

Natural Gas Flow Meter

Operation Manual



1. Product Description

1.1 Basic Functions

Suitable for sensor size: DN15 ~ DN200

Dual power supply (24VDC and 3.6 lithium battery)

Wide measurement range proportion : 25:1

Two-wire and three-wire universal design

Current output and RS485 with isolated output

Standard configuration with 4-20MA output, pulse output, high and low alarm, RS485 communication;

Optional HART protocol

Standard equipped with temperature and pressure compensation, measure and display flow in Nm³/H and m³/H.

LCD display, Chinese and English menu

Multistage nonlinear correction

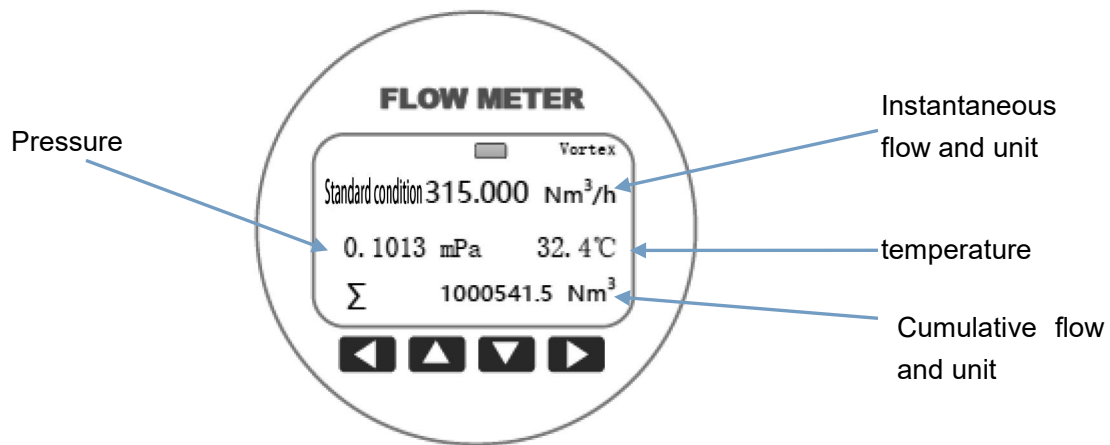
DSP spectrum analysis technology, excellent seismic performance and anti-electromagnetic interference.

1.2 The working conditions

The environment temperature: -20 ~ +65°C; humidity: 5% ~ 90%RH

2. Converter operations and parameter Settings

2.1 Keyboard definition and display



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



Factory setting fast key, down shift, number decline key;

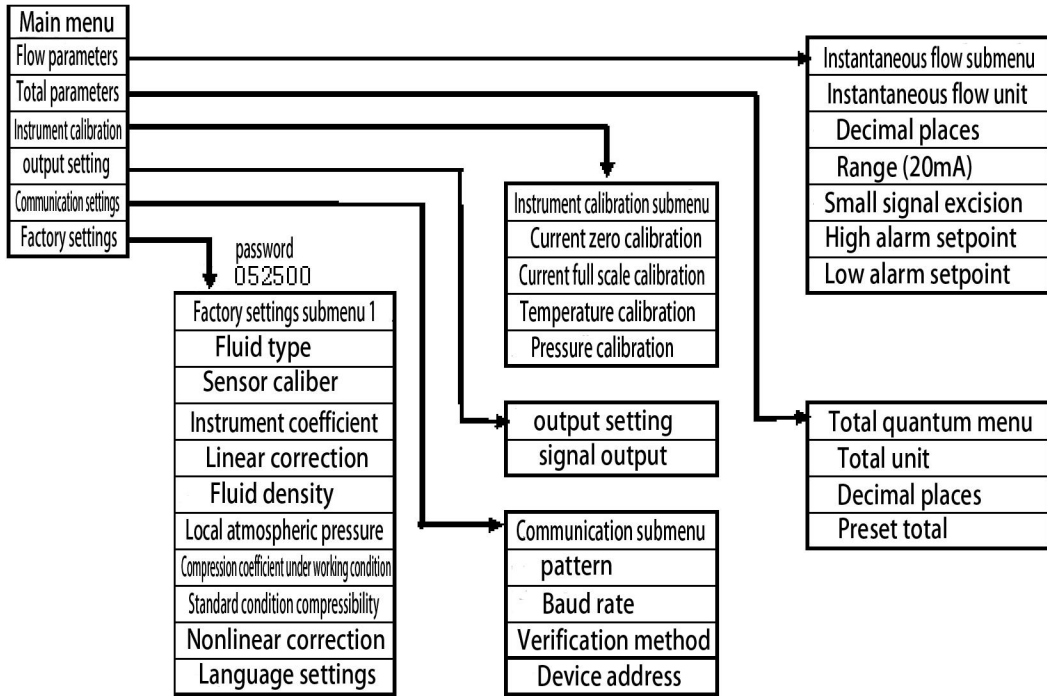


Up, number decline key;



move right, enter parameter Settings.

2.2 Converter menu structure



2.3 Converter Parameter Description

- **Parameter setting of instantaneous flow**

Flow unit	<p>option: L/s L/m L/h m3/s m3/m m3/h Nm3/h USG/s USG/m USG/h Kg/s Kg/m Kg/h t/s t/m t/h</p> <p>default value: m3/h</p> <p>set the unit of instantaneous flow</p> <p>L (liters), H (hours), T (tons), S (seconds), M (minutes)</p>
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Decimal place selection	Option: 0 1 2 3 , Default value: 1 Defines the number of decimal points of instantaneous flow
measuring range	floating number: 99999999.00-0.00 m3/h, The default value : 100.0 m3/h When the instantaneous flow reaches the range, the converter output 20mA, changing this parameter will affect the current output, high alarm and low alarm. Note: When you change this set value (measure range) , please note the unit of this parameter. You can change the unit of this parameter as needed.

