ALIAMASS

Thermal Mass Flowmeter

ATF2000 Series

Operation Manual

CE

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1. Introduction

ATF2000 Series thermal mass flow meter is designed on the basis of thermal dispersion. It adopts method of constant differential temperature to measuring gas flow. It has the advantages of small size, high digitization, easy installation and high accuracy.
The sensor consists of two platinum resistance temperature sensors. Using bridge circuit, one sensor is used as a temperature sensor to monitor the actual process values while the other is used as a heater which is maintained at a constant differential temperature above this by varying the power consumed by the sensor. It is possible to measure flow at high temperature and high pressure.

ALIA ATF2000 thermal gas mass flowmeter has the following technical advantages:

- No need for temperature and pressure compensation. It can measure the mass flow rate or standard volume flow rate of gas conveniently and accurately.
- Large range ratio. Gases with flow rates up to 120 m/s and down to 0.1 m/s can be measured. It can be used for gas leak detection.
- Good anti-seismic performance and long service life. The sensor has no moving parts and pressure sensitive parts. The measurement accuracy will not be affected by vibration.
- Easy installation and maintenance. Non-stop production installation and maintenance is possible if site conditions permit.
- Digital design. The whole instrument adopts a digital circuit which realizes accurate measurement and easy maintenance.

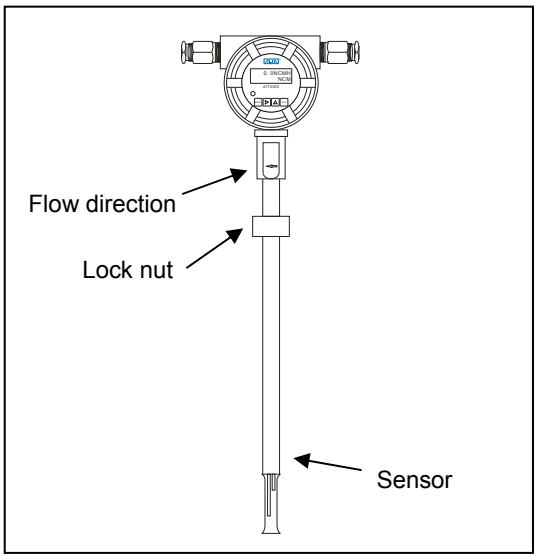
2. Technical Parameters and Functions

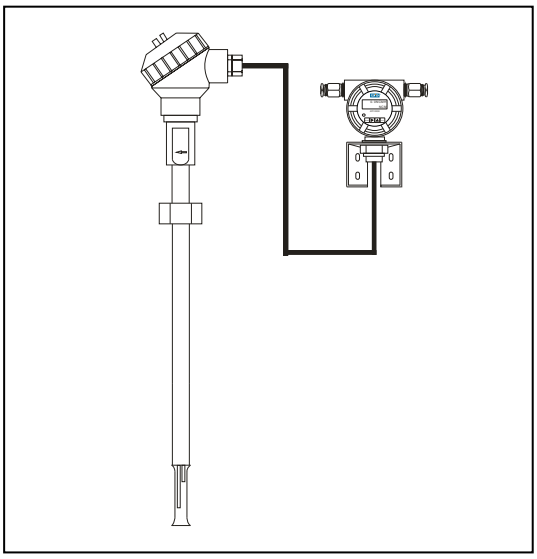
		Insertion type	Pipe-type
Measuring Medium		Single component gas and multi-component gas	
Pipe Size		Circular pipe: DN80-7000 mm or square pipe	Circular pipe: DN10-1000 mm
Flow Rate		0.1-120 m/s	
Accuracy		+/-1%, of reading +/-0.5% FS	
Working temperature		Normal temperature type: -40-200 °C High temperature type: -40-350 °C	
Working Pressure		Max. pressure: 63 kg/cm^2 (Please specify for special case)	
Power Supply		DC24V and AC90-260V Power ≤10W	
Response Speed		1s	
Output Signal	Current Output	4-20 mA (photoelectric isolation, up to 800 load), 2-channel 4-20 mA photoelectric isolation (optional: 2-channel 4-20 mA).	
	Pulse Output	Cumulative pulse: Optical isolated OD output, max. current is 120 mA, optional, 0.1-5999.9 ms of Pulse width adjustable (0.1 ms of resolution), the Min. Pulse interval time is 0.1-5999.9 ms (0.1 ms of resolution), the flow corresponding to a single pulse is 0.001-59999. (Optional)	
	Communication Output	RS-485 (MODBUS-RTU) (photoelectric isolation)	
	Alarm Output	No.2 circuit alarm limit can be DC30V/5A or AC250V/5A, which can be programmable to be normally open or normally closed state, as well as other alarm modes, such as flow and temperature limit alarm (optional function).	
Pipe Material		Metal or non-metallic	
Display		16 * 2, English, flow rate, total flow, medium temperature, alarm status, total running time, current date and time.	
IP Grade		Transmitter: IP67 Sensor: IP68	
Explosion-proof		Ex d IIC T4	

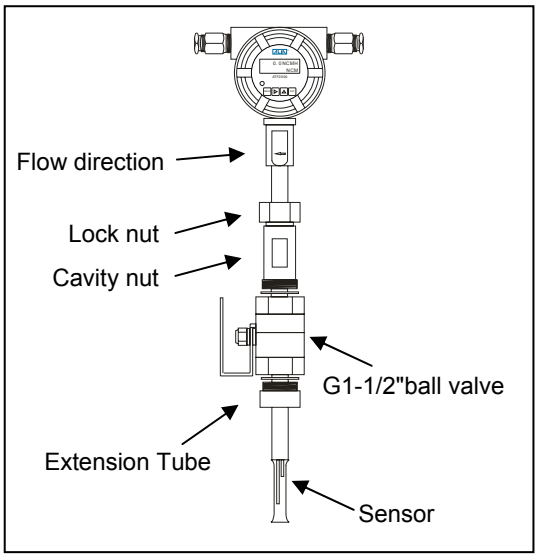
3. Appearance and Dimensions

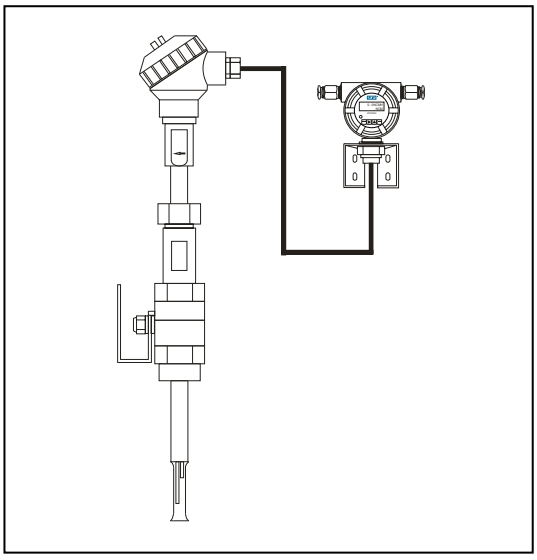
The thermal gas mass flow meter consists of a transmitter and a sensor. According to the working environment, it can be divided into general thermal gas mass flowmeter and explosion-proof thermal gas mass flowmeter.
According to the structure, it can be divided into integral plug-in type, integral pipe type, remote plug-in type and remote pipe type.
Integral type: The transmitter and sensor are integrated.
Remote type: The transmitter and sensor are remote.

3.1 Appearance



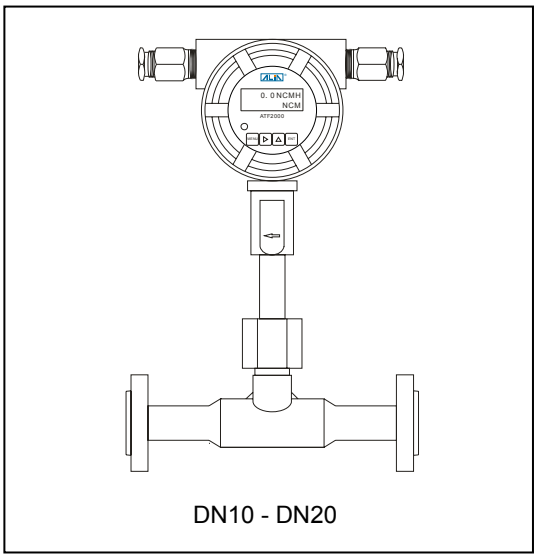




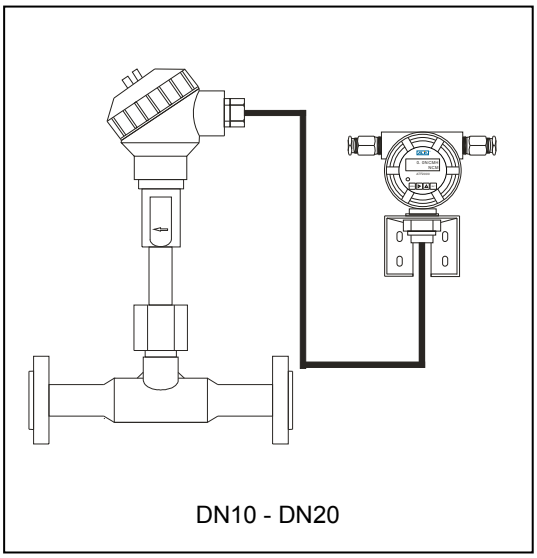


● On-line installation

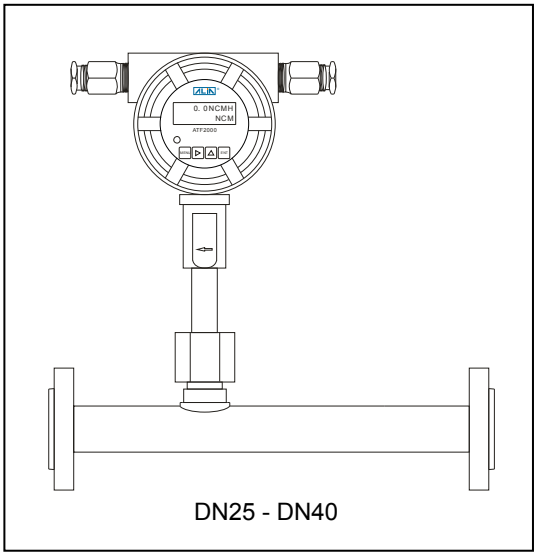
● On-line installation



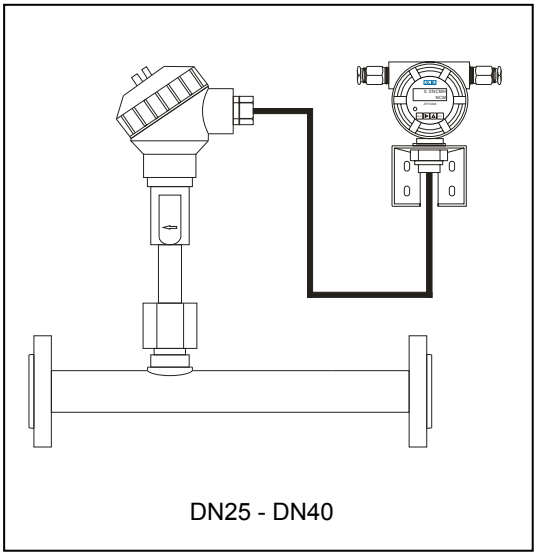
DN10 - DN20



DN10 - DN20



DN25 - DN40



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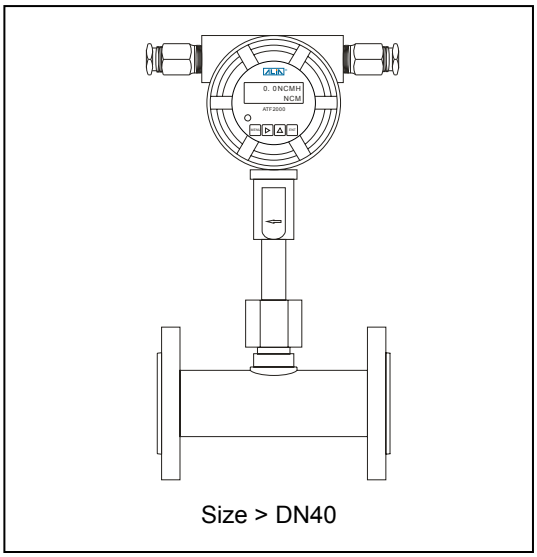

