Smart Vortex Flowmeter

Installation and Instruction Manual

I. Overview

The vortex flowmeter is based on the Karman vortex theory, and uses piezoelectric crystals to detect the vortex frequency generated when the fluid passes through the triangular column in the pipeline, thereby measuring the flow rate of the fluid. Vortex flowmeter is widely used in petroleum, chemical, power heating and other industries.

Vortex flowmeter has the following characteristics:

◆High precision and wide range;
◆ Wide range of media, can measure liquid, gas and steam;
◆High working temperature, up to 350 degrees;
◆No moving parts, no wear, high reliability;
◆Stainless steel material, corrosion resistance.

Ⅱ. Measurement Principle

When the fluid medium in the pipeline passes through the vortex triangular column, a vortex phenomenon occurs due to local acceleration (as shown in Figure 1). The vortices are staggered and separated, and pulsating pressure is generated in the wake behind the cylinder. The detection probe behind (or inside) the cylinder is subjected to the pulsating pressure, so that the piezoelectric crystal element buried in the probe is subjected to alternating stress. and generate an alternating charge signal. After the detection amplifier exchanges, amplifies, filters and shapes the signal, it outputs a voltage (or current) pulse signal with the same frequency as the vortex separation frequency, or outputs an analog current signal proportional to the vortex separation frequency after transformation processing. In this way, the flow rate of the fluid medium can be detected by measuring the vortex frequency signal, and then the flow rate of the medium can be calculated through the flow rate of the medium.

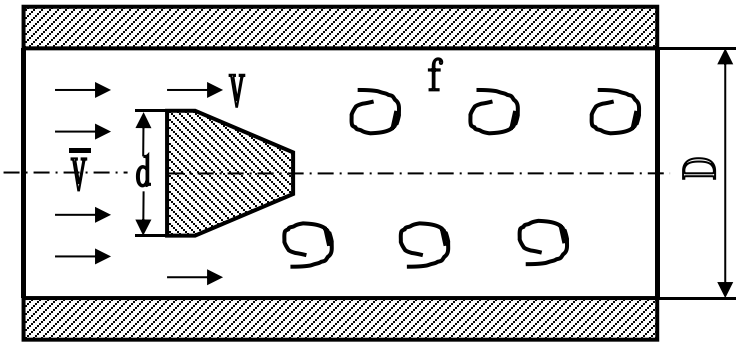


Figure 1

The release frequency of the Karman vortex street is related to the width of the three-column and the fluid velocity, but has nothing to do with the temperature and pressure of the medium. It can be expressed as: $f=S_tV/d$

In the formula: f- release frequency of Karman vortex street
V-media flow rate
D - the width of the triangular column
St-Strohal number

The Strohal number is an important parameter of the vortex flowmeter, and it is only related to the Reynolds number...Re of the medium. As long as the Reynolds number of the medium in the pipeline is kept in the range of 2*104 to 7*106, the Strohal number St will remain a constant (0.17~0.18), so that the fluid medium can be detected by measuring the vortex frequency signal. flow rate

Ⅲ. Specifications

3.1 Technical Parameter

◆Nominal diameter: Pipe section type: DN15-300mm
Insertion type: DN200-2000mm

◆Applicable medium: gas (air, oxygen, nitrogen, gas, natural gas, chemical gas, etc.), liquid (water, high temperature water, oil, food liquid, chemical liquid, etc.), steam (saturated steam, superheated steam)

◆Measurable medium temperature: -20 to 250 ℃, -20 to 350 ℃

◆Nominal pressure: ≤1.6MPa ≤2.5MPa ≤4.0MPa

◆Accuracy class: class 1.0, class 1.5

◆Velocity range: liquid 0.27-9m/s gas: 4-40m/s steam: 3-50m/s

◆Output signal: voltage pulse: low level≤1V, high level≥12V, pulse width 0.4ms, load resistance>150Ω

◆Power supply: pulse output: +24VDC; 4-20mA output: +24VDC;
On-site liquid crystal display: 3.6V No.5 lithium battery power supply, the service life is more than 2 years;

◆Ambient temperature: voltage pulse output: -30 - +65℃; 4-20mA output: -10 - +55 ℃; on-site LCD display: -25 -55 ℃;

3.2 Measuring Range

Table 1 Liquid and Gas Measurement Range

Nominal diameter mm	Liquid	Gas	Nominal diametermm	Liquid	Gas
	m3/h	m3/h		m3/h	m3/h
DN15	/	2-20	DN80	13-130	70-700
DN20	/	4-40	DN100	20-200	100-1000
DN25	1.5-10	6-60	DN125	36-360	150-1500
DN32	2-15	10-100	DN150	50-500	200-2000
DN40	3-20	18-180	DN200	100-1000	400-4000
DN50	4-40	30-300	DN250	150-1500	600-6000
DN65	6-60	50-500	DN300	200-2000	1000-1000

Note: Reference fluid: liquid: water at room temperature (t=20℃, ρ=1000kg/m3) ; gas at normal temperature and pressure (t=20℃, p=0.1MPa, ρ=1.205kg/m3)

