

Vortex Flow Meter

— CG series



20 May 2022

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Chapter 1. Overview

1.1 . Product scope of application

The vortex flow meter is a velocity flow meter that has a wide range of uses. It is suitable for flow measurement, measurement and control of liquids, steam and most gases.

The LUGB type vortex flow meter is a new flow meter launched by our company. It has reasonable design, powerful functions and leading linear correction function. It adopts a fine and low-power 45X30 full dot matrix LCD display, which is clear and intuitive and easy to operate; RS485 Or HART communication can meet the various needs of users; multiple compensation algorithms can meet almost all flow compensation calculations.

1.2 . Product features

▲ Non-blocking design : The entire sensor and wetted parts are made of stainless steel, with a simple structure and no moving parts. Holes, gaps and gaskets that are prone to failure are avoided as much as possible.

▲ Mechanical anti-vibration treatment : In the anti-seismic treatment part, our company's circuit part has been optimized to effectively filter out the vibration frequency caused by mechanical vibration.

▲ Simplified troubleshooting : The sensor is isolated from the process, easy to install, constant instrument coefficient, high data repeatability, good mutual contrast between the converter and the sensor, and convenient and quick maintenance process.

▲ Systematic stability : The detection sensor is not in direct contact with the measured medium, and is designed to resist water hammer and lightning strikes. The shell is corrosion-resistant and dirt-resistant; long-term system experiments have proven that its product performance is stable, has a long service life, is resistant to high temperatures, and has high reliability.

▲Analog and digital signal processing : The converter adopts advanced circuit design and can adopt analog type manually set on site and digital processing method with adaptive function. It has no drifting zero point, high precision and wide measurement range. The common range ratio is 10 : 1, the maximum reaches 15 :1 .

1.3 . Working principle

The basic principle of the intelligent vortex flowmeter is the Karman vortex principle, that is, "the frequency of vortex separation is proportional to the flow rate."

The diameter of the flow meter's flow body is basically the same as the nominal diameter of the meter. As shown in Figure 1, a cylinder approximately an isosceles triangle is inserted into the flow body. The axis of the cylinder is perpendicular to the flow direction of the measured medium, and the bottom surface faces the fluid. .

When the measured medium flows through the cylinder, vortices are generated alternately on both sides of the cylinder. The vortices are continuously generated and separated, and two rows of staggered vortices, called a "vortex street", are formed downstream of the cylinder. Theoretical analysis and experiments have proven that the frequency of vortex separation is proportional to the column side medium flow rate.

$$F = Sr \frac{V}{d}$$

Where: f - frequency of vortex separation on the side of the cylinder (Hz)

V——Flow velocity on column side (m/s) d——Width of column upstream surface (m);

Sr - Strouhal number, which is a constant that depends on the cross-sectional shape of the cylinder and is basically independent of the fluid properties and flow rate, Sr: 0.17~0.18.

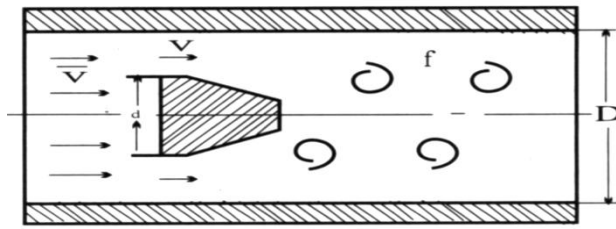


Figure 1 Vortex street in a circular tube

The design column width d of the intelligent vortex flowmeter has a fixed ratio to the flow tube diameter D . Therefore, the average flow velocity V flowing through the tube has a fixed ratio to the column side flow velocity $\bar{V}$:

$$\bar{V}/V = 1 - 1.25d/D$$

$$\text{then: } f = Sr \frac{\bar{V}}{d} = Sr \frac{\bar{V}}{(1 - 1.25d/D) d}$$

$$\bar{V} = \frac{1}{Sr} \cdot f (1 - 1.25d/D) d$$

Since in the above formula, d and D are known structural dimensions, and Sr is a constant, when the vortex separation frequency f is measured, the average flow velocity in the tube is measured, and the flow rate Q is measured: $Q = 3600 S \cdot V$ (m^3/h) .

In the formula: S - the flow area of the flow meter flow body (m^2)

$\bar{V}$ —The average flow velocity of the flow meter circulation body (m/s)

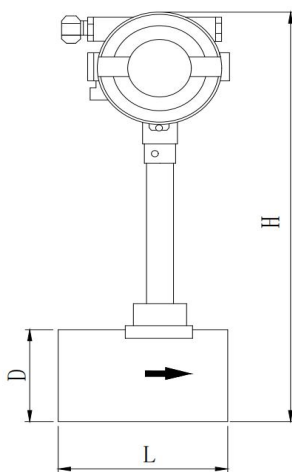
The vortices are staggered and separated, generating pulsating pressure in the wake on both sides of the cylinder and behind the cylinder. The detection probe located inside (or behind) the cylinder is affected by this tiny pulsating pressure, causing the detector embedded in the probe to The piezoelectric crystal element is subjected to alternating stress and generates alternating charge signals. The detection amplifier transforms, amplifies, filters and shapes the alternating charge signal, and then outputs a current (or voltage) pulse signal with the same frequency as the vortex separation frequency. Each pulse output by the flow meter will represent a certain volume of measured fluid. The total number of output pulses within a period of time will represent the total volume of fluid flowing through the flow meter during this period of time.

1.4 . Main technical parameters

Nominal diameter	15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300...
Pressure Level	PN16 (larger than PN16, order by agreement)
Medium and temperature	Medium: liquid, gas, steam, thermal oil; temperature: -20~250℃; -20~350℃
Body material	SS304; SS316L agreement ordering
Allow vibration acceleration	0.2g
Accuracy	Level 1.0; Level 1.5; Level 2.5
Turn down	1:6; 1:10; 1:15
Supply voltage	3.6V battery; DC24V
Output signal	Pulse, 4~20mA, RS485, Hart protocol
Explosion-proof signs	ExdII CT6 Gb
Protection level	IP65;IP68 protocol ordering
Environmental conditions	-20~55℃; relative humidity: 5~95%; atmospheric pressure: 86~106Kpa
Show	No display; LCD display
Electrical Interface	M20X1.5;NPT1/2

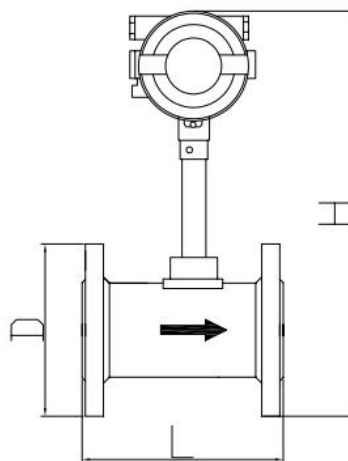
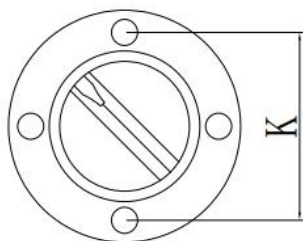
Chapter 2 . Instrument Structure and Installation Dimensions

2.1. Ordinary clamping size



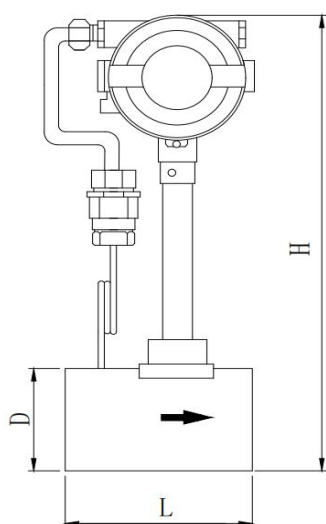
Nominal diameter	Ordinary body		
	Long L	Outer diameter D	Total high H
15	80	63	364
20	80	63	364
25	80	63	364
32	80	63	364
40	80	78	384
50	80	78	384
65	80	100	404
80	100	113	427
100	100	132	436
125	100	158	479
150	110	180	506
200	140	240	589
250	160	298	615
300	180	350	666