<p>Small signal removal</p>	<p>floating number: 9.90~0.00 % , default-value: 0.0 %</p> <p>This set value is a percentage of the range.</p>
<p>High alarm</p>	<p>Floating point Numbers: 99.00~1.00 % , The default value: 90.0 %</p> <p>This set value is a percentage of the range. For example, if this value is set to 10, it is equal to 10% of the range. If the absolute value of the instantaneous flow is greater than (range x 10%), the converter outputs a high alarm signal and the high alarm contact is closed.</p>
<p>Low alarm</p>	<p>Floating point Numbers: 99.00 to 0.00 %. Default value: 0.0 %</p> <p>This set value is a percentage of the range. For example, if this value is set to 10, it is equal to 10% of the range. If the absolute value of the instantaneous flow is less than (range x 10%), the converter outputs a low alarm signal and the low alarm contact is closed.</p>
<p>Damping time</p>	<p>Floating point Numbers: 30.0 ~ 0.1 , Default value: 1</p>

- **The total set:** Define related parameters of total.

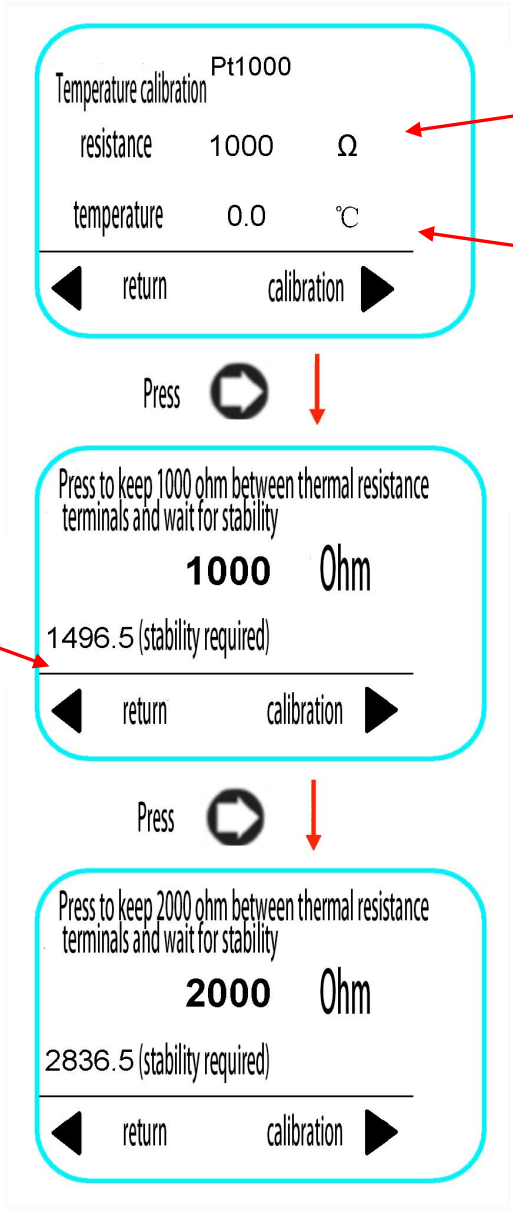
The total units	<p>Option: L(liter) m³ Nm³ USG Kg t(ton) ,</p> <p>The default value : m³</p> <p>Define total unit</p>
The decimal of the total value	<p>Option: 0 1 2 3 , The default value: 1</p> <p>Define the number of decimal points in the total</p>
The default volume	<p>Option: 99999999.00-0.00 m3/h , The default value : 0.0 m3/h</p> <p>Clear the total or set the total value</p>

- **The instrument calibration:** Calibrate current output and temperature and pressure measurement loop.

Zero calibration of current	<p>floating number: 5.0~3.0 , Default-value: 0.0</p> <p>After entering this submenu, use the multimeter to measure the current output value. If the current value is not equal to 4.0mA, input the true value measured by the multimeter, and the converter automatically completes the 4mA current output calibration standard value.</p> <p>Note:If the current output deviation is too large, multiple corrections are required to check the requirements, with the maximum input value of 5.0 for each correction</p>
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Current full scale calibration	<p>floating number: 21.0 ~ 19.0 , default-value: 0.0</p> <p>After entering this submenu, use the multimeter to measure the current output value. If the current value is not equal to 20.0mA, input the true value measured by the multimeter, and the converter automatically completes the 20mA current output calibration.</p> <p>Note: If the current output deviation is too large, multiple corrections will be required to check the requirement, with the maximum input value of 21.0 for each correction</p>
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temperature
calibration



actual
resistance

Actual
temperature

This value must
be stable

press , Complete temperature calibration and exit.

Pressure calibration

Pressure calibration

Coefficient input
Zero calibration

Press  ↓

For multi-point calibration, input the pressure value after it is stable

Gauge pressure 0.0 mPa

◀ return calibration ▶

Actual pressure (gauge pressure)

Press  ↓

Pressure zero
Measuring voltage 10.0 mv

Pressure value 0.0 mPa

◀ confirm -- + displacement ▶

This item is to implement the zero calibration of the pressure sensor.
The voltage is measured automatically.
The pressure value is entered manually.

Press  ↓

Pressure zero
Measuring voltage 277.1 mv

Pressure value 0.101 mPa

◀ return Next point ▶

Complete the calibration of pressure zero

Press  ↓

Pressure calibration

Pressure fullness
 Measuring voltage 277.1 mv
 Pressure value 0.101 mPa
 ◀ confirm ▼ -- + ▲ displacement ▶

Press  ↓

Pressure fullness
 Measuring voltage 277.1 mv
 Pressure value 0.101 mPa
 ◀ return preservation ▶

Press  ↓



Pressure correction-1
 Measuring voltage 423.2 mv
 Pressure value 0.2 mPa
 ◀ confirm ▼ -- + ▲ displacement ▶

Press  ↓

Pressure correction-1
 Measuring voltage 669.5 mv
 Pressure value 0.3 mPa
 ◀ return preservation ▶

Press  ↓

Calibration of pressure sensor range. Enter the actual pressure value

Press  Return to the menu and complete the pressure calibration
 If press  Then enter the pressure nonlinear correction

This is an option. If the pressure sensor is nonlinear, you can use the following methods to gradually adjust the linearity of the pressure sensor. However, the pressure value must be greater than zero, otherwise an error occurs.

