Turbine Flow meter S-TURB



Instruction Manual

Version 21

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I. General

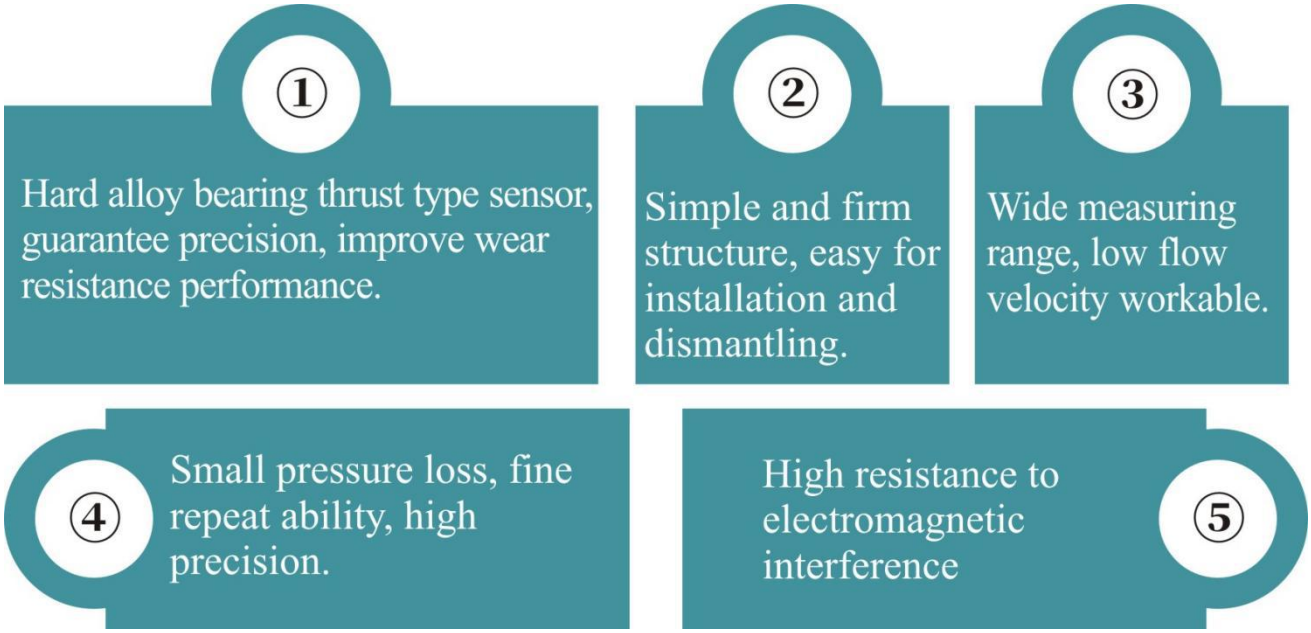
1.1 Introduction

S-TURB turbine flow meter consists of turbine flow sensor and transmitter unit; It measures volumetric fluid flow in a closed pipe and which is an ideal instrument for measuring liquid flow.

The flow meter is characterized by simple structure, high precision and easy installation&repair. The product can be used in a wide range of industries, including oil industry, chemical industry, metallurgy, water supply, paper-making, environment protection and food industry.

It is applicable in closed pipes to measure flow of liquid which will not erode stainless steel (1Cr18Ni9Ti), 2Cr13, Al2O3 and hard alloy and is free of impurities such as fiber and granules. It is also ideal for batching application, in association with display instruments with special functions, it can be used for purpose of automatic definite quantity control and alarming in case of excessive amount.

1.2 Product Features



1.3 Working Principle

When liquid flows through the sensor, the impulse of fluid will provide the blade with a rotation

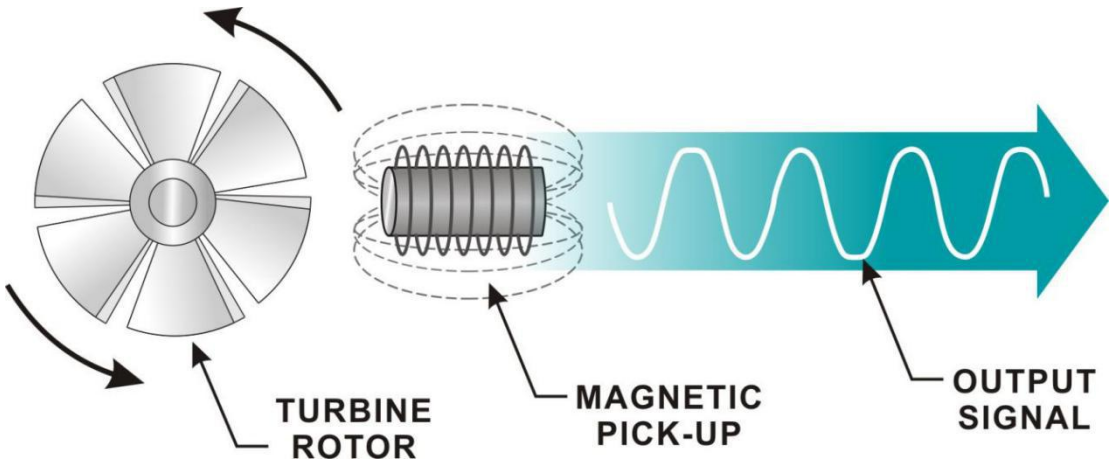
moment as there is an angle between the blade of impeller and the flow direction. the blade will rotate as the friction moment and the fluid resistance are overcome and it will reach a stable speed when the moments are at balance. under certain conditions, the rotation speed of blade will be in direct proportion to the flow velocity.

Due to the magnetic conductivity of blade, when located in the magnetic field generated by signal detector (made of permanent magnet steel and coils), the rotating blade will cut the magnetic lines and periodically change the flux through the coil, thereby inducing electrical impulse signals at both ends of the coil. the induced signals, after amplified and rectified by amplifier, will form a continuous rectangular impulse wave with certain amplitude which may be remotely transmitted to display instrument indicating the instant flow and the cumulative flow of fluid. within a certain range of flow, the impulse frequency is in direct proportion to the instant flow of fluid flowing through the sensor, which is shown in the equation below:

Wherein:

f	Impulse frequency [Hz];
k	Instrument factor of sensor [1/m^3], which is given by checklist. [1/L] is used as the unit, the equation will be;
Q	Instant flow of liquid (in operation) [m^3/h];
3600	Conversion factor.