2.2. Ordinary flange connection dimensions



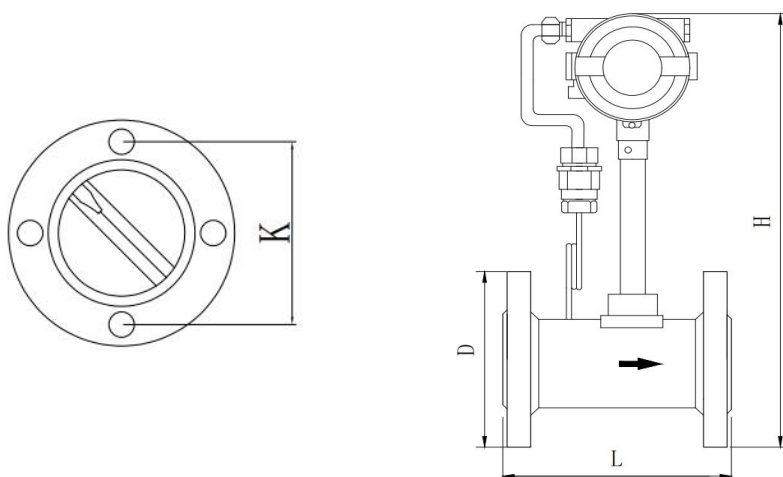
Nominal diameter	Ordinary flange connection body				
	L	D	H	K	n*φ
15	200	95	381	65	4*14
20	200	105	386	75	4*14
25	200	115	391	85	4*14
32	200	140	404	100	4*18
40	200	150	419	110	4*18
50	200	165	426	125	4*18
65	200	185	446	145	4*18
80	200	200	465	160	8*18
100	200	220	471	180	8*18
125	250	250	499	210	8*18
150	300	285	530	240	8*22
200	300	340	583	295	12*22
250	300	405	643	350	12*22
300	300	460	695	400	12*22

2.3. Temperature and pressure compensation type clamping size



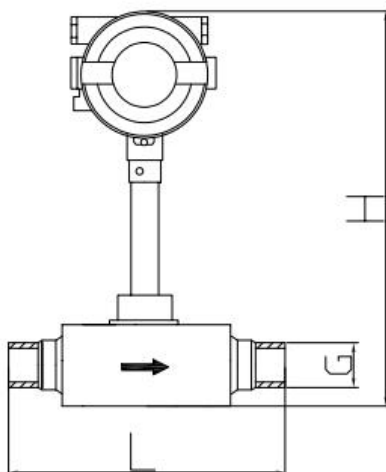
Nominal diameter	Temperature and pressure compensation type clamping body		
	L	D	H
15	100	63	364
20	100	63	364
25	100	63	364
32	100	63	364
40	100	78	384
50	100	78	384
65	100	100	404
80	100	113	427
100	100	132	436
125	100	158	479
150	110	180	506
200	140	240	589
250	160	298	615
300	180	350	666

2.4. Temperature and pressure compensation flange connection dimensions



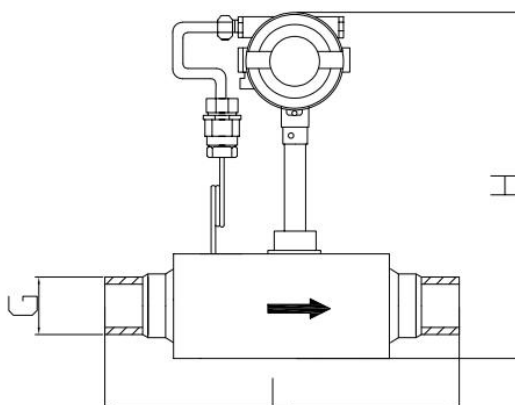
Nominal diameter	Temperature and pressure compensation flange connection body				
	L	D	H	K	n*φ
15	200	95	381	65	4*14
20	200	105	386	75	4*14
25	200	115	391	85	4*14
32	200	140	404	100	4*18
40	200	150	419	110	4*18
50	200	165	426	125	4*18
65	200	185	446	145	4*18
80	200	200	465	160	8*18
100	200	220	471	180	8*18
125	250	250	499	210	8*18
150	300	285	530	240	8*22
200	300	340	583	295	12*22
250	300	405	643	350	12*22
300	300	460	695	400	12*22

2.5 Ordinary thread size



Nominal diameter	Ordinary thread body		
	L	G	H
15	150	G1/2	364
20	150	G3/4	364
25	150	G1	364
32	150	G5/4	364
40	150	G3/2	384
50	150	G2	384

2.6 Temperature and pressure compensation thread size



Nominal diameter	Temperature and pressure compensation thread body		
	L	G	H
15	150	G1/2	364
20	150	G3/4	364
25	150	G1	364
32	150	G5/4	364
40	150	G3/2	384
50	150	G2	384

Chapter 3. Determination of flow caliber

3.1. Flow range table of each caliber

Nominal diameter DN(mm)	Flow range (m ³ /h)	
	Liquid	Gas
15	0.6 ~ 6	3 ~ 12
20	1~10	5 ~ 30
25	1.6~16	8~70
32	2.2~20	15 ~ 150
40	2.5~25	20 ~ 200
50	3.5~35	35~350
65	6.5~68	50~500
80	10~100	70~700
100	15~150	110~1500
125	27~275	150~1500
150	40~400	250~2200
200	80~800	600 ~ 4000
250	120~1200	960~5500
300	180~1800	1500 ~ 11500

Note 1: The flow range listed in the table is calibrated under the following conditions:

For gas, it is air at a temperature of 0°C and 1 standard atmosphere ($\rho_0=1.293\text{kg/m}^3$);

For the liquid, it is water at 4°C ($\rho_0=1000\text{kg/m}^3$);

For steam, it is dry saturated steam with an absolute pressure of 0.4Mpa ($\rho_0=2.1628\text{kg/m}^3$);

When the medium conditions are not the above conditions or used for other media, the flow range of the flow meter is affected by density and viscosity. At this time, the flow range is determined as follows:

Note: A. Lower limit flow:

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According to the lower limit flow Q_{min} given in the table, the reference medium density ρ_0 (gas $\rho_0=1.293\text{kg/m}^3$; liquid $\rho=1000\text{kg/m}^3$; steam $\rho_0=2.1628\text{kg/m}^3$) and the use medium density ρ , different uses can be calculated according to the following formula Medium density lower limit flow $Q_{min\rho}$;

$$Q_{min\rho}=Q_{min\rho_0}/\rho \quad (\text{m}^3/\text{h})$$

According to the kinematic viscosity ν of the medium used, the lower limit flow rate $Q_{min\nu}$ of the viscosity can be calculated according to the following formula

$$Q_{min\nu}=6\nu D \times 104 \quad (\text{m}^3/\text{h})$$

In the formula: D ——pipe inner diameter (mm) ν ——kinematic viscosity (m^2/s)

Compare $Q_{min\rho}$ and $Q_{min\nu}$, and take the larger value as the lower limit flow rate of this type of flowmeter when used in this medium.

Description: B. Upper limit traffic

The upper limit flow rates for various media are as shown in the table. Generally, the upper limit flow velocity of liquid is 6m/s ; the upper limit flow velocity of gas or steam is 45m/s .

Note 2: The resistance coefficient of the intelligent vortex flowmeter $C_d=2.2$: The resistance loss of the flowmeter under different flow rates can be calculated according to the following formula: Where: ΔP ——Resistance loss (Pa)

ρ ——medium density (kg/m^3)

V ——Average flow velocity in the pipe (m/s)

Note 3: When the medium used is liquid, in order to prevent vaporization and cavitation, the fluid pressure P at the flow meter should meet the following requirements:
 $P > 2.6\Delta P + 1.25P_s$

Convert the volume flow rate under known standard conditions to the volume flow rate under working conditions

The common measurement unit for general gases is the standard volume measurement unit, which is standard cubic meters per hour (Nm^3/h), referred to as "standard cubic meter". According to the following formula, first convert the standard state volume flow into

the working state volume flow, that is, cubic meters/hour (m³/h), and then compare it with the applicable flow range in Table 3.

$$Q_{\pm} = Q_{\text{标}} \times \frac{0.10325 \times (T_{\pm} + 273.15)}{293.15 \times (P_{\pm} + 0.101325)}$$

In the formula: $Q_{\pm}$: the volume flow rate under the working condition of the measured medium. (m³/h)

Q_{standard} : The volume flow rate of the measured medium under standard conditions. (Nm³/h, 20 °C, 0.1013MPa absolute pressure) ,

$T_{\pm}$: the medium temperature under the working condition of the measured medium.

$P_{\pm}$: The medium pressure under the working condition of the measured medium, gauge pressure .(MPa)

3. 2. Saturated steam flow range

For saturated steam, it can be selected according to the range of mass flow rate given in Table 4.