You can choose to press  To exit the next pressure calibration

Pressure calibration

Pressure correction-2
Measuring voltage 670.3 mv
Pressure value 0.3 mPa
confirm -- + displacement

This is an option
This pressure value must be greater than the first point correction value



Pressure correction-2
Measuring voltage 670.3 mv
Pressure value 0.3 mPa
return preservation

You can choose to press  Exit the next pressure calibration



Pressure correction-3
Measuring voltage 670.3 mv
Pressure value 0.4 mPa
confirm -- + displacement

This is an option
This pressure value must be greater than the second point correction value



Pressure correction-3
Measuring voltage 670.3 mv
Pressure value 0.4 mPa
return preservation

You can choose to press  Exit the next pressure calibration

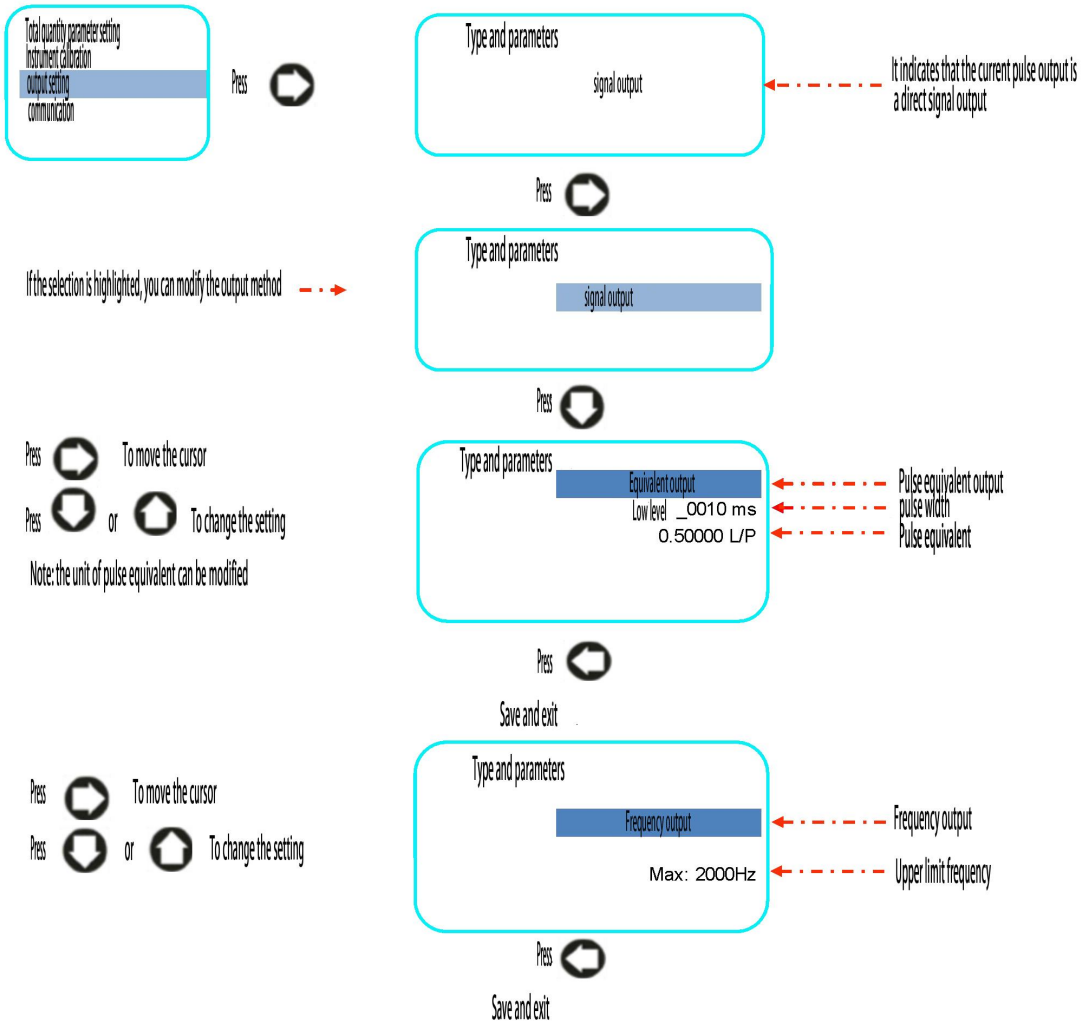


<p>Pressure calibration</p>		<p>This is an option This pressure value must be greater than the third point correction value</p>

- **Output Settings:** set **equivalent output**, **frequency output** and **Signal output** three output Parameters.

<p>upper frequency limit</p>	<p>floating number: 5000.0 - 100.0 Hz , default-value: 2000.0</p> <p>output frequency (Hz) = instantaneous flow (m3/h) ÷ measuring range (m3/h) × upper frequency limit (Hz)</p> <p>For example, if the instantaneous flow is equal to 100m3/h, the measuring range is equal to 200m3/h, and the upper limit of frequency is set to 2000HZ, then the output frequency corresponding to the instantaneous flow of 100m3/h is 1000HZ.</p>
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pulse equivalent	<p>floating number: 9999.0 – 0.0 , default-value: 0.0</p> <p>The unit of pulse equivalent is: L (L)/pulse. Users can change the unit of pulse equivalent as required: USG/P, Kg/P , t/P, Nm³/P, m³/P</p>
pulse width h (ms)	<p>floating number: 1000.0 ~ 0.0 ms , default-value: 0.0</p> <p>When the pulse width is set to 0, the duty cycle of the pulse is 1:1</p>
Signal output	<p>Raw signal output</p> <p>note:</p> <ol style="list-style-type: none"> 1、 It is only used to distinguish between frequency output and equivalent output 2、 The nonlinear correction also works on the original signal output 3, it is related to the instrument coefficient K <p>F(HZ)=3600/(Q*K)</p> <p>Q: instantaneous flow rate (m3/h) ;K:Instrument coefficient</p>



