VT3W-XXA Mixed Signal Processing

Instruction for Vortex Flowmeter Circuit V200329

directory

The chart

form

1. Circuit parameters of Flow Meter

Power supply: 12~24VDC/30mA(-20%~+15%);**Internal 3V6 lithium battery both switch automatically.**

(1) Three line 4 ~ 20 mA output current linear correction (Iout and GND circuit load 500 Ω @ 24V or less).

(2) Programmed Pulse output: high level ≥9V (supply voltage -1V);Low level < 0.5V; NPN Open Collector Output with 2K Pull-up resistance.

(3) Temperature measurement support Pt100 and Pt1000 software selection.

(4) Pressure measurement supports the selection of Silicon piezoresistive pressure sensor under 3K5 and 4-20mA Pressure Transmitter jumper.

(5) Communication supports 485 Communication of ModBus-RTU protocol.

2. Circuit description

VT3W-XXA Three-wire new third-generation Vortex Flowmeter Circuit, its Signal measurement circuit is an improved classical analog amplifying filter circuit, and it can calculate the frequency according to FFT Digital Signal Processing. The Fixed filter dual-mode Mixed Signal Processing circuit can calculate the frequency according to FFT Digital Signal Processing. It can not only trigger the frequency measurement according to the classical comparator, but also calculate the frequency according to FFT Digital Processing.Added to deal with a variety of complex on-site environment means.The new analog amplifying and filtering front-end circuit increases the input impedance and reduces the waveform distortion at the low frequency end.K1 was reduced to 6 bits by, and the filter capacitance parameters of K2 and K3 were adjusted according to the **1-2-5-10** rate, taking into account dn15-20, so as to make it more suitable for gas measurement of small diameter below DN25. However, the filtering of DN350 is slightly weakened.At the same time, the symmetry of K2 and K3 is conducive to synchronous adjustment. The pulse output circuit is improved and its adaptability to high frequency and output drive is improved.The filter and protection of the power input are added, and the reliability and anti-power noise capability are improved.

Circuit can be set by 12864 LCD Chinese/English prompt software menu measurement section (in digital mode).Signal far - transmission circuit can be Three-wire 4-20mA Output current signal.In addition, a Multi-Purpose Programmable Pulse Output signal, can be set for a variety of output modes.MODBUS485-RTU communication is also available.

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 count out: output converted pulse, the number of pulses 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 alarm, when the alarm output transistor leads to the ground is low level;When the 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 alarm, 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）Current output:

The current output is linear 4-20mA, 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.

3） ModBus communication function:

The transmitter supports communication with Modbus's 4800 and 9600 baud rates. Through the No.3 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;

4） Operating environment:

At low temperature, if the LCD refresh speed is too fast, the display will be unclear.Using the "ambient temperature" option in the engineer menu, set the refresh rate of the selected LCD screen to be usable at low temperature.-20℃

5） Frequency band selection:

According to the frequency range of vortex signal, 16 frequency bands are divided into: 1.6-45Hz, 2.4-65Hz, 3.6-90Hz, 4.8-120Hz, 6.4-160Hz, 8.8-220Hz, 11-275Hz, 14-350Hz, 18-450Hz, 22-550Hz, 28-700Hz, 18-450Hz, 22-550Hz, 28-700Hz, 34-850Hz, 42-1300Hz, 64-1600Hz, 96-2400Hz.The user can set the appropriate frequency band in the production setup menu according to the usage object.**Note that if the frequency range is not set correctly, the transmitter will not work properly.**

6） Menu of instrument production Settings:

In the production setting menu, various mode parameters such as signal gain, signal cutting peak-to-peak voltage, 50Hz cutting switch, strong anti-interference mode, signal filtering can be set. Wrong production parameter setting will reduce the performance of the instrument.Therefore, the production Settings menu must be professional staff can operate!

3. Circuit wiring

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

Iout	GND	Fout	V +

"Iout" : is 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" : is 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.

（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） Right temperature-voltage connection (6-bit low-end sub)

TRH	TRL	PIH	PVH	PVL	PIL

TRH and TRL are connected to the ends of Pt100 or Pt1000 platinum resistance.
Select Pt100 or Pt1000 from the engineer menu in "33" for internal software.

Pressure transmitter can be connected when both jumper wires are on the left "mA" :
At this time, the main terminal "V+" leads the line to the "+" end of the pressure

transmitter, and the "-" end of the pressure transmitter is connected to PVH.
Pressure sensor can be connected when both jumper wires are on the right "R-B" :

PIH and PIL's 200uA constant current source is divided into IN + and IN - of the pressure sensor; MV outputs VO+ and VO- of PVH and PVL splitter pressure sensing. Normally, a silicon piezoresistive sensor is used, which requires the equivalent resistance of the bridge to be less than 3K5 and the sensitivity to be greater than 25mV/mA.

（4） Lower battery connection (2-bit low-end sub)

- 3 v6	3 v6 +

"-3V6: connect the 3.6V lithium battery" - "end".

"3V6+" : connect 3.6V lithium battery "+" terminal.

