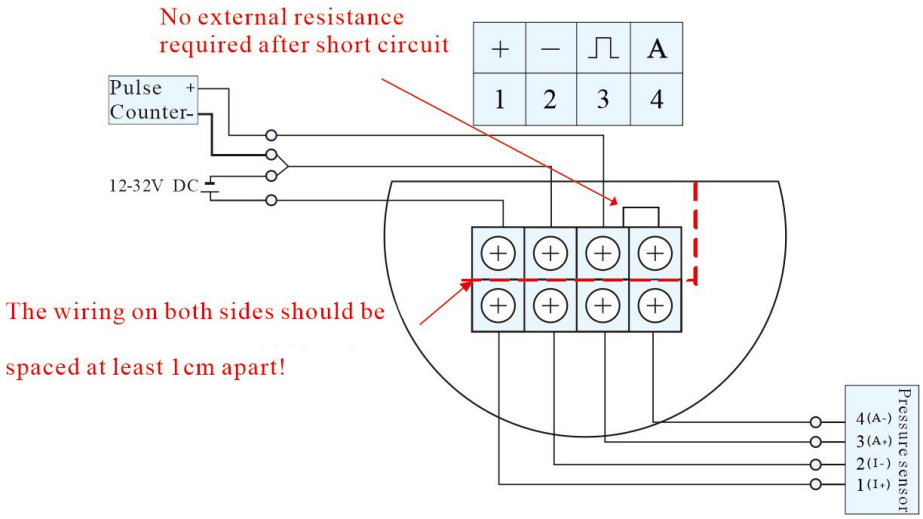


Fig.13

4. Connect external power supply DC12V-32V, 4-20mA DC output+HART+pressure sensor (Fig.14)

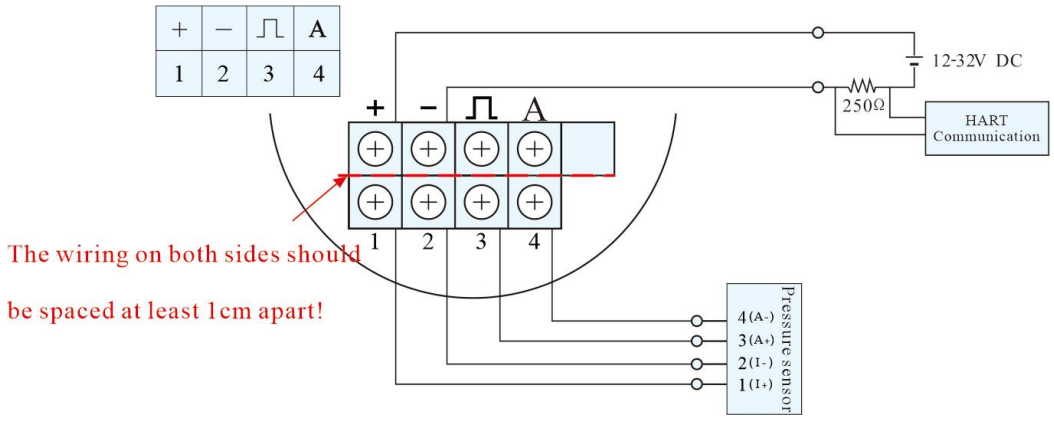


Fig.14

2.2 Wiring instructions for dual power supply (3.6V lithium battery+external DC12V~32V)

1. Dual power supply+pulse output (battery powered) (Fig.15)

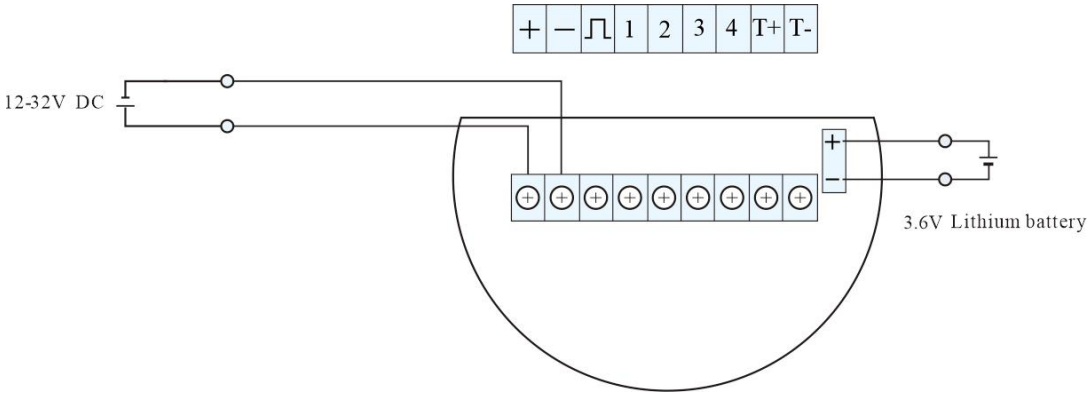


Fig.15