Instrument factor of each sensor will be filled out in verification certificate by the manufacturer. the instant flow and cumulative flow will be displayed when the value of k is loaded into associated display instrument.



Size- Flow Range- Connection

Size	Standard Flow Range(m3/h)	Extended Flow Range(m3/h)	Common Connection & Pressure	Customized Pressure
DN4	0.04-0.25	0.04-0.4	Thread/6.3MPa	4-42MPa
DN6	0.1-0.6	0.06-0.6	Thread/6.3MPa	
DN10	0.2-1.2	0.15-1.5	Thread/6.3MPa	
DN15	0.6-6	0.4-8	Thread/6.3MPa	
			Flange/4.0MPa	
DN20	0.8-8	0.45-9	Thread/6.3MPa	
			Flange/4.0MPa	
DN25	1-10	0.5-10	Thread/6.3MPa	
			Flange/4.0MPa	
DN32	1.5-15	0.75-15	Thread/6.3MPa	
			Flange/4.0MPa	
DN40	2-20	1-20	Thread/6.3MPa	
			Flange/4.0MPa	
DN50	4-40	2-40	Thread/6.3MPa	
			Flange/4.0MPa	
DN65	7-70	3.5-70	Thread/1.6MPa	
			Flange/1.6MPa	
DN80	10-100	5-100	Thread/1.6MPa	
			Flange/1.6MPa	
DN100	20-200	10-200	Thread/1.6MPa	
			Flange/1.6MPa	
DN125	25-250	12.5-250	Flange/1.6MPa	
DN150	30-300	15-300	Flange/1.6MPa	
DN200	80-800	40-800	Flange/1.6MPa	
Remark: Tri-clamp connection optional (Size DN4-DN80, pressure 1.6MPa)				

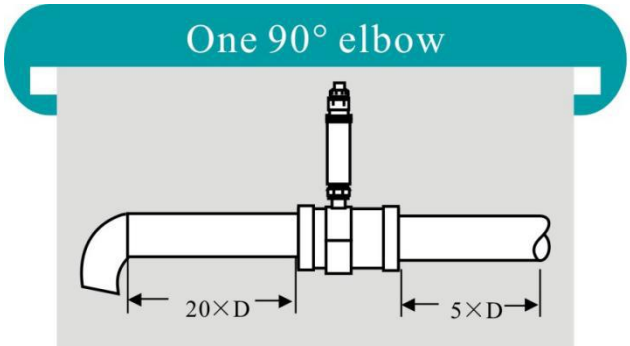
II. Installation Requirements

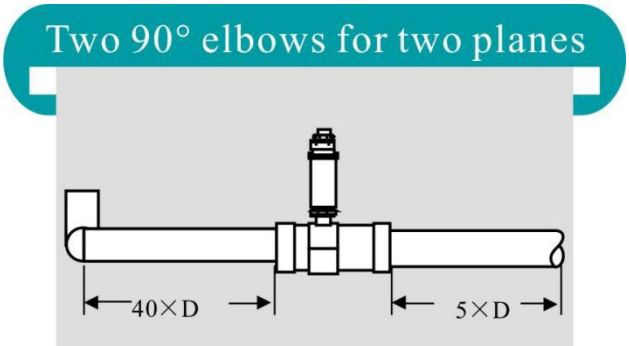
Flow meter may be installed horizontally or vertically. in the latter case the fluid shall be flowing from downward and fulfill the pipe to avoid bubbles; the flowing direction of liquid shall be consistent with the direction indicated by the arrow on casing of the sensor; as far as front and rear straight pipe sections are concerned , at upstream there shall be front straight pipe section at least 10 times of nominal drift diameter in length and at downstream no less than 5 times of nominal drift diameter in length. the internal wall of pipe sections shall be smooth and clean, free of defects such as indent, fouling and peeling. the pipe axis of the sensor shall be aligned with that of the neighboring pipe and the washers used for connection and sealing may not be embedded into depth of the pipe cavity; the sensors shall be kept away from foreign electric field and magnetic field, effective shielding measures shall be taken in case of necessity to avoid external interference.

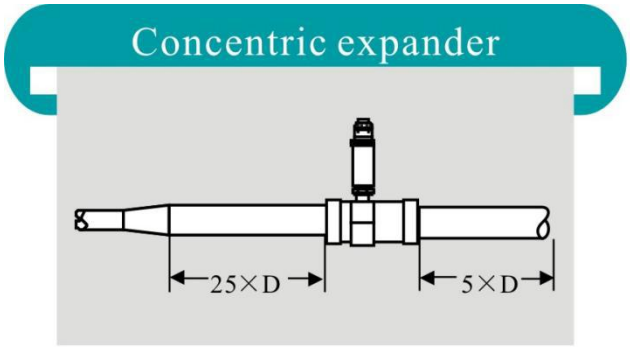
In order that the normal transfer of liquid will not be affected by maintenance, it is recommended that bypass pipes be installed at position of sensor.

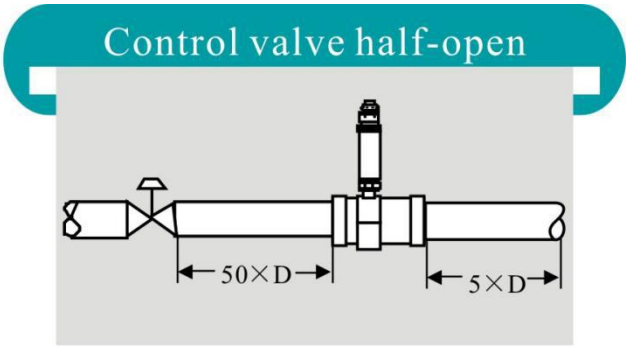
In case of open air installation, water proof measures shall be taken for purpose of amplifier and plug of the sensor. the wiring between sensor and display instrument is shown in Fig. as below.