As shown below: Table 4

Absolute pressure (Mpa)		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Temperature °C		120	133	144	152	159	165	170	175
Density kg/m ³		1.13	1.66	2.18	2.67	3.17	3.67	4.16	4.66
DN20	Qmin	6.22	9.13	12	14.7	17.4	20.2	23	25.6
	Qmax	56.5	83	43.6	133.5	158.5	183.5	208	233
DN25	Qmin	9.6	14	18.53	22.7	27	31.2	35.3	39.6
	Qmax	79.1	116.2	152.6	186.9	222	256.9	291.2	326.2
DN40	Qmin	24.9	36.5	48	58.7	69.7	80.7	91.5	102.5
	Qmax	249	365	480	587	697	807	915	1025
DN50	Qmin	40.7	59.8	78.5	96	114	132	150	168
	Qmax	362	531	698	854	1014	1174	1331	1491
DN65	Qmin	56.5	83	109	133.5	158.5	183.5	208	233

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	Qmax	542	797	1046	1282	1522	1762	1997	2237
DN80	Qmin	79	116	153	187	222	257	291	326
	Qmax	723	1062	1395	1709	2029	2349	2662	2982
DN100	Qmin	147	216	283	347	412	477	541	606
	Qmax	1243	1826	2398	2937	3487	4037	4576	5126
DN125	Qmin	226	332	436	534	634	734	832	932
	Qmax	1921	2822	3706	4539	5389	6239	7022	7922
DN150	Qmin	316	465	610	748	888	1028	1165	1305
	Qmax	2531	3718	4883	5981	7101	8221	9318	10438
DN200	Qmin	655	963	1264	1549	1839	2129	2413	2703
	Qmax	5605	8234	10813	13243	15723	18203	20634	23114
DN250	Qmin	1096	1610	2115	2590	3075	3560	4035	4520
	Qmax	9040	13280	17440	21360	25360	29360	33280	37280
DN300	Qmin	1560	2290	3008	3684	4375	5056	5741	6431
	Qmax	12430	18260	23980	29370	34870	40370	45760	51260

As shown below: Table 5

Absolute pressure (Mpa)		1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Temperature°C		180	184	189	192	195	198	201	204
Density kg/m ³		5.15	5.64	6.13	6.62	7.11	7.6	8.09	8.58
DN20	Qmin	28.3	31	33.7	36.4	39	41.8	44.5	47.2
	Qmax	257.5	282	306.5	331	355.5	380	404.5	429
DN25	Qmin	43.7	48	52	56.2	60.4	64.6	68.7	72.9
	Qmax	360.5	394.8	429.1	463.4	498	532	566.3	600.6
DN40	Qmin	113	124	135	145.6	156.4	167.2	180	188.8
	Qmax	1130	1240	1350	1456	1564	1672	1800	1888
DN50	Qmin	185	203	221	238	256	274	291	309
	Qmax	1648	1805	1962	2118	2275	2432	2589	2746
DN65	Qmin	257.5	282	306.5	331	355.5	380	404.5	429

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	Qmax	2472	2707	2942	3178	3413	3648	3883	4118
DN80	Qmin	361	395	429	463	498	532	566	600
	Qmax	3296	3610	3923	4237	4550	4864	5178	5491
DN100	Qmin	670	733	797	861	924	988	1052	1115
	Qmax	5665	6204	6743	7282	7821	8360	8899	9348
DN125	Qmin	1030	1128	1226	1324	1422	1520	1618	1716
	Qmax	8755	9588	10421	11254	12087	12920	13753	14586
DN150	Qmin	1442	1579	1716	1854	1991	2128	2265	2402
	Qmax	11536	12634	13731	14829	15926	17024	18122	19209
DN200	Qmin	2987	3271	3555	3840	4124	4408	4692	4976
	Qmax	25544	27974	30405	32835	35266	37696	40126	42557
DN250	Qmin	4996	5471	5946	6421	6683	7322	7847	8323
	Qmax	41200	45120	49040	52960	56880	60800	64720	68640
DN300	Qmin	7107	7783	8459	9136	9812	10488	11164	11840
	Qmax	56650	62040	67430	72820	78210	83600	88990	93480

3. 3. Superheated steam flow range

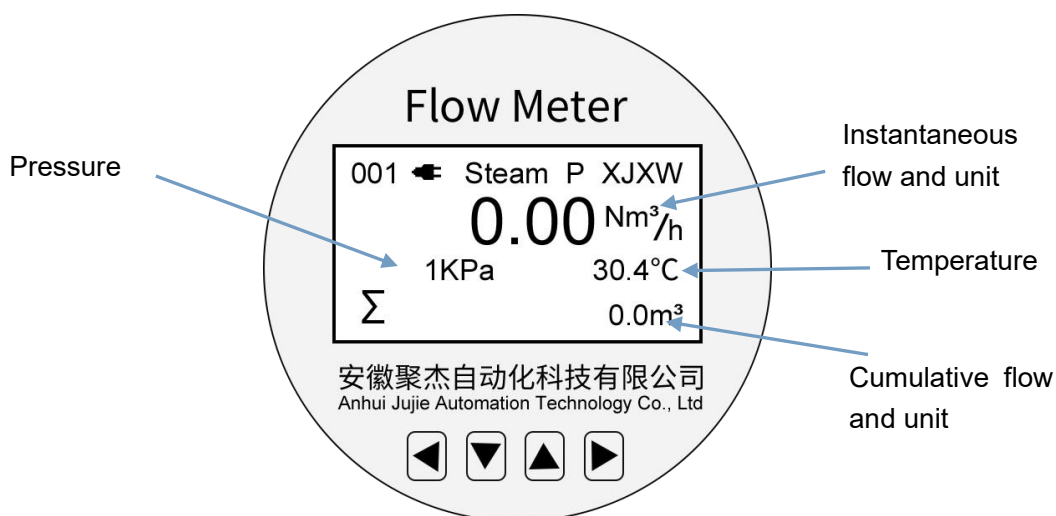
For superheated steam, you should first check the superheated steam table (Table 5) to find out its density value at the corresponding temperature and pressure (take absolute pressure: gauge pressure + 1), and then calculate the corresponding density value according to the given mass flow rate through the following formula The volume flow rate is compared with the corresponding caliber steam flow rate in Table 4 for selection.

$$Q(\text{m}^3/\text{h}) = \frac{G(\text{kg}/\text{h})}{\rho(\text{kg}/\text{m}^3)}$$

In the formula: G: mass flow rate ρ: medium density

Chapter 4. How to use

4. 1. Display method under working status (see the picture below)



LCD screen icon :



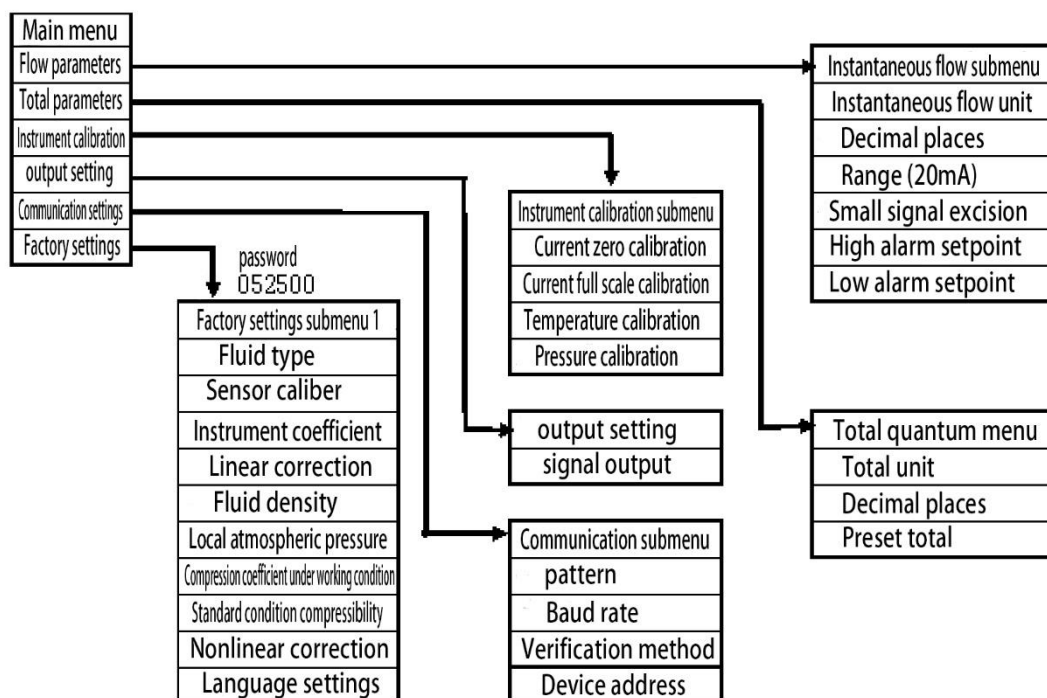
Left shift, parameter setting confirmation key and exit subdirectory key;

Factory-set shortcut keys, move down, and digital decrement keys;

Move up, numeric decrement keys;

Move right to enter parameter settings.

4.2 . Menu structure



4.3 Parameter description

Instantaneous flow parameter settings

Flow unit	Options: L/s L/m L/h m3/s m3/m m3/h Nm3/h USG/s USG/m USG/h Kg/s Kg/m Kg/h t/s t/m t/h Default value: m3/h Define the units of instantaneous flow: L (liter), h (hour), t (ton), s (second), m (minute)
Total number of decimal places	Options: 0 1 2 3, Default value: 1 Number of decimal points to define instantaneous flow rate
Measuring range	Floating point number: 99999999.00-0.00 m3/h, default value: 100.0 m3/h When the instantaneous flow reaches the measurement range, the converter outputs 20mA. Changing this parameter will affect the current output, high alarm and low alarm, etc. Note: When you modify this setting value (range), please pay attention to the unit of this parameter (range) The units of this parameter (range) can be modified as needed.