2. Dual power supply+485 communication (RS485 type) (Fig.16)

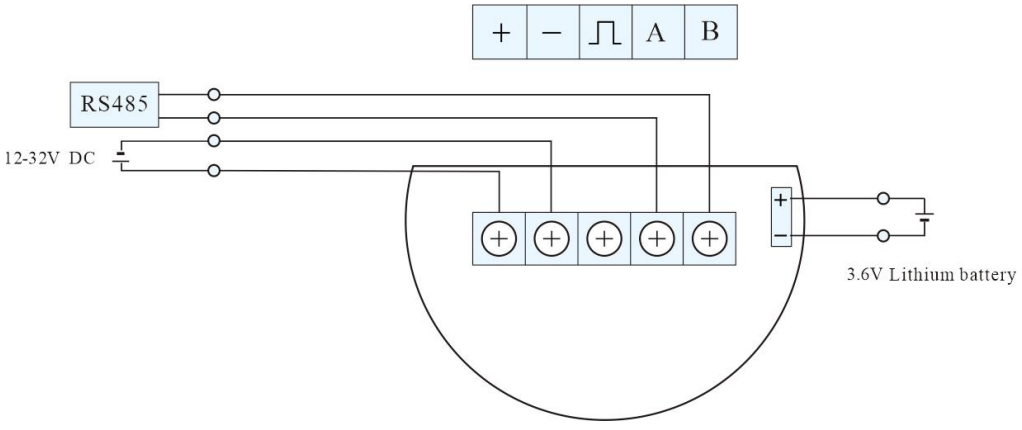


Fig.16

3. Dual power supply+485 communication+pulse output (RS485 type) (Fig.17)

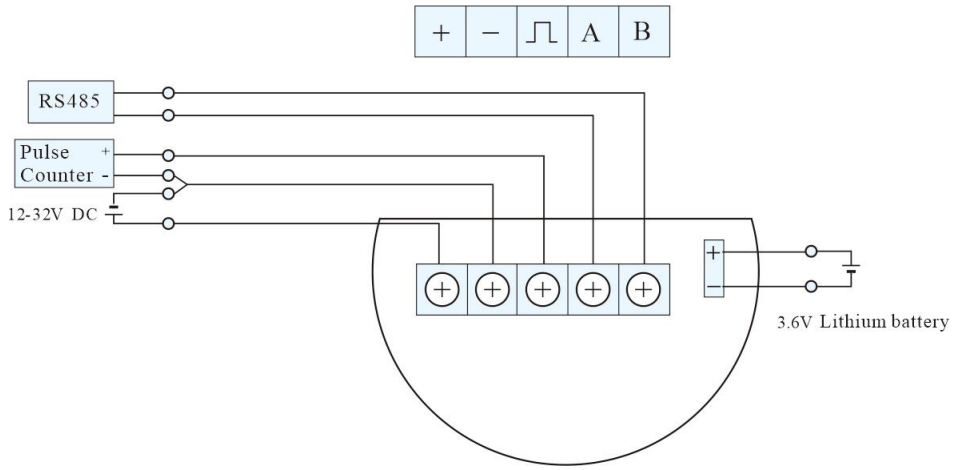


Fig.17

4. Dual power supply+485 communication+current output (to be ordered separately).

Note: Standard products do not have current output! If you need current output, please order separately! (Fig.18)