Tale 2 Saturated Steam Mass Flow Measurement Range

absolute pressure		0.07	0.1	0.14	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1	1.2	1.4	1.6	2	2.5	3	4	
temp ℃		90	99.6	109	120	134	144	152	159	165	170	180	188	195	201	212	224	234	250	flow unit
Density (KG/m³)		0.43	0.59	0.81	1.13	1.65	2.16	2.67	3.17	3.67	4.16	5.15	6.13	7.11	8.09	10.1	12.5	15	20.1	
DN15	Qmin	1	1.2	1.8	2.4	3.5	4.5	5.5	7	8	9	11	13	15	18	22	25	30	42	kg/h
	Qmax	10	12	18	24	35	45	55	70	80	90	110	130	150	180	220	250	300	420	
DN20	Qmin	2	2.5	3.5	5	7	9	12	14	15	18	22	25	30	35	42	50	60	85	
	Qmax	20	25	35	50	70	90	120	140	150	180	220	250	300	350	420	500	600	850	
DN25	Qmin	3	4	5.3	7	11	13	17	20	23	25	32	40	45	52	63	75	90	125	
	Qmax	30	40	53	70	110	130	170	200	230	250	320	400	450	520	630	750	900	1250	
DN32	Qmin	4	6	8	11	17	22	27	32	37	42	52	61	71	81	101	125	150	201	
	Qmax	48	65	89	124	182	238	294	349	404	458	567	674	782	890	1111	1375	1650	2211	
DN40	Qmin	8.5	12	15	21	30	40	50	58	66	75	93	110	128	150	180	225	270	361.8	
	Qmax	93.5	132	165	231	330	440	550	638	726	825	1023	1210	1408	1650	1980	2475	2970	3979.8	
DN50	Qmin	13	18	24	34	50	65	80	95	110	125	155	184	213	243	303	375	450	603	
	Qmax	143	195	267	373	545	713	881	1046	1211	1373	1700	2023	2346	2670	3333	4125	4950	6633	
DN65	Qmin	22	30	40	57	83	108	134	159	184	208	258	307	356	405	505	625	750	1005	
	Qmax	238	325	445	622	908	1188	1469	1744	2019	2288	2833	3372	3911	4450	5555	6875	8250	11055	
DN80	Qmin	30	41	57	79	116	151	187	222	257	291	361	429	498	566	707	875	1050	1407	
	Qmax	333	454	623	870	1271	1663	2056	2441	2826	3203	3966	4720	5475	6229	7777	9625	11550	15477	
DN100	Qmin	0.04	0.06	0.08	0.11	0.17	0.22	0.27	0.32	0.37	0.42	0.52	0.61	0.71	0.81	1.01	1.25	1.50	2.01	t/h
	Qmax	0.5	0.6	0.9	1.2	1.8	2.4	2.9	3.5	4.0	4.6	5.7	6.7	7.8	8.9	11.1	13.8	16.5	22.1	
DN125	Qmin	0.06	0.09	0.12	0.17	0.25	0.32	0.40	0.48	0.55	0.62	0.77	0.92	1.07	1.21	1.52	1.88	2.25	3.02	
	Qmax	0.7	1.0	1.3	1.9	2.7	3.6	4.4	5.2	6.1	6.9	8.5	10.1	11.7	13.3	16.7	20.6	24.8	33.2	
DN150	Qmin	0.09	0.12	0.16	0.23	0.33	0.43	0.53	0.63	0.73	0.83	1.03	1.23	1.42	1.62	2.02	2.50	3.00	4.02	
	Qmax	1.0	1.3	1.8	2.5	3.6	4.8	5.9	7.0	8.1	9.2	11.3	13.5	15.6	17.8	22.2	27.5	33.0	44.2	
DN200	Qmin	0.2	0.2	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	2.1	2.5	2.8	3.2	4.0	5.0	6.0	8.0	
	Qmax	2	3	4	5	7	10	12	14	16	18	23	27	31	36	44	55	66	88	
DN250	Qmin	0.3	0.4	0.5	0.7	1.0	1.3	1.6	1.9	2.2	2.5	3.1	3.7	4.3	4.9	6.1	7.5	9.0	12.1	
	Qmax	2.9	3.9	5.3	7.5	11	15	18	21	24	27	34	40	47	53	67	83	99	133	
DN300	Qmin	0.4	0.6	0.8	1.1	1.7	2.2	2.7	3.2	3.7	4.2	5.2	6.1	7.1	8.1	10.1	12.5	15.0	20.1	
	Qmax	5	6	9	12	18	24	29	35	40	46	57	67	78	89	111	138	165	221	

3.3 Common Gas Densities

Table 3 Density of relative pressure and temperature of superheated steam

unit: kg/m³

absolute pressure (MPa) \ temp (℃)	140	180	220	260	300	340	380	420	460
0.15	0.78	0.71	0.65	0.60	0.56	0.52	0.49	0.46	0.44
0.2	1.05	0.95	0.87	0.80	0.75	0.70	0.65	0.62	0.58
0.25	1.32	1.19	1.09	1.00	0.93	0.87	0.82	0.77	0.73
0.3	1.59	1.43	1.31	1.21	1.12	1.05	0.98	0.93	0.87
0.36	1.92	1.73	1.58	1.45	1.35	1.26	1.18	1.11	1.05
0.4		1.93	1.75	1.62	1.50	1.40	1.31	1.23	1.16
0.5		2.42	2.20	1.99	1.88	1.72	1.64	1.54	1.46
0.6		2.93	2.66	2.44	2.26	2.10	1.97	1.85	1.75
0.7		3.44	3.11	2.86	2.64	2.46	2.30	2.16	2.04
0.8		3.96	3.58	3.27	3.02	2.82	2.63	2.48	2.34
0.9		4.5	4.04	3.69	3.41	3.17	2.98	2.79	2.63
1		5.04	4.52	4.12	3.8	3.53	3.5	3.1	2.93
4			6.46	5.85	5.37	4.98	4.65	4.37	4.05
1.8			8.51	7.64	7.00	6.46	6.02	5.64	5.31
2			9.58	8.56	7.81	7.21	6.71	6.28	5.91
2.4				10.45	9.48	8.72	8.1	7.57	7.12
2.8				12.41	11.19	10.26	9.51	8.88	8.34
3.2				14.46	12.94	11.83	10.94	10.20	9.57
3.6				169.61	14.76	13.43	12.39	11.54	10.91

Note: When the density value is between the two in the table, it can be calculated by interpolation method

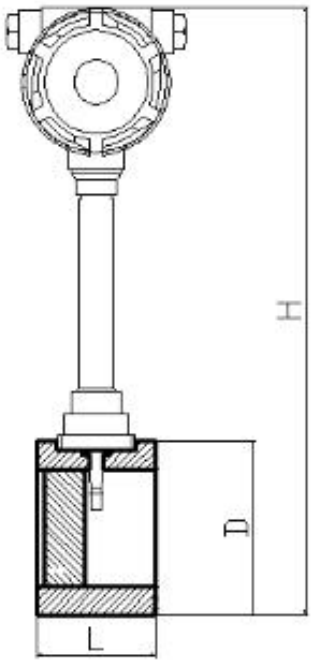
Table 4 Common Gas Densities

Item	0℃ 760mmhg	20℃ 760mmhg (ρ0)	Item	0℃ 760mmhg	20℃ 760mmhg (ρ0)
Air	1.2928	1.205	Acetylene	0.1717	1.091
N2	1.2506	1.165	CH4	0.7167	0.668
H2	0.0899	0.084	Ethane	1.3567	1.263
O2	1.4289	1.331	Propane	2.005	1.867
Chlorine	3.214	3.00	Ethylene	1.2604	1.174
Ammonia	1.771	0.719	Propylene	1.914	1.784
CO	1.2504	1.165	Natural gas	0.828	
CO2	1.977	1.842	Coal gas	0.802	