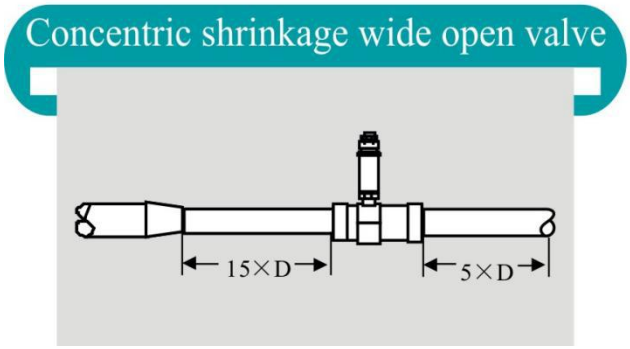
When fluid contains impurities, filter shall be additionally installed. the number of filter screen meshes is determined in accordance with the flow and impurity, normally 20 to 60 meshes. when fluid is mixed with free gases, gas eliminator shall be additionally installed. the complete pipe system shall be well sealed. the user shall fully understand the erosion nature of the measured medium to protect the sensor from being eroded.

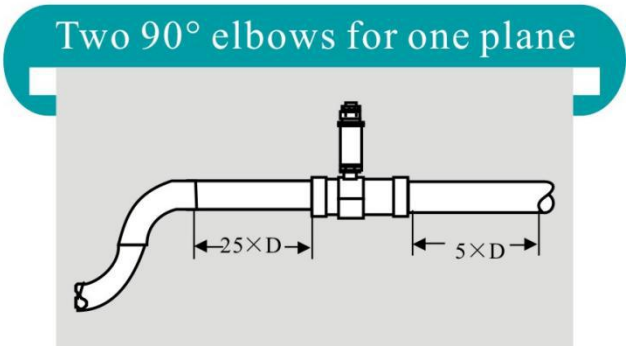












III. Operation

◆ When sensor is used, the liquid to be measured shall be clean and free of impurities such as fiber and granules.

◆ When sensor is used, it shall be at first slowly filled with liquid, then open the outlet valve (which should be installed behind the flow meter). it is prohibited to render the sensor under impact of high-velocity fluid when it is not filled with liquid.

◆ The maintenance interval for sensor is in general half a year. in case of maintenance and cleaning, attention shall be paid not to damage the parts in the measuring cavity, particularly the impeller. during assembly, watch carefully the positional relation between guide part and impeller.

◆ When the sensor will be out of service for a long time, the internal liquid shall be cleaned. after dried, the sensor shall be provided with protection sleeves at both ends to protect against dust and it shall be placed in dry conditions for storage.

◆ The associated filter shall be cleaned on regular basis and the internal liquid shall be cleaned when it is out of service for a long time. similar to sensor, the filter shall also be provided with dust protection and stored in dry conditions.

◆ The transmission wire of sensor may be overhead or buried (iron bushing shall be provided in the latter case).

◆ Prior to installation of sensor, the connection thereof with display instrument or oscilloscope shall be finished. then switch on the power, blow the impeller with

mouth or move the impeller with hand to make it rotate quickly, see if there is any reading. install the sensor if there is reading. in case of no reading, the related sections shall be inspected to eliminate any fault.

1. Parameters

Power Supply: 12~24V DC / 30mA (-20% ~ +15%);
3.6V Lithium battery powered (optional)

01 Three line 4 ~ 20 mA output current linear correction (Iout and GND circuit l oad 600 Ω @ 24 V or less).

02 Programmed pulse output: high level ≥9V (supply voltage -1V);
Low level < 0.5V; NPN open collector output with 2K pull-up resistance.

03 Communication supports RS485 communication of Modbus-RTU protocol.

2. Circuit Description

For this multi-functional electronics, its signal measurement circuit is an adjustable gain amplifier circuit, which can cope with a variety of sensors and complex environments. The filter and protection of the power input are increased, and the reliability and the ability to resist power noise are improved.

Various parameters can be selected through the prompt software menu. After LCD12864 data processing, the signal is transmitted remotely as a 3-wire 4-20mA current signal. In addition, the multi-purpose programmable pulse output signal can be set to a variety of output modes. RS485 communication is also available.

2.1 Pulse Output Mode:

A Signal frequency output: direct real-time output of the probe signal frequency, usually used for instrument calibration.

B Calibration frequency output: the output of the real-time monitoring signal after correction according to the flow coefficient.

C Frequency output: the frequency after the conversion is output, and the frequency value is calculated linearly according to the 1000Hz output of the

full-degree flow.

D Pulse output: output converted pulse, the number of Pulse is calculated according to the cumulative flow of each calculation cycle divided by the pulse equivalent, the maximum of each calculation cycle is allowed to output only 1000 pulses, if the actual number of pulses in the calculation cycle is greater than 1000, the automatic accumulation to the next calculation cycle output; at the minimum, only 4 pulses are allowed to be output per cycle. if the actual number of pulses in the calculation period is less than 4 pulses, it will be automatically accumulated to the output of the next calculation cycle. the effective level of the output pulse is high. Note: the engineer should set the appropriate pulse equivalent factor according to the current applicable object.

E Upper limit alarm output:higher than the set alarm flow output, when the alarm output transistor leads to the ground is low level; when output transistor is cut off, the pull-up resistance makes the terminal high.

F Lower limit alarm output： lower than the set alarm flow output, when the alarm output transistor conduction to the ground is low level; when the output transistor is cut off, the pull-up resistance makes the terminal high.

2.2 Current output:

The current is linear from Iout output 4-20mA to GND, and the output range is [4-22.4]mA. when the instantaneous flow is less than or equal to the lower cut flow, or when the signal frequency is 0, the 4mA current is output. in other cases, the output current value is calculated linearly according to the cut flow output of 4mA and the full flow output of 20mA. if the calculated current value exceeds 22.4mA, the maximum output is 22.4mA.