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Small signal resection	Floating point number: 9.90 ~ 0.00%, default value: 0.0% This setting value is a percentage of the range
High alarm	Floating point number: 99.00 ~ 1.00%, default value: 90.0% This setting value is a percentage of the measuring range. For example: if this value is set to 10, it is equal to the measuring range. 10%, if the absolute value of the instantaneous flow is greater than (range × 10%), the converter will output a high alarm signal, the high alarm contact is closed.
Low alarm	Floating point number: 99.00 ~ 0.00%, default value: 0.0% This setting value is a percentage of the measuring range. For example: if this value is set to 10, it is equal to the measuring range. 10%, if the absolute value of the instantaneous flow rate is less than (range × 10%), the converter outputs a low alarm signal, the low alarm contact is closed.
Damping time	Floating point number: 30.0 ~ 0.1, default value: 1

Total setting:

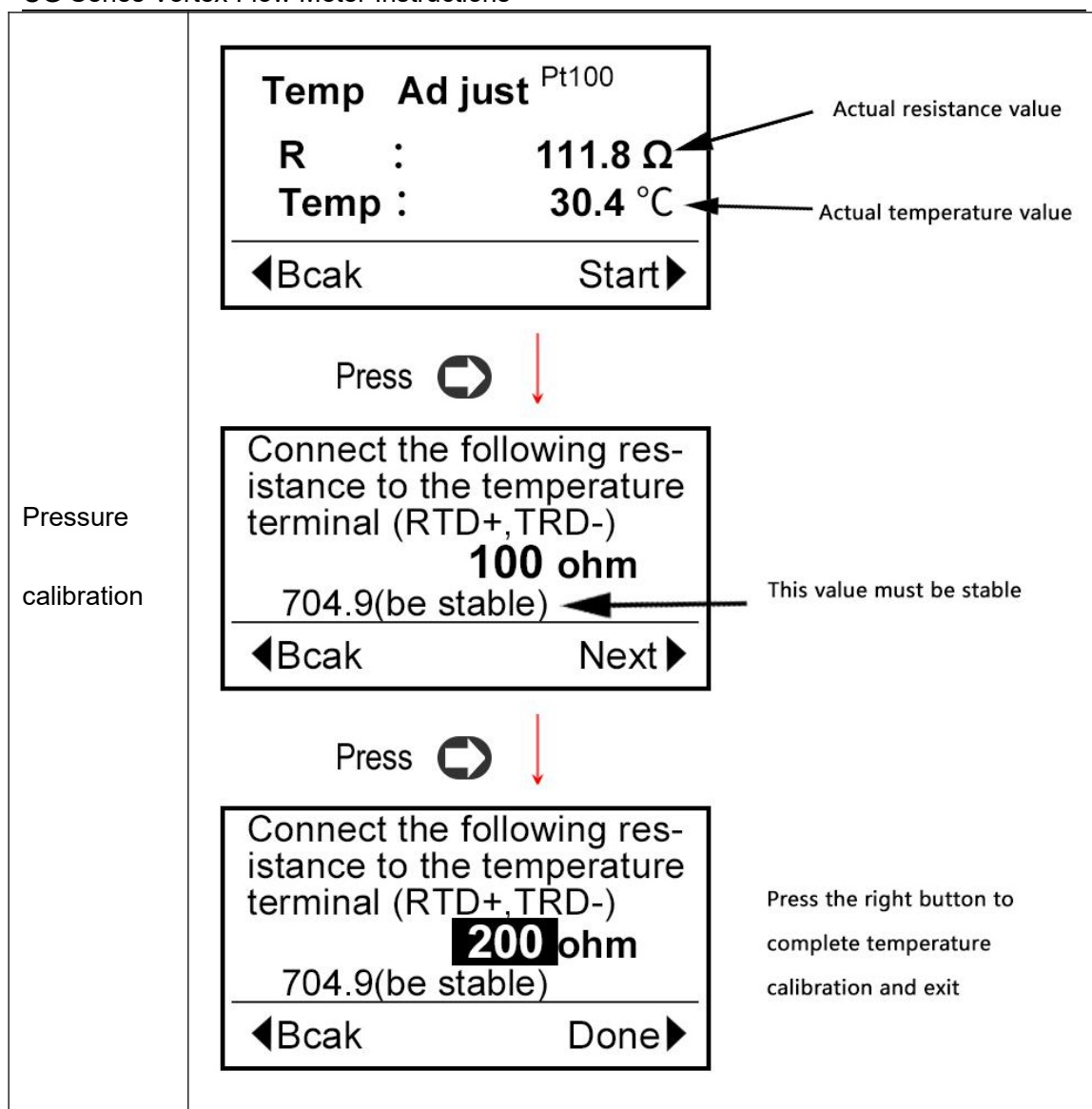
Define the relevant parameters of the total amount.

Total unit	Options: L(liter) m ³ Nm ³ USG Kg t(ton) , Default value: m ³ Define the total unit
Total number of decimal places	Options: 0 1 2 3 , Default: 1 Define the number of decimal places for the total
Default total amount	Options: 99999999.00-0.00 m ³ /h, default value: 0.0 m ³ /h Clear the total or set the total value

Instrument calibration:

Calibrate current output and calibrate temperature and pressure measurement loops.

Current zero point calibration	Floating point number: 5.0~3.0, default value: 0.0 After entering this submenu, use a multimeter to measure the current output value. If the current value is not equal to 4.0mA, input the true value measured by the multimeter, and the converter will automatically complete the 4mA current output calibration Notice: If the current output deviation is too large, multiple corrections are required to review the requirements. The maximum input value for each correction is 5.0
Current full scale calibration	Floating point number: 21.0 ~ 19.0, default value: 0.0 After entering this submenu, use a multimeter to measure the current output value. If the current value is not equal to 20.0mA, enter the true value measured by the multimeter, and the converter will automatically complete the 20mA current output calibration. Notice: If the current output deviation is too large, multiple corrections are required to review the requirements. The maximum input value for each correction is 21.0
Temperature calibration	Press  to complete temperature calibration and exit.



Pressure
calibration

Press Ad just

Press k&b

Press cutoff

Press 

put pressure to the sensor
enter value of the pressure

0.001Mpa
Absolute

Actual pressure
(gauge pressure)

◀Bcak

Start▶

Press 

Pressure Zero

voltage

-2720mV

pressure

00.100MPa

Zero point calibration of the
sensor, voltage is measured
automatically, pressure is
measured manually