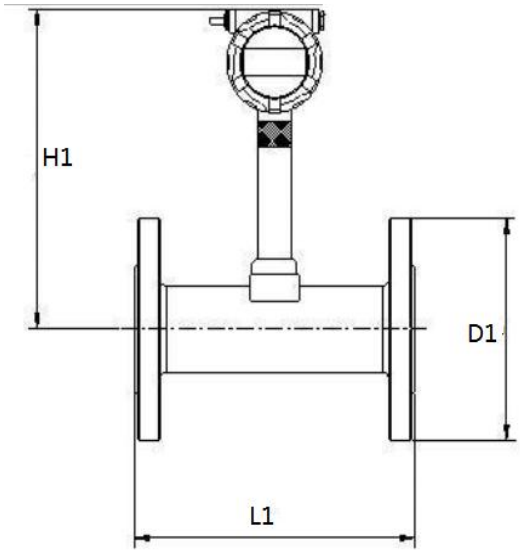
Note: The gas density ρ at other pressures P and temperature T applies the formula:

$$\rho=\rho0*2893P/(T+273.15)$$

3.4 Common Installation Dimensions



Flange-clamp type



Flange Connection

Table 5 External Dimensions

Diameter (mm)	Shell length L(mm)	Shell outer diameter D(mm)	Height H(mm)	Flange connection length L1(mm)	Height H1(mm)	Flange outside diameter D1(mm)
DN15	65	60.5	390	200	390	95
DN20	65	60.5	390	200	395	105
DN25	65	60.5	390	200	400	115
DN32	75	88	420	200	410	135
DN40	75	93	420	200	410	145
DN50	75	93	420	200	420	160
DN65	75	107	440	200	430	180
DN80	75	118	450	250	440	195
DN100	90	138	470	250	450	215
DN125	100	164	500	250	460	245
DN150	115	188	520	250	480	280
DN200	135	238	570	300	510	335
DN250	150	288	620	300	540	405
DN300	165	338	670	300	570	460

3.5. Installation Methods and Steps

3.5.1. Sensor Installation Location

A. Select a position without pipeline vibration, and the vibration acceleration is not greater than 2G, otherwise vibration reduction is required;

B. There must be enough straight pipe sections upstream and downstream of the sensor (see Figure 3);

C.The maintenance valve is installed upstream of the sensor, and the flow regulating valve is installed downstream of the sensor;

D. Select a location that is easy to install and maintain;

E. Choose a location with a dry environment;

F. It can be installed on horizontal pipelines or vertical pipelines, where the medium must flow from bottom to top;

G. Installed indoors, pay attention to waterproofing when installed outdoors, and the

cable should be bent into a U shape outside the amplifier box;

H. The sensor should be kept away from electrical noise;

I. When measuring gas, it is installed in a vertical pipeline, and the gas flow direction is not limited. However, if the pipe contains a small amount of liquid, in order to prevent the liquid from entering the measuring tube of the instrument, the airflow should flow from bottom to top, as shown in Figure (4) a;

J. In order to ensure that the pipe is filled with liquid, when installing the instrument in a vertical or inclined pipe, it should be ensured that the liquid flow direction is from bottom to top. If the pipeline contains a small amount of gas, in order to prevent the gas from entering the measuring tube of the meter, the meter should be installed at the lower part of the pipeline. As shown in Figure(4)b

