目　录

To correctly use the flowmeter, please read the user manual carefully!

1.Functions

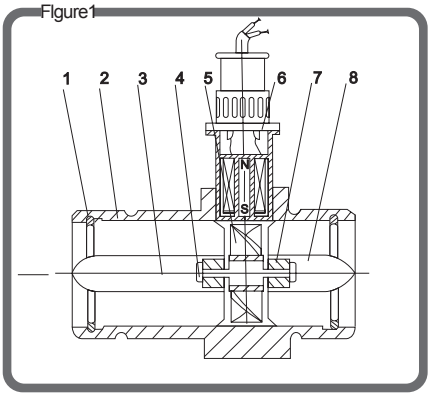
Turbine flowmeter (hereinafter referred to as TUF) is a kind of impeller type flow meter, which also includes anemometer and water meter, etc. TUF is composed of sensor and converter. The sensor uses a multi-blade rotor to feel the average velocity of fluid, thus to derive the flow rate or totalizer. Today, TUF has been widely used in various sectors like petroleum, chemical, scientific research, national defense and metering.

HLWGY series Turbine Flowmeter has simple structure, high accuracy, good repetitiveness, fast response and convenient maintenance. It is widely used for liquid without corrosion to stainless steel, Al2O3 or hard alloy, without fibre or particle and kinematic viscosity less than 50×10-6m2/s.

2.Working Principle

Figure 1 shows the structure diagram of turbine flow sensor. Seen from the figure, when the measured fluid flows through the sensor, under the action of fluid, the impeller stresses and rotates. Its speed is in direct proportion to pipeline average velocity. The rotation of impeller cyclically changes the magnetic resistive value of magnetoelectric converter. The magnetic flux in the detection line diagram consequent cyclically changes, generating periodic induction electric potential, i.e., electric pulse signal. After being amplified by the amplifier, it is sent to the display meter for displaying. Flow equation of turbine flowmeter can be divided into two types: practical flow equation and theoretical flow equation.

Figure1



1. Fastening; 2. Housing; 3. Front Baffle; 4. Thrust plate; 5. Impeller; 6. Magneto-electric induction type signal detector;7. Bearing; 8. Back Baffle

（1）Practical flow equation

qv=f/k Formula 1

qm=qvp Formula 2

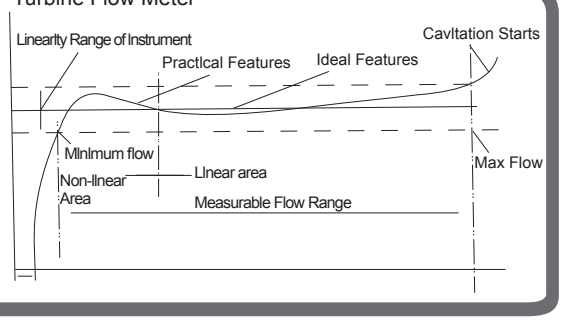
In the formula, qv,qm……are respectively volumetric flow m3/s, mass flow kg/s;

f……Frequency of flow meter output signal,Hz

K……Instrument Factor of flow meter,P/m3

The relation curve of flowmeter coefficient and flow rate (or the pipe Reynolds number) is as shown in Figure 2. Seen from the figure, instrument factor can be divided into two sections, i.e. linear segment and non-linear segment. Linear segment is approximately two-thirds of its work segment. Its characteristics are related to sensor structure size and fluid viscosity. The characteristics of nonlinear segment are greatly affected by bearing friction and fluid viscous resistance.

Figure 2 Features Curve of Turbine Flow Meter



When the flow rate is lower than the lower limit of flow range, instrument factor changes rapidly along with flow rate. The pressure loss and flow rate are approximately in square relationship. When the flow rate exceeds upper limit please pay attention to preventing cavitation.

The shapes of TUF characteristic curve with similar structure are similar. And the only difference is in the system error level. The instrument factor of sensor is got after the testing by flow calibration device. It regards the sensor as a black box and determines the conversion factor according to input (flow rate) and output (frequency pulse signal), convenient for practical application. But please note, there're some conditions for this conversion factor (instrument factor). Its calibration conditions are also reference conditions. If deviating from this condition at using, the factor will change. To which extent will depend on sensor type, pipe installation conditions and fluid physical properties.

（1）Theory Flow Equation

List motion equation of impeller according to momentum theorem.

$$J\frac{dw}{dt}=M_1-M_2-M_3-M_4$$

In the formula, J stands for inertia moment of impeller;

dw/dt: rotational acceleration of impeller;

M1: driving moment of fluid;

M2: viscous resistance moment;

M3: bearing friction resistance moment;

M4: magnetic resistance moment

When the impeller rotates in constant velocity, M1=M2+M3+M4. It can be concluded from theoretical analysis and experimental verification:

In the equation n stands for rotate speed of impeller.

qv: volumetric flow

A: the factor with relation to fluid physical characteristics (density, viscosity), impeller structure parameters (blade incidence, impeller diameter, runner sectional area).

B: the factor with relation to blade headspace and fluid velocity distribution.

C: the factor with relation to friction moment.

3.Features

1. High accuracy: ±1%, ±0.5%, ±0.2% for high accuracy.
2. Good repetitiveness: 0.05% ~ 0.2%.
3. Local display, flow rate and totalizer
4. Output of pulse frequency signal, 4-20mA & RS485
5. Very high frequency signal available, strong signal resolution.
6. Turndown: 1:20, 1:10
7. Compact structure, convenient maintenance, big flow capacity
8. Applicable for high pressure measurement; no tapping required on the meter body.
9. Multiple dedicated sensors;
10. Insertion type can be made for large pipe size, little pressure loss, low price, convenient maintenance.