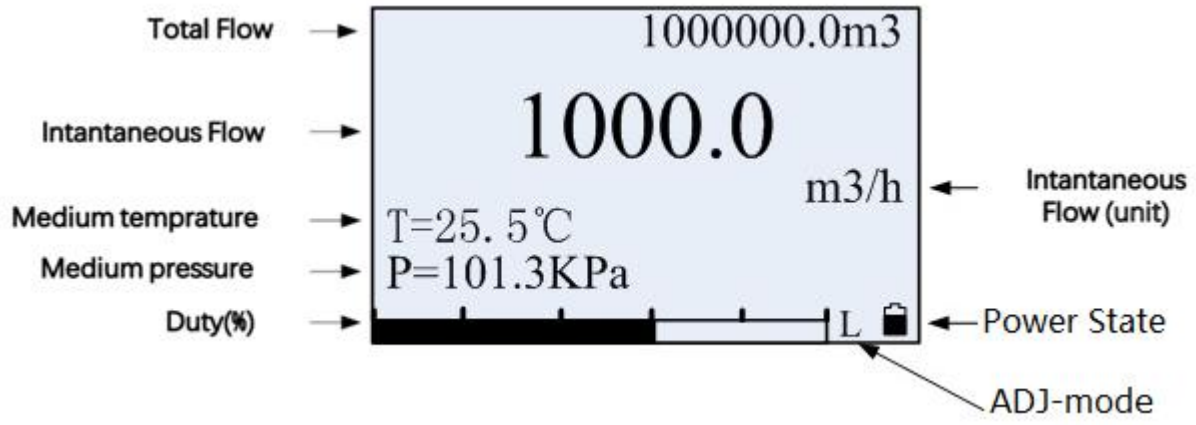
Generally, 3.6V 2# lithium battery is used, and the power consumption of the battery is less than 0.7mA (no 485); At 485, the power consumption is increased by 0.2-0.5mA. A 7Ah # 2 lithium battery can last more than a year.The nearby switch only controls whether the 3.6V lithium battery supplies power to the circuit. When "ON" is connected to the circuit, "OFF" cuts OFF the passage between the battery and the circuit. The external power supply connected to the battery and V+ can be automatically converted by double power supply.Automatically cut off the current and pulse output signal when the battery is supplied, and automatically resume output when there is external electricity.

485 communication is allowed when the battery is powered, but it is recommended to increase the communication interval in order to save power.

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



Signal comparison mode:

- L= low region 0-1/4; 1/4-1/2 H = high area
- S= narrow = 5%; M= medium = 10% of filter noise; W= width = 15% of filter noise; N: N = closed.

The "plug" pattern in the power supply mode indicates that the current power supply is provided;Display the "battery" pattern to indicate the current battery power supply

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 shown as "≡" after means that the current temperature and pressure are exceeded when measured, the default is used

Set the value, pay attention to the need to troubleshoot whether the sensor is abnormal!

When the T temperature identity is "Tu≡", it means the upper limit of the measurement temperature exceeding 500 degrees. At this time, the temperature is fixed to 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 to the setting value of "default temperature" in the engineer's menu.

When the pressure identity of P is "Pd≡", the measured pressure is lower than -101.3kPa. At this point, the pressure is fixed to the "default pressure" setting in the engineer menu.When the pressure identity scale of P is "Pu≡", it means that the measuring pressure exceeds the upper limit by one times the measuring range (the range is the difference between the upper limit of pressure and the lower limit of pressure), then the pressure is fixed to the setting value of "default pressure" in the engineer menu.

When T temperature or P pressure is "≈", it is the calculated value of reverse-extrapolation showing that the temperature or pressure is steam.

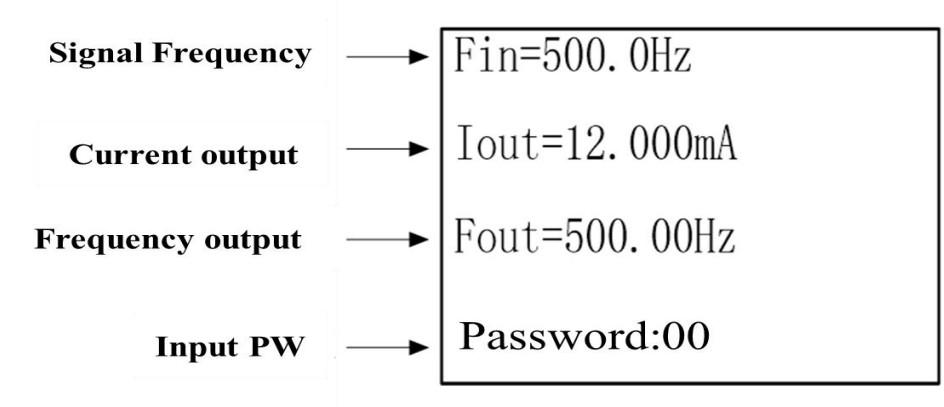


Figure 2 auxiliary working interface

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

- ✧ Fin - normal signal frequency
- ✧ FinCV - the signal amplitude is weak, the output is cut, and the flow is not calculated
- ✧ FinC5 - the signal belongs to 50Hz noise, the output is cut out, and the flow is not calculated
- ✧ FinFL - the signal is below the band range and the output is cut out
- ✧ FinFH - the signal is higher than the band range and the output is cut off
- ✧ FinSL - the signal wave number is too low, the output is cut, the flow is not calculated
- ✧ FinSM - the signal waves through the clutter, the output is cut off, the flow is not calculated
- ✧ FinCS - the signal feature belongs to the noise, the output is cut off, and the flow is not calculated

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

- ◆ F_bas - basic signal output, 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 - 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 is not generated; H-AL=1 - high alarm is generated
- L-al =0 - low alarm has not been generated; L-AL=1 - low alarm is generated
- NO - the current output is invalid

In the auxiliary interface, the value after the output current, in the power supply mode, is the actual output current value; Fixed display 0.0 in battery power mode (because there is no current output)

Switch between the main interface and the auxiliary interface by pressing the '+/S' left button and the '</E' right button.