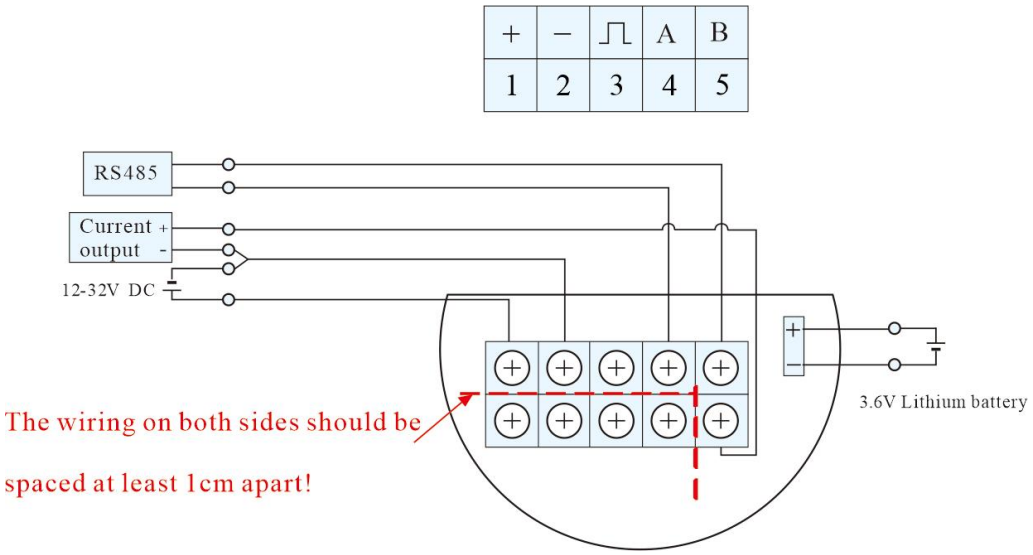


Fig.18

5. Dual power supply+pressure sensor (Fig.19)

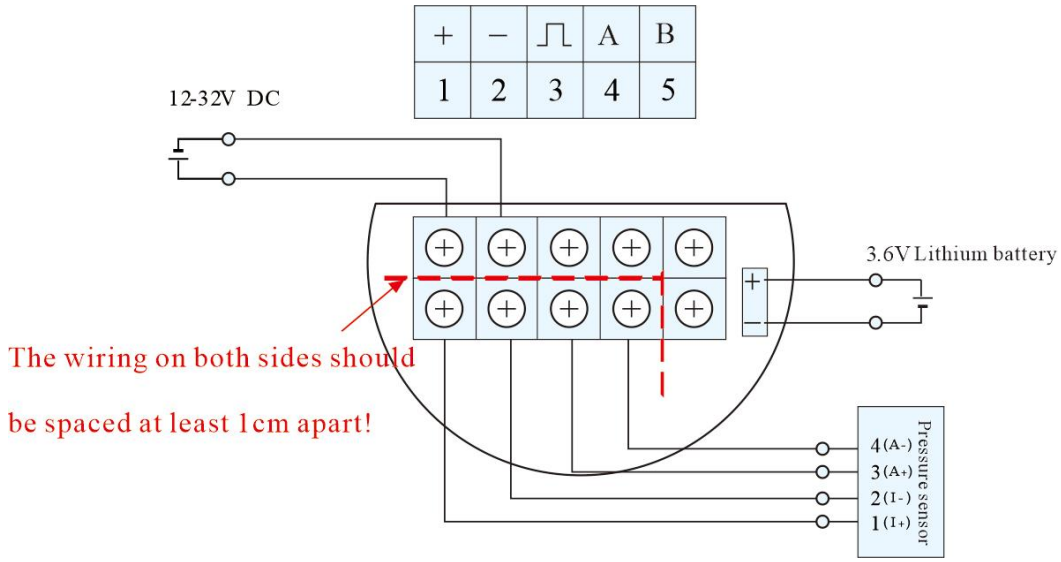


Fig.19

6. Dual power supply+pulse output+pressure sensor (Fig. 20).

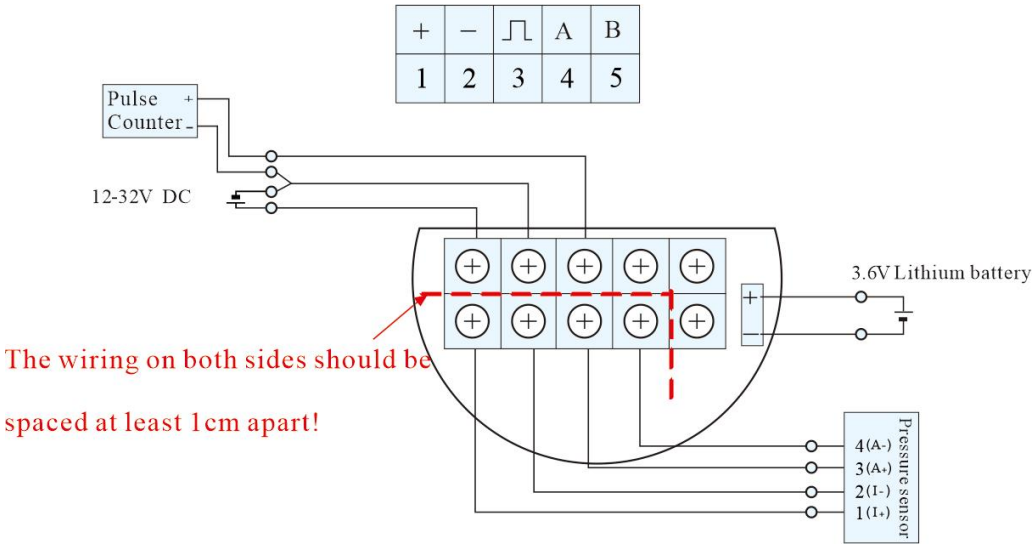


Fig. 20