4.Basic Parameters & Technical Performance

1.Measuring range & Working pressure

Instrument Diameter (mm)	Normal Flow Range (m3/h)	Extended Flow Range (m3/h)	Normal Pressure Rating(MPa)	Special Pressure Rating(MPa) (Flange Connection)
DN4	0.04~0.25	0.04~0.4	6.3	10, 16, 25
DN6	0.1~0.6	0.06~0.6	6.3	10, 16, 25
DN10	0.2~1.2	0.15~1.5	6.3	10, 16, 25
DN15	0.6~6	0.4~8	Thread connection/6.3 Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN20	0.8~8	0.45~9	Thread connection/6.3 Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN25	1~10	0.5~10	Thread connection/6.3 Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN32	1.5~15	0.8~15	Thread connection/6.3 Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN40	2~20	1~20	Thread connection/6.3 Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN50	4~40	2~40	Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN65	7~70	4~70	Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN80	10~100	5~100	Flange connection/2.5	4.0, 6.3, 10, 16, 25
DN100	20~200	10~200	Flange connection/1.6	4.0, 6.3, 10, 16, 25
DN125	25~250	13~250	Flange connection/1.6	2.5, 4.0, 6.3, 10, 16
DN150	30~300	15~300	Flange connection/1.6	2.5, 4.0, 6.3, 10, 16
DN200	80~800	40~800	Flange connection/1.6	2.5, 4.0, 6.3, 10, 16

5.Model Selection

Model								Description
HLWGY-	□	□/	□/	□/	□/	□/	□/	
DN	4							4mm
	6							6mm
	10							10mm
	15							15mm
	20							20mm
	25							25mm
	32							32mm
	40							40mm
	50							50mm
	65							65mm
	80							80mm
	100							100mm
	125							125mm
	150							150mm
	200							200mm
Type		N						Basic type, without display, 3.6V battery, output 3 wire pulse signal
		A						Local Display, 3.6V battery, output 3 wire pulse signal
		B						Local Display, 24V DC power supply, output 3 wire pulse signal
		C						Local Display, 24V DC power supply, 2 wire 4-20mA/pulse output
		C1						Local Display, 24V DC power supply, RS485 communication protocol
Accuracy			05					0.5
			10					1.0
Turbine Type				W				Extended Measuring Range
				S				Standard Measuring Range
Material					S			304 SS
					L			316 (L) SS
Explosion Proof								Non Explosion proof
						E		Explosion proof, ExdIIBT6
Pressure Rating							N	Normal (see table 2)
							H(x)	High Pressure (see table 2)

6.Installation Dimension

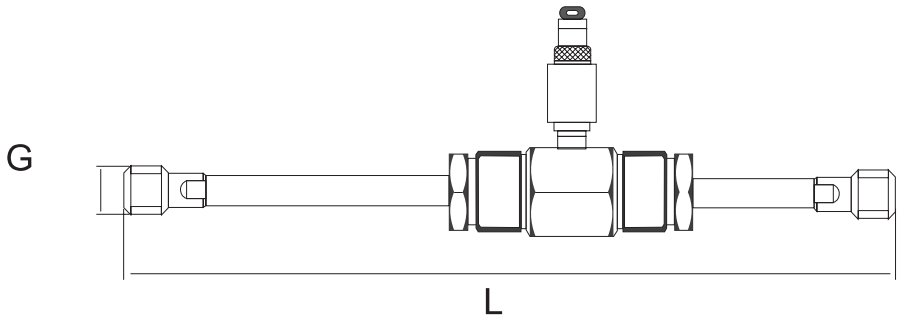


Diagram 6 HLWGY-4 ~ 10, thread connection type turbine flow sensor (including straight pipe section)

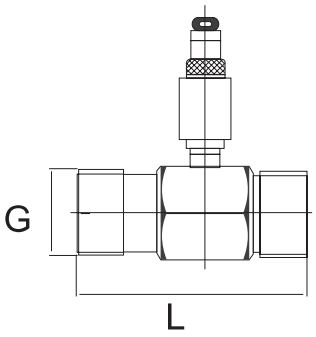


Diagram 7 HLWGY-15~40, thread connection type turbine flow sensor

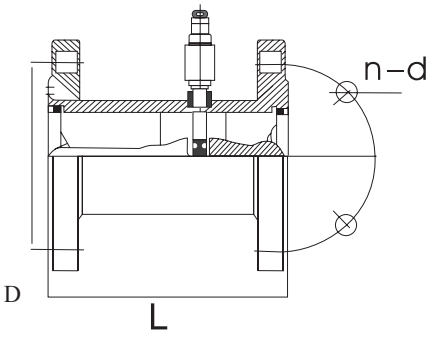


Diagram 8 HLWGY-50~200, flangeconnection type turbine flow sensor

DN (mm)	L (mm)	G	D (mm)	d (mm)	N (Hole No.)
4	295	G1/2			
6	330	G1/2			
10	450	G1/2			
15	75	G1	Φ65	Φ14	4
20	80	G1	Φ75	Φ14	4
25	100	G5/4	Φ85	Φ14	4
32	140	G2	Φ100	Φ14	4
40	140	G2	Φ110	Φ18	4
50	150		Φ125	Φ18	4
65	170		Φ145	Φ18	4
80	200		Φ160	Φ18	8
100	220		Φ180	Φ18	8
125	250		Φ210	Φ25	8
150	300		Φ250	Φ25	8
200	360		Φ295	Φ23	12

7.Attentions for Installation

（1）Installation site

The sensor should be installed in the place of ease of maintenance, no piping vibration, no strong electromagnetic interference and no thermal radiation effects. Typical installation piping system of turbine flowmeter is as shown in Figure 9. In the figure, the configuration of each part depends on the measured object, not necessarily all are required. Turbine flowmeter is sensitive to velocity distribution distortion in the pipe and rotary flow. So, it is required to configure necessary straight tube section or flow adjuster according to types of choked flow piece at upstream of sensor, as shown in figure 5. If the conditions of choked flow piece at upstream is not clear, generally, the suggested length of straight tube section at upstream is no less than 20D and downstream no less than 5D. If the installation space cannot meet the above mentioned requirements, you may install flow adjuster between choked flow piece and sensor. If the sensor is installed outdoors, measures to avoid direct sunlight and rain-proof are required.