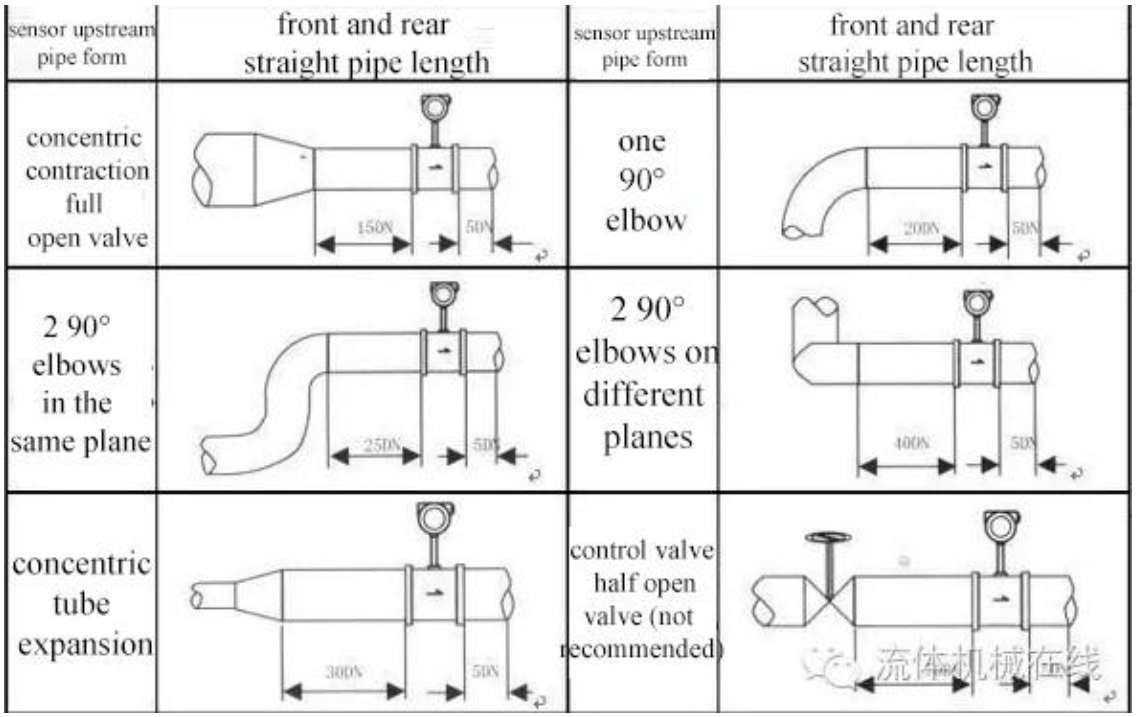


Figure 3

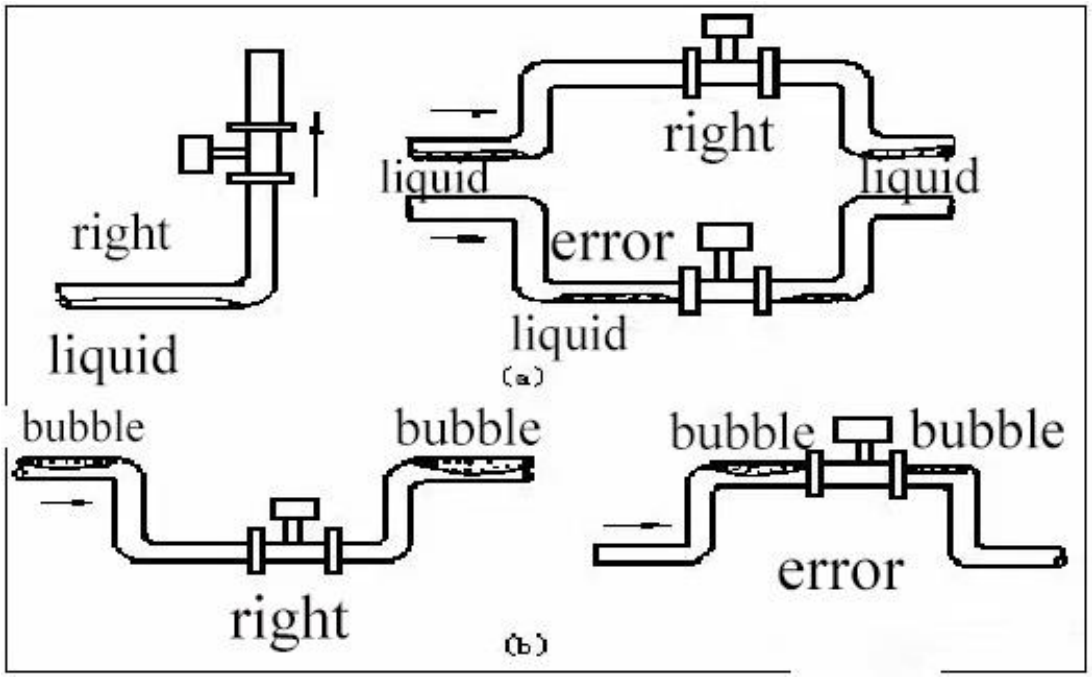
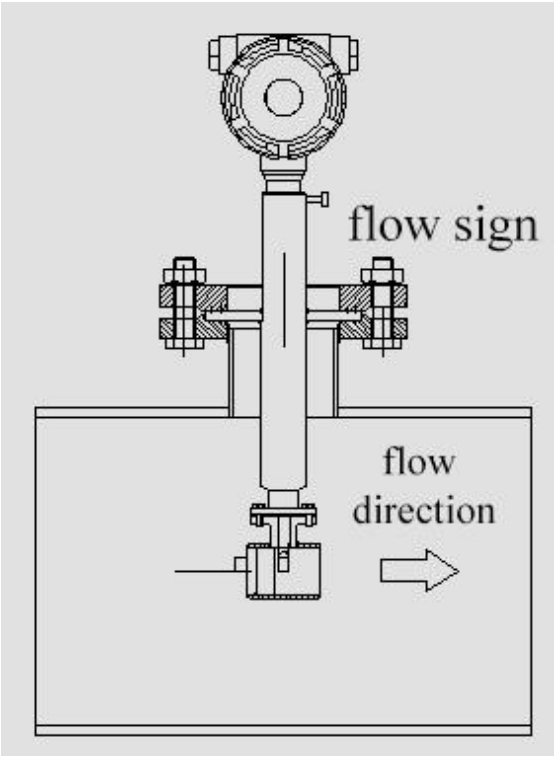


Figure 4

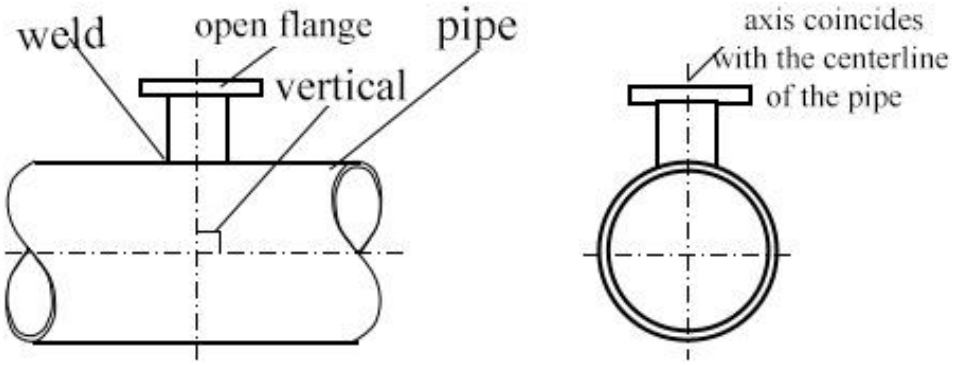
3.6. Insertion Vortex Flowmeter



Installation Steps:

A、Open a φ80 round hole on the pipe with gas welding, and insert the depth 1/2D (D is the pipe diameter);

B. Weld the welded short pipe flange (length 100mm) at the round hole of the pipe, and the flange axis is perpendicular to the pipe axis, as shown in the figure below;



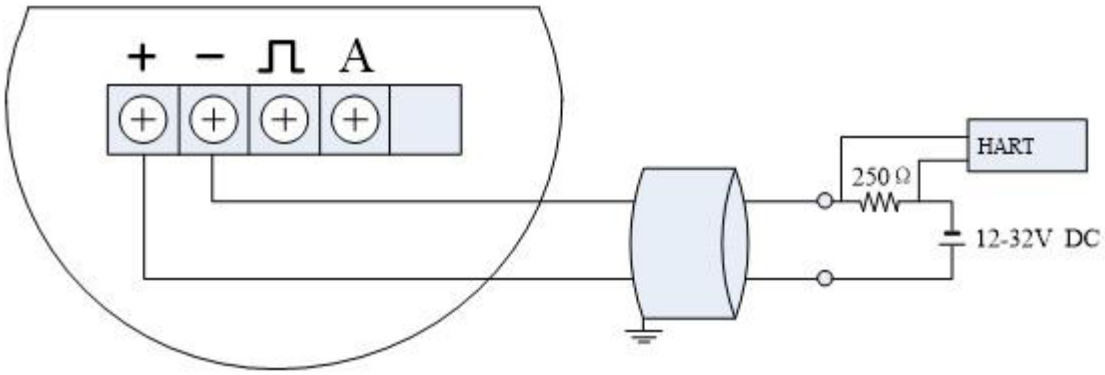
C. Determine whether to install the ball valve. When the flowmeter is installed and disassembled, it is allowed to interrupt the flow, and the ball valve does not need to be installed; if the flow is not allowed to be interrupted, the ball valve needs to be installed.

D. Install the ball valve: first install the ball valve on the open flange, open the ball valve, and install the plug-in vortex flowmeter on the ball valve. Without installing the ball valve: install the plug-in vortex flowmeter on the open flange, and tighten the screws .

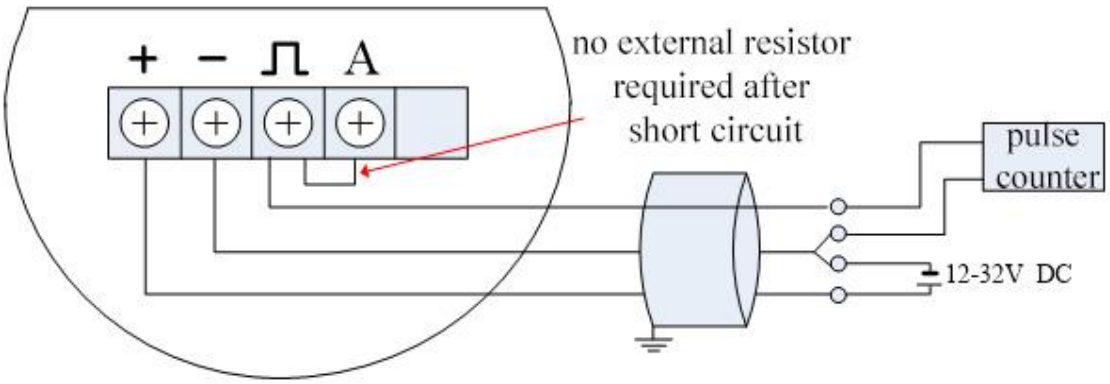
E. Check whether all links are completed, and slowly open the valve to observe whether there is leakage