Left key is + and next page, long press S to exit. Right-click < and page up, long press E to enter and confirm.

In the auxiliary interface, long press the '</E' left key to enter the password input state.The user can continue to press the '+/S' key to select the password number needed for the current input position, and press the '</E' key to move the input cursor position.After typing 2 passwords, long press '</E' to enter the function setting menu 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 display metering value.

About the refresh rate of the main work interface and the auxiliary work interface. In the engineer menu, there is the setting item of "ambient temperature". In the power-supply mode, if selected"**-10°C"**, it will refresh once every 1.2 seconds. If selected"**-20°C"**, refresh every 8 seconds; **In battery mode, refresh every 4 seconds.**

5. Flowmeter parameter setting menu

The flow meter menu includes user menu, engineer menu, manufacture menu and setup menu.Among them, the engineer menu must have professional knowledge of the operator to

set the menu content.**The setting menu and the manufacturing menu are set and calibrated by the factory when the flowmeter goes out. Only when there is the corresponding equipment can the parameter setting be modified, otherwise the flowmeter will be wrong or invalid!**

In the menu, long press the '< /E' key to enter the state of parameter modification of the selected item. If it is a parameter of numeric input type, enter the number through the '+/S' key, and '< /E' key to move the input cursor position.If the parameter is a selector type, then '+/S' or '< /E' can be used to scroll down the selection item. After selecting the content, long press the '< /E' key to confirm, and the transmitter will automatically update the setting parameter and store it. **Enter the password "61" to check the version number**

The user menu

Enter the password "22" to enter the user menu.

The functions and parameters of each menu are as follows

Serial 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 Quality: t/h; t/m; Kg/h; Kg/m
2	Q Mode **Qvw actual**	0: **Qvw actual** Actual volume flow (non-gas or liquid) 1: **Qm[dw]** mass flow(working condition density) 2: **Qvn[@TnPn]** standard gas volume flow 3: **Qmg[dn@TnPn]** mass flow of gas (standard density) 4:**Qm steam[T]** steam temperature compensation 5: **Qm steam[P]** steam pressure compensation 6: **Qm steam[T&P]** temperature and pressure Compensation of superheated steam **7: Special Mode (for user customization)**
3	Q Factor K [P/m3] **XXX. XXXXXXXX**	The flow meter coefficient required to calculate the flow. **The default is:3600.0, not to be 0;** The unit is P/m3, (pulse / m3)
4	Density [kg/m3] **XXXX. XXXX**	Suppose the density value of the fluid, **The default is: 1000.0** unit kg/m3 (0 is not allowed)
5	Q20mA m3/h **XXXXXX. XX**	Set the instantaneous flow corresponding to the 20mA current output (not allowed to be set to 0). **The default is: 1000.0**

		The units are the same as those selected in the unit selection
6	Q cut-Zero [%] **XX. X**	The percentage of the cutting flow in the full-degree flow is set. When the measured flow is lower than this percentage value, the calculated flow is 0 and the 4mA current is output. **default is: 0%**
7	Q Up Al m3/h **XXXXXX. XX**	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. **The default value is: 990.0**
8	Q Dn Al m3/h **XXXXXX. XX**	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. **The default value is: 10.0**
9	Damp S [S] **XX**	Value of 2~32 seconds for display and current output smoothing. **The default value is: 4 seconds**
10	Comm Address **0**	Set the device address of the 485Modbus. The default value of range 0-254 is: **0**
11	Clear Q **Enter** password XX	Clear the accumulative amount to 0 value, and the zeroing password is: "70"

Engineer menu: enter "33" password to enter the engineer menu. The functions and parameter meanings of each menu are as follows:

Serial number	The name of the menu	Functional specifications
1	language English	Set the instrument language type. Optional: Chinese; English **Default: Chinese**
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 according 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 **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 **9600,No**	Set 485 Modbus communication baud rate. Optional: 4800Odd; 4800Even; 4800No; 9600Odd; 9600Even; **9600No**;
5	Comm Switch **on**	Set whether Modbus communication function is enabled. Optional: **OFF;** ON
6	P_display **measure**	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, when the temperature of saturated steam is compensated **Off:** no pressure item is displayed
7	Set PC Pc≡[KPa] **0.00**	Set the default calculated value of gas pressure in KPa. When the sensor fault is selected as the default or when the pressure is measured (when the pressure is over 2 times the range), the equivalent after the home screen P is calculated with this pressure.
8	P0-Ref P0=[kPa] **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
9	T_display **measure**	Sets whether the fluid temperature is displayed. Optional: **Measure:** shows the temperature value calculated from the measured platinum resistance signal **Def:** "T ≡" displays the value of the default temperature item set in the following menu and is used for calculation **Calculate:** "P≈" shows the temperature of the calculated value of the backward calculation when the saturated steam pressure is compensated **Off:** no temperature is displayed
10	**Set Tc** **Tc≡[°C]** **20°C**	Select to set or measure platinum resistance fault (greater than) with this temperature calculation, the main screen T changed to the identity number display 500°C.The unit is °C
11	**T-TYPE** **Pt=1000**	Choose the type of resistance to measure the temperature. Optional: Pt=100**;** **Pt = 1000**