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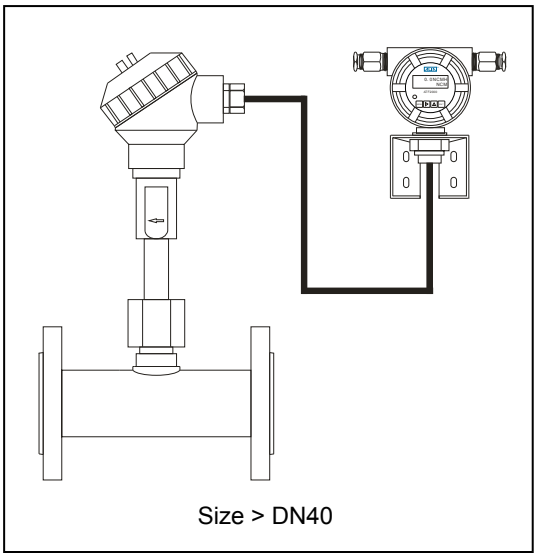


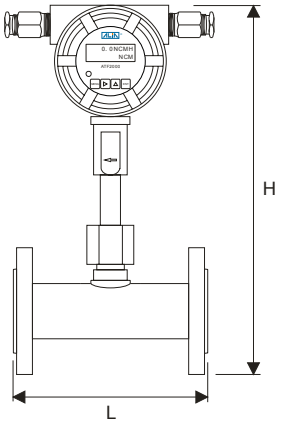
Size > DN40

3.2 Dimensions

Flange Type

Unit: mm

Size		Flange Type		Size		Flange Type		Size		Flange Type	
mm	Inch	L	H	mm	Inch	L	H	mm	Inch	L	H
10	3/8"	280	313	80	3"	200	390	400	16"	480	748
15	1/2"	280	318	100	4"	220	409	450	18"	510	805
20	3/4"	280	323	125	5"	250	437	500	20"	550	868
25	1"	360	319	150	6"	300	467	600	24"	620	980
32	1-1/4"	360	334	200	8"	350	525	700	28"	690	1060
40	1-1/2"	360	343	250	10"	400	584	800	32"	750	1168
50	2"	150	355	300	12"	420	638	1000	40"	890	1383
65	2-1/2"	170	376	350	14"	440	694				



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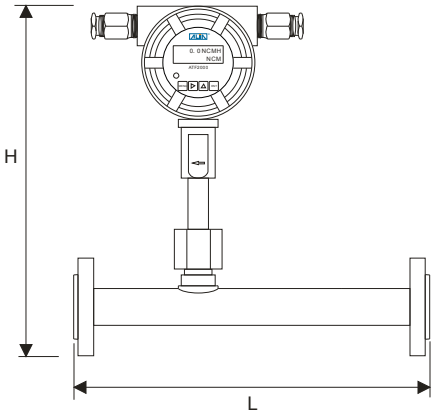
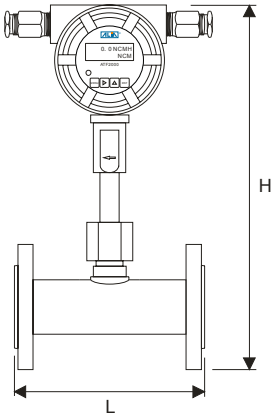


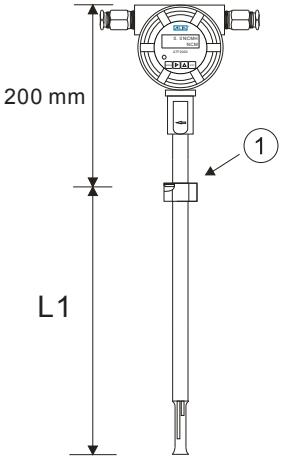
DN25 - DN40

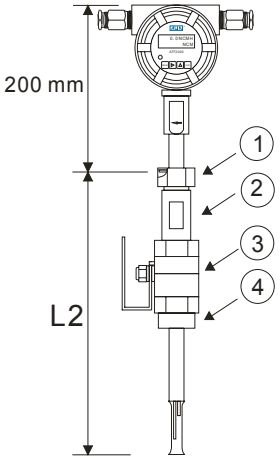


DN > 40

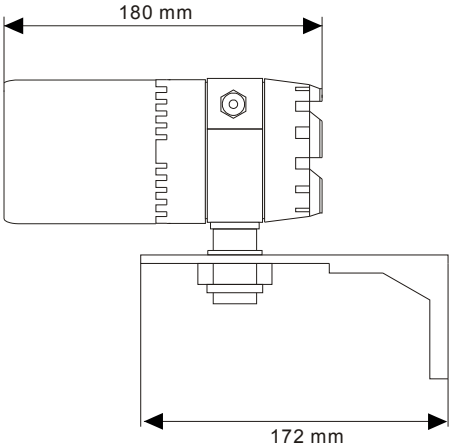
Insertion Type

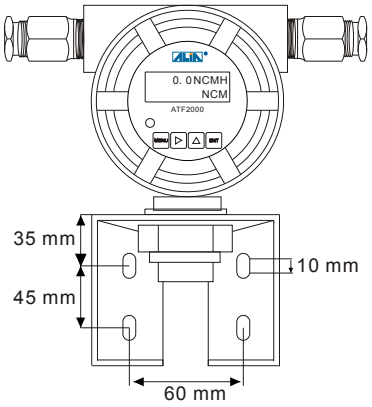
L1 (mm)	L2 (mm)	Size
235	410	DN80-200 mm
385	560	DN80-500 mm
635	810	DN80-1000 mm
885	1060	DN80-1500 mm
1135	1310	DN80-2000 mm
Other	Other	>DN2000 mm





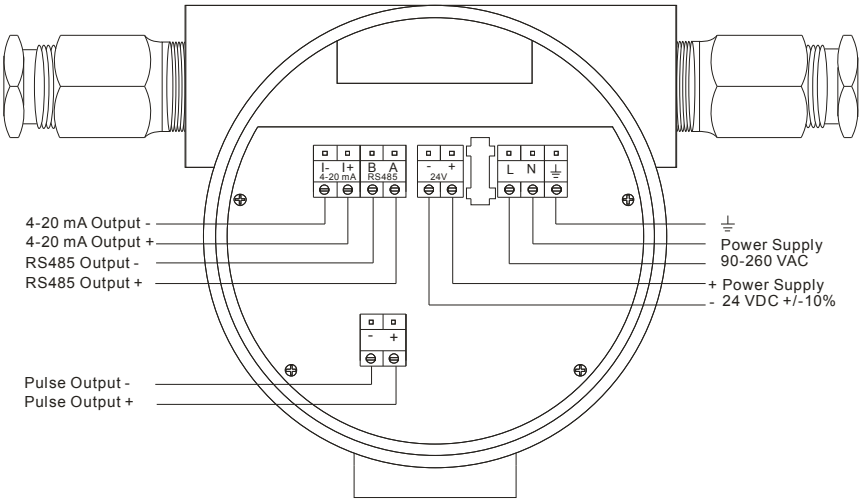
①	Nut	M33 * 2
②	Adapter	M33 * 2 / G1-1/2"
③	Ball Valve	G1-1/2"
④	Extension Tube	G1-1/2" / Welding

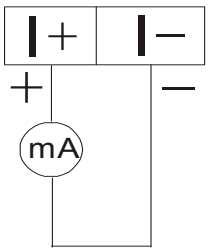
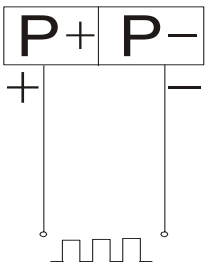
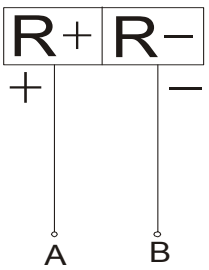




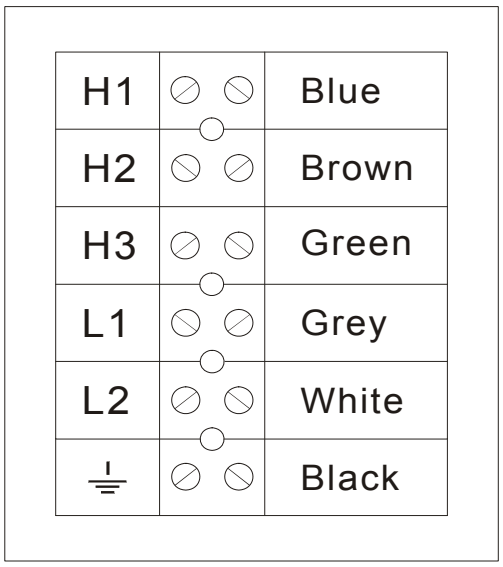
4. Wiring and Installation

4.1 Wiring



 Max. Output Load: 800 Ω	 Max. Supply Voltage: 35 VDC Max. Current: 120 mA	 MODBUS Output
4-20 mA Output (Hart Protocol)	Passive Pulse Output	MODBUS Output

4.2 The Wiring for Remote Type



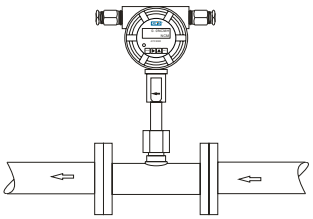
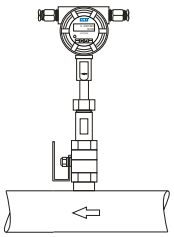
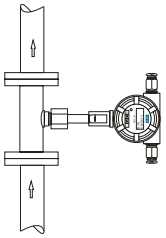
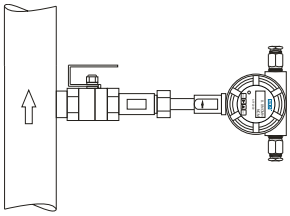
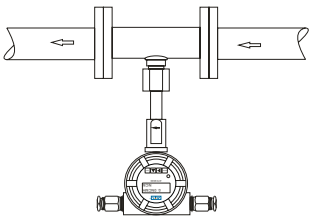
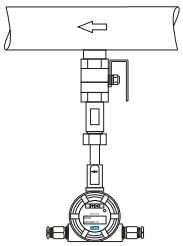
The meaning of wiring label is as follows:
PT10: H1,H2
PT1000: L1, L2-
Temperature compensation: H3
Shielded wire: GND

4.3 Installation

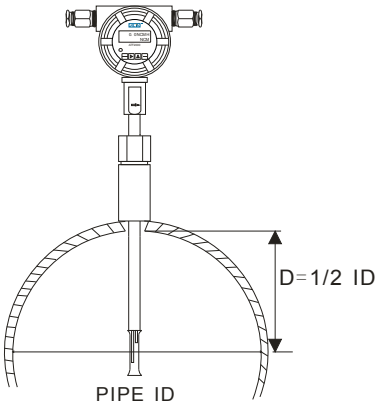
The flowmeter can be installed on horizontal, vertical or inclined pipes, and at any angle in the circumferential direction of pipes, but it's necessary to consider the convenience of operation and maintenance.
For dirty or humid gases, it's recommended to install the flow meter horizontally (up) to reduce the possibility of contamination of the sensor. The installation position of the sensor should avoid the lowest part of the pipeline to prevent the water from accumulating in the pipeline and make the flowmeter unable to work properly.

Installation Position

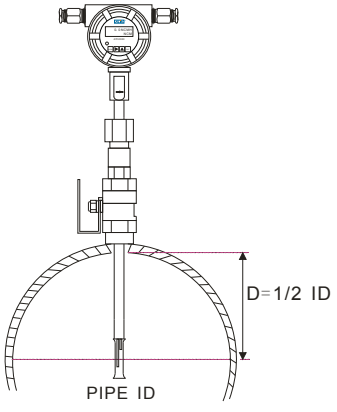
- Upstream distance should be 10D while downstream 5D. If there is a gas rectifier on pipeline or the gas flow rate is less than 30 m/s, upstream distance can be 5D and downstream can be 3D.
- Explosion-proof areas are prohibited from fire. If the pipes are not weldable, special clamps can be used to fix the sensor on the pipe. Manual drilling tool is used in the explosion-proof area and electric drilling tool is used in the safe area.
- The arrow direction "→" on the sensor housing should be consistent with the flow direction of gas. The insertion direction of the sensor should be perpendicular to the flow direction of gas.
- Do not install the flowmeter in places with strong vibration.
- Do not share power with equipment that contaminates the power supply such as inverters, welders. If necessary, install a power conditioner for the transmitter.