Ⅳ. Electrical Wiring

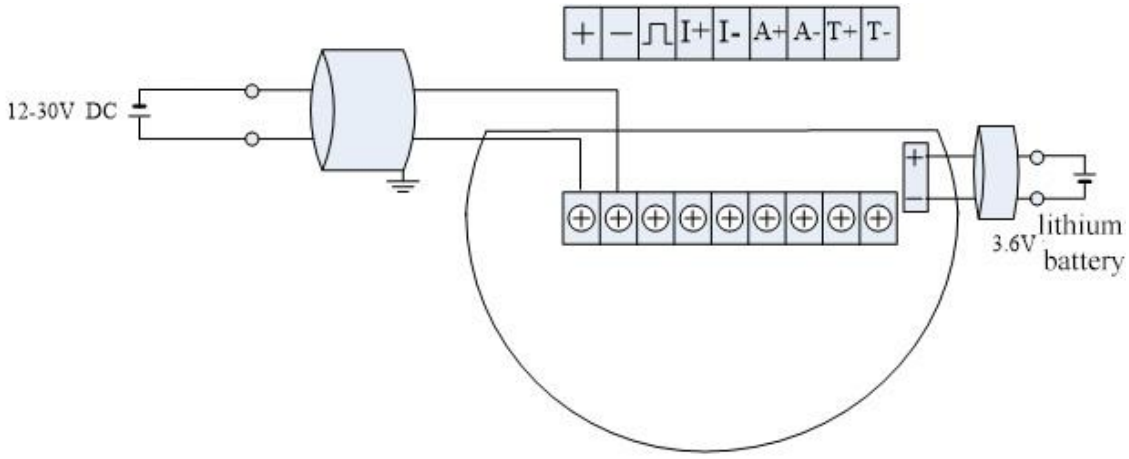
4.1 4-20mA output+HART



Pulse output

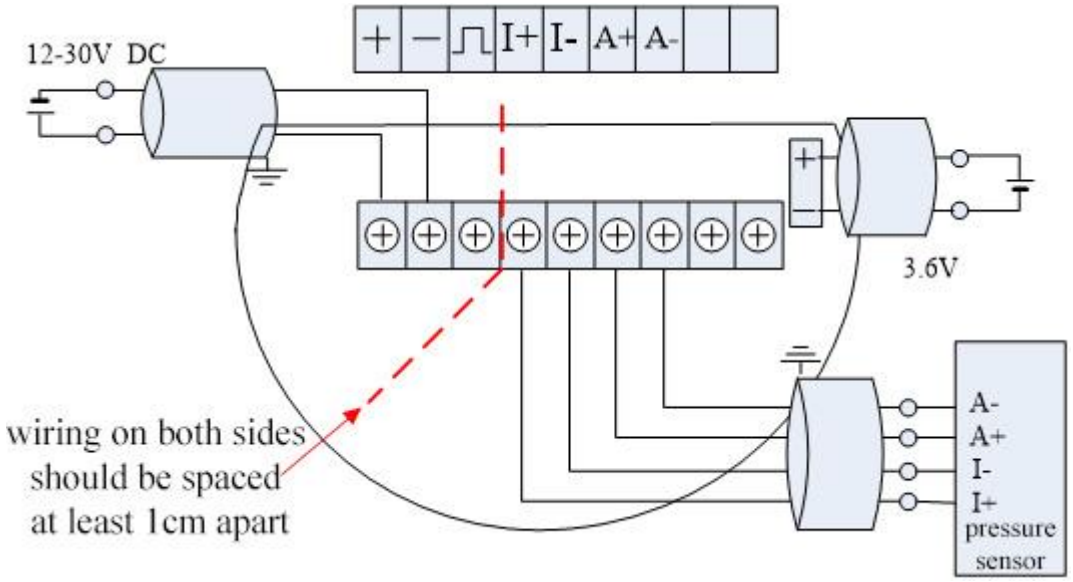


4.2 dual power supply + pulse output (battery powered type)



4.3 Dual power supply + pressure sensor

- Battery powered type uses H880BATDZ terminal board wiring as follows:



- RS485 type uses H880TDZ-485 terminal board wiring as follows:
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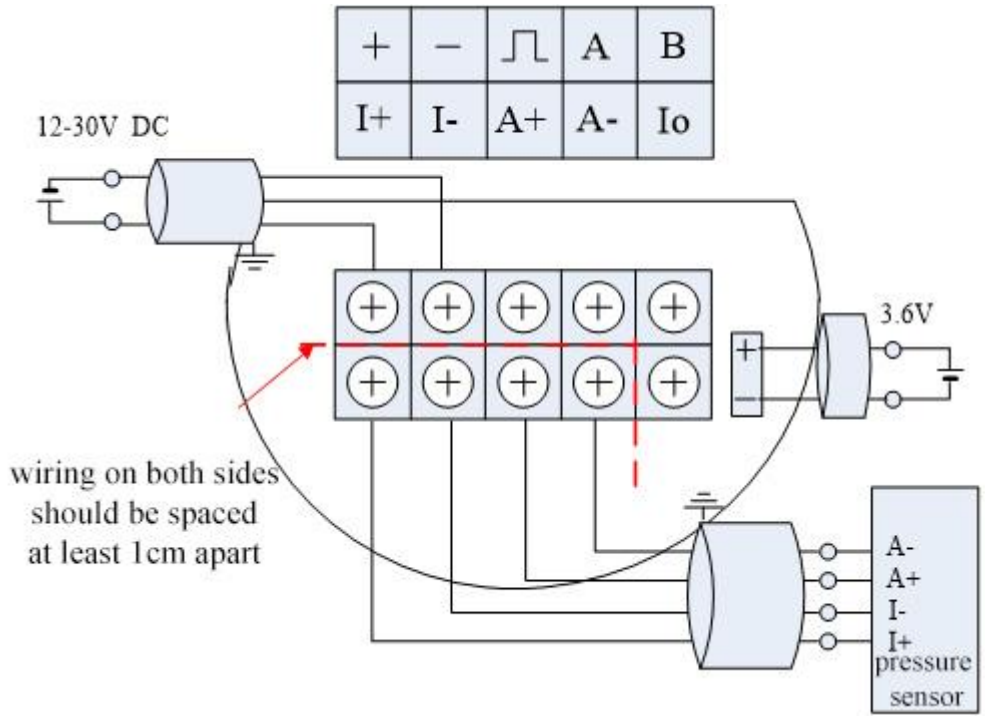
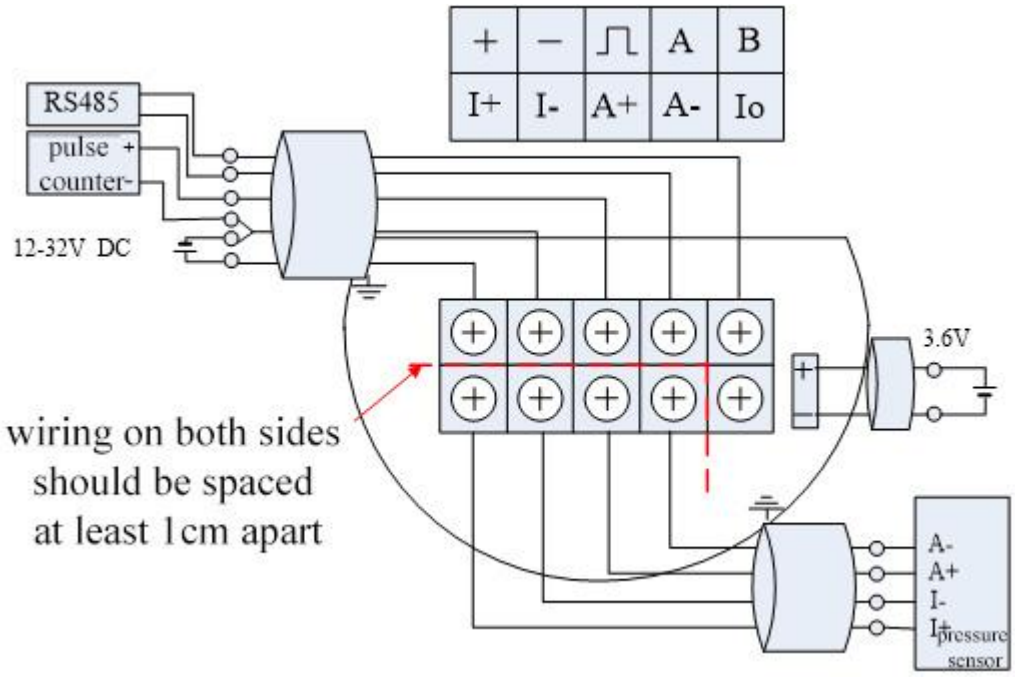
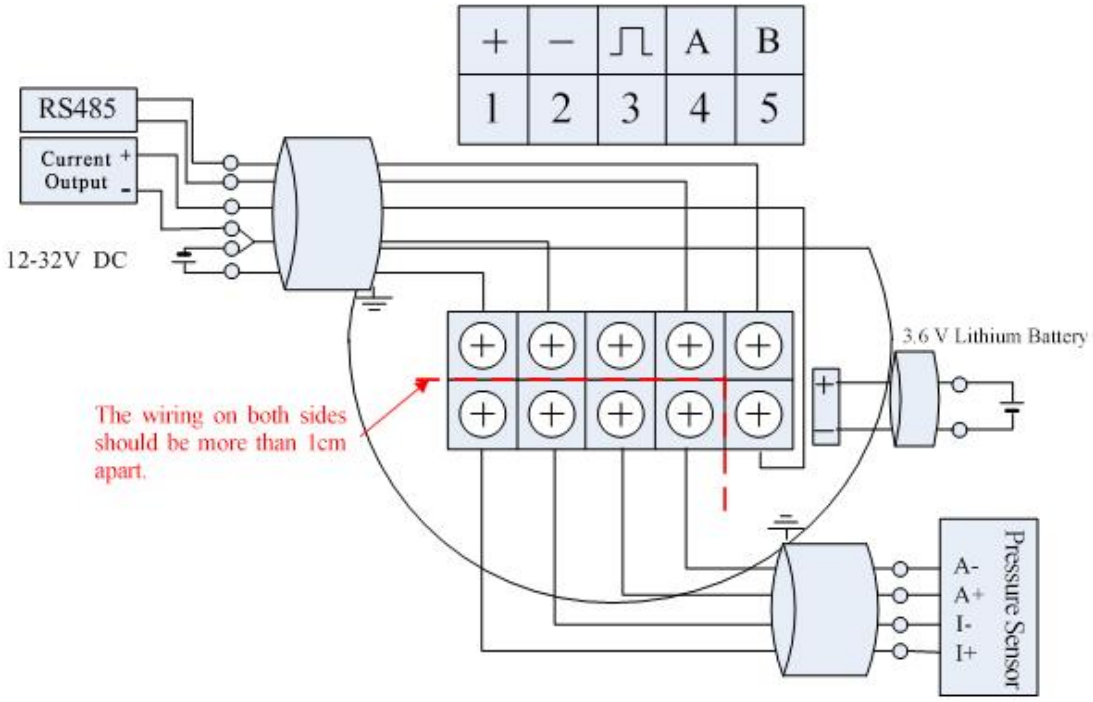


4.4 485 communication + dual power supply + pressure sensor + pulse output

RS485 type with pulse output uses H880TDZ-485 terminal board wiring as follows:



4.4 485 communication + dual power supply + pressure sensor + current output

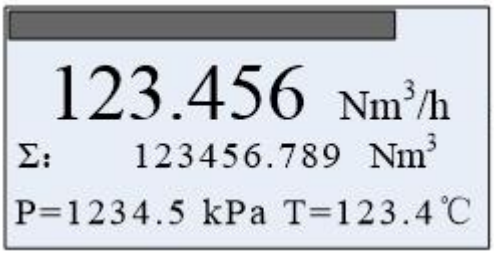


Installation precautions: The main circuit board must be reliably fixed on the housing (the purpose is to be grounded reliably) before testing!

Ⅴ. Converter Menu Structure and Parameter Setting

5.1 Three Line Display Mode

When the third line display is turned on, the display is as shown below:



In the way of progress bar, display the current percentage, instantaneous flow, cumulative flow, can be set to display frequency, density, pressure, temperature, current or percentage value

Other Display Instructions:

A. If the pressure or temperature sensor is set to "Automatic Collection" mode and a sensor failure is detected, the corresponding value will be replaced by the "Manual" setting value and will flash. The manual settings here refer to the "gas pressure" and "gas temperature" entered in the menu.

B. When the flow mode is saturated steam pressure compensation, the acquisition of the temperature sensor will not be started, and the temperature value will be displayed as "------", indicating that it is not used.

C. When the flow mode is saturated steam temperature compensation, the collection of the pressure sensor will not be started, and the pressure value will be

displayed as "------", indicating that it is not used.

In the normal display state, you can set the frequency, pressure, temperature, density, current, and percentage to be displayed in the third row by long pressing the M key.

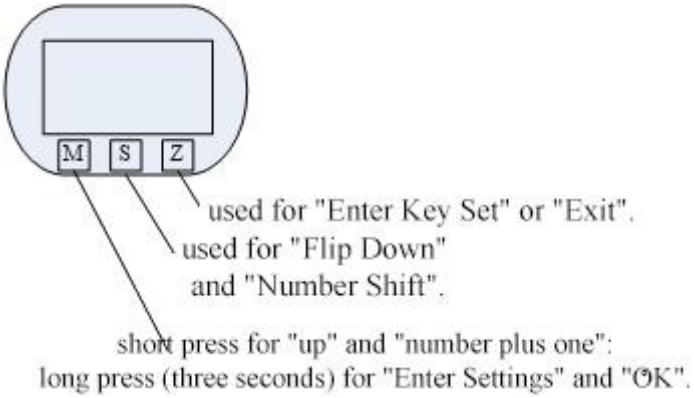
The third line shows the variable prompt as follows:

F:	Den:	P:	T:	Curr:	Per:	P= T=
frequency	density	pressure	temp	electric current	percentage	pressure and temperature

5.2 On-site Button Function Detailed Description

5.2.1 Button Basic Function Description

Supports "three-b +--utton" operation mode. The basic functions are as follows:



5.2.2 Field Configuration Entry and Exit

In the "normal display" state, press the "Z" key to enter the "field configuration". The "field configuration" parameters can be set using the "direct digital input" and "menu selection" methods.