7. Dual power supply+485 communication+pressure sensor+pulse output (Fig. 21).

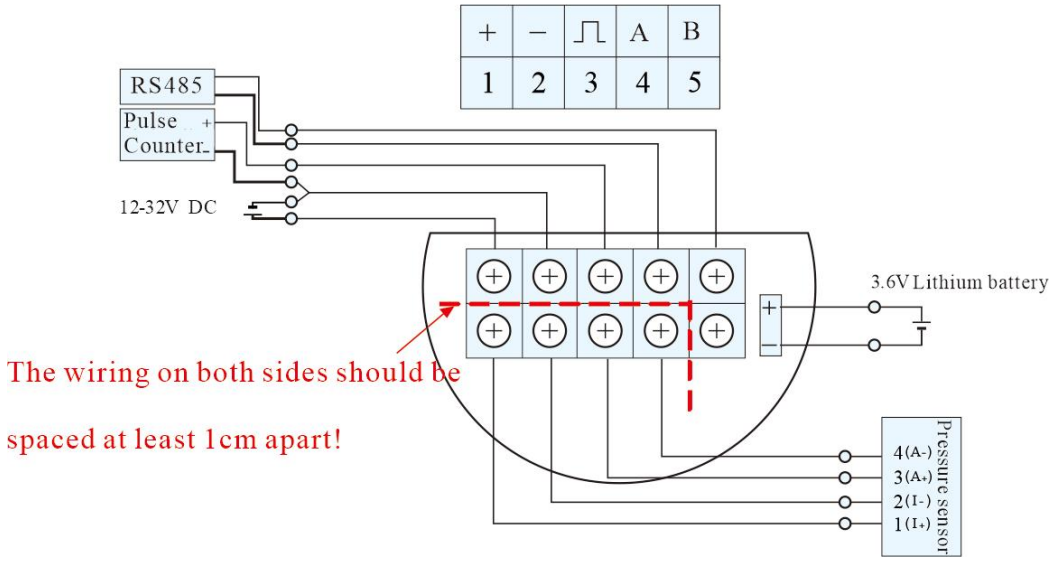


Fig. 21

8. Dual power supply+485 communication+pressure sensor+current output (ordered separately)

Note: Standard products do not have current output! If you need current output, please order separately! (Fig.22)