◀Next

▼-

+▼

Shift▶

Press 

Pressure Zero

voltage

-2720mV

pressure

00.100MPa

Complete zero point
calibration

◀Back

Next▶

Press 

Pressure calibration	Pressure Full voltage -2720mV pressure 00.100MPa ◀Next ▼- +▼ Shift▶ Press   Pressure Full voltage -2720mV pressure 00.100MPa ◀Next Next▶ Calibration of sensor range, input actual pressure value Calibration of sensor range, input actual pressure value Press the left button to return to the menu and complete pressure calibration
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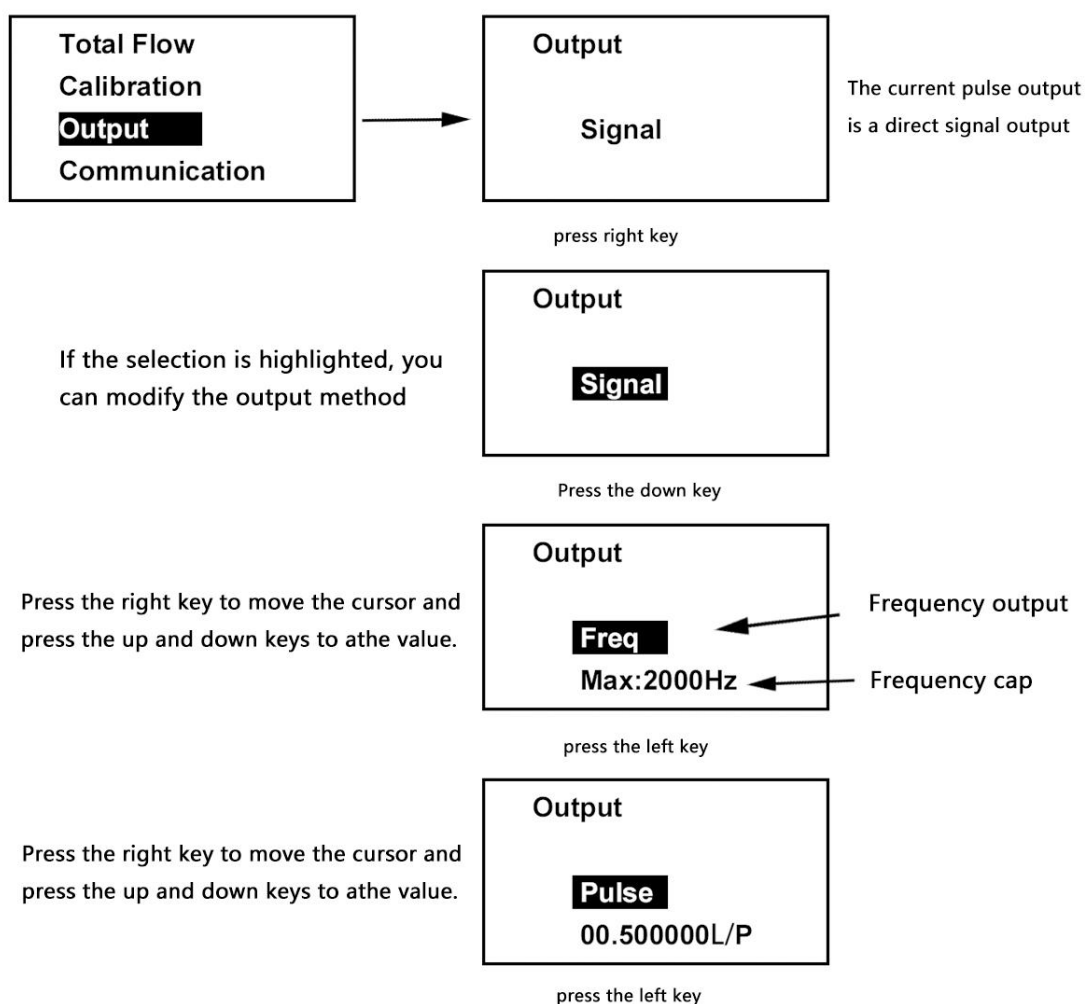
Output settings:

Set parameters for the three output modes of equivalent output, frequency output and signal output.

Frequency cap	Floating point: 5000.0 - 100.0 Hz, default: 2000.0 Output frequency (Hz) = instantaneous flow rate (m³/h) ÷ range (m³/h) × frequency upper limit (Hz) For example: the instantaneous flow rate is equal to 100m³/h, the measuring range is equal to 200m³/h, and the upper frequency limit is set to 2000HZ, then the output frequency corresponding to the instantaneous flow rate of 100m³/h is 1000HZ.
Pulse equivalent	Floating point number: 9999.0 – 0.0, default value: 0.0 The unit of pulse equivalent is: L (liter)/pulse. The user can change the unit of pulse equivalent as needed: USG/P, Kg/P, t/P, Nm³/P, m³/P
Pulse width h (ms)	Floating point number: 1000.0 ~ 0.0 ms, default value: 0.0 When the pulse width is set to "0", the duty cycle of the pulse is: 1:1
Signal output	Raw signal output Notice: 1. Only the difference between frequency output and equivalent

CG Series Vortex Flow Meter Instructions

output
 2. Nonlinear correction also works on the original signal output.
 3. It is related to the instrument coefficient K
 $F(HZ)=3600/(Q*K)$
 Q: Instantaneous flow rate (m3/h); K: Instrument coefficient



Communication settings: Set the parameters of RS485 communication

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Model	Options: Modbus-RTU Modbus-ASCII Default: Modbus-RTU
Baud rate	Options: 1200 2400 4800 9600 19200 38400 Default value: 19200 Note: Please set the baud rate not lower than 9600
Verification method	Options: No parity, even parity, odd parity Default: odd parity
Device address	Value: 247 ~ 1, Default value: 1

Factory parameter setting: First password 052500

Fluid type	Options: gas working condition flow, gas standard condition flow Default value: Gas operating flow rate Before calibrating the flow meter or using it, select the appropriate medium. Select different options and the software performs different algorithms
Caliber	Options: 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200 mm Default value: 50mm
Instrument coefficient	Floating point number, default value: automatically corresponds to each caliber Q (instantaneous flow rate, m ³ /h) = 3600 × F (frequency, HZ) ÷ k (k coefficient)) After completing the real flow detection, the final K coefficient needs to be set here. K (K coefficient) represents: the number of pulses output per cubic meter

Linear correction	(Q Max)_1 linear_2 linear_3 linear_4 Press  (Q Max)_1 0.0Hz 0.0000 N/m³ Press  In this item, set the frequency of the test point (Q Max)_1 000000.0 Hz 0.0000 N/m³ Press  In this item, set the instrument coefficient corresponding to the frequency (Q Max)_1 0.0 Hz 000000.0000 N/m³ (Q Max)_1 0.0Hz 0.0000 N/m³ Press  After completing the first point of linear correction, enter "Linear Correction-2". Note: The test point with the highest frequency must be the first point. Set the frequency from high to low.
Pressure to choose	Select the type of pressure sensor: Options: Absolute, Gauge and Fixed Pressure Default: Absolute pressure

	Linearity Density Pressure Type Temp Type Press  Pressure Type Gauge Press   Pressure Type Gauge Gauge Press   In this item, select the type of pressure sensor  Pressure Type Gauge Absolute Press  If you do not install a pressure sensor, you can set "set gauge pressure". Please note: the set pressure is gauge pressure.
Temperature selection	Select the type of temperature sensor: Options: PT100, PT1000 and set temperature Default value: PT1000 The operation method is the same as the pressure selection operation method.
Earth's atmospheric pressure	floating point number Default value: 0.101 mPa If the medium is selected as liquid, this parameter has no effect.
Standard compression coefficient	Floating point number; Default value: 1; If the medium is selected as liquid, this parameter has no effect.
Working condition	Floating point number; Default value: 1; If the medium is selected as liquid, this parameter has no effect.

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Compression coefficient	
Language settings	Default value: Chinese. Can be switched to English

4.4 . How to set parameters

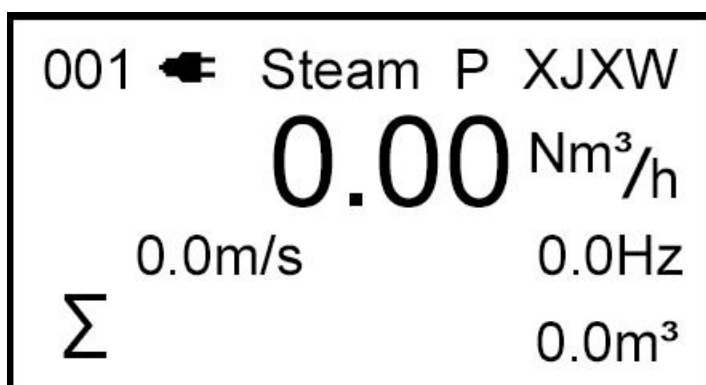


Figure 1 Instantaneous flow display interface

Press  to enter the menu settings, as shown in Figure 2:

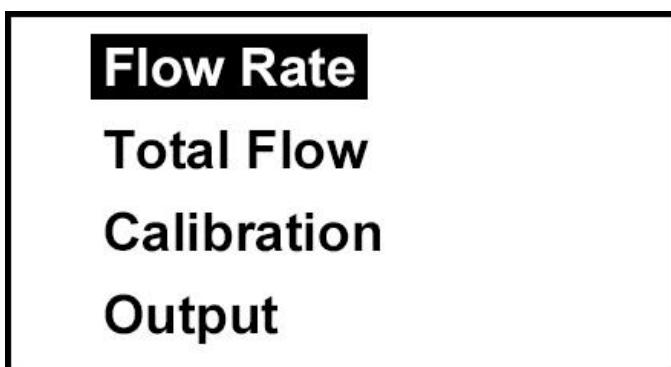


figure 2

In the interface shown in Figure 2, press  or  to select different submenus. Press  to return to the traffic display interface, as shown in Figure 1;

Press  or  to select the submenu, press  to enter the submenu to set parameters. For example: we need to set the "instantaneous flow parameter". When the

instantaneous flow parameter submenu turns bright, press it  and the display will be as shown in Figure 3 below:

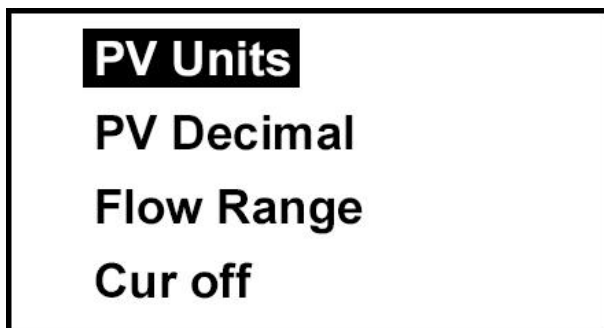


Figure 3

Press  or  to select the parameter you modified, the selected parameter will light up. If you need to return to the menu shown in Figure 2, press;  if you need to enter the next level menu, press  to set the parameters, as shown in Figure 4:

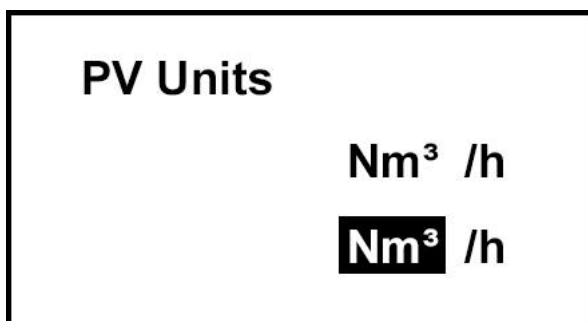


Figure 4

In this case, press  or  to modify the parameters, for example: As shown in Figure 4, you need to change the instantaneous flow unit "m³/h" to "m³/m", then press and the  instantaneous flow unit will become "m³ /m", as shown in Figure 5:

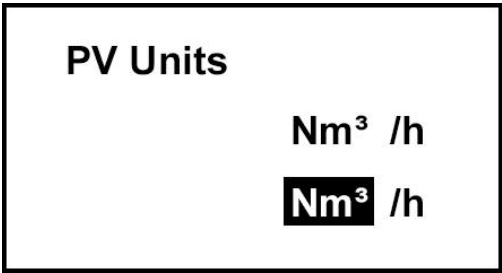


Figure 5

After modifying the parameters, if you need to save the settings, press  and the system will save it automatically, as shown in Figure 6:

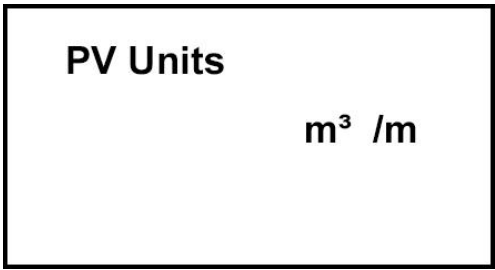


Figure 6

In this case, press  to save the settings and exit (Figure 3).

Chapter 5. Wiring

5.1 . 4-20mA current output wiring

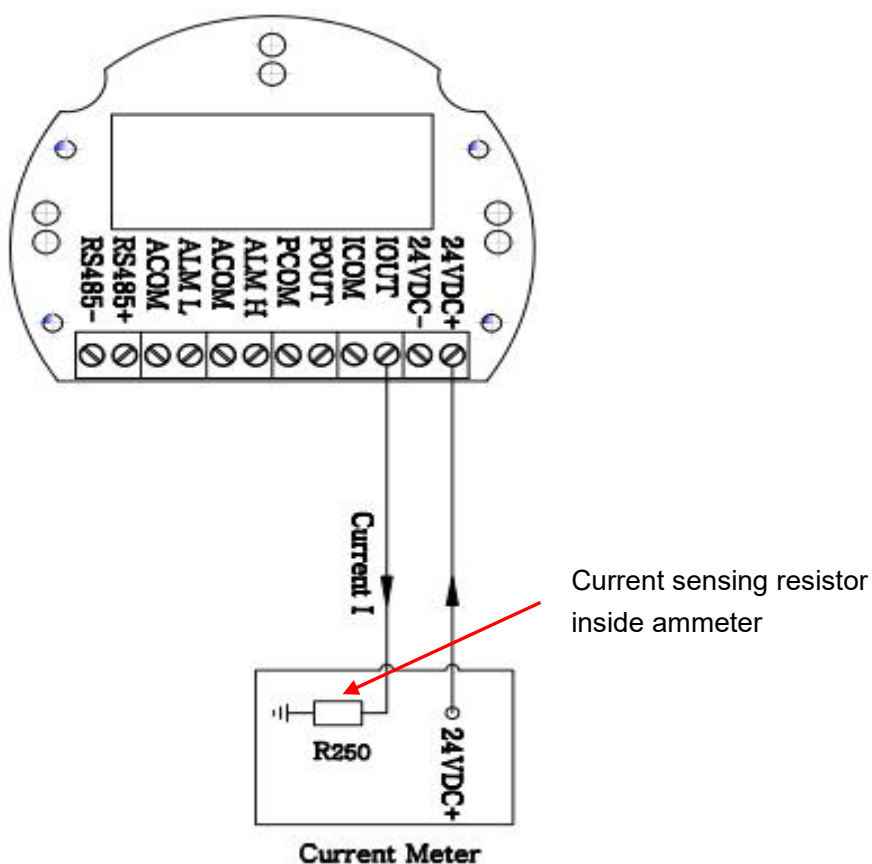
Terminal block silk screen	Function	Remark
24V+	DC 18-36V +	Power supply 24V+
24V -	DC 18~36v -	Power supply 24V -
IOUT	4~20Ma+	Load voltage <= 500 ohms
ICOM	4~20mA -	

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POUT	Frequency & Pulse Output+	
PCOM	Frequency & Pulse Output Common	
ALM H	High alarm+	It is recommended to use 24VDC intermediate relay, load current $\leq$ 30mA
ACOM	High alarm public terminal	
ALM L	Low alarm+	
ACOM	Low alarm common terminal-	
RS+	RS485+	RS485 terminal block
RS-	RS485-	