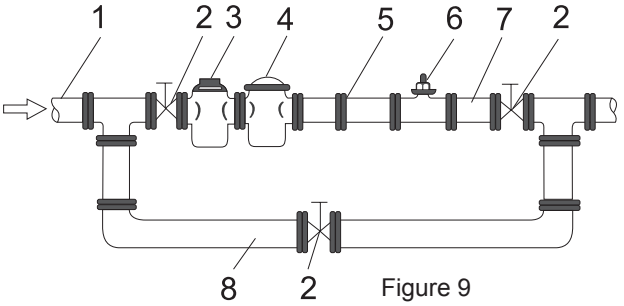


Figure 9

Entrance; 2. Valve; 3. Filter; 4. Air Eliminator ; 5. Front straight tube section;
6. Sensor; 7. Back straight tube section; bypass

Type of Choked flow piece at upstream	Single 90°elbow	Two 90°elbows on the same plane	Two 90°elbows on different planes	Concentric reducing pipe	Full-open valve	Half-open valve	Length at downstream
L/DN	20	25	40	15	20	50	5

（2）Installation Requirements to Connected Pipe

For the horizontally installed sensors, the incline (generally within about 5 °) which is discernible visually is not allowed. For vertically mounted sensors, the difference of pipe perpendicularity degree should be less than 5 ° and the flow direction must go upward.

For those sites which need continuous operation and cannot stop flowing, bypass pipe and reliable cut-off valve should be installed (see Figure 9). Please make sure the bypass tube without leakage at measuring.

For those newly laid pipelines, a short tube should be connected instead of sensor at the place for installing sensor. After “sweeping line” finishes and pipelines are confirmed clean, access the sensor formally. Sensor may be damaged if this work is neglected.

If the fluid contains impurities, filter should be installed at upstream side of sensor. For those that cannot stop flowing, two sets of filters should be installed in parallel to remove impurities in turn, or automatic cleaning type filter should be selected. If the measured liquid contains gas, air eliminator should be installed at upstream of sensor. Drain outlet or air removing outlet of filter or air eliminator should lead to a safe place. If the sensor is installed at the low point of pipeline, to prevent impurities in the fluid from precipitation and

retention, drain valve should be installed in the subsequent pipeline to regularly discharge precipitate and impurities.

P_{min}=2△P+1.25 PvPa Formula 5

In the equation Pmin —— lowest pressure, Pa

△P——pressure loss at maximum flow, Pa;

Pv——saturated steam pressure at max operating temperature of measured liquid, Pa.

Flow control valve should be installed at downstream of sensor. The stop valve at downstream side should be fully open at measuring. And these valves should not generate vibration or leak outward.

Check valve should be added for the flow path which might generate counter flow to prevent fluid from flowing inversely.

Sensor should be concentric to pipeline. The gaskets should not protrude into the pipeline. Liquid sensor should not be installed the highest point of horizontal pipe, lest that the gas (such as air mixed when stop flowing) gathered in the pipeline remains on the sensor, not easy to drain thus affecting measurement.

The front and back pipeline of sensor should support firmly without vibration. For the fluid which may easily condense, insulation measures should be taken to the sensor and front/back pipelines.

8.Debugging & Usage

Turbine Flow Sensor

Turbine flow sensor is calibrated and adjusted before delivery, no need for debugging. Connection of sensor to the secondary display instrument: Firstly, check if the output characteristic (frequency range of output pulse, amplitude, pulse width, etc.) of sensor matches the input characteristics of display instrument. Set parameters of display instrument according to sensor instrument factor. Check if sensor power supply and wire match with resistance. It should also be considered that the preamplifier of sensor anti-electromagnetic interference. If it is in outdoors measures should be taken to prevent rain. The dual-core or three-core communication cable with shielding and protective sleeve and the effective cross-sectional area of 1 2 5 to 2 m m2 multi-strand copper wire are typically used as transmission cable. Only one end of the shielded wiregrounds, preferably in the display instrument end. And please try to use one complete cable (discontinuous in the middle). The cables are preferably loaded into the metal pipe, in order to avoid mechanical damage. If another cable is loaded in the same metal pipe, then the maximum power conveyed by this cable can not be greater than 10 times minimum power outputted by flow signal cable of the instrument. The path of the transmission cable should not be in parallel with the dynamic power supply line or be laid in a concentrated area of power supply line, in order to avoid electromagnetic interference.