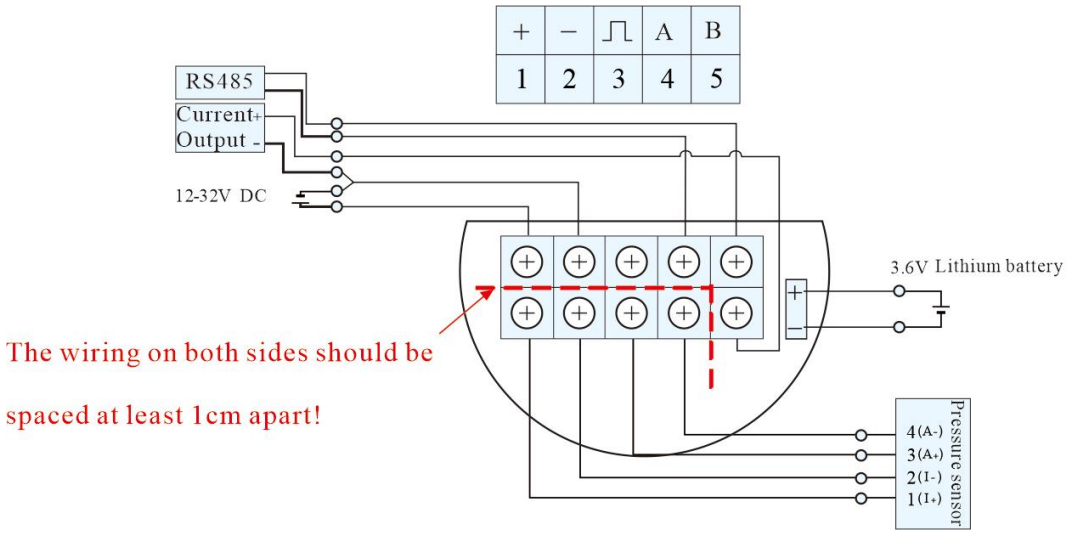


Fig.22

3. Display

The LCD was displayed by using a 128*64 dot array, supporting a multivariate display. This instrument supports two display modes:

3.1 Three lines display mode

When opening the third line display, the display is shown in the figure below(Fig.23):

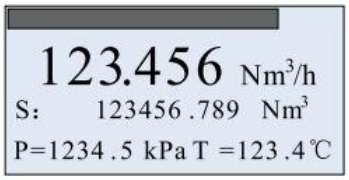


Fig.23

Display the current percentage as a progress bar,

Display the instantaneous flow.

Set it to display the cumulative flow.

It can be set to display the frequency,density, pressure,temperature,current or percentage value.

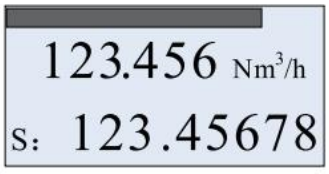
In the normal display state, the display frequency, pressure, temperature, density, current, and percentage can be set in the third line by long pressing the “M” button.

The third line shows the variable prompts as follows:

Prompts	F	Den:	P:	T:	Curr :	Per:	P = T=
Display the variable	Frequency	Density	Pressure	Temperature	Current	Percentage	Pressure and temperature

3.2 Two-line display mode

When the third line display is closed, the second line display is fixed, as shown in the Fig.24 below:



Display the current percentage in a progress bar.
Display instantaneous flow.
Display cumulative flow

Fig.24.

3.3 Detailed description of the field button function

1. Button basic function description

This product supports the "three-button" operation mode(Fig.25).The basic functions of the three buttons are as follows:

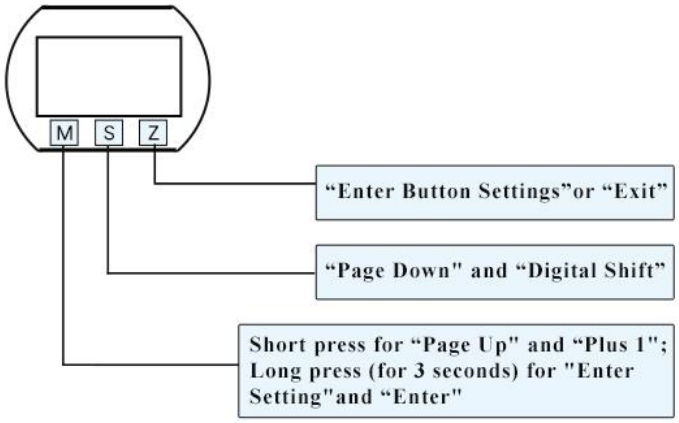


Fig.25

2. Enter the field configuration

In "Normal Display" state, press "Z" to enter "Field Configuration". "Field Configuration" parameters can be set with the "Direct Digital Input" and "Menu Selection" methods.

3. Exit from the field configuration

In "Field Configuration"status, press "Z" to exit "Field Configuration"and enter"Display status".

3.4 Data setting method

The field setting parameters are divided into two types: "Menu Selection"and "Direct Digital Input".