12	**Tn** **[°C]** **0.0 °C**	Set the calculation value of the standard temperature. Optional: **0°C;** 20°C
13	**Environ-T** **-10°C**	For different environments to select the LCD refresh rate. Optional: **-10°C:** when"**-10°C**"is selected in normal environment, the working interface will refresh every 1.2 seconds **-20°C:** when the low temperature environment is set"**-20°C**", the working interface will refresh every 6 seconds
14 14a - 14 j	Q-adj Ci Qi (%) *Q-percent* *Q-fac* *Q0[%]-(C0=X)C0-(Q0=X)* ***15.00*** ***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

Form 2 function description of engineer menu

Setup menu (important menu that directly determines the key performance of the instrument): In the password input state, input "44" to enter. The menu functions and parameter meanings are as follows:

No.	The name of the menu	Functional specifications
1	**Signal-TYPE** **MF: DN40-150 Gas**	Select the signal type. the vortex signal, input capacitance is selected in low frequency LF, medium frequency MF and high frequency HF areas, and the low frequency LF has better anti-interference. Optional: **UF:** DN10-15 cannot be selected temporarily;But reserve. **HF:**DN15-40 Gas for small diameter gas **MF:** DN40-150 Gas **MF:** DN15-40 lqd used for small and medium diameter gas or liquid **LF:** DN200-500 Gas **LF:** DN40-500 iqd used in large diameter gas and liquid **Analog manual circuit: 1-6 bits of K1 should be adjusted according to the reference table.**

2	**Gain** **GB1=OFF|GB1=ON** **G=7|G=8**	Options: **G=1|2;3|4;5|6;7|8;9|10;13|14;** **KSG-4=ON is large.** Select the signal gain.G=3|G=4 good anti-interference; Lower flow can be measured at G=13| at 14 or used for high temperature probes.
3	**VPP limit** **10-1000mV** **default: 100mV**	Set the lower limit voltage value of Vpp resection, unit mV, only valid in digital mode. **For manual operation: the sensitivity SB=2-8 is set by KSG bit by 1+ON=1, 2, 4 at 1-2-3 bit**
4	**Fre-Range** **default:** **7=14-350Hz**	Different frequency bands vortex street signal are selected. Optional: 0=1.6-45Hz 8=18-450Hz 1=2.4-65Hz 9=22-550Hz 2=3.6-90Hz 10=28-700Hz 3=4.8-120Hz 11=34-850Hz 4=6.4-160Hz 12=42-1050Hz 5=8.8-220Hz 13=52-1300Hz 6=11-275Hz 14=64-1600Hz 7=14-350Hz 15=96-2400Hz
5	**Work TYPE** **MANUAL**	Select the way the circuit processing. **Manual - triggered frequency measurement by hardware comparator; DS-frequency calculated by FFT by software.** Optional: manual; DS
6	**An-noise TYPE** **NA**	Select normal or anti- noise working mode. Anti-noise has a wider range of signal excision judgements. Optional: NA; ANS
7	**Signal-Adj-Set** **OFF**	options for setting signal calibration type: Low or High signal area or Measurement noise range%. Optional: LS 0-1/4; HS 1/4-1/2; Filter5%; Filter510%; Filter515%; OFF
8	**50Hz Cut** **ON**	Set whether to turn on the 50Hz excision function Optional: ON; **OFF**
9	**switch** **OFF**	Set the linear correction switch for flow coefficient Optional: **OFF; ON**
10	FREQ FOR DOT 1 Hz K1=3600.00 100.0	Set frequency value of the first correction point, unit Hz;
11	COEF FOR DOT 1 F1=100Hz 3600	Set the modified flow coefficient K1 corresponding to the frequency of the first correction point
12/14/16	FREQ DOT 2/3/4 COEF DOT 2/3/4	et the frequency value of the 2/3/4 correction point, Hz; Set the corrected flow coefficient K2/K3/K4

13/15/17		
18	FREQ FOR DOT 5 Hz K5=3600.00 100.0	Set the frequency value of the 5th correction point, Hz;
19	COEF FOR DOT 5 F5=100Hz 3600	Set the modified flow coefficient K5 corresponding to the frequency of the 5th correction point. END SAVE

Table 3 function description of setting menu

Note: all items in the setting menu have been strictly calibrated or set when the flowmeter leaves the factory. Non-professional personnel or users cannot modify or re-calibrate the items without professional equipment. Otherwise, the flowmeter will be wrong and cannot work.