Pipe-Type		Plug-in Type	
Horizontal Pipeline Installation (Up)		Horizontal Pipeline Installation (Up)	
	√ Recommended		√ Recommended
	√ Recommended		√ Recommended
	× Not Recommended		× Not Recommended

4.3.1 The Installation of Plug-in Flowmeter



Insertion Type



Hot Tap Type

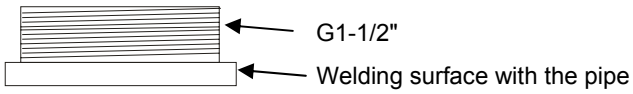
The connection of extension tube can be divided into welding type and clamp type according to different pipe materials (weldable and non-weldable). If the pipe material is cast iron or non-metallic, the extension tube can not be mounted by welding. In this case, the special fixture provided by the manufacturer (the extension tube is welded to the fixture) should be used. The size of the fixture depends on the outer diameter of the pipe.

● Welding type

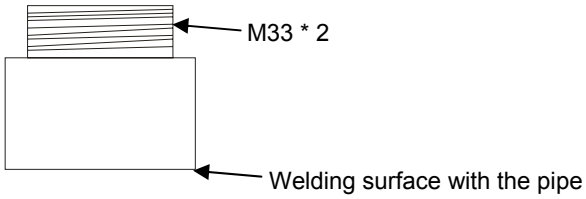
1. Locate the apex of the pipe and adjust the threaded extension tube (G1-1/2" threaded extension tube or M33 * 2 threaded extension tube) to the apex to make the axis of the threaded hole passes through the apex and is perpendicular to the axis of the pipe.

2. Weld the threaded extension tube to the pipe by welding machine. It must be welded firmly, and no welding defects such as slag inclusions and air holes are allowed.

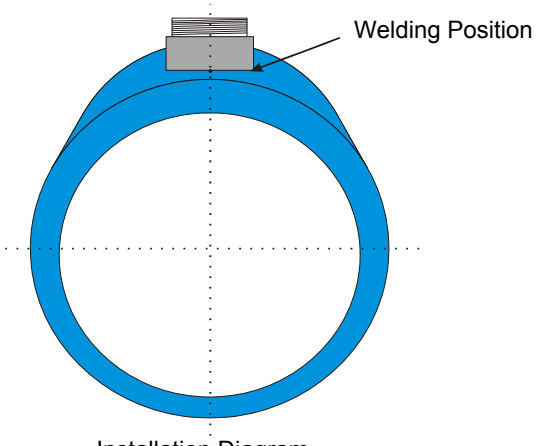
Note: If air cutting is used, the base should be welded after tapping.



G1-1/2" Threaded Extension Tube



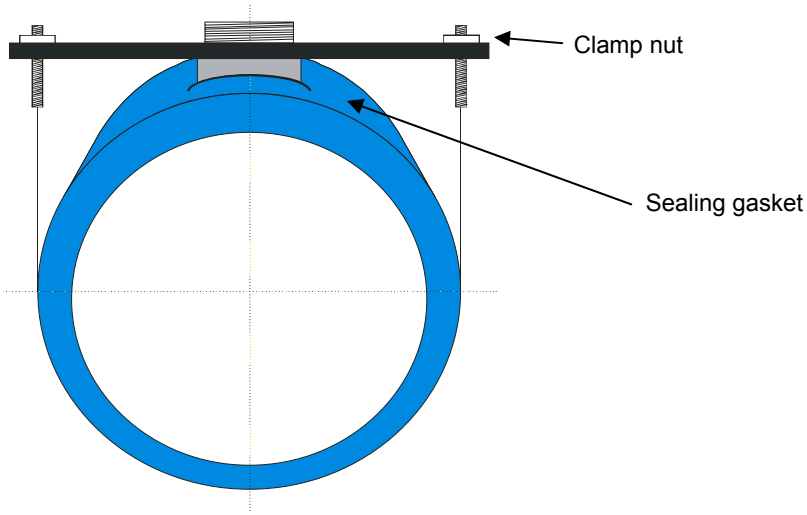
M33 * 2 Threaded Extension Tube



Installation Diagram

● Strap-on type (Saddle fitting (carbon steel))

1. Place the fixture on the pipe and locate the apex of the pipe and adjust the threaded base to the apex to make the axis of the threaded hole passes through the apex and is perpendicular to the axis of the pipe.
2. Tighten the two nuts on the clamp to ensure that they will not loosen after locking.



Installation Diagram

4.3.2 Drilling Hole

Check the installation environment carefully before drilling hole to ensure safe operation. After the hole is drilled, close the valve in time to avoid air leakage.

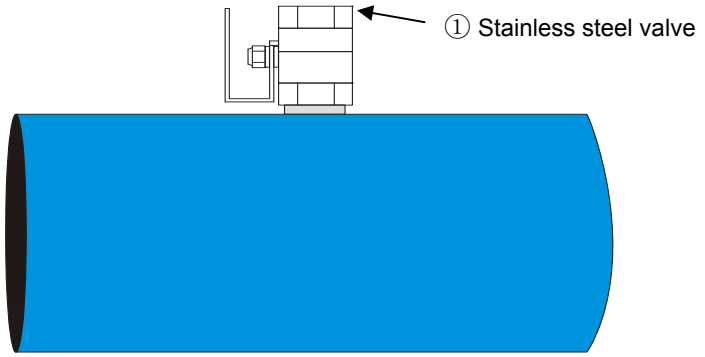
● Non-online

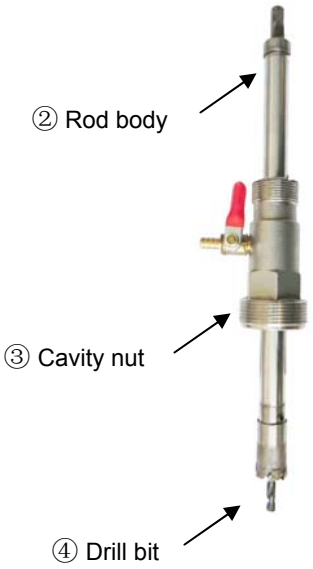
When the production is stopped, there are many ways to drill holes. The diameter of the hole should not be less than 22 mm, and the axis of the hole should be concentric with the axis of the hole of the extension tube. After drilling the hole, tighten the stainless steel valve to the extension tube. (G1-1/2" / M33 * 2 threaded extension tube is sealed with gasket)

● Online

If on-line drilling is needed, the special drill tool of our company can be used to achieve on-line installation. The special drill tools include manual drill tool and electric drill tool. Manual drill tool are required for use in an explosion-proof environment.
The following is a brief description of how to use the electric drill tool.

1. Tighten the stainless steel valve ① to the extension tube and open it.
2. Hold the cavity nut ③ and move the rod body ② upward so that the drill bit ④ can return to the cavity nut ③.
3. Connect cavity nut ③ with stainless steel valve ① and pay attention to tightening and sealing the thread.
4. Push the rod body ② down to the pipe wall and connect the electric drill ⑤ to the top of the rod to start drilling.
5. After drilling, remove the electric drill ⑤ and then adjust the rod upward until the rod remote from the stainless steel valve ①. Close the stainless steel valve ① and turn the cavity nut to remote it from the valve. The drilling is completed.





⑤ Electric drill

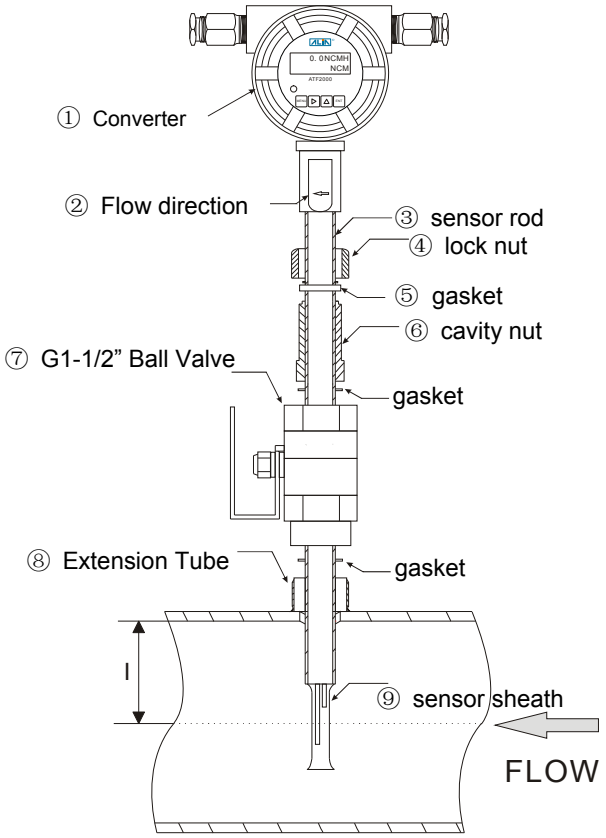
4.3.3 The Installation of Plug-in Flowmeter (Hot Tap Tape)

1. Loosen the lock nut ④ on the sensor rod to enable the cavity nut to slide along the sensor rod ③ to the sensor sheath ⑨ so that the sensor sheath ⑨can fully retract into the cavity nut ⑥.

2. Fasten the cavity nut ⑥ to the ball valve. (The G1-1/2" threaded base is sealed with a gasket)

3. Open the stainless steel ball valve and insert the sensor rod into the pipe.

4. Insert the sensor rod into the pipe until it reaches the limit boss. Turn the sensor rod to make the direction of the arrow on the flowmeter is consistent with the flow of the medium, and then lock the lock nut ④.



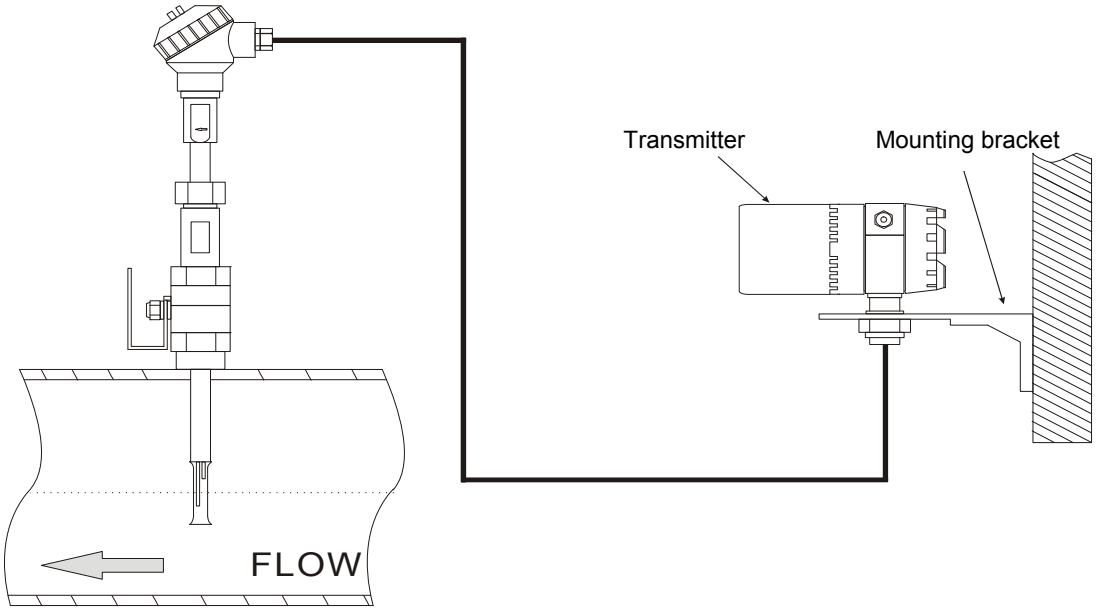
Note: Please insert the sensor sheath ⑨ into the center of the pipe during use.