9. USAGE

1、Function：

1）Accuracy frequency measurement of 0.8-30KHz ect.,

2）4-20mA output;

3） Upper & lower limit alarm output, whose monitoring parameters, high & low alarm and electrical level output way could be set according to requirements;

4） Three ways 12 bit DA input;(temperature, pressure , battery voltage)

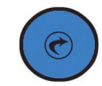
5） 0-1000Hz frequency output;

6） Accumulative flow can be recorded;

7） Overall power consumption is 450 μ A。

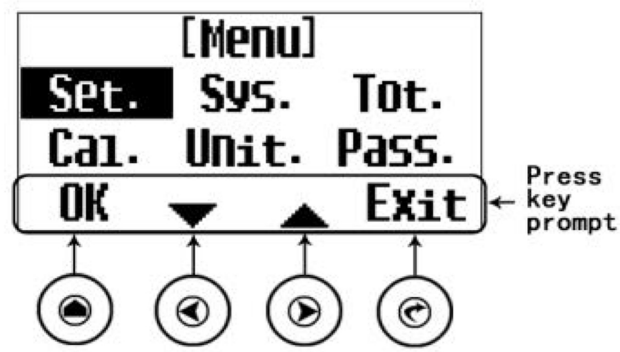
2、Key instruction：

1） There are four keys on the panel board.

Set （OK） Key	Left shift （minus 1） Key	Right shift （Plus 1） Key	Exit （Shift） Key
			

2） Other interface lowest part ,except working interface,called press key prompt （Chart 5.2.1),from left to right corresponding four keys,prompt the current function of the key.

Chart 5.2.1

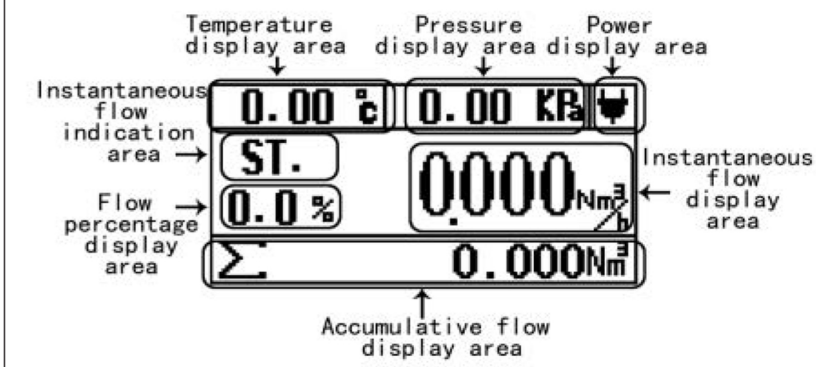


3、Working interface explanation

4、It has two screens, main display interface (chart 5.3.1) and secondary interface (chart 5.3.2) , press Right shift （Plus 1） Key to changing-over.

1） Main display interface （chart 5.3.1）

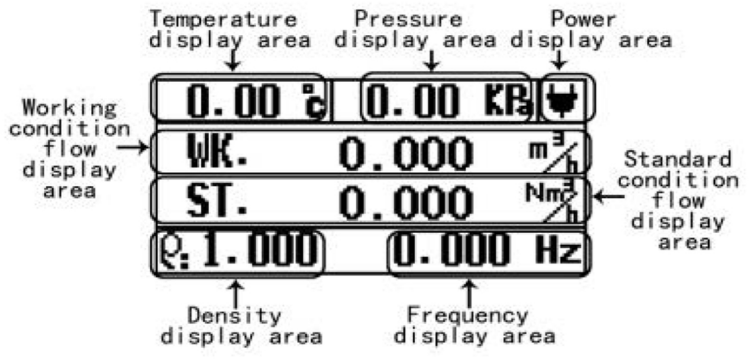
Chart 5.3.1



Temperature displayarea:	When have temperature compensation,display current temperature value. No compensation display "-----" Over range display " Over" Error display " Error "
Pressure display area:	When have pressure compensation,display current pressure value. No compensation display "-----" Over range display " Over " Error display "Error"
Power display area:	Display current power situation; Battery power supply display " " , When battery power is insufficient , display twinkle; External power supply display " "
Instantaneous flow indication area:	Acquiescent flow in working condition, press the left shift key, changing-over in working & standard condition.
Flow percentage display area:	Display the current instantaneous flow in the current range of percentage
Instantaneous flow display area:	Display instantaneous flow indication area corresponding instantaneous flow. If instantaneous flow indication is in standard condition, display standard condition flow. If instantaneous flow indication is in working condition, display working condition flow.
Accumulative flow display area:	Display accumulative total flow

2) Secondary interface (chart 5.3.2)

Chart 5.3.2

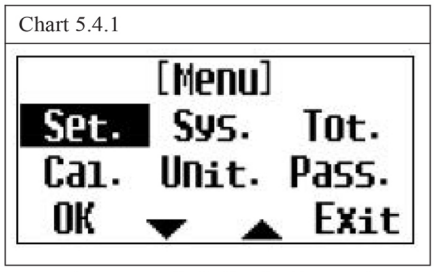


Temperature display area:	When have temperature compensation,display current temperature value. No compensation display "-----" Over range display "Over" Error display "Error"
Pressure display area:	When have pressure compensation,display current pressure value. No compensation display "-----" Over range display "Over" Error display "Error"
Power display area:	Display current power situation; Battery power supply display "▯" , When battery power is insufficient , display twinkle; External power supply display "🔌"
Working condition flow display area:	Display current working condition flow rate
Standard condition flow display area:	Display current standard condition flow rate
Density display area:	Display current density
Frequency display area:	Display current collected frequency

4、Operation method:

1) Under working interface(main display interface or secondary interface), press set (OK)key,enter set menu option. (chart 5.4.1) ;

Chart 5.4.1



2) Under set menu option (chart 5.4.1), use Left shift (minus 1) Key and Right shift (Plus 1) Key selection entering menu.

Press set(OK)key entering corresponding option Enter password interface (chart 5.4.2) ;

Press Exit (Shift) key to back the working interface.

Chart 5.4.2

3) Under enter password interface (chart 5.4.2), Exit (shift) move the cursor.

Use left shift (minus 1) key, right shift (plus 1)key revise the value of cursor location.