In the "field configuration" state, press the "Z" key to exit the "field configuration" and enter the "display" state.

Note: The instrument records the state of the last exit button setting, and press "Z" to return to the state of the last exit.

5.2.3 "Menu selection" Setting Method

- Press and hold the M key, the underline moves to the second line, indicating that the settings can be changed.
- Short press the M key to scroll up the options, or press the S button to scroll down the options.
- During the data setting process, long press the M key to save the settings. After saving, the underline is automatically moved to the first line;
  "Direct digital input" setting method
- Press and hold the M key, the underline moves to the second line, indicating

that the settings can be changed.

- Short press the M key to switch symbols.
- Press the S key to shift to the right, and the underline moves to the first digit, indicating that it can be modified. Short press the M key to add one to the number.
- Press the S key again to set the numbers in sequence, and the setting method is exactly the same as the first one.
- During the data setting process, long press the M key to save the setting data; or press the Z key to exit the setting.

Special Note:

- During the setting process, long press the "M" key for three seconds to save and end the data setting;
- During the setting process, press the "Z" key to exit the current setting without saving. Or return to the previous menu.
- After completing the setting or exiting the setting, it will stay in the current setting interface.

5.2.4 Basic Functionality (no password required)

English prompt	**Chinese prompt**	**Setting method**	**Remark**
Contrast	对比度	menu choice	Level 1~5, the higher the level, the darker the font. Generally choose 3.
Protection	写保护	Long press the M key to switch	On (Write Disable) Off (Write Enable)
Min Alarm(%)	报警下限(%)	Direct digital input	unit：%
Max Alarm(%)	报警上限(%)	direct digital input	unit：%
Meter Size	口径	read only	Calibre can be viewed without entering a password
Flow Mode	流量模式	menu choice	liquid volume (Liquid Qv) liquid mass (Liquid Qm) gas volume (Gas Qv) gas mass (Gas Qm) steam volume (Steam Qv) superheated steam quality(PT) (Steam(P/T) Saturated steam mass(T) (Sat_Steam(T)) Saturated steam mass(P) (Sat_Steam(P))
Instantaneous flow unit Unit_Qv	流量体积单位流量质量单位	menu choice	volume unit support: Nm^3/h，Nm^3/m，Nm^3/s，l/s，l/m，l/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，

Unit_Qm			USG/s，USG /m，USG /h， UKG/s，UKG /m，UKG /h，bbl/h，bbl/d， Special(custom unit) mass 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) Note: The cumulative flow unit is determined according to the instantaneous flow unit, see "Correspondence Table of Instantaneous Flow Unit and Cumulative Flow Unit"
Upper Range Value range 100%	量程上限	Direct digital input	
Density (kg/m^3) Density (g/cm^3)	密度 (kg/m^3) 密度 (g/cm^3)	direct digital input	Gas density (unit: kg/m3) Liquid density (unit: g/cm3)
Gauge Pre.(Kpa)	气体表压力 (Kpa)	direct digital input	Unit: kpa, when measuring liquid, this item is not available
Temperature (℃)	气体温度 (℃)	direct digital input	Unit: °C, when measuring liquid, this item is not available
(low flow excision) PV Cutoff (%)	小流量切除 (%)	direct digital input	range: 0% ~ 20%
Damping (S)	阻尼 (S)	direct digital input	range: 0 ~ 64S
(Instantaneous flow decimal places) Disp. Point	小数点位数	menu choice	range: 0，1，2， 3
Display Mode	显示模式	menu choice	2_line Display：Display only instantaneous and cumulative flow 3_line Display：Add 3rd line to display
Total Reset	累积流量清零	menu choice	“Yes”, Realize the accumulated flow clearing “No”, do not operate
Total Overflow	累积流量溢出次数	read only	If the cumulative flow is greater than 9999999, the overflow count is incremented by 1.
K-Factor	仪表系数 K	read only	When no password is entered, the meter coefficient can be viewed

5.2.5 Advanced Features

In item 50, enter different passwords to enter different special functions.

Code	密码	Direct digital input	Input ****50 to enter setting items 51~59. Enter ****60 to enter the 60th item of setting. Enter ****61 to enter the 61st item of setting. Enter ****62 to enter the 62nd item of setting. Enter ****63 to enter the 63rd item of setting. Input ****40 to enter the setting items 40~41. Input ****38 to enter the setting items 38~39. Enter ****11 to enter to view items 11~13. Enter ****90 to enter the setting items 90~91. Enter ***111 to enter the preset cumulative flow.
Signal Monitor [51]	信号监测	read only	LCD display example： 450.00 CH 2 of which ： 450.00is the current magnification CH2 is the current channel number
MeterSize [52]	口径	menu choice	Option：15mm，20mm，25mm，32mm，40mm，50mm，65mm，80mm，100mm，125mm，150mm，200mm，250mm，300mm，350mm，400mm，450mm，500mm，600mm; Note: LCD displays DN15, which means caliber 15mm After changing the diameter of the vortex street, the lower limit flow rate, the maximum magnification factor and the meter coefficient (K value) must be reset. For details, see the "Special Instructions" at the back of the table

Fluid Type [53]	介质	menu choice	Gas Liquid Note: After changing the medium, the lower limit flow rate, maximum magnification, and meter coefficient (K value) must be reset. For details, see "Special Instructions" at the back of the table.
Low Flow Limit [54]	下限流量	direct digital input	Determined according to the caliber and the measuring medium. [The unit is fixed as m3/h (working condition), and the lower limit of the measurement frequency 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]	上限流量	direct digital input	The upper limit flow automatically defaults to 10 times the lower limit flow, and the actual measured upper limit is 2.5 times the set value. [The unit is fixed as m3/h (working condition), and the upper limit of the measurement frequency is determined together with the instrument coefficient] When the actual required turndown ratio exceeds 20:1, the upper limit flow value can be manually modified.
(magnification)Max AMP.[56]	设置放大倍数	direct digital input	It is recommended to be between 200 and 1000. Usually around 400
K-Factor[57]	仪表系数 K	direct digital input	Determined according to the caliber and the measuring medium. The unit is fixed at 1/m3. That is, how many pulses are set to correspond to 1 m3 of volume flow.
Pulse Factor Unit [58]	脉冲系数单位	menu choice	Supported units are: m3, N m3, t, kg, Scf, cf, USG (US gallon), UKG (imperial gallon), bbl (barrel), lb (pound).
Pulse Factor [59]	输出脉冲系数	direct digital input	Enter the number of output pulses corresponding to one "pulse coefficient unit". If you want to output the original pulse,