1. The Menu Selection setting method

Long press "M" button and move underline to the second line.It means you can change your settings.

Short press "M" button, flip the option up, or press "S" button, and flip the option down.

During the data settings, long press "M" button to save the settings.When it is saved, the underline automatically moves to the first line;

2. "Direct Digital Input" setting method

Long press "M" button and move underline to the second line.It means you can change your settings.Press "M" button briefly to switch the symbols.

Press “S” key to move right and move underline to the first digit, indicating modifiable, short press “M” key, and add one digit.

Press “S” key again to set the number in the same way as the first one.During data setting, long press “M” to save the setting data, or press “Z” key to exit the setting.

3.5 Field configuration function

1. Basic features (password-free)

Tab.7

Set variable	English prompt	Chinese prompt	Setting method	Note
Contrast	Contrast	Contrast	Menu selection	Level 1~5, the larger, the darker the font.Generally, Level3 can be used.
Write-protect	Protection	Write-protect	Switch by long press M key.	Open(Write Disable) Close(Write Enable)
Low alarm limit setting	Min Alarm(%)	Low alarm setting (%)	Direct digital input	Unit: %
High alarm limit setting	Max Alarm(%)	High alarm setting (%)	Direct digital input	Unit: %
The diameter of vortex[52]	Meter Size	Caliber	Read only	When you are not entering a password, you can view the caliber
Flow mode	Flow Mode	Flow mode	Menu selection	Liquid volume (Liquid Qv) Liquid quality(Liquid Qm) Gas volume(Gas Qv) Gas mass (Gas Qm) Vapour volume (Steam Qv) Superheated steam quality(PT) (Steam (P/T)) Saturating steam quality(T) (Sat_Steam(T)) Saturating steam quality(P) (Sat_ Steam(P)
Transient flow unit	Unit_Qv Unit_Qm	Flow volume unit Flow quality unit	Menu selection	Volume unit support: Nm^3/h，Nm^3/m，Nm^3/s, l/s，l/m，1/h, m^3/s，m^3/m，m^3/h，m^3/d, Scf/s，Scf/m，Scf/h, cf/s，cf/m，cf/h, USG/s，USG /m，USG /h, UKG/s，UKG /m，UKG /h, bbl/h，bbl/d, Special(Custom unit) Quality unit support: g/s , g/m，g/h， kg/s，kg/m，kg/h，kg/d, t/m，t/h，t/d, lb/h，lb/d Special(Custom unit)
Scale upper limit	Range 100%	Scale upper limit	Direct digital input	

Density	Density (kg/m^3) Density (g/cm^3)	Density(kg/ m^3) Density(g/c m^3)	Direct digital input	Gas density (unit: kg / m^3) Liquid density (in gram / cubic centimeter)
Gas pressure (gauge pressure)	Gauge Pre. (KPa)	Gas gauge pressure (KPa)	Direct digital input	Unit: KPa,it is not available when measuring the liquid.
Gas temperature (℃)	Temperature(℃)	Gas temperature(°C)	Direct digital input	Unit: ℃, which is not available when measuring the liquid.
Small flow resection	PV Cutoff (%)	Small flow resection(%)	Direct digital input	Range: 0% ~ 20%
Damp	Damping (S)	Damp(S)	Direct digital input	Range: 0 ~ 64S
Number of decimal points of the instantaneous flow	Disp. Point	The decimal point digits	Menu selection	Range: 0, 1, 2, 3
Display mode	Display Mode	Display mode	Menu selection	Two lines display (2 _ line Display): display only instantaneous and cumulative flow. Three lines display (3_line Display): Add line 3 display
Cumulative flow zero	Total Reset	Cumulative flow zero	Menu selection	(Yes),Maximize the zero clearance of the cumulative flow. (NO)，No operation is performed.
Accumulated flow spill-over time(s)	Total Overflow	Accumulated flow spill-over time(s)	Read only	Cumulative flow is greater than 9999999, overflow number plus 1.
Meter factor (K value) [57]	K-Factor	Meter factor (K)	Read only	Check the instrument coefficient, without entering a password.

2. Advanced features (manufacturer use, require different password)

Enter different passwords and you can enter different special functions.