- Communication Settings: Set RS485 communication parameters

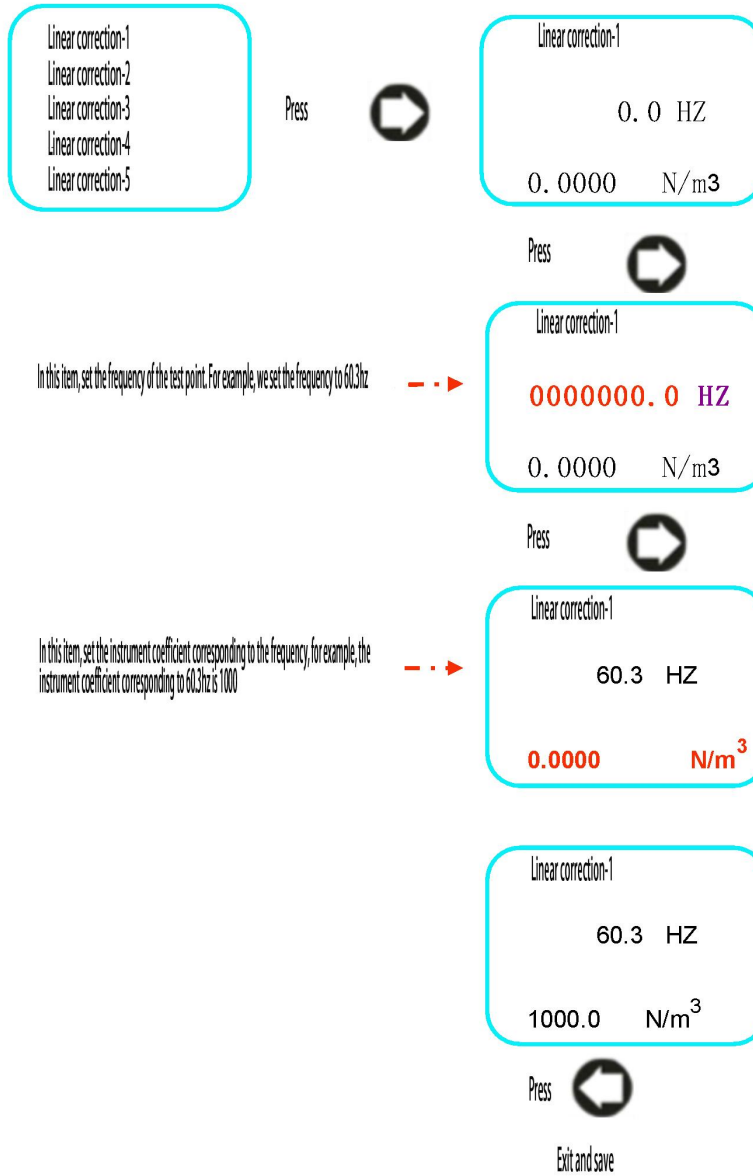
model	Option: Modbus-RTU Modbus-ASCII Default value: Modbus-RTU
Baud rate	Option: 1200 2400 4800 9600 19200 38400 Default value: 19200 Note: Set the baud rate no lower than 9600
verification mode	Options: no check, even check, odd check Default value: odd check

device address	numerical value: 247 ~ 1 , default-value: 1
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- **Factory parameter setting:** The first password 052500 . ,

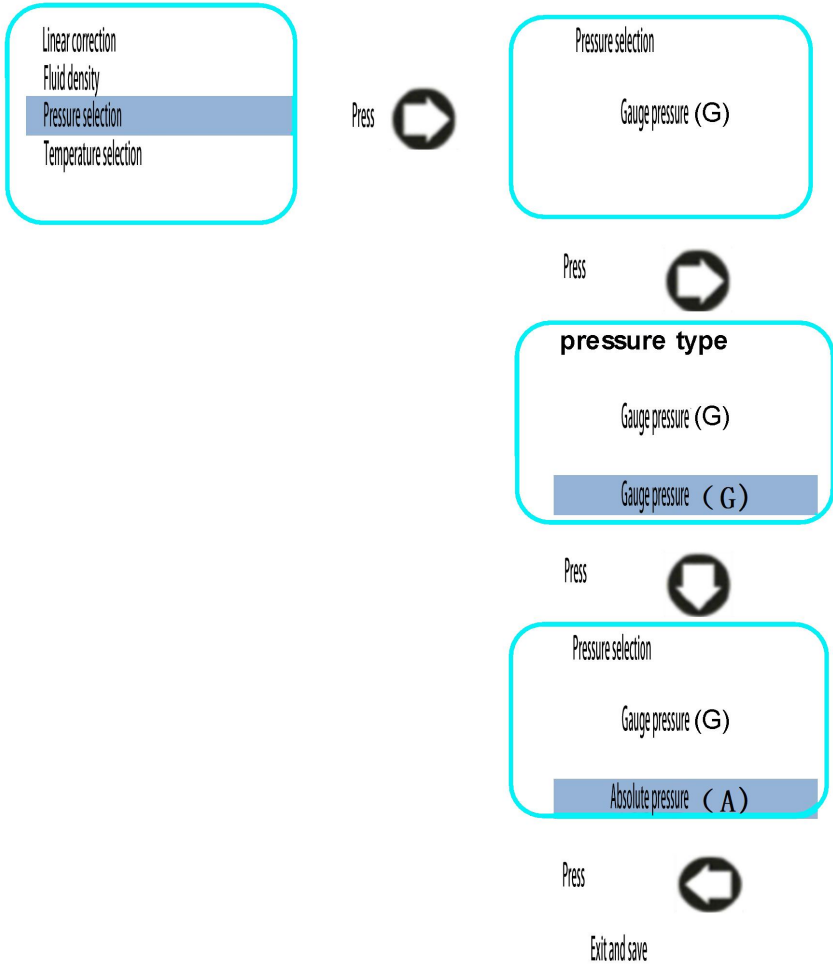
Fluid type	Options: gas flow rate, gas standard flow rate Default value: gas flow rate Select the appropriate medium before verifying the flowmeter or using it. With different options selected, the software executes different algorithms.
caliber	Options: 15、20、25、32、40、50、65、80、100、125、150、200 mm default-value: 50 mm
Instrument coefficient	Floating-point number, default value: corresponds to each caliber automatically Q (instantaneous flow rate, m^3/h) = $3600 \times F$ (frequency, HZ) $\div k$ (kcoefficient) After the real flow detection is completed, the final K coefficient needs to be set here. K (K coefficient) represents: the number of pulses per cubic meter output.