To ensure that the sensor sheath ⑨ is inserted into the center of the pipe, please measure the total length L of the sensor rod. After insertion, the length of the rod outside the pipe should be

$$l = L - 1 / 2DN - \text{wall thickness}.$$

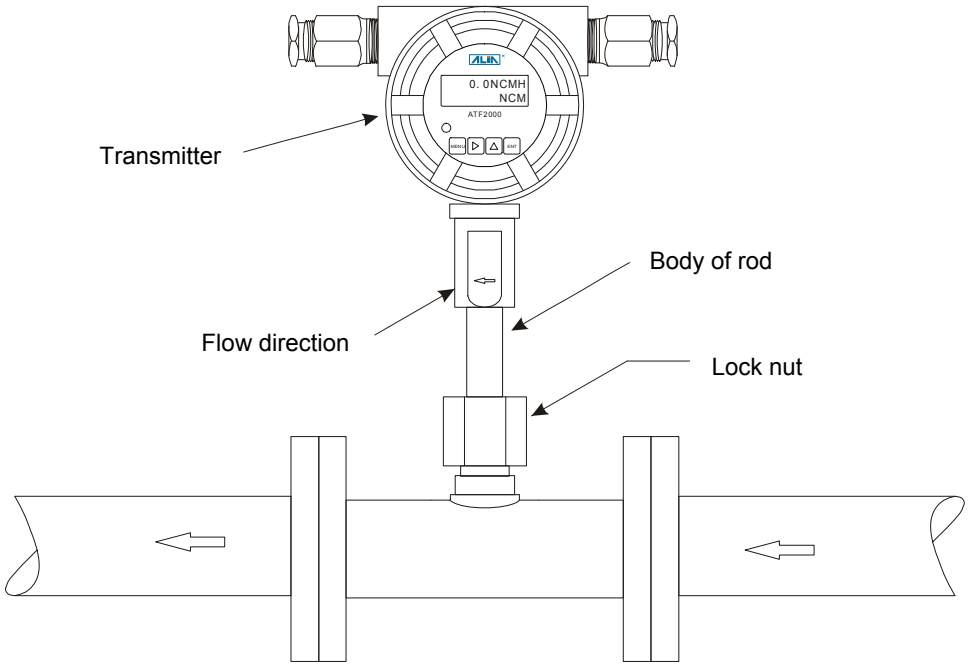
So it's required to design the length of the extension tube before the installation.

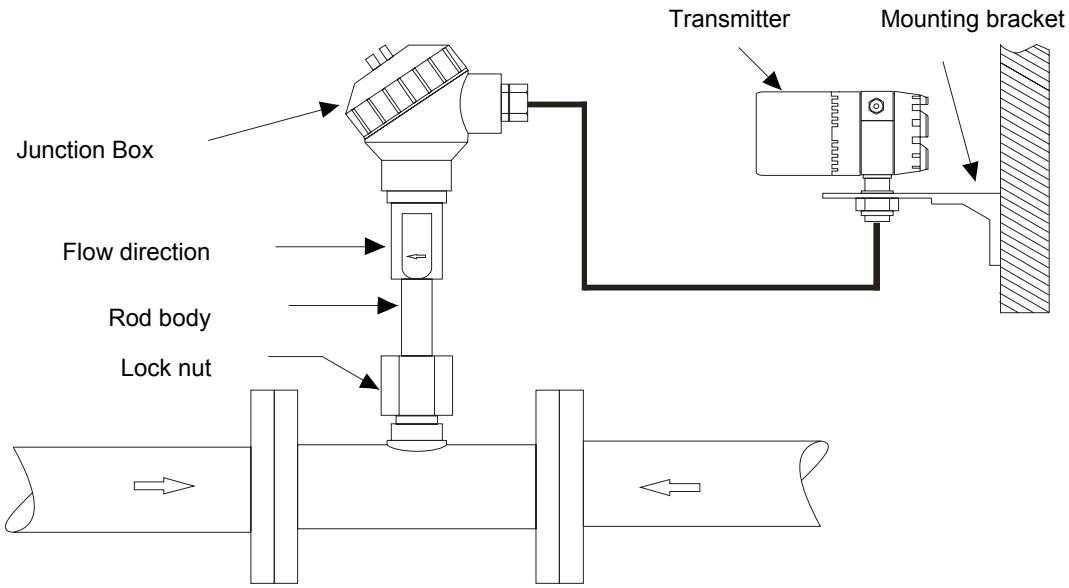
4.3.4 The Installation of Remote Plug-in Flowmeter



4.3.5 The Installation of Pipe Type Flowmeter

The production should be stopped during installation and the connection of the pipeline (flange or threaded) should be confirmed.
The sensor has been assembled on the special pipe before leaving factory. Users only need to assemble the pipe to the site, which is simpler than the installation of the plug-in flowmeter. During installation, please cut the pipe and install the mating flange according to the length of the sensor. Lock the flange hole by bolts and install the pipe type flowmeter on the pipe. Please note that the flow of the medium should be consistent with the direction of the arrow on the flowmeter.





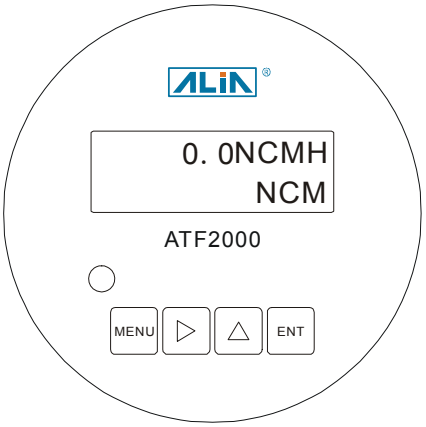
5. Debugging and Running

5.1 Keyboard & Display

● Keyboard

The thermal mass flow meter has 4 keys and it shows by 2 * 16 characters. The flow rate and totalizer, medium temperature and total time, current date and time, and instrument status data can be displayed in four screens.

Key name	Key icon	Function under normal display	Function user parameter setting
Set key	MENU	Enter parameter setting	1. Cancel the current input value 2. Return to previous menu
Move key	▷	None	Move cursor
Up key	△	Cycle display the measurement menu	Modify value
Enter key	ENT	Confirm	Save and exit



● IR Remote control (Optional)

The intrinsically safe remote control (ExibIICT6) is an infrared remote control with 16 keys. It adopts the design of sending signal only (no infrared signal received). The remote control is mainly used to set the parameters of the transmitter if it's not allowed to power on the transmitter and open its cover on site for parameter setting. Align the infrared emitter of the remote control with the receiver on the meter, and set the meter's parameters by keeping the distance less than three meters without blocking.

"PRINT": Meaningless
">": Cursor movement key, which is used to move the cursor when setting parameter.
"∧": Change the value. The measurement menu is displayed cyclically during measurement.
"MENU": Switch between the interface of parameter setting and measurement. When setting the parameter, if the cursor is at the position where the value is entered, press this button to cancel the current input value.
"ENT": Confirm the entered data.
"0-9" and ".": It's used to enter values and decimal points.

5.2 Parameter Input

When the instrument is powered on, press MENU to enter parameter setting. The screen will show two lines, the upper right corner displays the menu number. The "ENT" key is used to confirm the modified parameters; the ">" key is used to move the cursor or turn the page; the cursor is the underline below the value. If input value in a certain position, press the "∧" key to increase or decrease (decimal point and 0-9) the value.

In the parameter input interface, if the cursor is at the menu number, press the "MENU" key to switch the interface to measurement interface.

In the measurement interface, press "∧" to show the measurement menu in a loop. If the menu where the parameter is located has a "→" prompt, it indicates that the length of the current parameter is beyond the display, press ">" to turn to the next page.

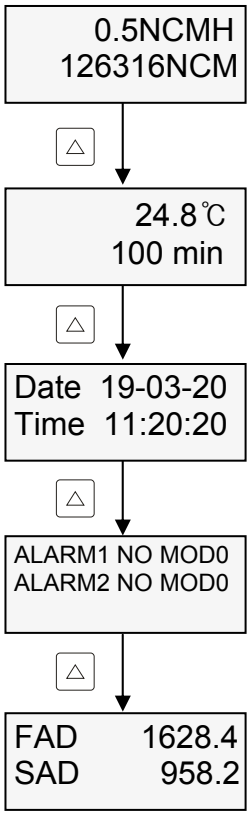
Each parameter is explained in detail below. The meter has two-level menus, there are five main menus and each main menu contains several sub-menus.

On the left of each "Parameter Description" is a simulation diagram of the LCD. The two digits in the upper right corner of the display represent the menu number. After setting some menu items and pressing the ENT key, users need to press the MENU key twice to restart the meter for the setting to take effect or wait until the menu items are all set and then to restart the meter.

Note:

1. **Please do not interchange circuit boards between meters, otherwise it will affect the normal operation of meter. If necessary, please contact ALIA engineers.**
2. **When setting parameters, please ensure that the power supply of the instrument is normal. If the power is suddenly turned off, the parameters may be lost. After power on, it's necessary to confirm again whether the parameters are set successfully.**

5.3 Display Interface



In the normal interface, press △ to switch the display interface.
1. Flow 2. Medium temperature and total running time
3. Date and time 4. Instrument data

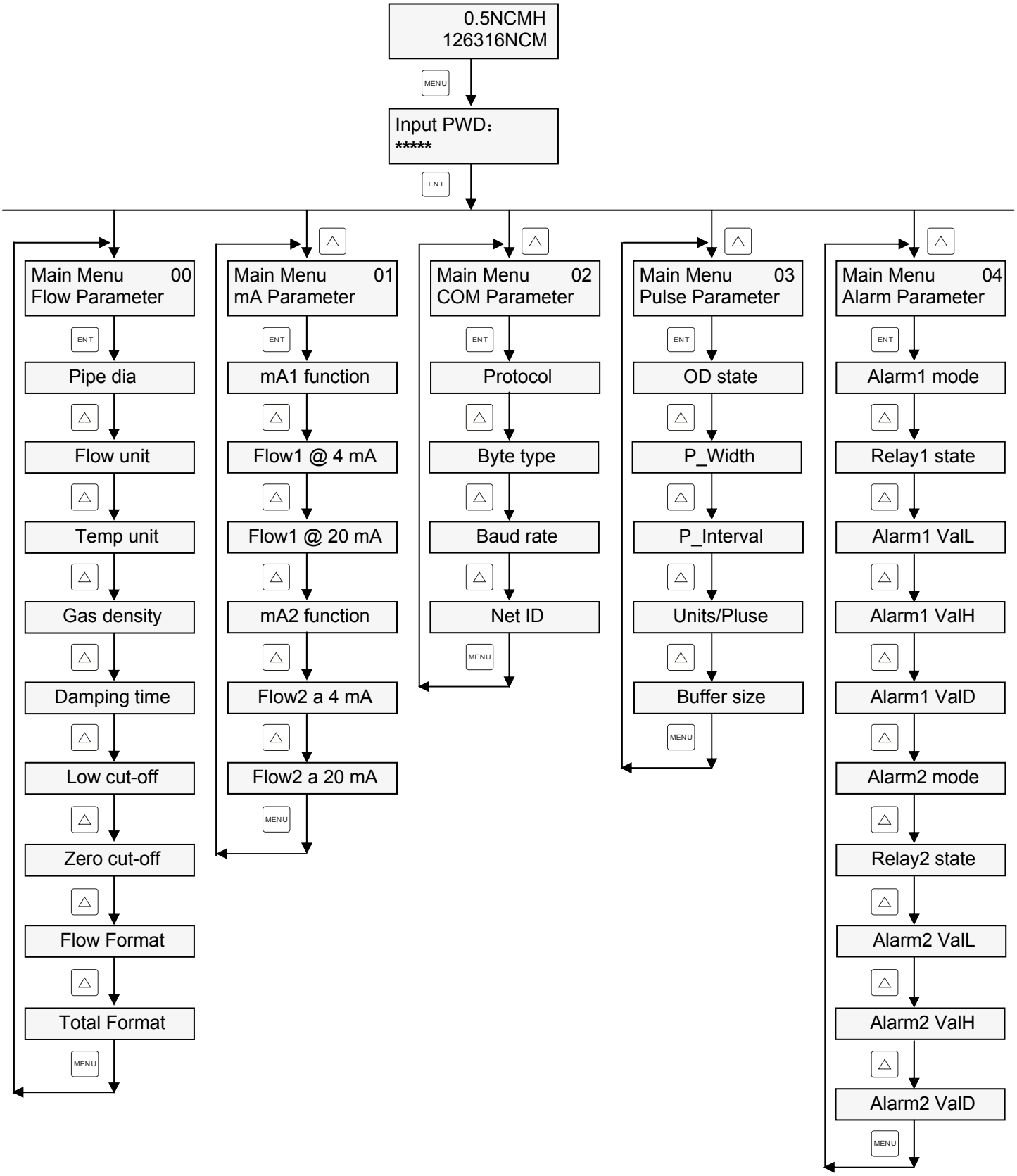
Medium temperature and total running time
Press △ to switch the display interface.
It's used to display the current temperature of the measurement medium and the total running time of instrument.