After setting the correct password , press set (OK)key to enter corresponding option setting icon

menu interface.(more details,please back sheet).
If the password is not right, it will prompt “wrong password” and back to the working interface, at this time need to repeat the steps above.

4) Under option setting icon menu interface, use left shift (minus 1) key, right shift (plus 1)key select the entering setting menu.
Press set (OK) key enter corresponding setting menu’s subsidiary menu option, arrow indication cursor can move to the subsidiary menu.
Press Exit (shift) key back to the main display interface (chart 5.2.1)

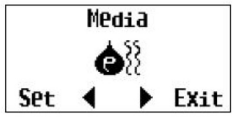
5)Under subsidiary menu interface , use left shift (minus 1) key, right shift (plus 1)key select setting subsidiary menu.
Press set (OK) key enter corresponding setting subsidiary menu parameter setting status,arrow indication cursor can move to subsidiary menu parameter setting .
Press Exit (shift) key back to corresponding superior setting icon menu interface.

6) Subsidiary menu parameter setting status, use left shift (minus 1) key, right shift (plus 1)key revise corresponding parameter.If the parameter is digit, Exit (shift) key move cursor, if other parameters, Exit (shift) key invalid.Press set (OK) key , keep the current setting parameter and back to the corresponding superior subsidiary menu.

7)Setting menu option (chart 5.4.1) total has six options: setting, system,total,calibration,unit and password.
The user can set the setting, system,total,unit and password, calibration setting by the factory.

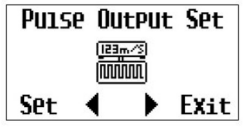
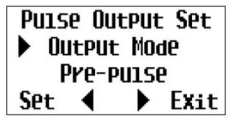
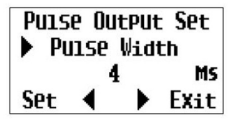
5、Menu explanation

1) Setting menu (password: 1006)

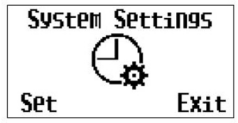
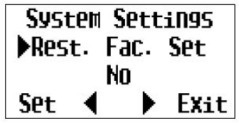
Setting option icon menu	Setting option subsidiary menu	Setting parameter	Factory parameters
		None: no compensation,this moment temperature,pressure and density setting invalid .unit: m^3/h Media density: can set density compensation by manual operation. This moment temperature and pressure setting invalid.Unit: Kg/h (or t/h) Gas volume (T): Gas volume temperature compensation, unit : Nm^3/h Gas volume (P): Gas volume pressure compensation, unit : Nm^3/h Gas volume (TP): Gas volume T&P compensation,unit: Nm^3/h Gas quality (S): Gas mass in Standard condition compensation, unit: Kg/h (or t/h) Saturation(T): Saturated vapour temperature compensation, unit: Kg/h (or t/h) Saturation (P): Saturated vapour pressure compensation, unit: Kg/h (or t/h)	Set as per customer order

		Overheated(TP): Overheated vapour T&P compensation, Unit: Kg/h (or t/h) :	
	Media ▶ Density 1.0000 kg/m³ Set ◀ ▶ Exit	Media density value : range 0.0000~999999 Unit :kg/m³	
Communication Set ◀ ▶ Exit	Communication ▶ Address 6 Set ◀ ▶ Exit	Communication address, range 0-255	6
	Communication ▶ Baud Rate 9600 Set ◀ ▶ Exit	Communication Baud rate,please check below: 1200 2400 4800 9600	
	Communication ▶ Protocol Modbus V1.4 Set ◀ ▶ Exit	Communication Protocol: ModbusV1.3 ModbusV1.4	Modbus V1.4
Upper Limit Alarm Set ◀ ▶ Exit Lower Limit Alarm Set ◀ ▶ Exit	Upper Limit Alarm ▶ Output Level Low Level Set ◀ ▶ Exit	Alarm output electrical level: No alarm High electrical level Low electrical level	No alarm
	Upper Limit Alarm ▶ Alarm Parame Standard Flow Set ◀ ▶ Exit	Alarm monitor parameter low under working condition low under standard condition Pressure Temperature	Standard condition flow rate
	Upper Limit Alarm ▶Ret. Diff. Val 0.500 Set ◀ ▶ Exit	Alarm return difference value, range 0.000~999.999, Unit is the same with current monitor unit	0.5
	Upper Limit Alarm ▶ Alarm Value 1000.00 Set ◀ ▶ Exit	Alarm value , range0.00~99999.99, Unit is the same with current monitor unit	1000
Temp. Settings Set ◀ ▶ Exit	Temp. Settings ▶ Temp. Input Auto Set ◀ ▶ Exit	Temperature compensation mode: Automatic compensation , temperature from sensor measure Hand compensation, temperature from setting temperature value	Set as per customer order
	Temp. Settings ▶ Temp. Value 0.00 ℃ Set ◀ ▶ Exit	Temperature setting value , range -999.99~+999.99, Unit: ℃ When using temperature compensation and temperature input manual setting available.	0.00
	Temp. Settings ▶Standard Temp. 20.00 ℃ Set ◀ ▶ Exit	Temperature under standard condition, range -999.99~+999.99, Unit: ℃	20.00