Production and manufacturing menu: enter the "55" password to enter the production and manufacturing menu. Menu functions and parameter meanings are shown in the following table

No.	The name of the menu	Functional specifications
1	**Init Date Enter Password:XX**	The corresponding type is initialized according to the input password. The input values: **70**: set the parameters of each menu to the initial value and save to EEPROM memory
2	**Adj Pt=100R ADC= 2500.0**	Calibration Pt=100Ω ADC value, connect 100 ohm resistance to perform calibration . Long Press E
3	**Adj Pt=200R ADC= 5000.0**	Calibrate the Pt=200Ω ADC value and perform the calibration after the 200 ohm resistance is connected. Long Press E
4	**Adj Pt=1000R ADC= 6000.0**	Calibration Pt=1000Ω ADC value, connect 1000 ohm resistance to perform calibration . Long Press E
5	**Adj Pt=2000R ADC= 12000.0**	Calibration Pt=2000Ω ADC value, connect 2000 ohm resistance to perform calibration . Long Press E

6	Pmax KPa [KPa] **1600.0**	Set the upper limit value of fluid pressure, that is, set the full degree of pressure measurement
7	Adj Pmax AD ADC = **1000.0**	Adjust the ADC value of the upper limit of pressure. After the pressure is stabilized at the upper limit set value, Long press E for correction
8	Pmin KPa [KPa] **0.0**	Set the lower limit value of fluid pressure, that is, set the zero point of pressure measurement
9	Adj Pmin AD ADC = **10.0**	Adjust the ADC value of the lower limit of pressure, and perform the correction according to E after the pressure is stabilized at the lower limit set value
10	Iout=4mA [mA] 4.005	Calibration of output 4mA current. After confirmation, the actual output current is measured by high precision ammeter. And input the measured value of high precision table in this interface and confirm again.
11	Iout=12mA [mA] 12.023	Calibration of output 4mA current. Long press E for correction , Confirm the actual output current of the transmitter at this time and type it
12	Iout=20mA [mA] 19.875	Calibration of output 20mA current. the actual output current is measured with a high-precision ammeter, and the measured value of the high-precision meter is input at this interface and confirmed again.

Table 5 function description of manufacturing menu

In the menu, after the correction of AD item, the measured ADC value is displayed, and the next operation is prompted. If the current ADC value is used, long press the '< /E' key under "save" to save.If errors or errors are found in the correction value, press the '+/S' key to switch to 'modify', long press the '< /E' key to enter the modified state, enter the corrected ADC value, and then long press the '< /E' key to save."Modify?Press '< /E' to manually modify the length and set the correction value.

Note: each item in the manufacturing menu has been strictly calibrated or set when the flowmeter leaves the factory. The user cannot modify or re-calibrate the items without professional equipment, otherwise the flowmeter will be wrong or metering failure.

. 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, which only reads and maintains register values, is command No.3.Only 4800 and 9600 baud rates are supported, and the response time is within 50mS.Modbus continuous command interval minimum 100mS;

Table 5 is the offset address and data format of each value in the Modbus command

Address offset	Action object	The data format	Number of data bytes
0	The instantaneous flow	Floating point types	4
4	Flow at Working condition	Floating point types	4
8	Accumulator low	Integer types	4
12	Accumulative high	Integer types	4
16	The fluid temperature	Floating point types	4
20	Fluid pressure	Floating point types	4
24	Measure the frequency	Floating point types	4
28	The output current	Floating point types	4
32	Instantaneous flow unit sequence code	Short integer type	2

Table 5 transmitter Modbus read hold register command resolution

On 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-64bit) = high cumulant (integer) * 1000000.0 + low cumulant (integer) / 1000.0

The accumulative flow unit is the instantaneous flow unit.

As for the flow unit code, the flow unit is the physical unit obtained by matching the sequence code value of the flow unit with the following table.

code	0	1	2	3	4	5	6	7
units	m3 / h	m3 / m	l/h	l/m	t/h	t/m	kg/h.	kg/m

Table 6 instantaneous flow unit code table

For details of Modbus command and message format, please refer to protocol specification such as Modbus white paper.

Test point TP0-TP3:

TP3	TP2	TP1	TP0
After hard to trigger	After filtering	signal amplifed	GND

Oscilloscope can be used to observe the signal between TP3-TP1 and TP0=GND or on the circuit board.

The pre-stage amplification waveform was observed at the test point TP1, the waveform after the hardware filtering was observed at TP2, and the square wave output from the hardware was observed at TP3. Each measurement point was only for observation and testing, and the important one was the TP2 waveform.Note that the final output produced by the software will be different from TP3.The final output can be affected by changing the Settings in "33"and"44".

Attachment: troubleshooting

1）Advantages and disadvantages of digital signal processing and analog amplifying circuits:

The advantage of digital signal processing is that the range is measured in a wide range and the signal frequency of the flowmeter can be automatically adjusted to a good working point only if the signal frequency of the flowmeter is roughly known.FFT spectrum analysis was used to analyze the output, so the lower limit frequency fluctuation was small, the flow rate was stable, and the ability to resist impact interference and 50Hz aliasing was strong.The disadvantage is that it is the strongest sine wave as the true signal, so in the valve noise is equal to strong audio interference or equal amplitude and equal period of uniform vibration and strong radio interference, the formation of a strong sine wave in the test section, it is possible to be mismeasured as a flow signal.

The disadvantage of analog amplifying circuit is that it has a narrow range and needs to adjust the fixed filter parameters according to the actual working frequency.The low frequency filtering order is low, but the filtering is insufficient when the clutter is large in the lower limit area, so the lower limit flow fluctuates greatly.The advantage is that amplification, filtering, trigger sensitivity can be manually adjusted and fixed, so in the case of strong interference, usually experienced technicians can always find a compromise parameter to make the interference and signal relationship to an acceptable level, although it is not ideal or unable to work.