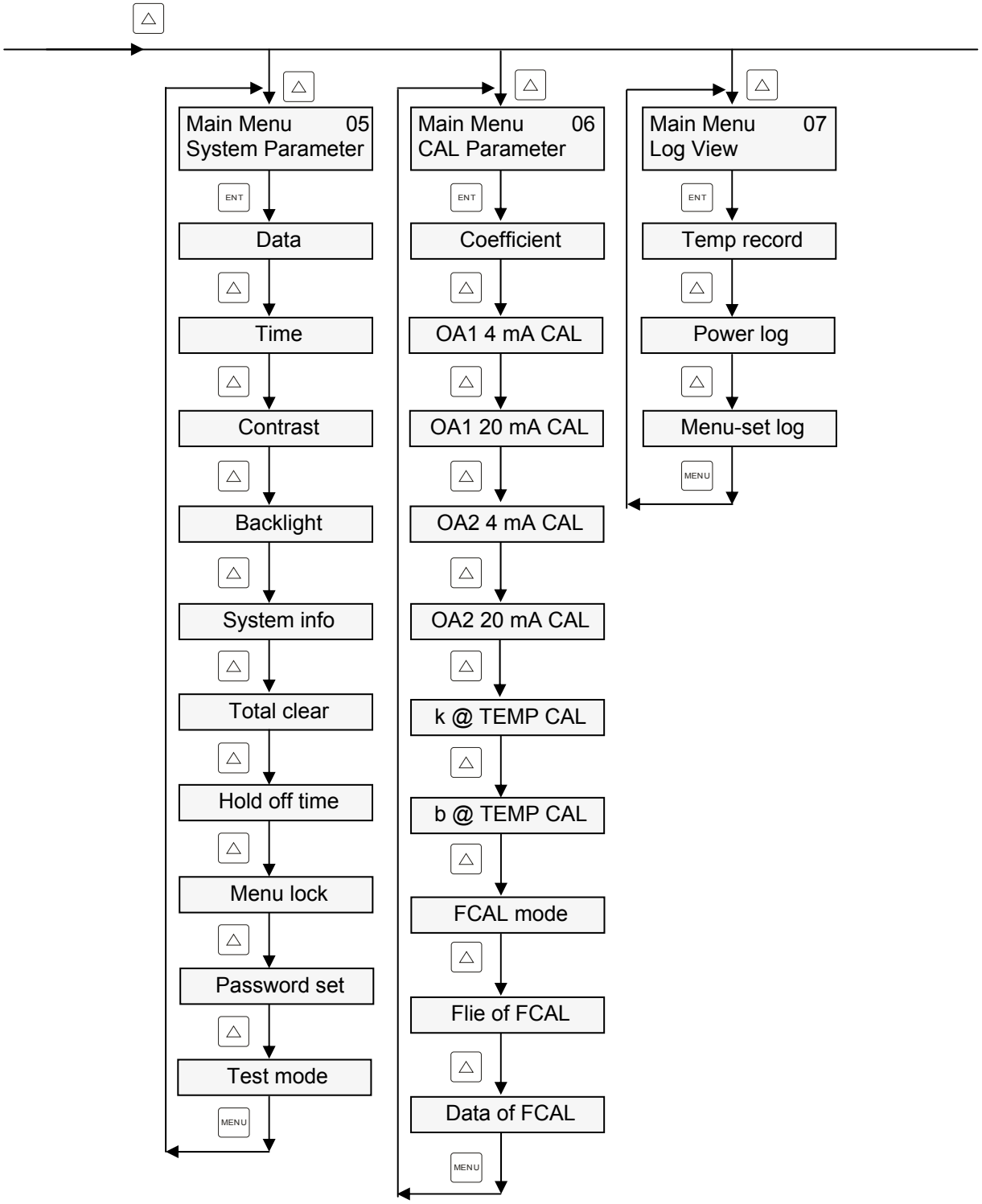
Date and time
Press △ to switch the display interface.
It's used to display the current time (date and time).

Alarm status
Press △ to switch the display interface.
If NO MOD0 appears, it means that the meter has no alarm output function.

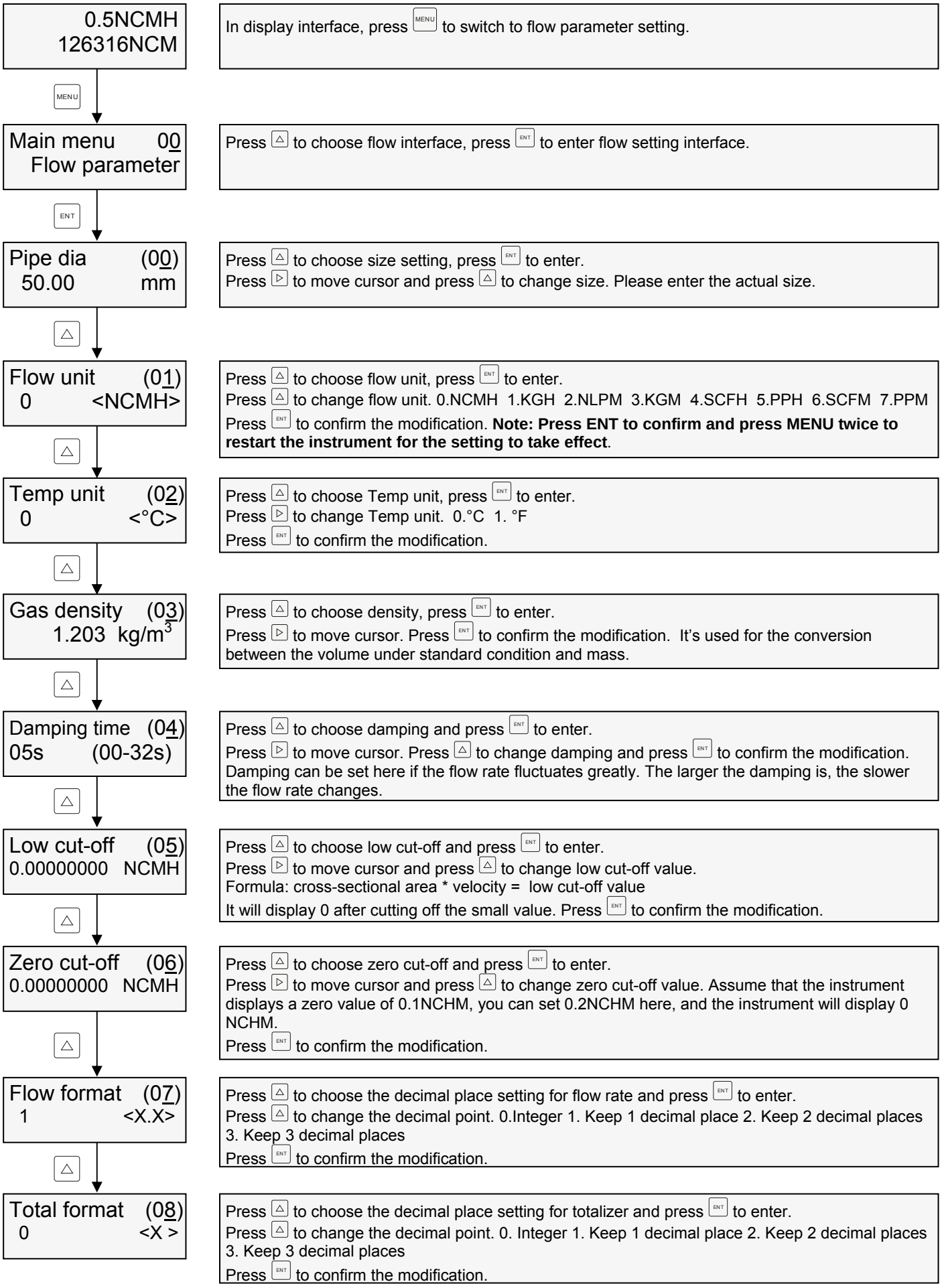
Instrument data，press △ to switch the display interface.
It's used to determine the fault and check if the sensor is normal.

6. Operation

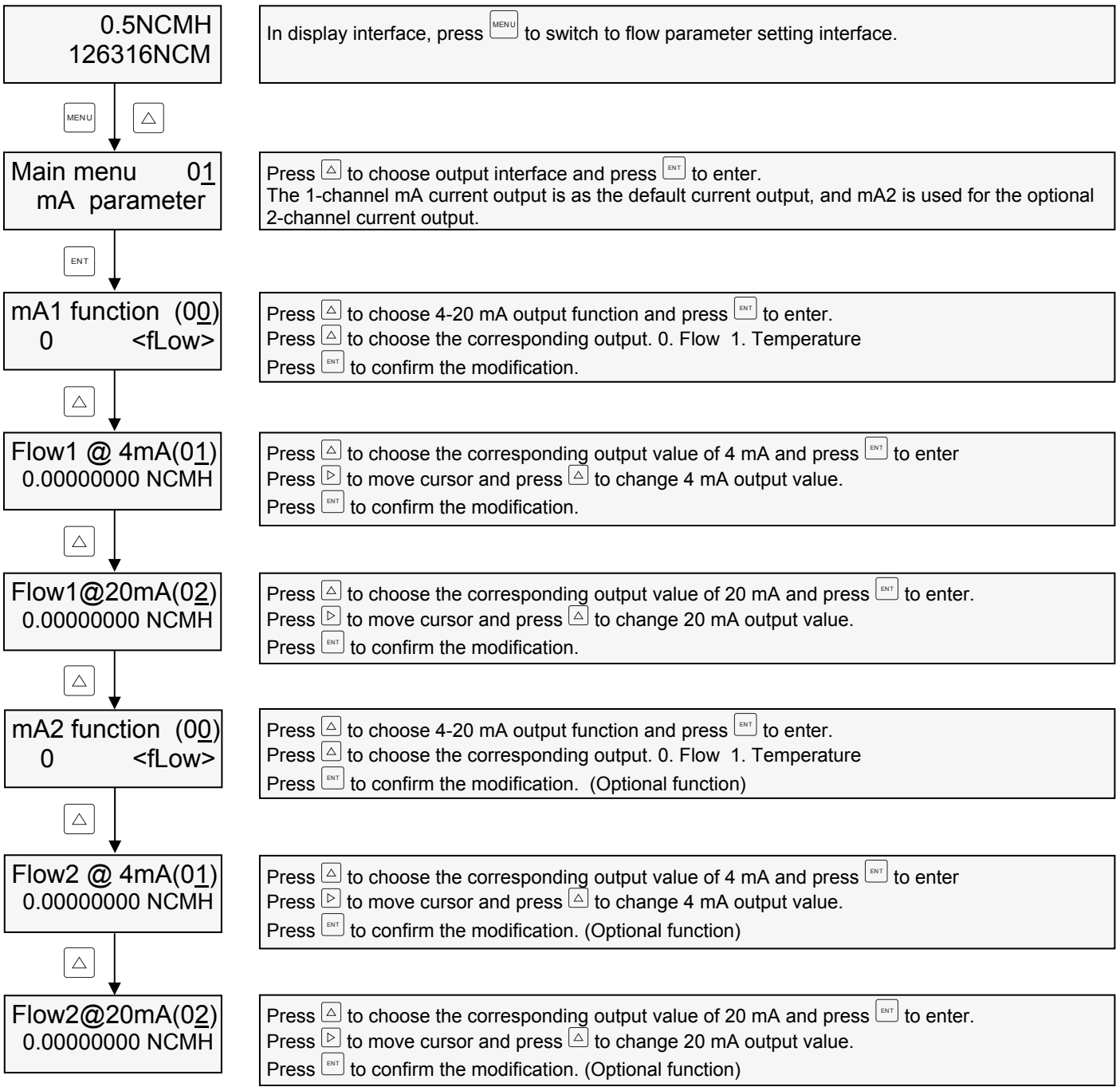

0.5NCMH
126316NCM
MENU
Input PWD:
*****
ENT
Main Menu 00
Flow Parameter
Pipe dia
Flow unit
Temp unit
Gas density
Damping time
Low cut-off
Zero cut-off
Flow Format
Total Format
MENU
Main Menu 01
mA Parameter
mA1 function
Flow1 @ 4 mA
Flow1 @ 20 mA
mA2 function
Flow2 a 4 mA
Flow2 a 20 mA
MENU
Main Menu 02
COM Parameter
Protocol
Byte type
Baud rate
Net ID
MENU
Main Menu 03
Pulse Parameter
OD state
P_Width
P_Interval
Units/Pluse
Buffer size
MENU
Main Menu 04
Alarm Parameter
Alarm1 mode
Relay1 state
Alarm1 ValL
Alarm1 ValH
Alarm1 ValD
Alarm2 mode
Relay2 state
Alarm2 ValL
Alarm2 ValH
Alarm2 ValD
MENU