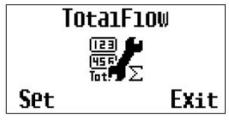
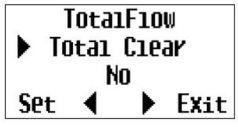
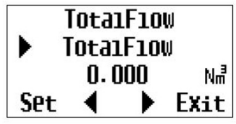
	Temp. Settings ▶ Max Temp. 400.00 ℃ Set ◀ ▶ Exit	Temperature normal upper limit value : range -999.99~+999.99, Unit: ℃	
	Temp. Settings ▶ Min Temp. 0.00 ℃ Set ◀ ▶ Exit	Temperature normal lower limit value : range -999.99~+999.99, Unit: ℃	0.00
Press. Settings Set ◀ ▶ Exit	Press. Settings ▶ Press. Input Auto Set ◀ ▶ Exit	Pressure compensation mode: Automatic compensation , pressure from sensor measure Hand compensation, pressure from setting temperature value	
	Press. Settings ▶ Press. Value 0.00 KPa Set ◀ ▶ Exit	Pressure setting value , range -99999.99~+99999.99, Unit:KPa When using pressure compensation and pressure input manual setting available.	0.00
	Press. Settings ▶Standard Press 101.324 KPa Set ◀ ▶ Exit	Pressure under standard condition, range -999.99~+999.99, Unit:KPa	101.324
	Press. Settings ▶ Max Pressure 6000.00 KPa Set ◀ ▶ Exit	Pressure normal upper limit value, range: 99999.99~+99999.99， Unit: KPa	
	Press. Settings ▶ Min pressure 0.00 KPa Set ◀ ▶ Exit	Pressure normal lower limit value, range: 99999.99~ +99999.99， Unit: KPa	0.00
Flow Settings Set ◀ ▶ Exit	Flow Settings ▶Cut-off Freq. 2.00 Hz Set ◀ ▶ Exit	Flow lower limit corresponding cut-off Freq. Range 0.00~999.99, unit : Hz. Can not check the flow below this Freq.	
	Flow Settings ▶ Max Flow 1800.00 Nm^3/h Set ◀ ▶ Exit	Flow upper limit , range 0.00~99999.99, unit depend on the current standard condition unit.	
Damptime Set Set ◀ ▶ Exit	Damptime Set ▶Sampled Cycle 2S Set ◀ ▶ Exit	Temperature&pressure sampled cycle. 2s 4s 8s Noted: acquiescent 2S, if changed will influence damptime.	2s
	Damptime Set ▶ Damping Time 10S Set ◀ ▶ Exit	Damptime set: 0s 14s 34s 1s 18s 38s 2s 20s 40s 4s 24s 44s 8s 28s 48s 10s 30s 50s	8s

		Pulse output mode: Pre-pulse: Current flow transform corresponding frequency output 0-1000Hz: flow transform 0-1000Hz ratio output Accumulative pulse : Equivalent output	Pre-pulse
		Pulse width, range 0-9999, unit : ms Output mode is accumulative pulse valid.	4
		Pulse Equivalent , range 0.000~9999.999, Unit depend on current accumulative value.	1.000

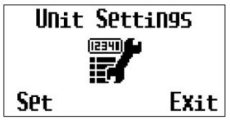
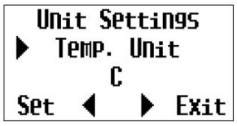
2) System menu (password: 1006)

Setting option icon menu	Setting option subsidiary menu	Setting parameter	Factory parameter
		Recover factory setting: yes no	NO
		Display language: Chinese English	Chinese

3) Total menu (password: 1006)

Setting option icon menu	Setting option subsidiary menu	Setting parameter	Factory parameter
		Total clear: yes no	no
		TotalFlow, range, 0.000~9999999.999 Unit : current standard condition unit. Revise current total flow.	

4) Unit menu

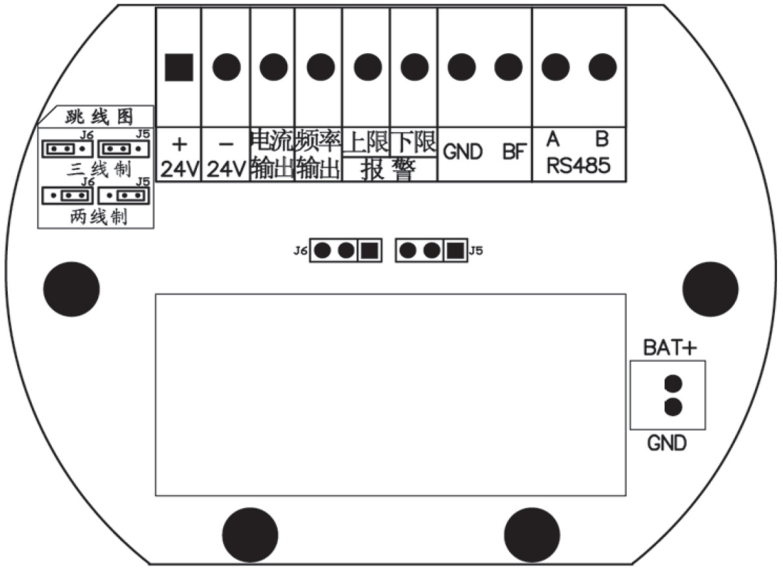
<table>
<tr><td colspan="4"> 
</td></tr>
<tr><td>Setting option icon menu</td><td>Setting option subsidiary menu</td><td>Setting parameter</td><td>Factory parameter</td></tr>
<tr><td rowspan="4"> 
</td><td> 
</td><td>Current Stanflow unit selection
No compensation: m³/h, m³/Min, L/h, L/Min
Mass flow: Kg/h, Kg/Min, t/h, t/Min
Volume flow: Nm³/h, Nm³/Min, NL/h, NL/Min Remark: this option revision is refer to instant value convert. No revision for accumulative value & communication.</td><td></td></tr>
<tr><td> 
</td><td>Current Workflow unit selection
Volume flow: m³/h, m³/Min, L/h, L/Min
Mass flow: Kg/h, Kg/Min, t/h, t/Min
Remark: this option revision is refer to instant value convert. No revision for accumulative value & communication.</td><td></td></tr>
<tr><td> 
</td><td>Current temperature unit selection
C: degree celsius
F: degree Fahrenheit
Remark: this option revision is refer to instant value convert. No revision for accumulative value & communication.</td><td>C: degree Celsius</td></tr>
<tr><td> 
</td><td>Current pressure unit selection
KPa
MPa
When pressure more than 1000KPa, The unit will exchange the corresponding MPa.
This option revision is refer to instant value convert. No revision for accumulative value & communication.</td><td>automatic</td></tr>
</table>