Therefore, we suggest that the "manual" mode should be preferred for general conditions and the "DS" digital mode for special cases.

2）Conventional volume flow rate and conventional gas mass flow rate in algorithm selection:

In the algorithm, the conventional volume flow rate refers to the uncompensated flow rate, which is used for liquid or uncompensated gas.The volume flow rate of standard gas is calculated by gaseous equation, while the mass flow rate of conventional gas is calculated by standard volume multiplied by standard density.

3）Operating frequency band selection:

In the signal processing is divided into 16 band, 5 times overlapping 25 times frequency band, to ensure that the instrument has at least 20 times range available.In different frequency bands, the internal software and hardware of the circuit are different in the conditions of sampling, filtering and upper and lower limit excision.**Therefore must use the instrument caliber and the measuring medium correct choice can work normally.**

4）Parameter setting:

When the factory setting is not working normally, the signal processing circuit parameters can be manually adjusted.Set the mV value of the gain and the lower limit time signal, change the operating frequency band, so as to improve the measurement ability of the high temperature probe and the small flow rate or improve the anti-interference performance, but the two are usually adjusted in opposite directions.

5） 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 and 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 not corrected.Effective for correction of frequency and flow and linear frequency and current.

6）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.There are maximum and minimum limits on the output value of the equivalent pulse calculated according to the cumulative flow, and the appropriate pulse equivalent must be selected to make the number of pulses per cycle lower than the limit value of the upper 1000 pulses.**

7）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.

8）Type status of temperature pressure display:

The "=" equal sign of the thermobaric display indicates that the thermobaric display is the measured value.The "congruent" identity indicates that the temperature pressure is displayed as the default value of the setting."≈" means the temperature and pressure display

is the pressure calculated by the temperature or the temperature calculated by the pressure when the saturated steam temperature or pressure compensation algorithm.

9）Selection of ambient temperature:

Due to the slow response of the LCD screen in low temperature can not see, so when the environment is lower you can choose **-20°C** to make the screen update about 6 seconds, so that the low temperature can see the data. **-10°C At higher you can optionally restore the display to the normal update interval of 2 seconds.**

10） Temperature and pressure calibration during production and maintenance:

For temperature calibration, there should be a standard resistance box or a standard resistance corresponding to the calibration value. After the resistance is connected to the corresponding menu, press "E" key to confirm.**If the value is normal, confirm again to save it. For modification, press "+" to change the confirmation prompt to "E" to save after modification.**Pt100 is 100 and 200Ω 2 points. Pt1000 times 1000 and 2000Ω 2 points.

11） 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.

Setting of VT3W analog amplifier filter circuit:

Reference table for parameter setting of vortex flow meter amplifier (liquid)

Dn	Charge amplification K1						The Upper limit K2								The lower limit K3							
mm	1	2	3	4	5	6	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
15	↑		↑	↑		↑					↑						↑					
20	↑		↑	↑		↑						↑			↑	↑	↑					
25	↑	↑	↑	↑	↑	↑						↑						↑				
40	↑	↑	↑	↑	↑	↑							↑		↑	↑	↑	↑				
50	↑	↑	↑	↑	↑	↑							↑						↑			
80	↑	↑	↑	↑	↑	↑							↑					↑	↑			
100	↑	↑	↑	↑	↑	↑							↑							↑		

125	↑	↑	↑	↑	↑	↑						↑	↑							↑	
150	↑	↑	↑	↑	↑	↑						↑	↑						↑	↑	
200		↑	↑		↑	↑					↑	↑	↑						↑	↑	↑	
250		↑	↑		↑	↑					↑	↑	↑						↑	↑	↑	
300		↑	↑		↑	↑								↑								↑
350		↑	↑		↑	↑							↑	↑						↑	↑	↑

10M/180P/390P//10M/180P/390P 1539/723/328.4/153/72.4/32.8/15.9/7.2Hz **159/72.4/33.8/15.9/7.24/3.39/1.6/0.7**Hz

Parameters setting of vortex flow meter amplifier refer to table (gas)

Dn	Charge amplification K1						The Upper limit K2								The lower limit K3							
mm	1	2	3	4	5	6	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
15	↑	↑		↑	↑		↑								↑							
20	↑	↑		↑	↑		↑								↑							
25	↑	↑		↑	↑			↑								↑						
40	↑		↑	↑		↑		↑	↑						↑	↑						
50	↑		↑	↑		↑		↑	↑								↑					
80	↑		↑	↑		↑			↑	↑						↑	↑					
100	↑		↑	↑		↑			↑	↑					↑	↑	↑					
125	↑		↑	↑		↑					↑				↑	↑	↑					
150	↑		↑	↑		↑					↑							↑				
200	↑	↑	↑	↑	↑	↑						↑						↑				
250	↑	↑	↑	↑	↑	↑					↑	↑			↑	↑	↑	↑				
300		↑	↑		↑	↑							↑						↑			
350		↑	↑		↑	↑						↑	↑						↑			

10M/180P/390P//10M/180P/390P 1539/723/328.4/153/72.4/32.8/15.9/7.2Hz **159/72.4/33.8/15.9/7.24/3.39/1.6/0.7**Hz

The arrow up indicates that the switch position is ON, and the switch without the arrow is OFF.**Usually the lower frequency is first determined by the switch K3 value**

Normally the gain GB=7(adjusted between 1-14);Trigger sensitivity SB=4 (adjusted between 2 and 8).