linear correction



After completing the first linear correction, go to "Linear Correction -2".

Note: the highest test point of frequency must be the first point. Set the frequency from large to small.

<p>Pressure choose</p>	<p>Select the type of pressure sensor: option: Absolute pressure, gauge pressure and fixed pressure Default value: absolute pressure</p>  <p>If you do not have a pressure sensor installed, you can set the "set meter pressure", please note: the set pressure is the gauge pressure.</p>
<p>Temperature selection</p>	<p>Select the type of temperature sensor: options: PT100、 PT1000 and set temperature The default value: PT1000 The operation method is the same as the pressure selection operation method.</p>

To atmospheric pressure	floating number default-value: 0.101 mPa If the medium is selected as liquid, this parameter has no effect.
compression coefficient of m ³ /h	floating number; default-value: 1 ; If the medium is selected as liquid, this parameter has no effect.
compression coefficient of Nm ³ /h	floating number ; default-value: 1 ; If the medium is selected as liquid, this parameter has no effect.
language settings	Default value: Chinese. You can switch to English.

Senior password 905250 . Set spectrum analysis parameters (if you do not understand spectrum analysis, please do not modify)

Sampling rate	Floating point number, the sampling rate corresponds to the diameter of the flow meter, and it is forbidden to change
Upper limit of spectrum	Define the upper limit of signal frequency The default value corresponds to the meter diameter, but can also be adjusted according to the upper limit of the flow range.

<p>Lower limit of spectrum</p>	<p>Define the lower limit of signal frequency</p> <p>The default value corresponds to the meter diameter, but can be adjusted according to the lower limit of the flow range.</p>
<p>Power threshold</p>	<p>floating number</p> <p>Default values are set according to the diameter of the flow meter automatically , or you can change them according to the actual signal power threshold. The power threshold corresponds to "M" in the spectrum display interface.</p>
<p>Power ratio</p>	<p>A floating point number, corresponding to "R" in the spectrum display interface. This parameter is the minimum value that meets the signal requirements.</p>

2.4 How to Set parameters

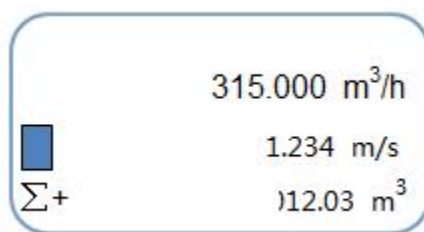


Figure 1 Instantaneous flow display interface

Press  Enter the menu Settings, as shown in Figure 2:

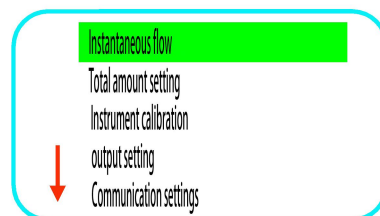





Figure 2

In the interface shown in Figure 2, press  or  Different Sub menu can be selected. Press  Then back to flow display interface, as shown in Figure 1.









Press  or  choose Sub menu, Press  Enter the sub menu to set the parameters. For example, we need to set the "instantaneous flow parameter", When the instantaneous flow parameters sub menu becomes bright, press  then it is shown as figure 3 below:



Figure 3

Press  or  to select the parameters that you need modify, The selected parameter will be highlighted, and if you need to return to the menu shown in Figure 2, press ; If you need to go to the next level menu, press  to set parameters, as shown in Figure 4:

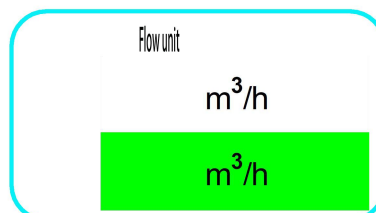





Figure 4

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

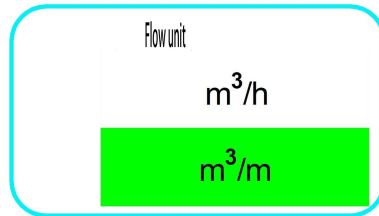



Figure 5

After modifying parameters, If you need to save your Settings,press  , The system will save it automatically , as shown in Figure 6:

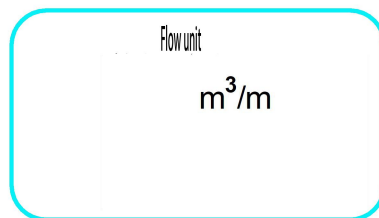

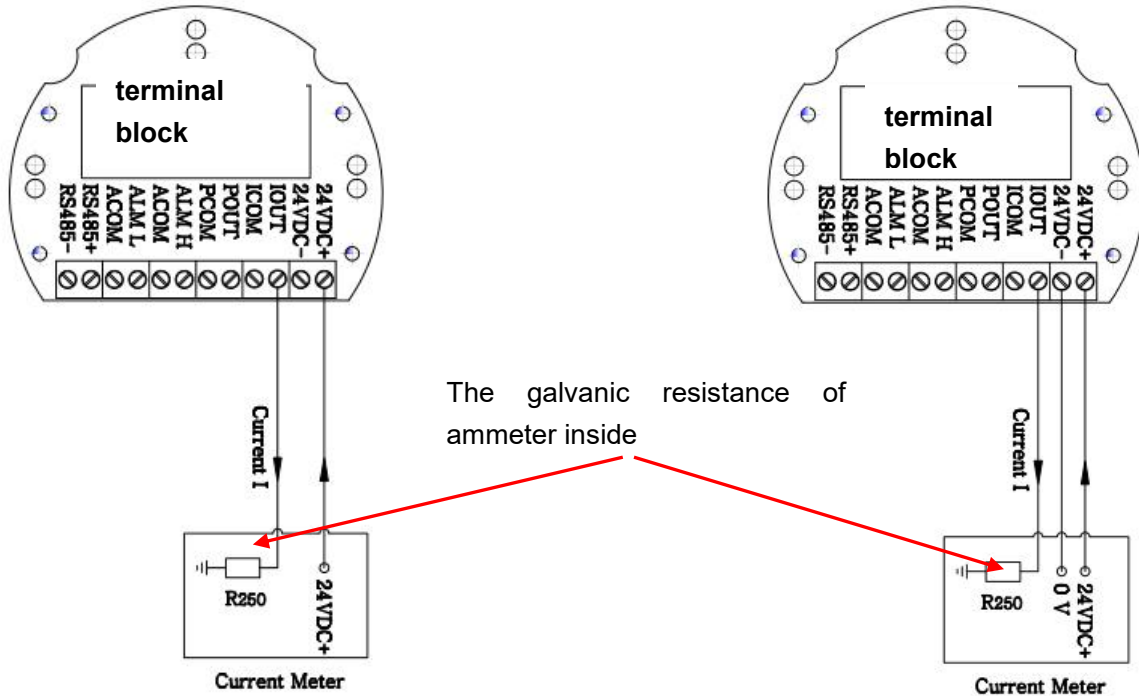


Figure 6

In this case, press  , Save the Settings and exit (Figure 3).

3. Wiring diagram and output definition

3.1 4-20mA wiring diagram of current output



Two-wire wiring diagram

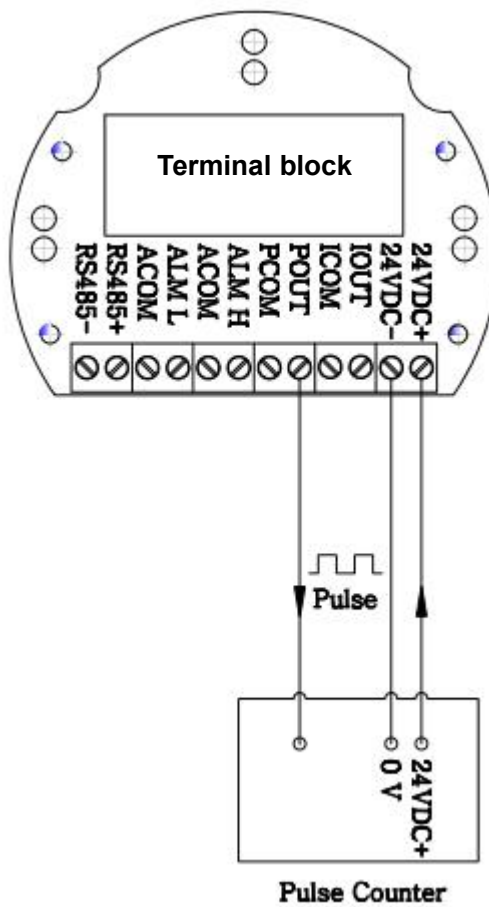
Three-wire wiring diagram

Definition of wiring terminals

interface	function	note
24V +	DC 18 - 36V +	power supply 24V +
24 -	DC 18~36v -	power supply 24V -
IOUT	4~20Ma +	The load current <= - 500Ohm
ICOM	4~20mA -	
POUT	frequency & pulse output +	
PCOM	frequency & pulse output common terminal	
ALM H	high alarm +	It is recommended to use a 24VDC

ACOM	High alarm public port	intermediate relay with a load current $\leq 30\text{mA}$
ALM L	Low alarm +	
ACOM	Low alarm public port -	
RS+	RS485 +	RS485 wiring terminal
RS-	RS485 -	