2.3 Modbus communication function:

The transmitter supports communication with Modbus 4800 and 9600 baud rates. through the No.03 command of Modbus-RTU protocol (read and maintain register), the transmitter dynamically reads various parameters of real-time operation of the instrument, and the response time is within 50mS. Modbus continuous command interval minimum 100mS;

2.4 Operating environment:

Due to different ambient temperatures, the display response speed of LCD screen also changes. if the LCD refresh speed is too fast at low temperature, the display will not be clear. using the “ambient temperature” option in the engineer menu, set

and select the refresh speed of the LCD screen to refresh down to 8 seconds, which can be used at low temperature. -20℃

3. Circuit Wiring

3.1 Main power supply and output signal terminal (middle 4-bit large hanging frame terminal)

Iout	GND	Fout	V +

“Iout”	4~20mA current output terminal. flow from the output current Iout flowed to the computer or display table of 10-250 Ω sampling resistor, after sampling resistance and negative class, flow back to the power supply “-” side.
“GND”	Connect 12-24V power “-”end.
“Fout”	The output end of the pulse signal. the output of the flow-related pulse signal is an NPN open collector output containing 2K pull-up resistance. the high level is the power supply voltage of -1V, and the low level is less than 0.5V. namely the VH = Vi - 1; VL < 0.5 V.
“V+”	Connect the “+” end of 12-24V power supply.

3.2 Left communication line (2-bit low-end sub)

B -	A +

“B-”	Connect to the “B-” end of 485 communication.
“A+”	Connect the “A+” end of 485 communication.

3.3 Lower battery connection (2-bit low terminal)

-3V	3V6

“-3V6”	Connect 3.6V lithium battery “ - ” terminal.
“3V6+”	Connect 3.6V lithium battery “+” terminal.

Generally, it is recommended to use 3.6V 2# lithium battery; the power consumption of the meter is less than 0.7mA (when there is no RS485), the power consumption is increased by 0.2-0.6mA when there is RS485; A 7Ah 2# lithium battery can be used for more than one year.
The nearby switch only controls whether the 3.6V lithium battery supplies power to the circuit. when It is“ON”, the circuit is connected, or it will cut off the path between the battery and the circuit. the battery power and the external power supply connected to V+ can automatically switch (dual power supplies). when it is battery powered, the current and pulse output signal are automatically cut off, and the output is automatically restored when there is external power.
RS485 communication is allowed when the battery is powered, but in order to save power consumption, it is recommended to increase the communication interval time.

4. Flow Meter Working Interface

The working interface of the flowmeter includes two interfaces, one is the main interface and the other is the auxiliary interface. As shown in figure:

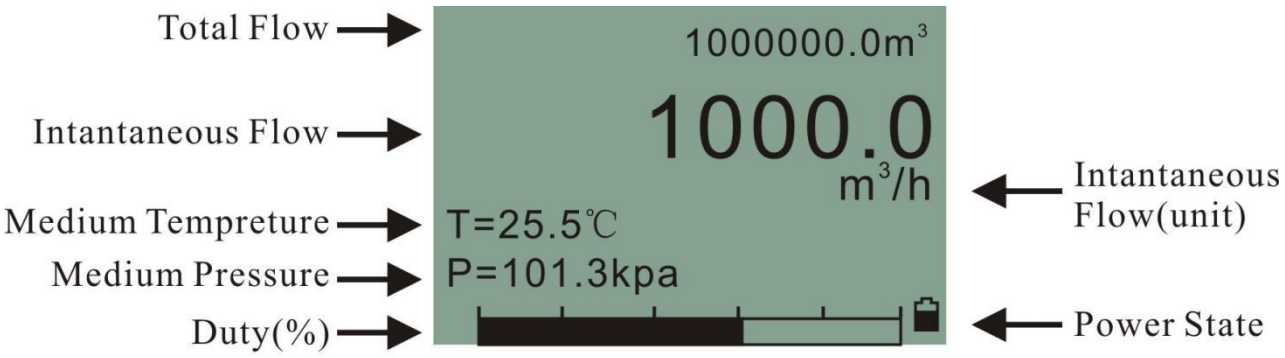


Figure 1 Main Working Interface

✧ The “plug” pattern in the power supply mode indicates that the external power supply is

provided; Display the “battery” pattern to indicate it is battery powered currently.

- ✧ When T temperature and P pressure are shown as “=”, it means that the current temperature and pressure are measured values.
- ✧ When T temperature and P pressure are displayed as “≡”, the default value of current temperature and pressure is used. Please note that if there is “u” or “d” after T/P, it is necessary to check whether the sensor is abnormal!
- ✧ When the identity of T(temperature) is “Tu≡”, it means the upper limit of the measurement temperature exceeding 500 ℃. at this time, the temperature is fixed at the setting value of “default temperature” in the engineer menu.
- ✧ when T temperature's identity scale is “Td≡”, it indicates the lower limit of the measurement temperature exceeding -200 degrees, and then the temperature is fixed at the setting value of “default temperature” in the engineer menu.
- ✧ When the identity scale of P pressure is “Pd≡”, the measured pressure is lower than -101.3kPa. at this time, the pressure is fixed at the “default pressure” setting in the engineer menu.
- ✧ When the identity scale of P pressure is “Pu≡”, it means that the measuring pressure exceeds the upper limit by double the range (the range is the difference between the upper limit of pressure and the lower limit of pressure), then the pressure is fixed at the setting value of “default pressure” in the engineer menu.