The above table values are for reference only. In actual use, due to the difference in liquid viscosity and gas density, it should be adjusted around this value. When the frequency is low, K2/K3 can be increased synchronously or adjusted to one to three levels in the direction of large diameter.**When the frequency is high, the K2/K3 can be synchronously reduced or to the direction of small diameter to adjust one to three.**

K2 is in the same place as K3, scale over 1/10. K2 is one bit higher than K3, and the range is 1/5. The band can only be moved and compressed, and cannot be widened.

Common Settings in the "44" menu:

1） Common Settings in the "44" Settings menu

Project:	Work TYPE	An-noise TYPE	Signal -Adj-Set	50 Hz Cut	K-LINE ADJ
usually	**manual**	**NA-standar**	**OFF**	**ON**	**OFF**

		d			
optional	DS-digital	ANS-Antinoise		OFF	ON

When the signal is normal, the manual mode has better real-time performance. When the signal is bad, the gain can be adjusted to increase the K2K3 filter and the digital mode can be tried.

The lower limit of the standard mode is low, and the anti-noise can be tried in ds-digital mode when the interference and vibration are large.

Usually cut 50Hz power frequency interference. Only in the case of normal flow error can be set to cut 50Hz as off, not cut 50Hz.

2） In the "44" setting menu, gas application Settings for each caliber : (steam usually increases the frequency band of 1-2 stages)

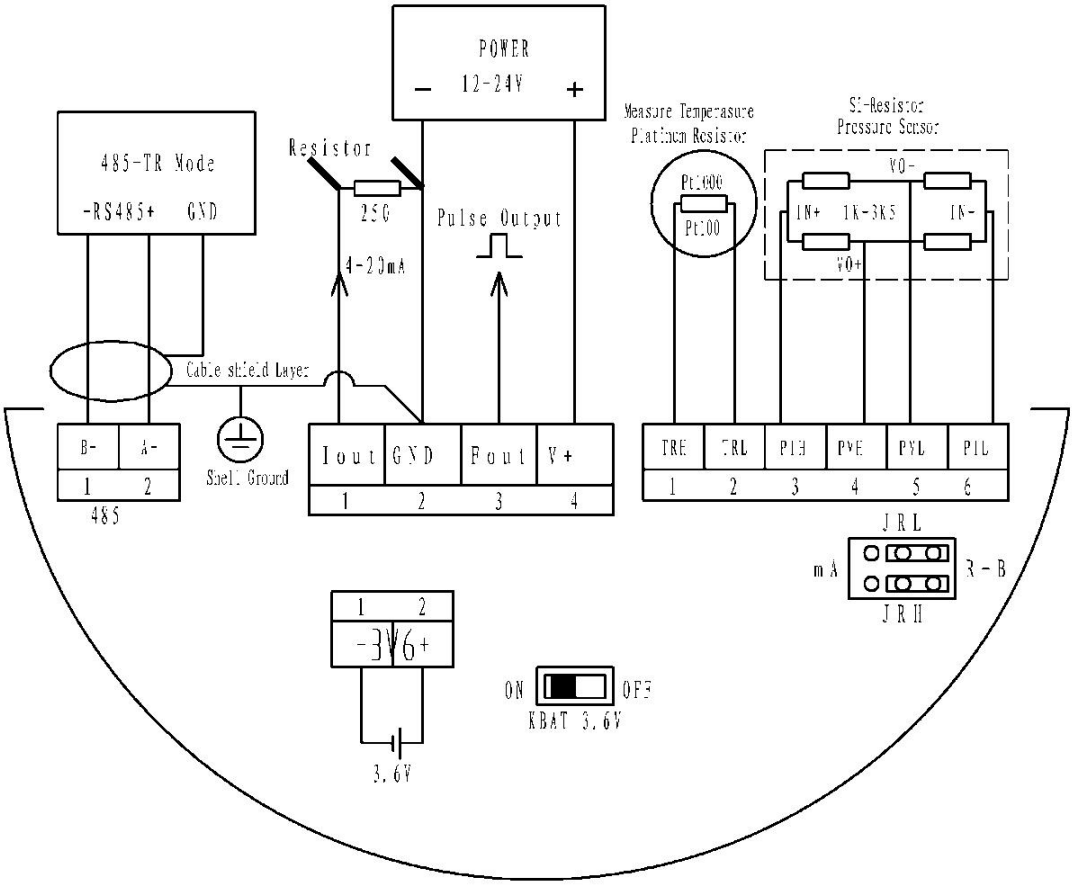
Dn mm	instrument coefficient K(P/m3)	Signal and gain selection		VPP limit	Fre-Range	
		signal -TYPE	**Gain**	(mV)	**No.**	**Signal frequency (Hz)**
15	340000	HF	**10**	50	**15**	**96-2400.**
20	150000	HF	**10**	50	**15**	**96-2400.**
25	76000	HF	**10**	50	**15**	**96-2400.**
32	31000	HF	**10**	50	**14**	**64-1600.**
40	18000	HF	**6**	50	**13**	**52-1300.**
50	9400	MF	**6**	70	**11**	**34-850.**
65	4300	MF	**6**	70	**10**	**28-700.**
80	2280	MF	**6**	100	**9**	**22-550.**
100	1160	MF	**6**	100	**8**	**18-450.**
125	605	MF	**8**	100	**8**	**18-450.**
150	340	MF	**8**	70	**7**	**14-350.**
200	143	MF	**8**	70	**6**	**11-275.**
250	77.6	LF	**10**	70	**5**	**8.8-220.**
300	42.8	LF	**10**	70	**4**	**6.4-160.**
350	26.7	LF	**13**	70	**3**	**4.8-120.**
400	17.7	LF	**13**	70	**3**	**4.8-120.**