			set the same value for "meter coefficient (K value)" and "output pulse coefficient", and set "pulse coefficient unit" to m3.
K-Factor Trim Fi K-Factor Trim Yi [60]	五点修正频率 i, 五点修正系数 i,	direct digital input	where K-Factor Trim F1 is the frequency of the first correction point. K-Factor Trim Y1 is the K correction coefficient of the first correction point, please refer to item 6.2 for details. And so on, i is 1, 2, 3, 4, 5.
Frequency Factor [61]	五点修正频率系数	direct digital input	Multiply the frequency value of the five-point correction by this coefficient, and use it as the frequency value of the new correction point. Normally, it should be 1. When using water for calibration, when it is used for gas measurement, you can set this coefficient to make the five-point correction coefficient continue to be effective.
(channel setting) AMP. Channel [62]	通道设置	menu choice	There are three options: CH_1, CH_2, CH_3. CH_3 has the largest magnification; CH_1 has the smallest magnification; illustrate: CH2 is generally used for liquid measurement, corresponding to the selection of X1 and X2 in the configuration software. CH_3 is generally used for gas measurement, corresponding to the selection of X1, X2 and X3 in the configuration software.
Work Mode [63]	工作模式	menu choice	F_1: Anti-seismic mode; F_2: standard mode; F_3: Turbo mode F_4: Test mode Explanation: Generally choose F_2.
4mA Trim[40]	4mA 校准		Calibration steps:

20mA Trim [41]	20mA 校准		1. Press and hold the "M" key for three seconds to enter the calibration; 2. Short press the M key to decrease the current; press the S key to increase the current, the step is 16 microamps; 3. Press and hold the "M" key for three seconds to save the calibration; or press the Z key to exit without saving.
Min Pre. (Kpa) 【38】	最小压力值	direct digital input	【This parameter is only used for steam quality measurement】 In the steam measurement mode, when the pressure compensation is activated, if the pressure is less than the set "minimum pressure value", the flow will automatically return to 0.
Min Temp. (℃) 【39】	最小温度值	direct digital input	【This parameter is only used for steam quality measurement】 In the steam measurement mode, when the pressure compensation is activated, if the pressure is less than the set "minimum pressure value", the flow will automatically return to 0.
Version【11】	版本	read only	version number
Max Frequency 【12】	最大频率	read only	Internally converted frequency value corresponding to the upper limit flow.
Min Frequency 【13】	最小频率	read only	Internally converted frequency value corresponding to the lower limit flow.
Modbus Addr.	Modbus 地址	direct digital input	1 ~ 247
Modbus Baud.	Modbus 速率	menu choice	Option ： "9600" ,"4800" ,"2400" , "1200" , " 600"
Total Preset 【111】	累积流量预设置	direct digital input	Used to directly set the current accumulated flow value.

Ⅵ. Troubleshooting

Fault 1: There is flow in the pipeline, the sensor has no output or the intelligent flow totalizer does not display:

A. First make sure that there is flow in the pipeline, and it is greater than the lower limit of the flow rate that can be measured by the sensor. Whether the small signal of the instrument is cut off is too large, you can modify it in the parameter setting.

B. Check whether the internal wiring of the instrument is wrong or broken: the method is to check the wiring or tap the pipeline with a hammer or a wooden stick, adjust the totalizer to the display frequency, and see if there is a frequency display, if there is a display, the wiring is correct, no frequency If it is displayed, there may be an error in the line, and the line needs to be checked.

C. Judging the quality of the amplifier: The method is to remove the probe wire on the amplifier board to see if the sensor has output or whether the intelligent flow totalizer has a 50HZ frequency display. If there is no output, you need to replace the amplifier board. If there is output, it means Amplifier is OK.

D. To judge the quality of the sensor: The method is to remove the two leads of the sensor head from the amplifier board, and use a multimeter to measure the resistance between the two leads of the sensor head and the resistance of the two leads of the sensor head to the housing, both of which should be greater than 2MΩ, otherwise the sensor head needs to be replaced.

E. If there is no problem with the sensor, check whether the pressure transmitter and platinum thermal resistance are damaged. First, check whether the pressure and temperature display on the totalizer is correct. If there is no problem, it can be judged that the intelligent flow totalizer is damaged.

Fault 2: There is no flow in the pipeline, the sensor has output or the intelligent flow totalizer has display:

A. Check whether the sensor installation position vibrates too much. If the vibration is too large, you can consider installing the vibration damping bracket.

B. Poor grounding of the instrument introduces interference.

C. Removal in small signal ablation.

Fault 3: The flow in the pipeline is normal, and the instrument shows that the flow swings too much:

A. If the installation is incorrect or improper, first check whether the pipe section meets the requirements. The gas guarantees the first 10D and the back 5D straight pipe section, and the liquid straight pipe section does not meet the requirements, which will have a greater impact.

B. There may be electromagnetic interference on site. Method: Strengthen the filtering function, lower the sensitivity, and realize by adjusting the dial switch.

C. On-site flow is too small, lower than the lower limit of flow.

D. A similar situation occurs when the measured liquid has a pulsating flow.

Fault 4: On-site frequency display 50hz:

A. The shielded wire is not grounded, or the grounding of the converter is poor

B. There is static electricity in the pipeline, which produces interference signals

Fault 5: The actual flow change is inconsistent with the display:

A. When the actual flow increases, the instrument display can be reduced, and the reason for the on-site working conditions (such as pipeline technology) can be checked.

B. The actual flow rate decreases, but the instrument display increases. Most of them are due to the vibration of the pipeline or the gasket is not at the center of the pipeline during installation, so it should be re-installed.

Fault 6: The instrument display of the same working condition is inconsistent, and the difference is large

A. The empirical value is wrong, or the working conditions are different (such as pipeline direction problem, straight pipe section problem, vibration problem, etc.)

B. Parameter modification

C. The flow rate is too low under working conditions, and the flow rate is not linear

D. The flowmeter with integrated temperature and pressure compensation, the temperature and pressure are faulty

E. Whether the parameter setting unit is the same

Fault 6: The display of the 4-20mA output meter is inconsistent with the system display

A. The units set by the parameters are inconsistent, or the ranges do not correspond to the same

B. Field wiring is wrong

C. The 4-20mA output cable is too long and the loss is large

Fault 7: The instrument display does not match the actual

A. Whether the flow exceeds the measurement range

B. Confirm whether the parameters are correct. If the temperature and pressure are confirmed for steam, and the working and standard conditions for general gases, if there is no problem, please confirm the instrument coefficient. The instrument coefficient is inversely proportional to the instrument.