△
Main Menu 05
System Parameter
ENT
Data
△
Time
△
Contrast
△
Backlight
△
System info
△
Total clear
△
Hold off time
△
Menu lock
△
Password set
△
Test mode
MENU
Main Menu 06
CAL Parameter
ENT
Coefficient
△
OA1 4 mA CAL
△
OA1 20 mA CAL
△
OA2 4 mA CAL
△
OA2 20 mA CAL
△
k @ TEMP CAL
△
b @ TEMP CAL
△
FCAL mode
△
Flie of FCAL
△
Data of FCAL
MENU
Main Menu 07
Log View
ENT
Temp record
△
Power log
△
Menu-set log
MENU

6.1 Flow Parameter Setting

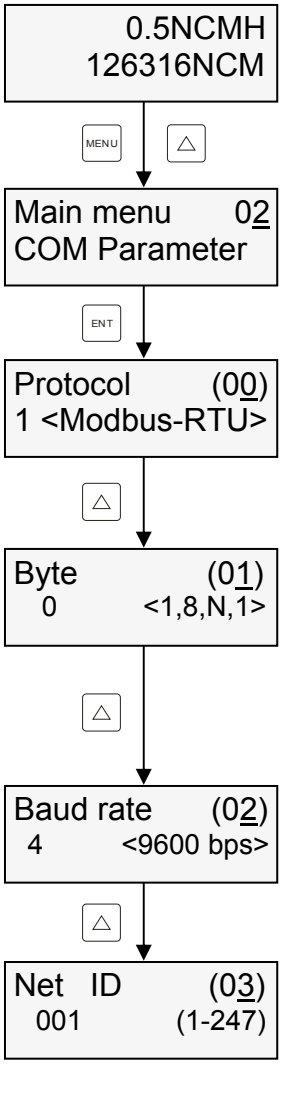


6.2 Output Setting



Note: Only 4-20 mA loop of 1-channel can be selected in HART function.

6.3 Communication Setting



In display interface, press MENU to switch to flow parameter setting interface.

Press △ to choose Communication interface and press ENT to enter.

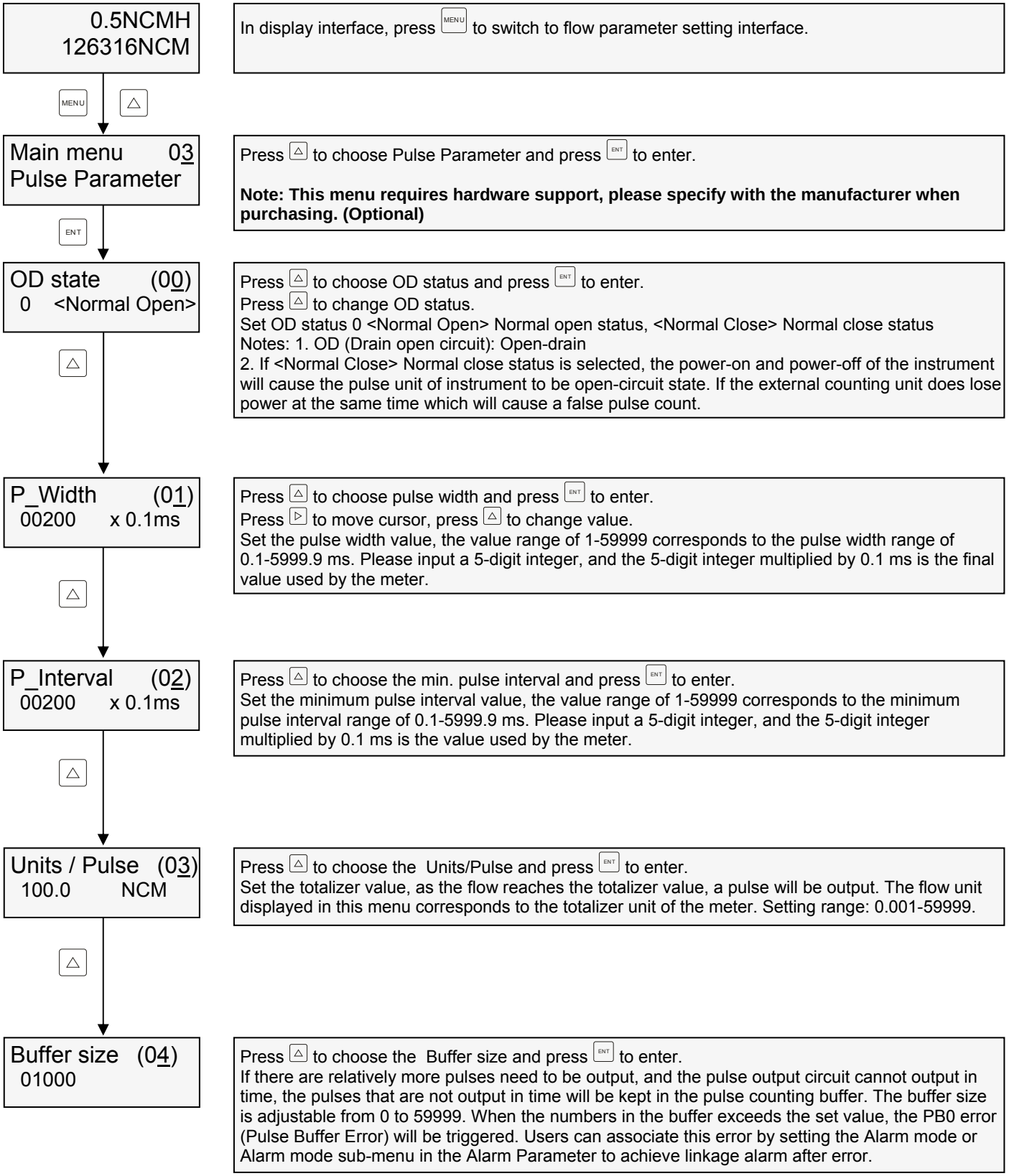
Press △ to choose protocol and press ENT to enter.
Press △ to change communication output. 0. MProtocol (custom protocol) 1. MODBUS-RTU
Note: Press ENT to confirm and press MENU twice to restart the instrument for the setting to take effect.

Byte format
Press ENT to enter.
Option: 0-5
0-0 parity bit, 1 stop bit 1-odd parity, 1 stop bit 2-even parity, 1 stop bit
3-0 parity bit, 2 stop bits 4-odd parity, 2 stop bits 5-even parity, 2 stop bits
Note: Press ENT to confirm and press MENU twice to restart the instrument for the setting to take effect.

Press △ to choose baud rate and press ENT to enter.
Option: 0-3 0. 1200 1. 2400 2. 4800 3. 9600
Note: Press ENT to confirm and press MENU twice to restart the instrument for the setting to take effect.

Press △ to choose Net ID and press ENT to enter.
Option: 001-247
Note: Press ENT to confirm and press MENU twice to restart the instrument for the setting to take effect.

6.4 Pulse Parameter Setting



In display interface, press MENU to switch to flow parameter setting interface.

Press △ to choose Pulse Parameter and press ENT to enter.

Note: This menu requires hardware support, please specify with the manufacturer when purchasing. (Optional)

Press △ to choose OD status and press ENT to enter.
Press △ to change OD status.
Set OD status 0 <Normal Open> Normal open status, <Normal Close> Normal close status
Notes: 1. OD (Drain open circuit): Open-drain
2. If <Normal Close> Normal close status is selected, the power-on and power-off of the instrument will cause the pulse unit of instrument to be open-circuit state. If the external counting unit does lose power at the same time which will cause a false pulse count.

Press △ to choose pulse width and press ENT to enter.
Press ▷ to move cursor, press △ to change value.
Set the pulse width value, the value range of 1-59999 corresponds to the pulse width range of 0.1-5999.9 ms. Please input a 5-digit integer, and the 5-digit integer multiplied by 0.1 ms is the final value used by the meter.

Press △ to choose the min. pulse interval and press ENT to enter.
Set the minimum pulse interval value, the value range of 1-59999 corresponds to the minimum pulse interval range of 0.1-5999.9 ms. Please input a 5-digit integer, and the 5-digit integer multiplied by 0.1 ms is the value used by the meter.

Press △ to choose the Units/Pulse and press ENT to enter.
Set the totalizer value, as the flow reaches the totalizer value, a pulse will be output. The flow unit displayed in this menu corresponds to the totalizer unit of the meter. Setting range: 0.001-59999.

Press △ to choose the Buffer size and press ENT to enter.
If there are relatively more pulses need to be output, and the pulse output circuit cannot output in time, the pulses that are not output in time will be kept in the pulse counting buffer. The buffer size is adjustable from 0 to 59999. When the numbers in the buffer exceeds the set value, the PB0 error (Pulse Buffer Error) will be triggered. Users can associate this error by setting the Alarm mode or Alarm mode sub-menu in the Alarm Parameter to achieve linkage alarm after error.

The time unit s of "P_Width" and "P_Interval" are ms, and the setting range is from 0.1 to 5999.9 ms.
Figure 1 shows the scope controlled by the parameter in the "normally open" mode, and Figure 2 shows the scope controlled by the parameter in the "normally closed" mode.