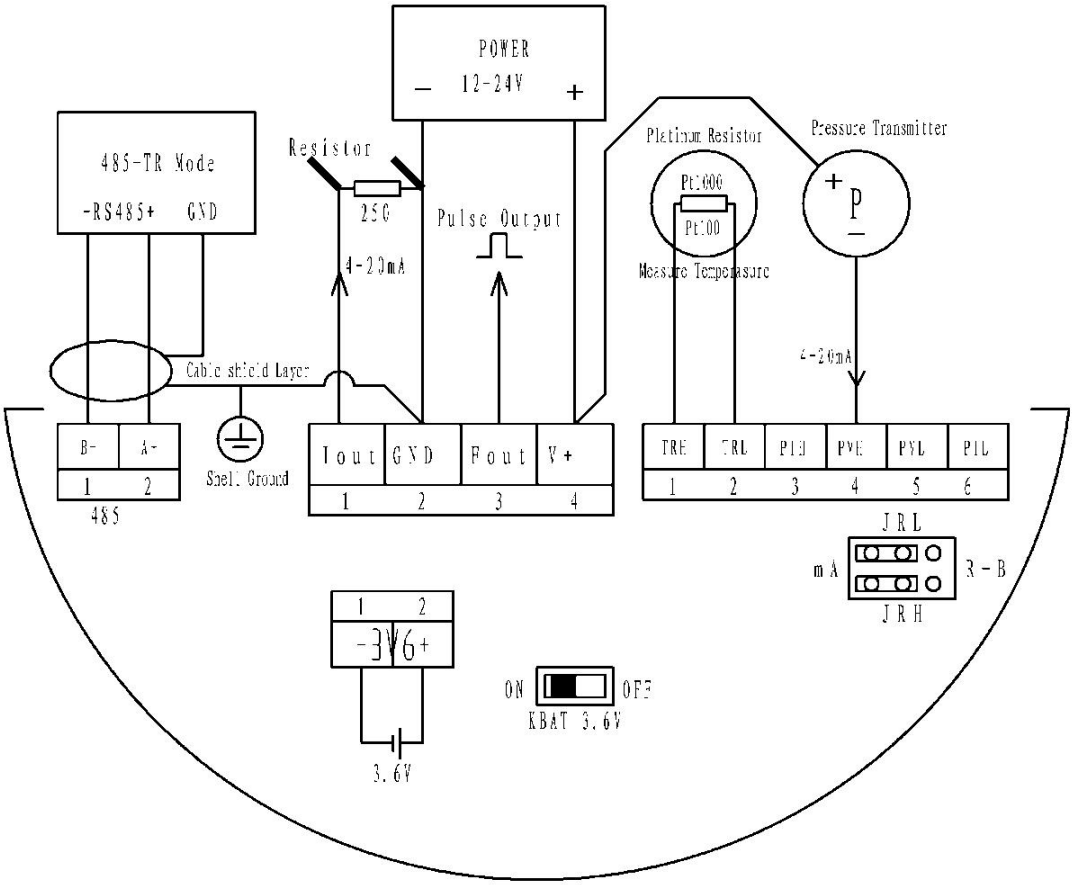
3） In the "44" setting menu, the application Settings of each liquid caliber are as follows:

Dn mm	instrument coefficient K(P/m3)	Signal and gain selection		VPP limit	Fre-Range	
		signal -TYPE	**Gain**	(mV)	**No.**	**Signal frequency (Hz)**
15	340000	MF	**8**	70	**12**	**42-1050.**
20	150000	MF	**8**	70	**9**	**22-550.**
25	76000	MF	**8**	70	**7**	**14-350.**
32	31000	MF	**8**	70	**5**	**8.8-220.**

40	18000	MF	**6**	70	**5**	**8.8-220.**
50	9400	LF	**6**	100	**4**	**6.4-160.**
65	4300	LF	**6**	100	**4**	**6.4-160.**
80	2280	LF	**6**	100	**3**	**4.8-120.**
100	1160	LF	**8**	100	**2**	**3.6-90.**
125	605	LF	**8**	100	**2**	**3.6-90.**
150	340	LF	**8**	100	**1**	**2.4-65.**
200	143	LF	**10**	100	**1**	**2.4-65.**
250	77.6	LF	**10**	70	**0**	**1.6-45**
300	42.8	LF	**10**	70	**0**	**1.6-45**
350	26.7	LF	**14**	70	**0**	**1.6-45**
400	17.7	LF	**14**	70	**0**	**1.6-45**

Qvw actual: F=K*Qv/3600, F: Hz; Qv: m3 / h; K: P/m3; Calculate the working frequency.
Mass flow: F=K*Qm/(3.6*d), F: Hz; Qm: t/h; d: kg/m3; K: P/m3; Calculate the working frequency.





VT3WCTB Temperature&Pressure 485Communication Vortex FlowMeter Wiring Diagram