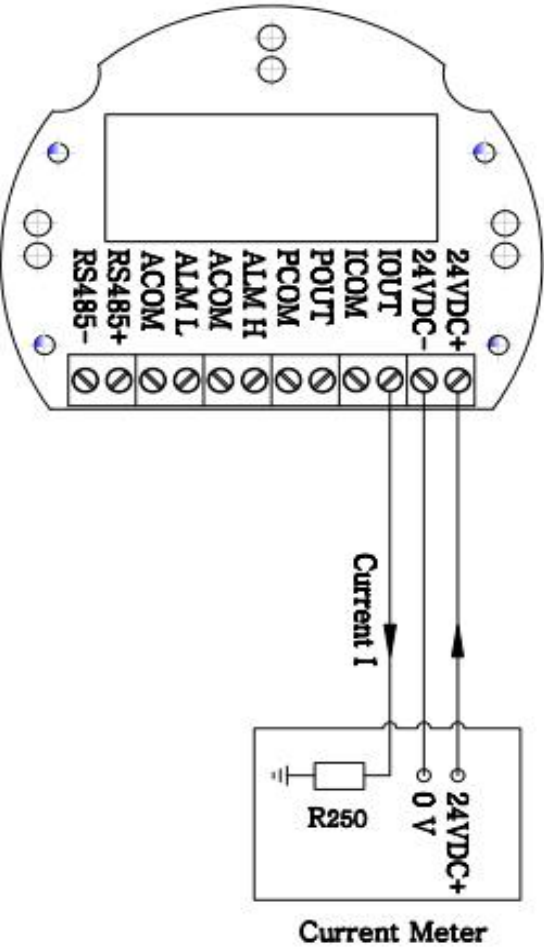
Two-wire wiring diagram

Terminal definition

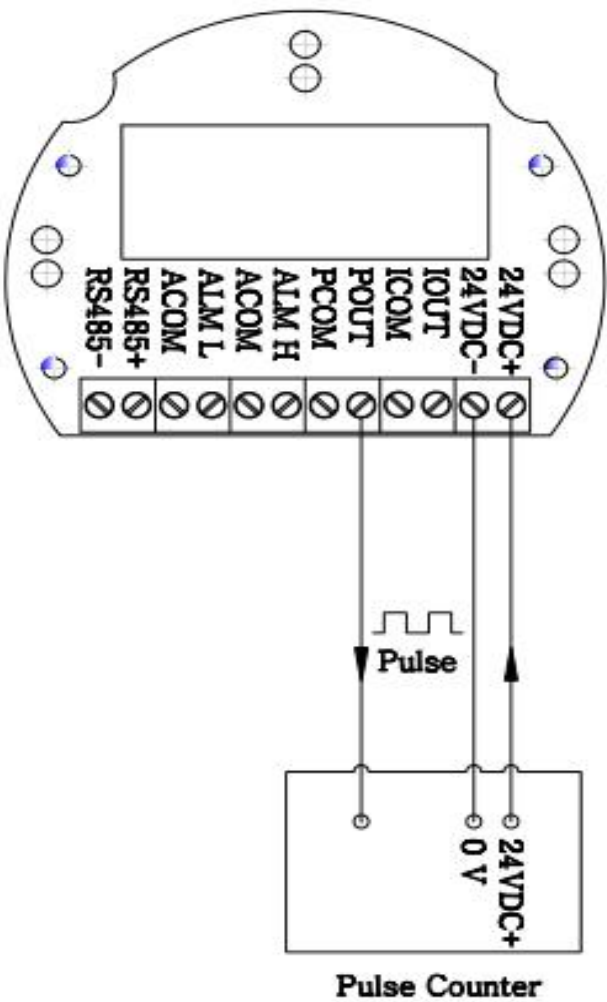


Three-wire wiring diagram

Terminal definition



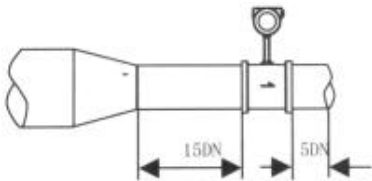
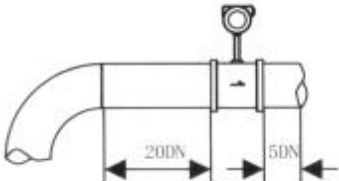
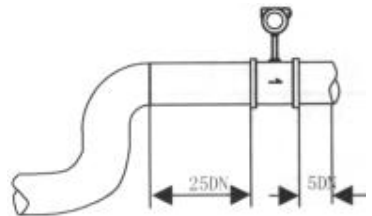
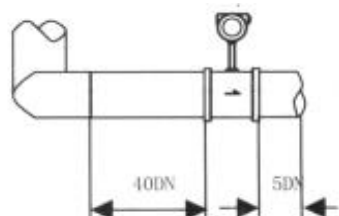
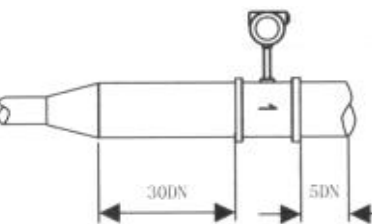
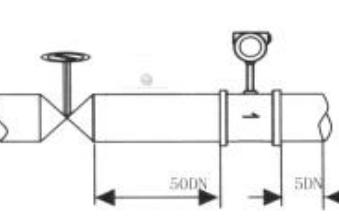
5.2 . Pulse output wiring diagram



Chapter 6. Vortex flow meter pipeline installation design

6.1. Precautions for installation of vortex flow meter

6.1.1 The vortex flow meter has certain requirements for the upstream and downstream straight pipe sections of the installation point, otherwise it will affect the flow field of the medium in the pipeline and affect the measurement accuracy of the meter. The length requirements of the upstream and downstream straight pipe sections of the instrument are shown in Figure (3). DN is the nominal diameter of the instrument. Unit: mm

Sensor upstream Pipe type	Front and rear straight pipe length	Sensor upstream Pipe type	Front and rear straight pipe length
Concentric contraction Fully open valve		a 90 degree elbow	
Two on the same plane 90 degree elbow		Two on different planes 90 degree elbow	
Concentric expansion		Regulating valve Half open valve (Not recommen ded)	

Picture (3)

Note: The regulating valve should not be installed upstream of the vortex flow meter, but should be installed 10D downstream of the vortex flow meter.

6.1.2 The inner diameter of the upstream and downstream piping should be the same. If there is a difference, the inner diameter D_p of the piping and the inner diameter D_b of the vortex instrument meter should satisfy the following relationship :

$$0.98D_b \leq D_p \leq 1.05D_b$$

The upstream and downstream piping should be concentric with the inner diameter of the flow meter, and the non-axiality between them should be less than $0.05D_b$

6.1.3 The sealing gasket between the meter and the flange cannot protrude into the pipe during installation, and its inner diameter should be 1-2mm larger than the inner diameter of the meter.

6.1.4 Installation design of pressure measuring holes and temperature measuring holes. When the pipeline under test needs to be installed with a temperature and pressure transmitter, the pressure measuring hole should be set at 3-5D downstream, and the temperature measuring hole should be set at 6-8D downstream. D is the nominal diameter of the instrument, unit: mm

6.1.5 The instrument can be installed horizontally, vertically or tilted on the pipeline.

6.1.6 When measuring gas, install the instrument in the vertical pipeline, and the gas flow direction is not limited. However, if the pipeline contains a small amount of liquid, in order to prevent the liquid from entering the instrument measuring tube, the air flow should flow from bottom to top, as shown in Figure (6) a

6.1.7 When measuring liquids, in order to ensure that the pipe is filled with liquid, when installing instruments in vertical or inclined pipes, the liquid flow direction should be ensured 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 instrument, the instrument should be installed at a lower point in the pipeline .

in Figure (6) b

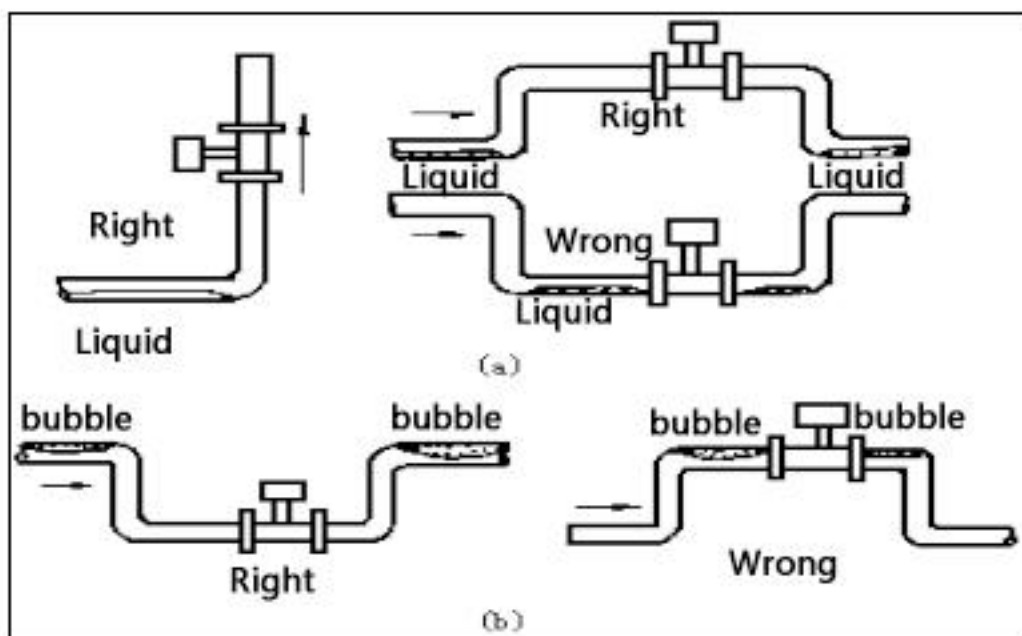
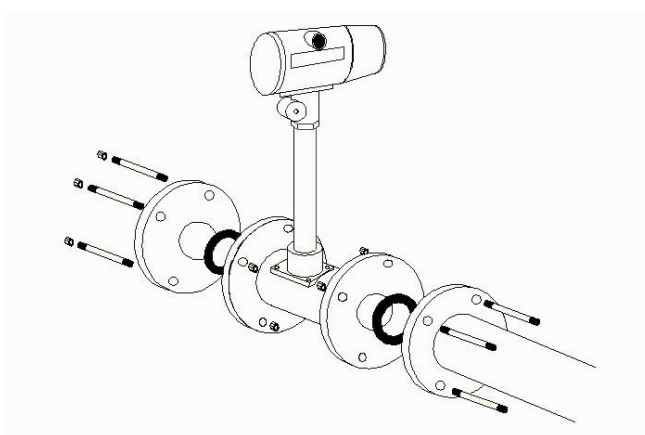


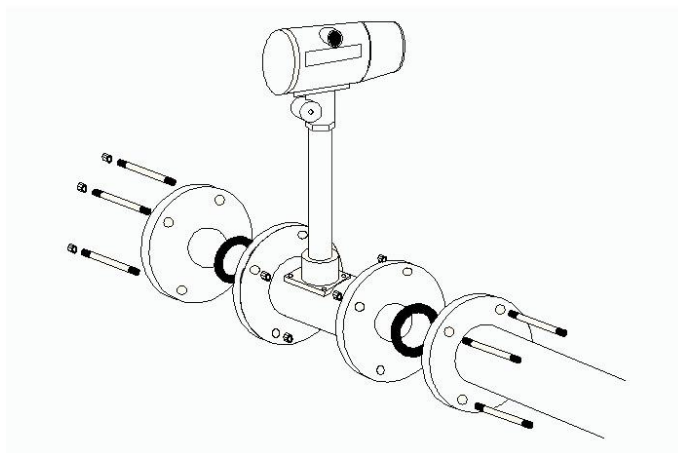
Figure (6)

6.1.8 When measuring high-temperature and low-temperature media, attention should be paid to insulation measures. The high temperature inside the converter (inside the meter housing) should generally not exceed 70°C; low temperatures can easily cause condensation inside the converter, reducing the insulation resistance of the printed circuit board and affecting the normal operation of the instrument.