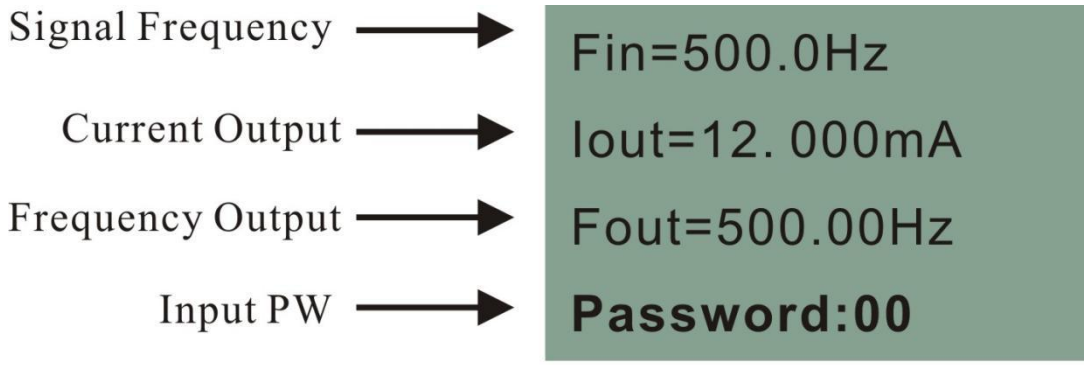


Figure 2 Auxiliary Working Interface

In the auxiliary interface, different names of signal frequency lines represent different running states.

▲ Fin - normal signal frequency

▲ FinC5 - the signal belongs to 50Hz noise, the output is cut out, and the flow rate is not calculated

In the auxiliary interface, different names of output frequency lines represent different output states.

▲ F_bas - basic signal output, that is according to the measured signal frequency output

▲ F_adj - calibration output, calibration output by multi-point K value detailed

algorithm see the following section

▲ F_out - Line frequency output. according to the measured signal, calculate the output signal of a certain frequency.

Signal frequency =(instantaneous flow / full flow) * 1000 (Hz)

▲ Pulse - Pulse output, the number of output pulses calculated according to the “Pulse factor” in the menu

▲ H-AL=0 - high alarm not generated

▲ L-AL=0 - low alarm not generated

▲ H-AL=1 - high alarm is generated

▲ L-AL=1 - low alarm is generated

▲ NO - the current output is invalid

In the auxiliary interface, the value behind the output current line is the actual output current value in the power supply mode; in the battery power supply mode, it is fixedly displayed as 0.0 (because there is no current output at this time).

Switch between main interface and auxiliary interface by pressing **‘+/S’** left key and **‘</E’** right key. **The left button**“+” is for page down, long press left button is to exit (S). **Right key** < is for page up, long press right button is to enter and confirm (E).

In the auxiliary interface, long press **‘</E’ right** key to enter the password input state. The user can select the password number that needs to be entered at the current input position by continuously pressing the ‘+/S’ key, and press the ‘</E’ key to move the input cursor position.

After entering the 2-digit password, long press ‘</E’ to enter the function setting list corresponding to the password; in the password input state, long press the ‘+/S’ key to return to the auxiliary interface and continue to update the displayed measurement value.

About the refresh speed of the main work interface and auxiliary work interface. In the engineer menu, there is an "ambient temperature" setting item. **In the external power supply mode, if you select -10℃, refresh every 1.2 seconds; if you choose -20℃, refresh every 8 seconds; In battery power mode, refresh every 4 seconds .**

5. Flowmeter Parameter Setting Menu

The flowmeter menu includes four groups: user menu, engineer menu, manufacturing menu, and setting menu. Among them, the engineer menu must be set by the operator with professional knowledge to set the menu content. **The setup menu and manufacturing menu** are set and calibrated by the factory when the flowmeter is out of the field. After leaving the factory, **the parameter settings of this type must be modified under the condition of the corresponding equipment, otherwise it will cause the flowmeter to measure errors or become invalid!**

In the menu, long press the'</E' key to enter the parameter modification state of the selected item, if it is a numeric input type parameter, enter the number through the'+/S' key, and move the

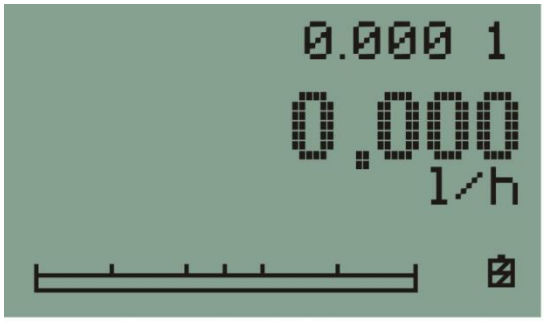
cursor position with the'</E' key. After the input is completed Long press the'</E' key to confirm the input, and the transmitter will automatically update the setting parameters and store them; if the parameter is an option type, scroll up and down the option through'+/S' or'</E', after selecting the content, Long press the'</E' key to confirm, the transmitter will automatically update the setting parameters and store them.

5.1 Enter the password “22” in the user menu to enter the user menu. the functions and parameters of each menu are as follows

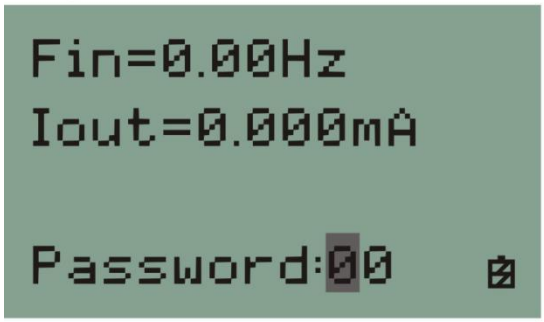
Number	The name of the menu	Functional specifications
1	Q Unit m3/h	Set the instantaneous flow unit and select it according to the type of flow algorithm Optional: volume: m3/h; m3/m; L/h; L/m;SG/h; SG/m Quality: t/h; t/m;Kg/h;Kg/m;lb/h;lb/m
2	Q Mode Qvw actual	The flow algorithm is set and the meter compensates the instantaneous flow according to the algorithm Optional: Qvw actual: Conventional volume flow (flow rate in liquid conditions) Qm: Conventional mass flow (operating condition density must be set) Special Mode: (for user customization)
3	K Factor default is 3600.0	The flow meter coefficient required when calculating the flow rate. the unit is P/m3, (pulse/square)
4	Density [kg/m3] default is 1000.0	Suppose the density value of the fluid, unit kg/m3(0 is not allowed)
5	20mA default is 1000.0	Set the instantaneous flow corresponding to the 20mA current output (not allowed to be set to 0). the units are the same as those selected flow unit.