Tab.8

Operation Code	Code	Password	Direct input	Enter * * * * 50 to set items 51 to 59.
Signal monitoring [51]	Signal Monitor	Signal monitoring	Read only	LCD display example: 450.00 CH 2 Where: 450.00 is the current magnification. The CH2 is the current channel number.
The diameter of vortex [52]	Meter Size	Caliber	Menu selection	Option: 20mm, 25mm, 32mm, 40mm, 50mm, 65mm, 80mm, 100mm, 125mm, 150mm, 200mm, 250mm, 300mm, 350mm, 400mm, 450mm, 500mm, 600mm; Note: The LCD shows the DN15, indicating the diameter I5mm. After changing the vortex diameter, the lower limit flow, maximum magnification, instrument coefficient (K value) must be set again, as detailed in the "Special Instructions" behind the table.
Medium[53]	Fluid Type	Medium	Menu selection	(Gas) (Liquid) Note: After changing the medium, you must reset the lower limit flow, maximum magnification, instrument factor (K value), see "Special Instructions" later in the table.

Low Flow Limit [54]	Low Flow Limit	Low Flow Limit	Direct digital input	Determined by the caliber and measuring medium. [The unit is fixed to m^3 / h (working condition), and the lower frequency limit of the measurement is determined together with the instrument coefficient]. The lower limit of the actual measurement is about half of the set value.
High Flow Limit[55]	High Flow Limit	High Flow Limit	Direct digital input	The upper flow automatically defaults to 10 times the lower flow, and the upper limit of the actual measurement is 2.5 times the set value. [The unit is fixed to m^3 / h (working condition), and the measured frequency upper limit is determined together with the instrument coefficient] The upper flow value can be manually modified when the actual required range ratio exceeds 20:1.
Magnification [56] [56]	Max AMP.	Set the magnificatio	Direct digital input	Recommended range is between 200 and 1000.Usually at around 400.
Instrument coefficient (K-value)[57]	K-Factor	Instrument coefficient K	Direct digital input	Determined by the caliber and measuring medium.Unit is fixed to 1 / m^3. That is, how many pulses correspond to 1 m^3 volume flow.
Pulse coefficient unit[58]	Pulse Factor Unit	Pulse coefficient unit	Menu selection	Supported units are: m^3, N m, t, kg, Scf, cf, USG (US gallon), UKG (British gallon), bbl (barrel), lb.
Output pulse coefficient [59]	Pulse Factor	Output pulse coefficient	Direct digital input	Enter the corresponding number of output pulses under 1 "pulse coefficient unit". If the original pulse is to be output, set the instrument coefficient (K value) and the Output Pulse coefficient with the same value, and the Pulse Coefficient Unit is set to m^3.

Special explanation:

After modifying the "vortex diameter", the "lower limit flow", "maximum magnification "and" instrument coefficient K " must be reset according to the gauge and measurement medium, otherwise the instrument may work abnormally.[If you change the caliber through the configuration software, these parameters automatically transfer the default values]

The setting of the lower limit flow, CH selection and magnification is significantly related to the good working relationship of the vortex. Please set it carefully according to the actual application situation.

The magnification setting range is: 20 ~ 2,000 times, which can be adjusted according to the field signal, noise, vibration, etc.

3.6 Description of the flow mode setting of the vortex

1. Gas Qv

A.Measure the operating condition volume and set as follows:

Density: Set to density at 20℃ (Do not participate in operations.)

Pressure:0.0KPa

Temperature:20℃

B.Measure the standard condition volume as follows:

Density: Standard condition density (Do not participate in operations.)

Pressure: Current pressure (gauge pressure KPa)

Temperature: Current temperature (℃)

2. Gas mass flow-Qm

A.The current density is known and set as follows: (The state conversion coefficient is 1)

Density: It is set to the current actual density.

Pressure:0.0KPa

Temperature:20℃

B.Known standard density is set as follows: (Internal state conversion is according to temperature and pressure).

Density: Standard condition density (density at 20℃)

Pressure: Current pressure (gauge pressure KPa)

Temperature: Current temperature(℃)

3. Liquid Qv

A. Measure the volume, as set below:

Density: 1.0 or the current density (not involved in the operation)

4. Liquid Qm

A. Set the current density, as set below:

Density: It is set to the current actual density.