5） Password Menu

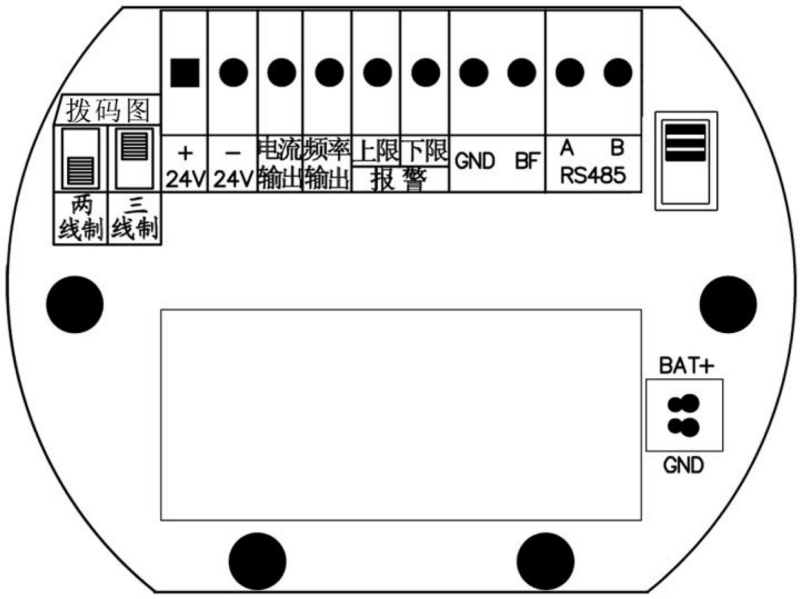
<table>
<tr><td colspan="4"> 
</td></tr>
<tr><td>Setting option icon menu</td><td>Setting option subsidiary menu</td><td>Setting parameter</td><td>Factory parameter</td></tr>
<tr><td> 
</td><td> 
</td><td>Input corresponding setting option old password</td><td></td></tr>
<tr><td> 
</td><td> 
</td><td>Password eorr, return operation interface</td><td></td></tr>
<tr><td> 
</td><td> 
</td><td>Password correct, enter input new password interface.
Input corresponding setting option new password
After finishing the setting, press(OK)key, preserve the new password.</td><td></td></tr>
<tr><td> 
</td><td> 
</td><td>Point out “complete”,return to operation interface.</td><td></td></tr>
</table>

6、Wiring diagram：

1) Patch cord version



2）Dial-up version



3）Terminal meaning：

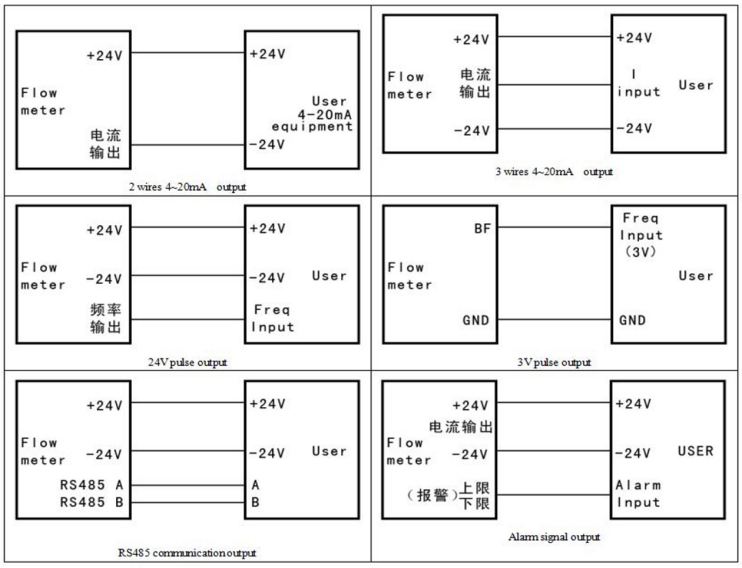
+24V	24V power input（+）
-24V	24V power input（-）
电流输出	4~20mA output
频率输出	24V pulse output
（报警）上限	upper limit alarm output
（报警）下限	lower limit alarm

	output
GND	3V pulse place
BF	3V pulse output
RS485 A	485 communication line（A+）
RS485 B	485 communication line（B+）

4）Patch cord (Dial-up) diagram：

	
When 3 wires，J5、J6 patch cord cap jump to left. When 2 wires，J5、J6 patch cord cap jump to right.	When 3 wires，see picture，dial to up When 2 wires，see picture，dial to down
Patch cord version	Dial up version

5)Line diagrammatic sketch



10.Precautions for Use

(1) Open and close sequence for putting into operation

For flow sensor not installed with bypass pipe, firstly open upstream valve of the flow sensor at a moderate opening degree, then slowly open the downstream valve. Run at very small flow for some time (say 10 minutes), then fully open upstream valve, then increase the opening degree of downstream valve, adjust to the desired normal flow.

For the flow sensor installed with bypass pipe, firstly fully open the bypass pipe valve, open the upstream valve in moderate degree, then slowly open the downstream valve, then turn down the opening degree of bypass valve to make the instrument run at very small flow for some time. Then fully open upstream valve, fully close bypass valve (to ensure no leakage), finally adjust opening degree at downstream to required flow.