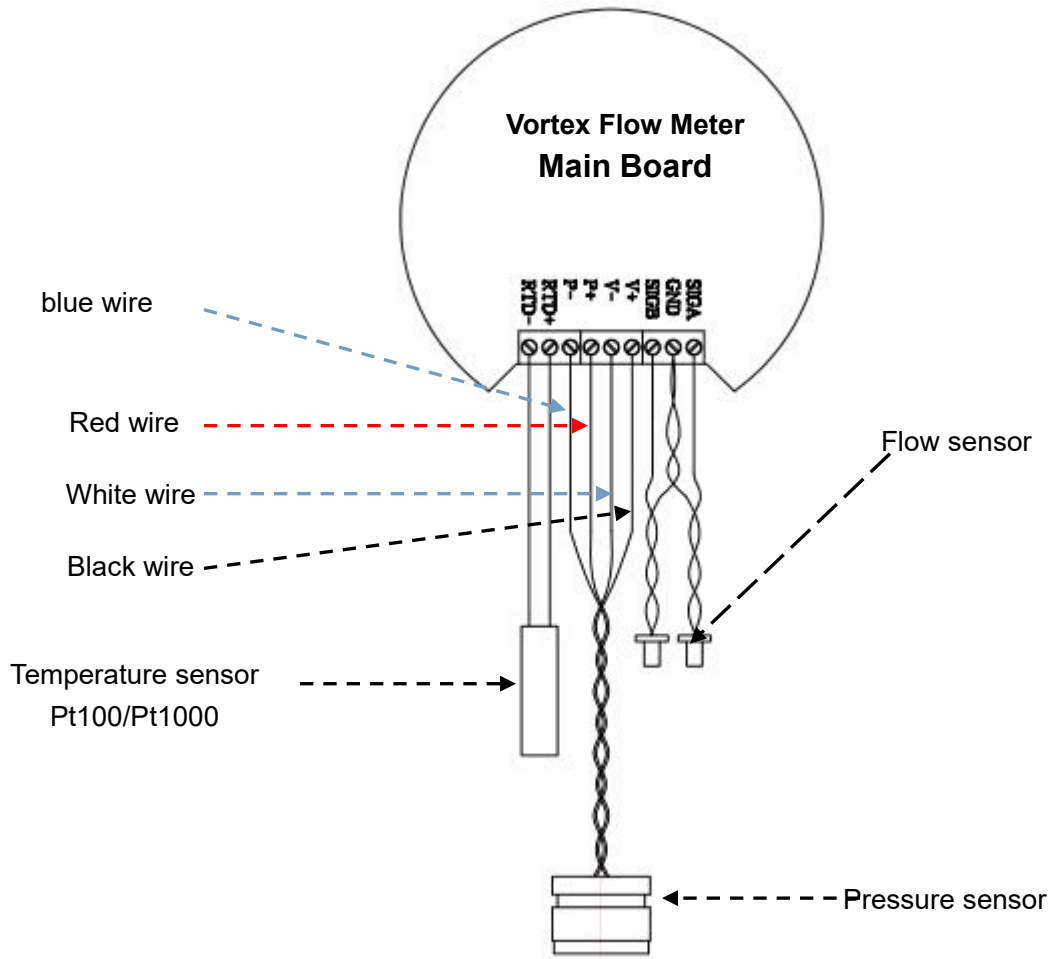
3.2 Wiring diagram for pulse output



3.3 Wiring between converter and sensor

Definition of wiring terminals on the motherboard

printing	function	note
SIGA	Signal cable for flow sensor	
GND	Ground line (signal common line)	
SIGB	Signal cable for flow sensor	
V+	power supply (+)to pressure sensor	Connect pressure sensor
V-	power supply (-)to pressure sensor	
P+	Pressure sensor signal(+)	
P-	Pressure sensor signal(-)	
RTD+	thermal resistance	Pt100 or Pt1000, two-wiring
RTD-		



4. Debug key points

4.1 Set the key parameters of the flow meter

Since our converter is a universal circuit design for Precision vortex flow meter and vortex flow meter, We set the fixed dip switch as follows, which is set according to the caliber when install the circuit board :(the position of the dip switch is on the motherboard)

Diameter	K1=K2=ON	K3=ON
DN15	2	1
DN20	2	2
DN25, DN32, DN40	1	3
DN50, DN65, DN80, DN100	1	4
DN125, DN150, DN200	1	5

Enter<factory parameter setting>, choose "medium"

Enter<factory parameter setting>, choose "caliber"

Enter<flow parameter setting>, Set the **range**, **Unit** and **other parameters**

Enter<Output Settings>, Select the output mode and set parameters

If necessary, Enter the password **905250** Factory parameter setting, Modify spectrum analysis parameters.

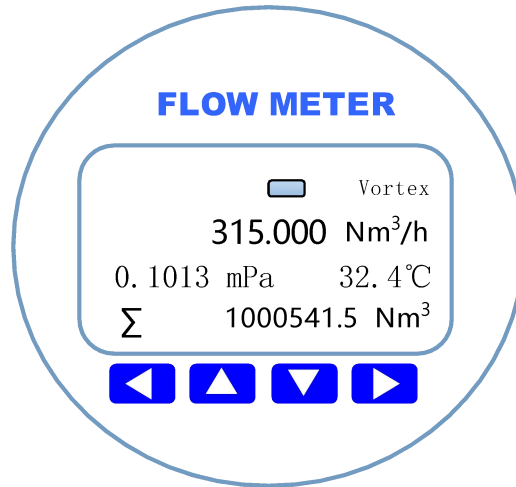
Note:

- The temperature of the converter has been calibrated before delivery, so you only need to select PT100 or PT1000 in the menu of "Factory Parameter Setting", and there is no need to calibrate the temperature.
- You need to select the type of pressure sensor in the "Factory Parameter Settings" menu, and then connect to the pressure sensor, and actually press down for pressure calibration.

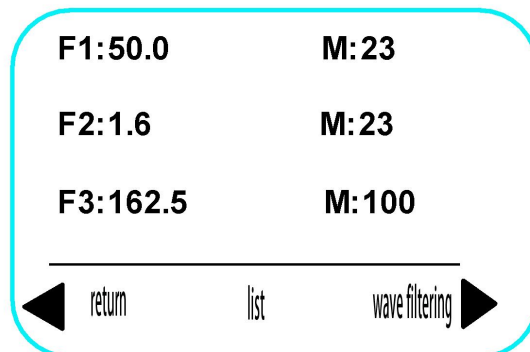
When using sonic nozzle test device or fan system for testing, please pay attention to select "medium" in the menu: standard condition or working flow rate, and the output corresponds to this.

For Example: if you choose "Nm³/h", then the output 4-20mA or pulse or frequency or original signal corresponds to standard condition flow; If you choose "m³/h", then the output 4-20mA or pulse or frequency or original signal corresponds to the working condition flow.