6.2. Installation diagram of vortex flow meter



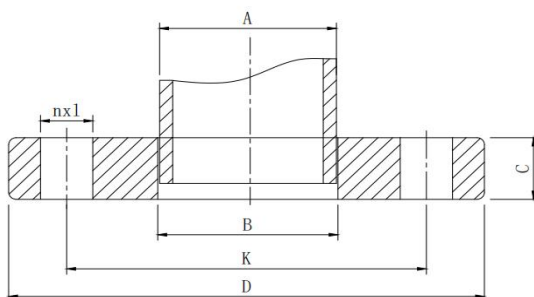
Installation diagram of clamp-on vortex flow meter



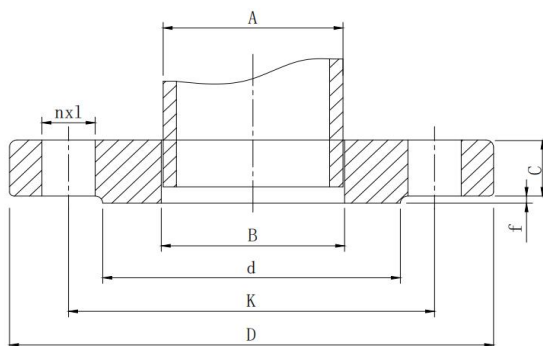
Flange connection diagram

6.3.Flange size

For the convenience of design, the flange data of the most commonly used connection methods are now provided, according to the national standard GB/T9119-2000



Flat (FF) plate flat welded steel pipe flange



Raised Face (RF) Plate Flat Welded Steel Pipe Flange

PN grade	DN	Connection size						Sealing surface		Flang e thickn ess C	Flange the inside diamete r of B
		Steel Pipe outer diam eter A	flange outer diamo ter D	Cent er dista nce K	bolt Apert ure L	bolt		d	f		
						qua ntity n	Thre ad Spe cific ation				
PN10	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	60.3	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	4	M16	118	2	20	77.5
	80	88.9	200	160	18	8	M16	132	2	20	90.5
	100	114.3	220	180	18	8	M16	156	2	22	116
	125	139.7	250	210	18	8	M16	184	2	22	141.5
	150	168.3	285	240	22	8	M20	211	2	24	170.5
	200	219.1	340	295	22	8	M20	266	2	24	221.5
	250	273	395	350	22	12	M20	319	2	26	276.5
	300	323.9	455	400	22	12	M20	370	2	28	327.5

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	350	355.6	505	460	22	16	M20	429	2	30	359.5
	400	406.4	565	515	26	16	M24	480	2	32	411
	450	457	615	565	26	20	M24	530	2	35	462
	500	508	670	620	26	20	M24	582	2	38	513.5
	600	610	780	725	30	20	M27	682	2	42	616.5

PN grade	DN	Connection size						Sealing surface		Flang e thick ness C	flange the inside diameter of B
		Steel Pipe outer diam eter A	Flan ge oute r diam eter D	Cen ter dist anc e K	bolt Aper ture L	bolt		d	f		
						qua ntity n	Thre ad speci ficati ons				
PN16	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	60.3	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	4	M16	118	2	20	77.5
	80	88.9	200	160	18	8	M16	132	2	20	90.5
	100	114.3	220	180	18	8	M16	156	2	22	116
	125	139.7	250	210	18	8	M16	184	2	22	141.5
	150	168.3	285	240	22	8	M20	211	2	24	170.5
	200	219.1	340	295	22	8	M20	266	2	24	221.5
	250	273	395	350	22	12	M20	319	2	26	276.5
	300	323.9	455	400	22	12	M20	370	2	28	327.5
	350	355.6	505	460	22	16	M20	429	2	30	359.5
	400	406.4	565	515	26	16	M24	480	2	32	411

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	450	457	615	565	26	20	M24	530	2	35	462
	500	508	670	620	26	20	M24	582	2	38	513.5
	600	610	780	725	30	20	M27	682	2	42	616.5

PN grade	DN	Connection size						Sealing surface		Flan ge thick ness C	flange the inside diamet er of B
		Steel Pipe outer diamet er A	flang e outer diam eter D	cent er dist anc e K	bolt Aper ture L	bolt		d	f		
						qua ntity n	Thre ad Spec ificati on				
PN40	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	60.3	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	8	M16	118	2	22	77.5
	80	88.9	200	160	18	8	M16	132	2	24	90.5
	100	114.3	235	190	22	8	M20	156	2	26	116
	125	139.7	270	220	26	8	M24	184	2	28	141.5
	150	168.3	300	250	26	8	M24	211	2	30	170.5
	200	219.1	375	320	30	8	M27	284	2	36	221.5
	250	273	450	385	33	12	M30	345	2	42	276.5
	300	323.9	515	450	33	16	M30	409	2	48	327.5
	350	355.6	580	510	36	16	M33	465	2	55	359.5
	400	406.4	660	585	39	16	M36	535	2	60	411
	450	457	685	610	39	20	M36	560	2	66	462
	500	508	755	670	42	20	M39	615	2	72	513.5
	600	610	890	795	48	20	M45	735	2	84	616.5

Our company can customize various non-standard flanges, American standard, and European standard flanges according to customer needs.

Chapter 7. Fault phenomena and troubleshooting methods

Fault phenomenon	Possible Causes	Method of exclusion
No output signal after turning on the power	1. There is no medium flow in the pipeline or the flow rate is lower than the starting flow rate; 2. The power supply and output cable are not connected correctly; 3. The preamplifier is damaged (the calculator does not count and the instantaneous value is "0"); 4. The drive amplifier circuit is damaged (the calculator display is normal).	1. Increase the medium flow rate or switch to a flow meter with a smaller diameter to meet the requirements of the flow range; 2. Correct wiring; 3. Replace the preamplifier; 4. Replace damaged components in the drive amplifier.
The flowmeter has a signal output when there is no flow	1. The flow meter is poorly grounded and strong current and other ground wiring are interfered with; 2. The amplifier sensitivity is too high or self-excitation occurs; 3. The power supply is unstable, poor filtering and other electrical interference.	1. Connect the ground wire correctly to eliminate interference; 2. Replace the preamplifier; 3. Repair or replace the power supply to eliminate interference.
The instantaneous flow indication is unstable	1. The medium flow is unstable; 2. The sensitivity of the amplifier is too high or too low, causing over-counting and missing pulses; 3. There are debris inside the shell; 4. Poor grounding; 5. The flow rate is lower than the lower limit; 6. The rear sealing ring extends into the pipe, causing	1. Test again after the flow rate is stable; 2. Replace the preamplifier; 3. Remove dirt; 4. Check the grounding line to make it normal

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	disturbance.	
The cumulative flow indication does not match the actual cumulative volume.	1. The flow meter instrument coefficient input is incorrect; 2. The user's normal flow rate is lower or higher than the normal flow range of the selected flow meter; 3. The flow meter itself is out of tolerance	1. Enter the correct instrument coefficient after recalibration; 2. Adjust the pipeline flow to normal or select a flow meter of appropriate specifications; 3. Recalibrate.
Display is abnormal	The converter button has poor contact or the button is locked.	Replace display board.
After replacing the battery with a new one crash occurs	The power-on reset circuit is abnormal or the oscillation circuit does not oscillate	Reinstall the battery (recharge after 5 seconds)

Chapter 8. Packaging, Transportation and Storage

8.1. The flow meter should be packed in a strong wooden box (medium and small diameter flow meters can be packed in cartons if they are protected by foam). They should not move freely in the box and should be handled with care when handling.

8.2. The transportation and storage conditions of the flow meter should comply with the requirements of GB/T 9329-1999 "Basic Environmental Conditions and Test Methods for Transportation and Storage of Instruments".

8.3. The storage of flow meters should meet the following conditions:

Rain and moisture proof

Not immune to mechanical vibration or shock

Temperature range: 5℃~40℃

Relative humidity: no more than 90%

The environment does not contain corrosive gases

Appendix: RS485 communication address table

Variable name	Register first address	Register length	Instruction code	Data type
Instantaneous traffic	0x01	0x02	0x04	floating point number
Instantaneous flow unit	0x03	0x01	0x04	integer
Total amount	0x04	0x04	0x04	double precision
Total unit	0x08	0x01	0x04	integer
Temperature	0x09	0x02	0x04	floating point number
Pressure	0x0b	0x02	0x04	floating point number
Total amount (m3)	0x0d	0x02	0x03 0x04	floating point number
Continuous reading (addresses are consecutive)				
Instantaneous traffic	0x14	0x02	0x04	floating point number
Total amount	0x16	0x02	0x04	floating point number
Temperature	0x18	0x02	0x04	floating point number
Pressure	0x1a	0x02	0x04	floating point number
Instantaneous traffic	0x1e	0x02	0x04	float inverse
Total amount	0x20	0x02	0x04	float inverse
Temperature	0x22	0x02	0x04	float inverse
Pressure	0x24	0x02	0x04	float inverse