(2) Commissioning of low and high temperature fluid

For pipeline with low-temperature fluid, evacuate the water before the fluid flows through. Firstly run for 15 minutes at low flow rate, then gradually increase to normal flow. Please carry out slowly when stopping the flow to make the pipe temperature gradually near ambient temperature. Running of high-temperature fluid is similar to this.

(3) Other Notes

Please open and close the valve as steadily as possible. It's better to use the method of "two sections open, two sections close" to prevent fluid suddenly impacting impeller and even causing water hammer phenomenon thus damage Impeller.

Check downstream pressure of flow sensor. When the pipeline pressure is not high, check at the initial stage of operation if the sensor downstream pressure under maximum flow rate is greater than Pmin calculated by formula 5, otherwise measures should be taken to prevent cavitation.

Instrument factor of flow sensor will be written on the check list after calibration. Instrument factor will change due to bearing wear after long-term use. So, offline or online calibration should be done regularly. If the flow range exceeds allowed range, sensor should be replaced.

To ensure flow meter work normally for long term, running checks should be strengthened. Once abnormal conditions are found, take measures to eliminate.

Monitoring impeller rotation, once abnormal sound is heard, use oscilloscope to monitor coil output waveform; in case of abnormal waveform, check sensor internal spare parts in time. If suspecting of abnormal phenomenon, please check promptly. Please make filter unblocked. You may judge if it is blocked as per the differential pressure on the pressure gauge at inlet and outlet. Please periodically discharge gas escaped from the liquid in air eliminator.

11.Common Faults & Handling Methods

Breakdown	Possible Reasons	Solution
Fluid flows normally but no display; total counter doesn't increase.	1) Check if power line, fuse, function selection switch or signal line is open circuit or with poor contact. 2) Check if internal printing plate of indicator or contact element is with poor contact. 3) Check detecting coil 4) Check sensor internal breakdown if the above 3 are all normal. Please check if impeller touches inner wall of sensor, if something gets stuck, or if axis & bearing get stuck or breakage.	1) Use ohm meter to troubleshoot fault point. 2) For checking breakdown of printing board, you may use a new one to check. 3) Mark the position of detecting coil on the sensor body, screw off detection head, fast moving the metal plate under detection head, if the figure of counter doesn't increase then check whether there're break line or welding spot desoldering. 4) Remove foreign body, clean or replace damaged parts; after recovery, blow or stir the impeller with hand, should no grating, recalibrate after replacing bearing and other parts, then get new instrument factor.
Not operate to decrease flow but flow indication gradually decreases.	Check as per the following order 1) If the filter is blocked; if differential pressure of filter increases then indicates it is blocked. 2) The spool of valve on flow sensor is loose; the opening degree automatically decreases. 3) Impeller is hindered by sundries or foreign body into gap of bearing, resistance force increases and thus velocity decreases.	1) Clean filter 2) Judging from if valve hand wheel is effective, repair or replace after confirmation. 3) discharge sensor to clean, re-calibrate if necessary
Fluid not flowing, flow display not zero or not stable	1) poor connection of transmission line shielding grounding; outside interference signal into indicator input end 2) Pipe vibrates, impeller shakes along with it, generating wrong signal 3) Caused by close lax of stop valve; instrument will indicate leakage. 4) Internal circuit board of indicator or electronic elements damaged, generating interference	1) Check if shielding layer and indicator terminal are well connected with earth. 2) Strengthen pipeline, or add bracket before and after sensor to prevent vibration. 3) Repair or replace valve 4) Use "Short Circuit Method" or check item by item to judge interference source and find trouble spot.

Significant difference between the valve on indicator and assessed value by experience	1) Internal trouble of sensor flowing channel, such as corroded or abraded by fluid; sundries blocking makes impeller rotate abnormally; instrument factor changes; impeller corroded or impacted, peak deforms, affecting normal cutting of magnetic line of force; output signal of detection coil abnormal; instrument factor changes; fluid temperature too high or too low; axis and bearing expands or shrinks; too large gap change causes impeller rotates abnormally, instrument factor changes. 2) Cavitation affects impeller rotating. 3) Reason on pipe flowing; such as check valve not installed, appearing reverse flow; bypass valve not closed tightly, leakage exists, large velocity distribution distortion at upstream of sensor (such as due to valves not fully open at upstream); large viscosity change caused by temperature 4) Indicator internal trouble 5) The permanent magnetic material element in the detector loses magnetism; when the magnetism weakens to some extent, it will affect measuring value. 6) Practical flow exceeds the flow range regulated by sensor	Use 1) to 4) to find trouble reason, then find solution as per specific reason. 5) Replace the element that loses magnetism. 6) Replace suitable sensor.

12.Transportation & Storage

Sensor should be placed in a firm wooden case (carton for small size flow meter) and not allowed to play freely in the case. Please handle carefully.

Storage site should meet the following requirements:

Rain proof & moisture proof

Not affected by mechanical vibration or impacting.

Temperature range: -20℃~+55℃

Relative humidity: not greater than 80%

No corrosive gas in the environment

13.Precautions for Unpacking

After opening the case, check the accessories as per packing list. Please check if the sensor is damaged due to transportation.

14.Ordering Instruction

User should select suitable model according to nominal diameter, working pressure, working temperature, flow range, fluid name and ambient conditions when placing the order. If explosion proof is required please do select ex-proof type flow meter.

If flow indicator from our company is required, please read corresponding user manual and select suitable model. Or our technical person may select the model for you according to specification provided by you. Please specify the specification and length if signal transmission cable is required.