4.2 When the actual flow is available, check the DSP parameters if necessary (generally not necessary).

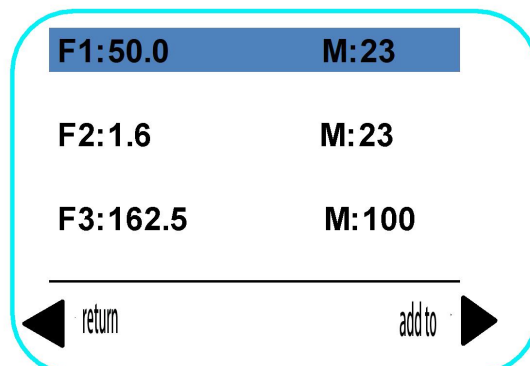


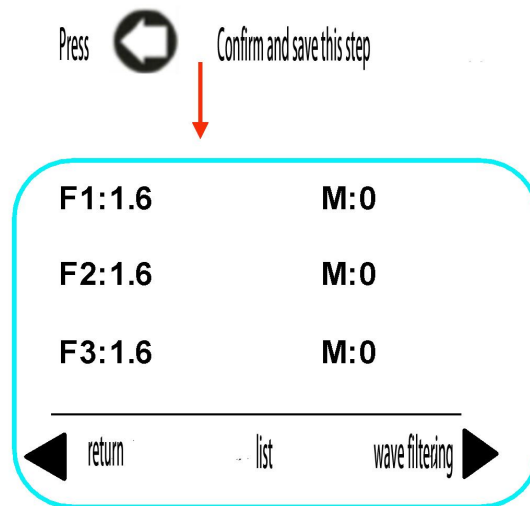
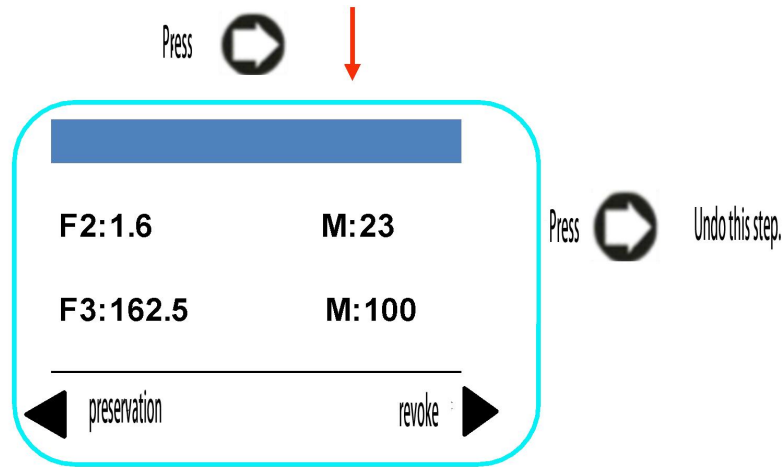
In the above menu, press  button, Enter the DSP spectrum analysis screen, as shown below:



If 50Hz is an interference signal, it can be filtered in the following ways

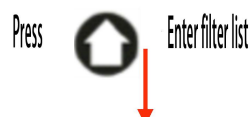
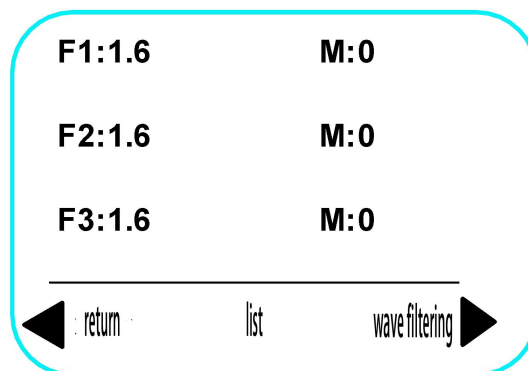
Press  ↓






Then 50Hz interference signal is filtered out

If there are multiple interfering signals, the above method can be used to filter them out without affecting the measurement. All the filtered signals are displayed in the **list**. The filtered signals can be found in the way shown in the following figure, and the signals that have been incorrectly filtered can also be recovered. the way as follow:





50.	23	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0

◀ return Remove ▶

Press  Light up the signal to be recovered

50.	23	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0

◀ return Remove ▶

Press  be

0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0

◀ preservation revoke ▶

Press  Confirm and save this step,

0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0
0.0	0	0.0	0

◀ return Remove ▶

All the filtered signals are shown in the list on the left.

As shown above, the 50HZ signal is removed from the filter list.

5. The packing storage

The transmitter is placed inside a special foam box to prevent damage during transportation.

Documents delivered with the product include operation manual, certificate, and packing list. In order to prevent the instrument from being damaged, during transportation, please maintain the manufacturer's packaging before arriving at the installation site. Storage location should meet the following conditions: placed in the indoor and rain, moisture and mechanical vibration small.

The appendix: RS485 communication address table

Name	Register first address	Register length	Instruction code	Data types
instantaneous flow	0x01	0x02	0x04	floating number
Unit of instantaneous flow	0x03	0x01	0x04	integer
Total flow	0x04	0x04	0x04	double precision
The total units	0x08	0x01	0x04	integer
temperature	0x09	0x02	0x04	floating number
pressure	0x0b	0x02	0x04	floating

				number
Total flow (m3)	0x0d	0x02	0x03 0x04	floating number
Linking (addresses consecutive)				
instantaneous flow	0x14	0x02	0x04	floating number
Total flow	0x16	0x02	0x04	floating number
temperature	0x18	0x02	0x04	floating number
pressure	0x1a	0x02	0x04	floating number
Linking (addresses consecutive)				
instantaneous flow rate	0x1e	0x02	0x04	float inverse
Total flow	0x20	0x02	0x04	float inverse
temperature	0x22	0x02	0x04	float inverse
pressure	0x24	0x02	0x04	float inverse

The appendix 8: unit definition

instantaneous flow	unit	code	unit	code
	Nm3/h	0x00	usg/h	0x09
	Nm3/m	0x01	usg/m	0x0a
	Nm3/s	0x02	usg/s	0x0b
	m3/h	0x03	kg/h	0x0c
	m3/m	0x04	kg/m	0x0d
	m3/s	0x05	kg/s	0x0e
	L/h	0x06	t/h	0x0f
	L/m	0x07	t/m	0x10
	L/s	0x08	t/s	0x11
Total flow	Nm3	0x00		
	m3	0x01		
	L	0x02		
	usg	0x03		
	kg	0x04		
temperature	t	0x05		