6	Q cut-Zero default is 0.0%	Set the percentage of full-scale flow occupied by the cut-off flow. when the measured flow rate is lower than this percentage value, the calculated flow rate will be 0 and a 4mA current will be output.
7	Q Up Al m3/h default is 990.0	Set the upper limit of alarm flow threshold, when the flow is higher than this value, the output alarm. The unit is the same as the selected unit.
8	Q Dn Al m3/h default is 10.0	Set the lower limit of alarm flow threshold, when the flow is lower than this value, the output alarm. the unit is the same as the selected unit.
9	Damp S [S] default is 4	Value of 2~32 seconds for display and current output smoothing. the default value is: 4 seconds
10	Comm Address default is 0	Set the device address of the Modbus RTU RS485. the default value of range 0-254, the default setting is 0.
11	Clear Q Enter	Clear the accumulative amount to 0, and the password is: “70”

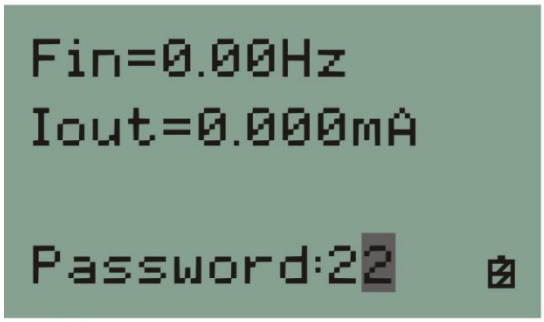
1: Flow rate unit setting.



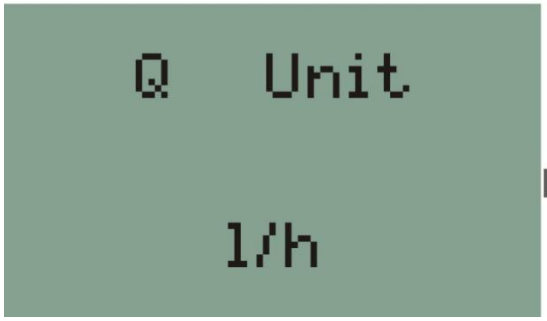
Press the left button and then
Press the right button
a few seconds to enter.



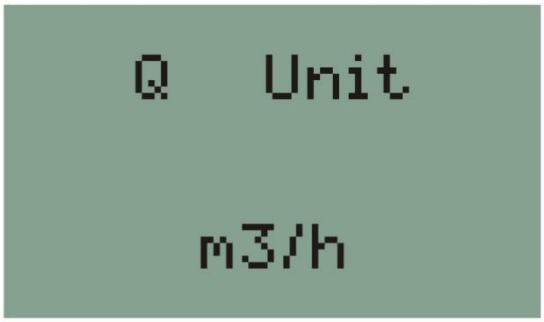
Passward is 22.



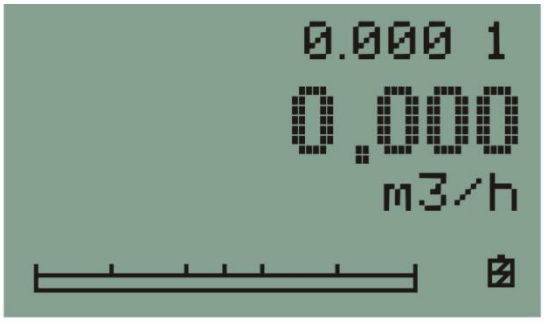
And then press the right
button and enter the Q unit.



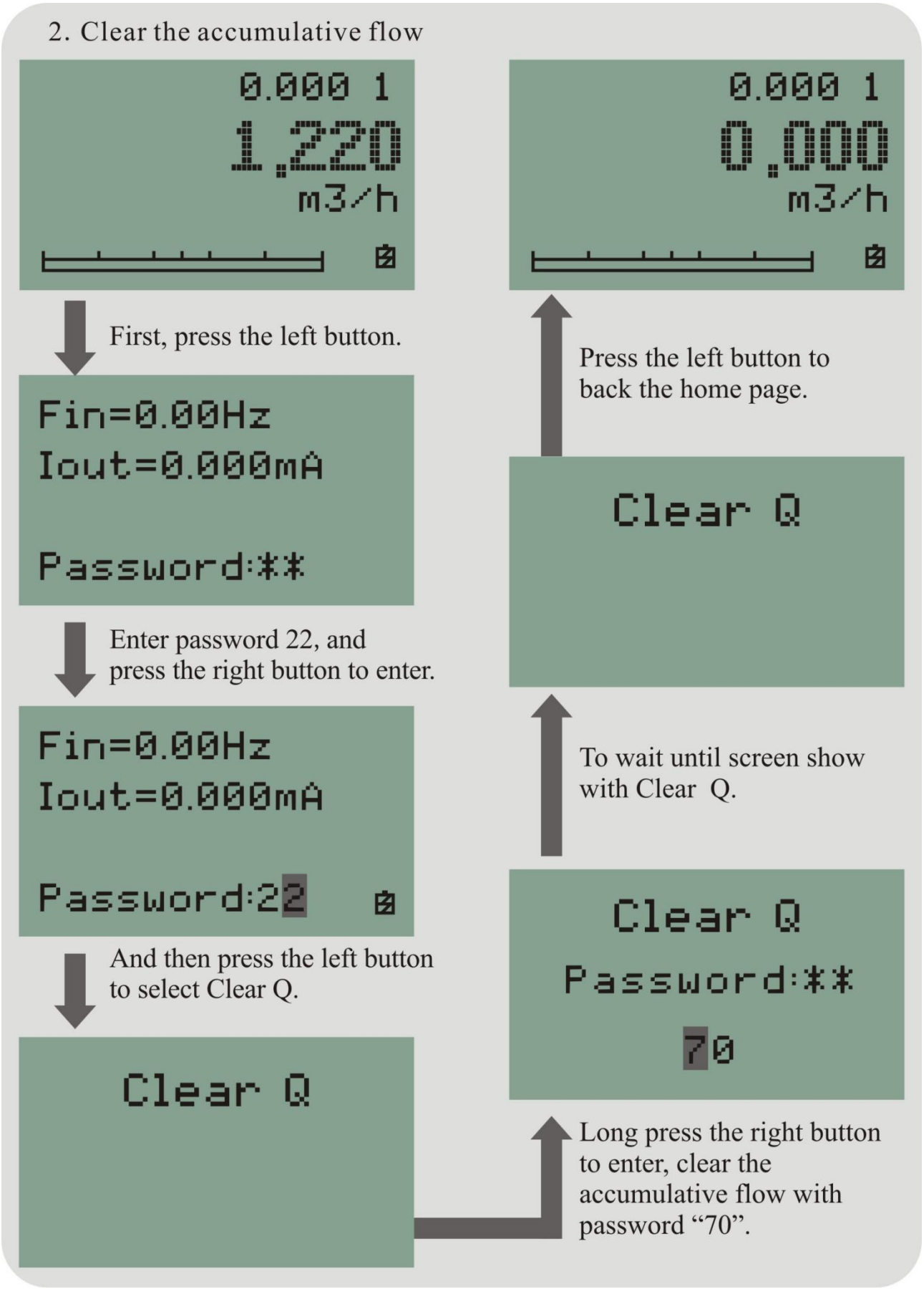
Press the left button,
Volume flow unit: m^3/h,
m^3/m, L/h, L/m, SG/h, SG/m
Mass flow unit: t/h, t/m, kg/h,
kg/m, lb/h, lb/m
For example, if you need
m^3/h, press the right button
a few seconds to save the
selection.