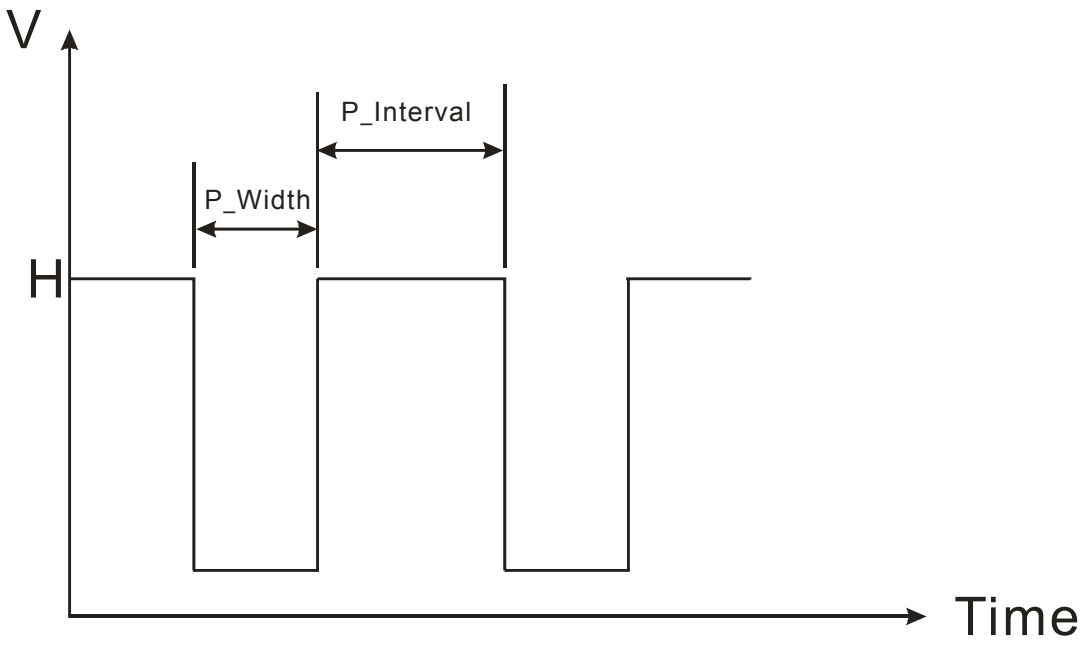


Figure 1

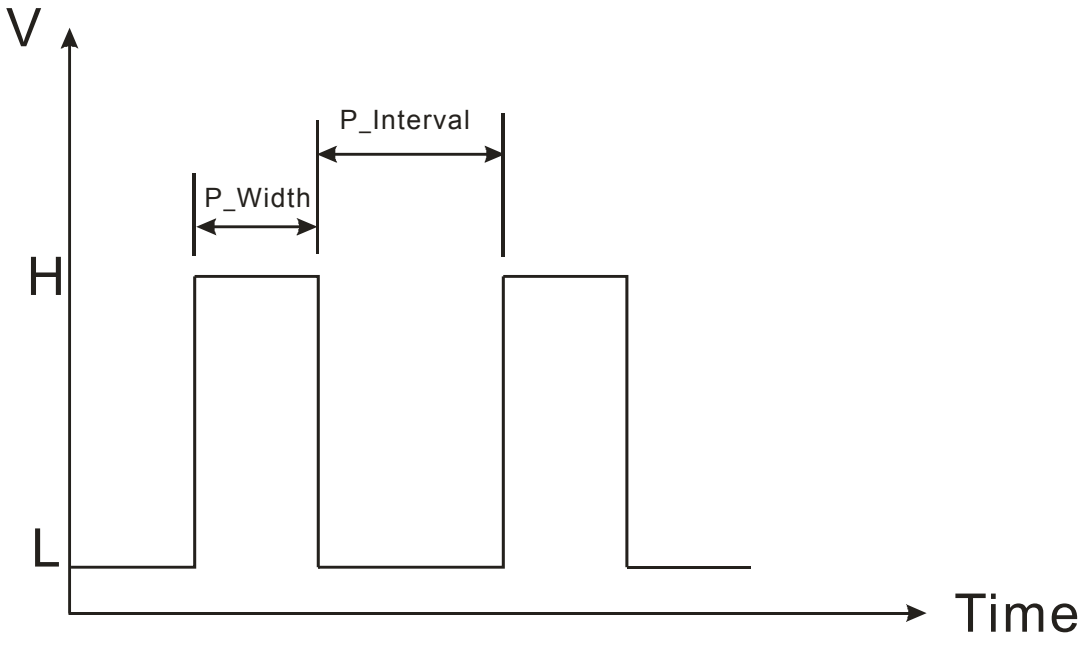
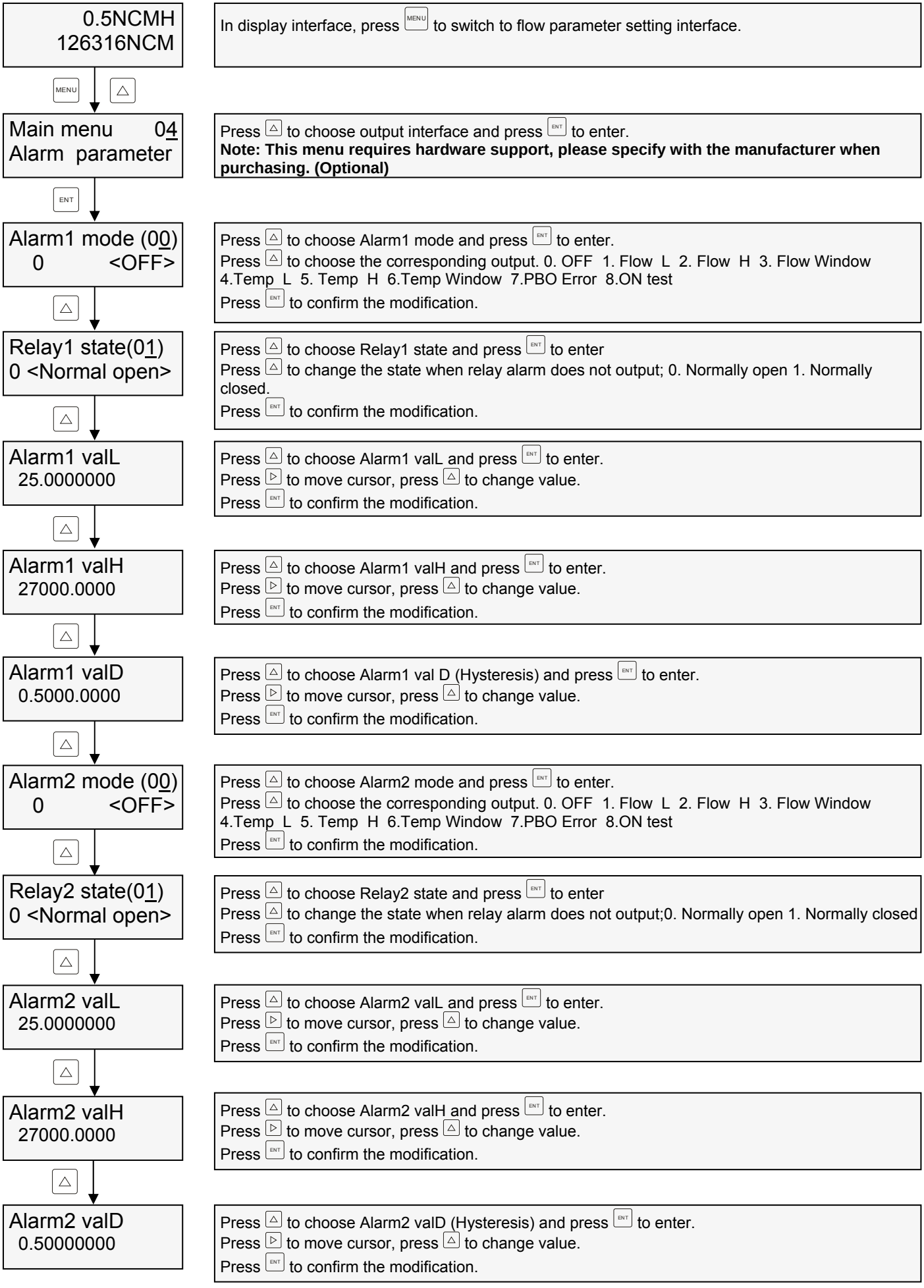


Figure 2

6.5 Alarm Parameter Setting



6.6 System Parameter Setting

0.5NCMH 126316NCM	In display interface, press MENU to switch to parameter setting interface.
MENU △	
Main menu 05 System parameter	Press △ to choose system parameter, press ENT to enter parameter setting interface.
ENT	
Date (00) 19-03-20	Press △ to set date, press ENT to enter. Enter 6 digits, year (2 digits), month (2 digits) and day (2 digits), remoted by"-"in the middle. Press ENT to confirm.
△	
Time (01) 15:13:13	Press △ to set time, press ENT to enter. Enter 6 digits, hour (2 digits), minute (2 digits) and second (2 digits), remoted by":"in the middle. Press ENT to confirm.
△	
Contrast (02) 3	Press △ to set LCD contrast and press ENT to enter. Press △ to change the screen brightness. Range: 0-9. The larger the value is, the brighter the screen will be. The smaller the value is, the darker the screen will be. Press ENT to confirm.
△	
Backlight (03) 99s (0-98,99)	Press △ to choose backlight time and press ENT to enter. Press ▷ to move cursor, press △ to change backlight time. 1-98s: the backlight time when there is no operation on the screen. 99s: the backlight is always on 0: the backlight is turned off.
△	
System info (04) VER:04-0.41,T8→	Press △ to choose system version and press ENT to enter. Press ▷ to turn the page and press MENU to return.
△	
Total clear (05) 0 <Not action>	Press △ to choose total clear and press ENT to enter. Press △ to choose clear total or not. 0. Not action 1. Clr total Press ENT to confirm.
△	
Hold off time (06) 20s (00-99s)	Press △ to choose Holdoff time and press ENT to enter. Press ▷ to move cursor, press △ to change Holdoff time The meter sensor needs a heating balance time every time the meter is powered on again. During this time, the sensor is with rated power consumption, which causes the measured value from the flowmeter much larger than the actual value. This menu is used to set a time so that every time the meter is powered off and on, the flow measurement will not be performed within the specified time, and the countdown mark of "H **S" will be displayed in the flowrate measurement interface. Default is as 20s. Press ENT to confirm.
△	
Menu lock (07) 0 <Un lock>	Press △ to choose menu lock and press ENT to enter. Press △ to change value. 0-unlock 1-lock If the keyboard input is locked, the password is needed to enter any parameter. Please DO NOT change password. Press ENT to confirm.

△

Password set (08)
*****

Press △ to set password, press ENT to enter.
Press ▷ to move cursor and press △ to change the value. Please DO NOT change password. Default is 00000.
Press ENT to confirm.

△

Test mode (09)
0000

This feature is for manufacturer use only.

6.7 Instrument Coefficient

0.5NCMH
126316NCM

In display interface, press MENU to switch to parameter setting interface.

MENU △

Main menu 06
CAL parameter

Press △ to choose parameter calibration and press ENT to enter.

ENT

Coefficient (00)
100.0%

Press △ to choose instrument coefficient and press ENT to enter.
Press ▷ to move cursor and press △ to change value.
It has been calibrated before leaving the factory. Do not change the value or the flow accuracy will be affected.
Press ENT to confirm.

△

OA1 4mA CAL (01)
0819

Press △ to choose 1-channel 4 mA output calibration and press ENT to enter.
Press ▷ to move cursor, press △ to choose 4 mA output calibration value. If 4 mA output is inaccurate, users can slowly adjust the calibration value.
If the output is 3.9 mA, please slowly increase the value to 4 mA, and vice versa.
Press ENT to confirm.

△

OA1 20mA CAL(02)
4000

Press △ to choose 1-channel 20 mA output calibration and press ENT to enter.
Press ▷ to move cursor, press △ to choose 20 mA output calibration value. If 20 mA output is inaccurate, users can slowly adjust the calibration value. If the output is 19 mA, please slowly increase the value to 20 mA, and vice versa. Press ENT to confirm.

△

OA2 4mA CAL (03)
0819

Press △ to choose 2-channel 4 mA output calibration and press ENT to enter.
Press ▷ to move cursor, press △ to choose 4 mA output calibration value. If 4 mA output is inaccurate, users can slowly adjust the calibration value.
If the output is 3.9 mA, please slowly increase the value to 4 mA, and vice versa.
Press ENT to confirm. (Optional function)