5. Steam Qv

Density: 1.0 or the current density (not involved in the operation)

Pressure: 0.0KPa (not involved in the operation)

Temperature: 20℃ ((not involved in the operation)

6. Steam quality flow

A.Superheated steam quality(PT)(Steam(P/T)):

If the external temperature or pressure sensor fails (or the temperature or pressure sensor), the steam density is calculated at the input temperature or pressure input:

Pressure: Current gauge pressure KPa

Temperature: Current temperature℃

B.Saturating steam quality(T)(Sat_Steam(T)):

If the external temperature sensor fails (or has no temperature sensor), the steam density is calculated at the input temperature:

Temperature: Current temperature℃

C.Saturating steam quality(P)(Sat_Steam(P)):

If the external pressure sensor fails (or fails to handle the pressure sensor), the steam density is calculated according to the input pressure:

Pressure: Current gauge pressure KPa

3.7 Explanation of temperature and pressure compensation type (the parameters of the temperature and pressure integrated type have been set before leaving the factory)

3.7.1 Pressure sensors use diffused silicon sensors, and temperature sensors use PT100 or PT1000.

V. Maintenance

1. The vortex flow sensor has no motor parts, and it is generally not regularly maintained under normal use, but when the measured medium has dirt, the internal surface shall be cleaned regularly.When washing, the vortex generator and detection probe should be effectively protected, and shall not touch its surface, edges, etc.

2. Do not arbitrarily remove the parts of the sensor without the consent of the manufacturer, otherwise it shall be responsible.

3. After maintenance, the sensor amplifier end cover shall be tightened and carefully checked without any debris.

4. If the fault of the sensor occurs, first check whether the sensor power supply is normal and whether the pipe flow changes. Generally, refer to Tab.9. If the fault cannot be eliminated, please contact the manufacturer to solve the problem.

Tab.9

Fault phenomenon	Causes	Elimination methods
The sensor has no output signal after connecting with the power supply.	1.The sensor power supply is not normal. 2.No fluid flow exists in the tube.	1.Check the power supply and grounding shielding. 2.Ensure the normal fluid flow in the pipe.
There is no medium flow in the tube, but the sensor has an output signal.	1.Poor grounding, and introduce interference. 2.The vibration of the pipeline is large. 3.The detection amplifier gain is too large.	1.Check the grounding line. 2.Take vibration reduction measures. 3.Reduce gain
Small flow signal is unstable and increase the flow stability.	1.The flow rate is too small, below the lower limit of the sensor operation flow rate. 2.Amplifier gain is too small.	1.Increase the flow or switch to small-caliber sensors. 2.Increase gain.
After the sensor is used for a period of time,the measurement accuracy decreases, or even no flow.	1.The measurement medium is dirty, with a foreign body, the sensor scale or wrapped by a foreign body 2.Detect component damage	1.Remove the sensor for cleaning. 2.Return to the factory for maintenance.

VI. Pre-Sale and After-Sales Services

1. Provide free technical consultation and help users choose the type.

2. Delivery to the door, Guide installation and commissioning; one year within the warranty period.

Attached: Vortex Flow Sensor Order Consultation Form

Order Company		Postal address		Tel Zip code	
Use company		Postal address		Tel Zip code	
Pipeline condition	The outer diameter X the wall thickness= × mm		Medium name	Density	kg/m^3

Medium state	Gas state☐ Liquid state ☐ Saturated vapour ☐ Superheated vapor☐		
Flow range	Lowest( )Highest( )Common use ( )t/h☐ m^3/h☐ operating mode☐ Standard condition☐		
Fluid pressure	Lowest( ) Highest( ) Common use( ) MPa Gage pressure☐ Absolute pressure☐		
Fluid temperature (F.T.)	Lowest( ) Highest( ) Common use( )℃	Installation environment	High temperature☐ Damp☐ Explosive☐
Installation site	Indoor installation ☐ Outdoor installation☐ Elevated installation☐ Underground installation☐		
Select model: LUGB—( ) Quantity( )set			
Supporting instrument: MC51—( )intelligent flow totalizer( )set The YBY diffusive silicon pressure transmitter( )set Pt100 hot resistance ( )pcs Other requirements:			
Note descriptions:			
1.Please fill in this form carefully and click √ in the ☐. 2.This form is made in duplicate. Please fill in and seal and send it back to the company together with the contract (please leave one copy). 3.This form can be copied and used.	The user filling personnel: Date: Supplier reviewer: Date:		

Contact

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