and then press the left button to
go back the homepage, the
flow unit will display m^3/h.



2. Clear the accumulative flow



5.2 Engineer Menu:

Password input state, enter “33” password to enter the engineer menu. the function and parameter meanings of each menu are as follows:

Number	The name of the	Functional specifications
1	Language ENGLISH	Set the instrument language type Optional: Chinese; English
2	Pulse Type F_bas	Select the output type according to the requirements, each output detail key main interface explanation. Optional: F_bas: The signal frequency of the measuring sensor (unmodified) F_adj: Frequency output after correction by 5 point coefficient F_out: Output linear frequency of 0-1000Hz accordin to flow range Pulse: Accumulates the pulse with output flow of selected pulse factor H-AL: Press the upper limit of alarm to output the signal of alarm switch L-AL: Press lower limit to output alarm switch signal
3	Pulse Factor default is 0.01	Valid only for equivalent pulse outputs, meaning how many cumulative flow units per pulse represents Optional: 0.00001; 0.0001; 0.001; 0.01; 0.1; 1.0; 10.0; 100.0
4	Comm Param default is 9600,No	Modbus RTU RS485 baud rate. Optional: 4800 Odd; 4800 Even; 4800 No; 9600 Odd; 9600 Even; 9600 No;
5	Comm. Switch default is on	Set whether Modbus communication function is enabled. Optional: OFF; ON

6	P_display default is OFF	Sets whether the fluid pressure is displayed. Optional: Measure: shows the pressure value by the measured pressure signal Deft: “P≡” displays the value of the default pressure item set in the following menu and is used for calculation Calculate: “P≈” shows the pressure of the calculated value Off: no pressure item is displayed
7	P0-Ref P0=[kPa] default is 101.32	Set the pressure value at the reference end, which is used for the high-altitude correction when the gauge pressure sensor calculates the absolute pressure. The absolute pressure sensor should be set to 0.0KPa
8	Tn [℃] default is 0.0℃	Set the calculation value of the standard temperature. Optional: 0℃; 20℃
9	Environ-T default is -10℃	For different environments to select the LCD refresh rate. Optional: -10℃: when “-10℃” is selected in normal environment the working interface will refresh every 1.2 seconds -20℃: when the low temperature environment is set “-20℃”, the working interface will refresh every 6 seconds
10	Flow correction factor, default C is 1.00	Flow percentage Qi range 0~120%; flow coefficient Ci range 0.8~1.2 (Ci= standard flow/measured flow) Note: 5 point correction, when making the traffic correction each percentage point increases, and can only occur once, Ci default to 1.0

Table 1 Function Description of Engineer Menu

5.3 Modbus Communication

According to MODBUS-RTU communication protocol, the three-wire transmitter can quickly read the operation parameters in the maintenance register. the Modbus command that reads and maintains the register value is command No.03. Only 4800 and 9600 baud rates are supported, and the response time is within 50mS. Modbus continuous command interval minimum 100 mS.

Table 2 is the offset address and data format of each value in the Modbus

Address Offset	Action Object	Data Format	The Number of Data Bytes
0	The instantaneous flow	Floating point type	4
4	Flow at working condition	Floating point type	4
8	Accumulator low	Integer type	4
12	Accumulator high	Integer type	4
16	Fluid temperature	Floating point type	4
20	Fluid pressure	Floating point type	4
24	Measure frequency	Floating point type	4
28	Output current	Floating point type	4
32	Instantaneous flow unit code	Short integer type	2

Table 2 Modbus Read Hold register Command Resolution

As for the cumulant, the cumulant consists of high and low parts. the low part of the cumulant is a fixed-point integer. after the data is converted to base 10, the high part of the cumulant is the integer value of the cumulant divided by the quotient of 1000,000. the calculation formula is:
Cumulant (floating point) = high cumulant (integer) * 1000000.0 + low cumulant (integer) / 1000.0
The accumulative flow unit is the instantaneous flow unit.

For the flow unit code, the flow unit is the physical unit obtained by the flow unit code value with 0-7 or 0-11.
For details of Modbus command and message format, please refer to protocol specification such as Modbus white paper.

5.4 FAQ

5.4.1 Flow correction coefficient and flow coefficient correction:

Flow correction coefficient is in the flow calculation according to the basic formula to calculate the working condition of the flow by the flow correction coefficient to calculate the correction. the correction coefficient is usually set as the percentage of the target relative to the full-degree flow. correction coefficient C= standard flow/measured flow value without correction. the points are interpolated linearly. without correction, C=1, and the correction value is limited to the range of 0.8-1.2. Only for flow, linear frequency and current.

Flow coefficient correction is the linear correction calculation of flow meter coefficient. the correction usually first sets the average instrument coefficient K in the user menu, and then sets the frequency point to the calibration frequency of the instrument according to the standard fixed point. input the flow coefficient of the corresponding frequency point. the points are normalized to the average instrument coefficient by linear interpolation. Set “off” when it is not corrected. It is effective for correction of frequency& flow and linear frequency &current.

5.4.2 Pulse output type and usage:

The signal pulse in the pulse output type is to track the output of the original signal pulse and is usually used for initial calibration. the correction frequency is the corrected signal frequency output linearly corrected according to the flow coefficient. the linear frequency output of 0-1000hz is the output frequency corresponding to the instantaneous flow rate, and the output frequency is 1000Hz at the full flow rate. the correction coefficient C value linear correction and compensation calculation are effective for the frequency output, which is usually used to measure the computer channel of frequency input. the pulse output is calculated according to the cumulative flow, and there are maximum and minimum limits on the output value of each calculation period.

5.4.3 Pulse equivalent:

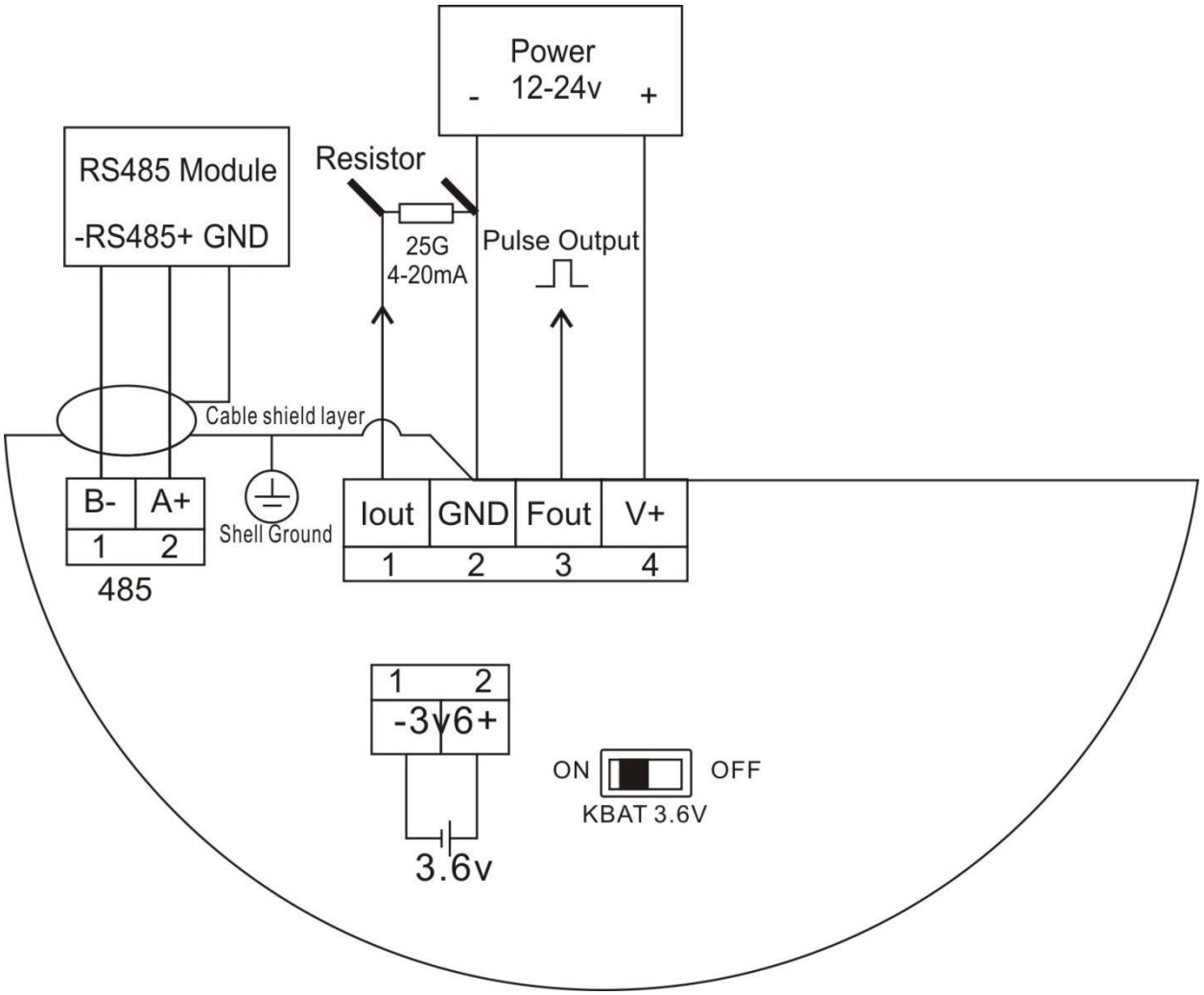
The pulse equivalent is the output factor and its value is the flow unit/pulse. that is, how many units of flow does each pulse represent? Its value must be kept within 1000 pulses per measurement period.

5.4.4 Selection of ambient temperature:

Due to the LCD screen responds slowly at low temperatures, it can't be seen clearly, so when the environment is lower -10℃, you can choose -20℃ to make the screen update about 6 seconds, so that the low temperature can see the data. at higher -10℃ you can optionally -10℃ restore the display to the normal update interval of 2 seconds.

5.4.5 Calibration of output current:
For the calibration of output current, the standard ammeter shall be connected to the current circuit in series. after the corresponding mA item is confirmed by pressing the “E” key, the current output of approximate value shall be obtained. at this time, the calibration shall be completed after the actual display value of ammeter is input and confirmed. 4/12/20 Usually three calibration points should be carried out each time.

6. Wiring Diagram



SMERI s.r.l.
Via Mario Idiomi, 3/13
I - 20057 Assago (MI)
Tel. +39 02 539 8941
E-mail smeri@smeri.com
www.smeri-international.com