△

OA2 20mA CAL(04)
4000

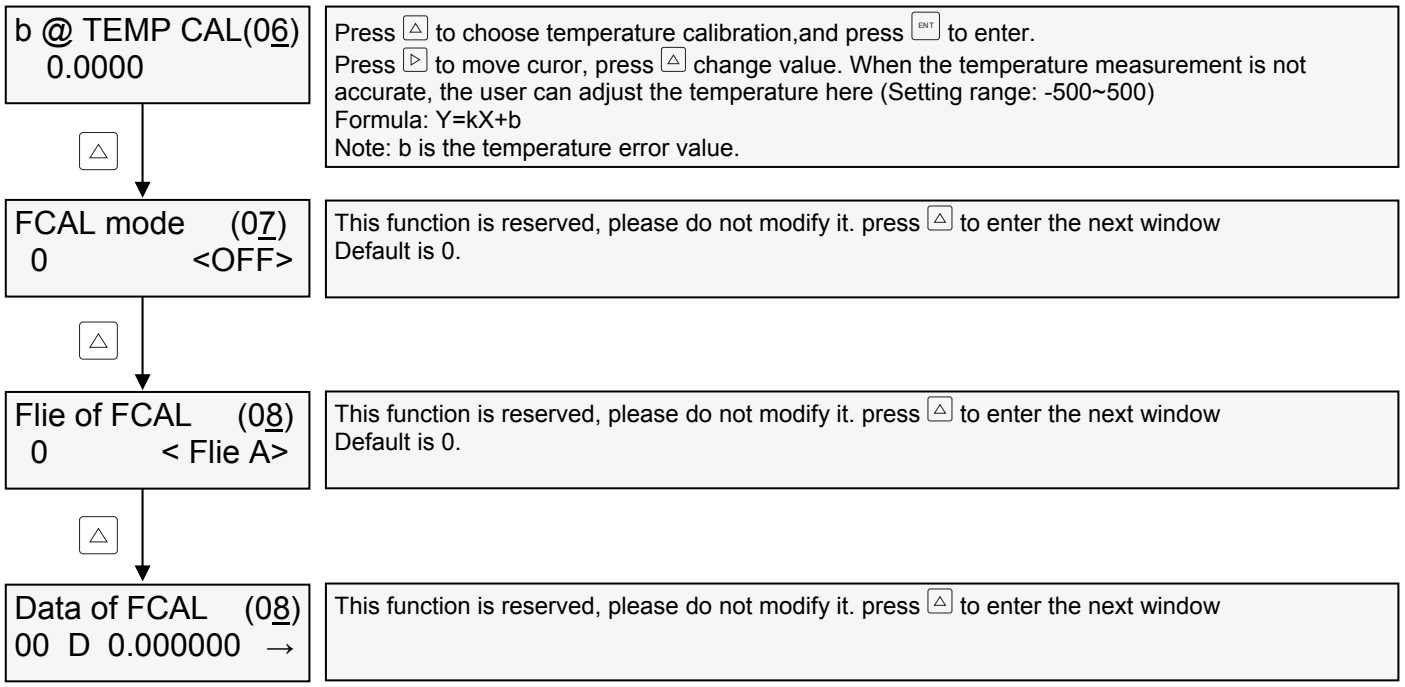
Press △ to choose 2-channel 20 mA output calibration and press ENT to enter.
Press ▷ to move cursor, press △ to choose 20 mA output calibration value. If 20 mA output is inaccurate, users can slowly adjust the calibration value. If the output is 19 mA, please slowly increase the value to 20 mA, and vice versa. Press ENT to confirm. (Optional function)

△

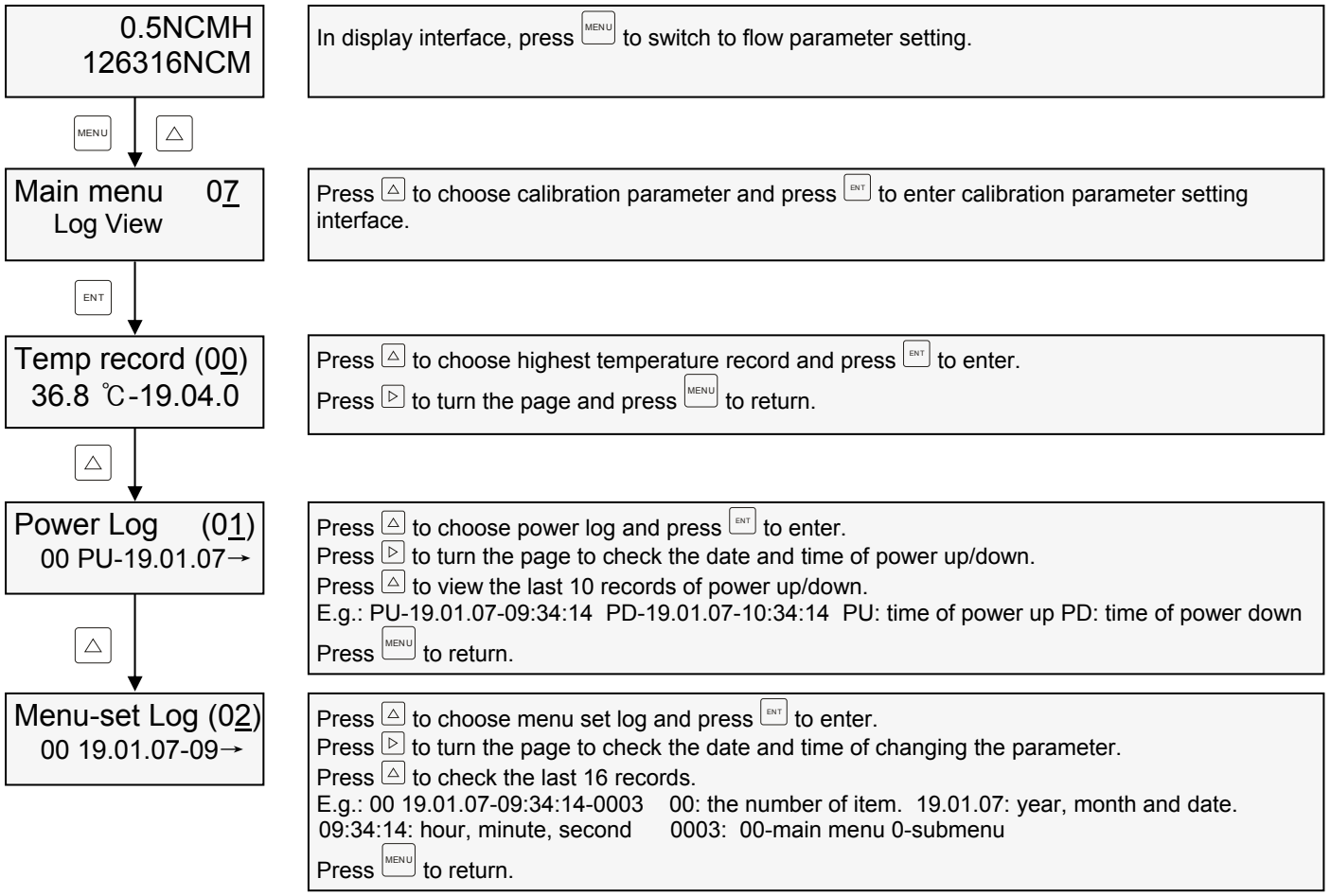
k @ TEMP CAL(05)
1.000

Press △ to choose temperature calibration, and press ENT to enter.
Press ▷ to move cursor, press △ to change value. When the temperature measurement is not accurate, the user can adjust the temperature coefficient here (Setting range: 0-2)
Formula: Y=kX+b
Note: k is the temperature coefficient. After adjustment, the entire temperature measurement curve coefficient will be changed. Please do not modify it unless necessary.

△


b @ TEMP CAL(06)
0.0000
Press △ to choose temperature calibration,and press ENT to enter.
Press ▷ to move curor, press △ change value. When the temperature measurement is not accurate, the user can adjust the temperature here (Setting range: -500~500)
Formula: Y=kX+b
Note: b is the temperature error value.
△
FCAL mode (07)
0 <OFF>
This function is reserved, please do not modify it. press △ to enter the next window
Default is 0.
△
Flie of FCAL (08)
0 < Flie A>
This function is reserved, please do not modify it. press △ to enter the next window
Default is 0.
△
Data of FCAL (08)
00 D 0.000000 →
This function is reserved, please do not modify it. press △ to enter the next window

6.8 View Log


0.5NCMH
126316NCM
In display interface, press MENU to switch to flow parameter setting.
MENU △
Main menu 07
Log View
Press △ to choose calibration parameter and press ENT to enter calibration parameter setting interface.
ENT
Temp record (00)
36.8 ℃-19.04.0
Press △ to choose highest temperature record and press ENT to enter.
Press ▷ to turn the page and press MENU to return.
△
Power Log (01)
00 PU-19.01.07→
Press △ to choose power log and press ENT to enter.
Press ▷ to turn the page to check the date and time of power up/down.
Press △ to view the last 10 records of power up/down.
E.g.: PU-19.01.07-09:34:14 PD-19.01.07-10:34:14 PU: time of power up PD: time of power down
Press MENU to return.
△
Menu-set Log (02)
00 19.01.07-09→
Press △ to choose menu set log and press ENT to enter.
Press ▷ to turn the page to check the date and time of changing the parameter.
Press △ to check the last 16 records.
E.g.: 00 19.01.07-09:34:14-0003 00: the number of item. 19.01.07: year, month and date.
09:34:14: hour, minute, second 0003: 00-main menu 0-submenu
Press MENU to return.

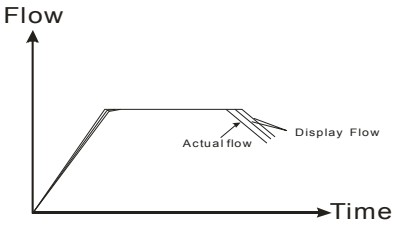
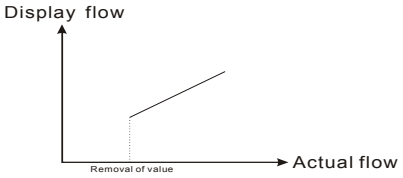
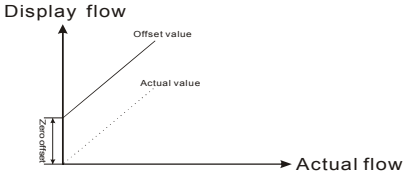
7. Maintenance

If the measuring medium is dirty, some dirt may accumulate on the instrument sensor after running for a period of time. Thus the sensor needs to be cleaned and maintained regularly to remove dirt. But if the measurement medium is pure, this step can be omitted.
The plug-in instrument can realize the non-stop production maintenance and operation under the premise of ensuring that the measurement medium and the on-site environment permit the on-line disassembly without stopping production. The disassembly is the reverse of the installation. For Pipe-type instrument, the production should be stopped for disassembly and maintenance.

8. Troubleshooting

Trouble	Possible cause	Treatment
No display	A. Power supply B. The fuse of meter is broken	A. Check the supply voltage and polarity B. Measure the voltage at the terminals C. Check if the fuse is broken
Small flow	A. The flow direction indicated on flowmeter is different from which of the actual flow B. The sensor is dirty	A. Adjust the angle of the flowmeter so that the flow direction on the flowmeter is the same as the gas flow direction B. Take out the sensor and clean it
Abnormal flow, great fluctuation	A. The fluid is pulsating B. The sensor is dirty C. The sensor is broken	A. Increase the damping coefficient B. Take out the sensor and clean it C. Return to the manufacturer for maintenance
4-20 mA is abnormal	A. 20 mA The range of 20 mA is set incorrectly B. The wiring does not form a loop. C. Circuit failure	A. Set the range correctly B. Check the wiring C. Return to the manufacturer for maintenance
RS485 is abnormal	A. Baud rate or address is set wrongly B. The polarity is reverse	A. Set them correctly B. Change the polarity

9. Noun Interpretation

Name	Menu	Illustrate	Factory setting
Damping time	Damping time	Damping time determines the tracking speed of the displayed flow rate to actual flow rate. 	5S
Low cut-off	Low cut-off	It is used to cut off the small flow that users do not want to display and measure accumulative. If the actual flow is lower than this value, the transmitter will shows 0 flow rate. 	0.1
Zero cut-off	Zero cut-off	If zero offset occurs in the instrument, it is necessary to adjust the zero and cut off the corresponding zero value. 	0.1
Coefficient	Coefficient	The method to correct the accuracy of instrument is as follows: Meter coefficient = {Truth value / (Apparent value / original coefficient)} * 100% E.g.: Truth value = 1 Nm^3/hr Apparent value = 0.8 Nm^3/hr Original coefficient = 100% Meter coefficient = {1/(0.8/1)} * 100% = 125% The coefficient is set to 125%	Set the value according to the default coefficient.

10. MODBUS Address

MODBUS Table					
NO.	Content	Data Type	Address	Length	Read
1	Flow rate	Float	Ox0101	Ox0002	03
2	Totalizer	Float	Ox0103	Ox0002	03
3	Temperature	Float	Ox0105	Ox0002	03

Notes: The unit of flow rate is consistent with which set in the instrument. If a volume unit is set, the unit of flow rate is Nm^3/hr. If a mass unit is set, the unit of flow rate is kg/hr.

The unit of totalizer is consistent with which set in the instrument. If a volume unit is set, the unit of totalizer is Nm^3. If a mass unit is set, the unit of totalizer is kg.

Temperature unit is °C.

Data sending and receiving

E.g.: Read flow rate
1. The format of the send command:
(MODBUS Address) + (Function Code) + (Address) + (Register Length) + (CRC Check Code)
001 03 Ox0101 Ox0002 Automatic generation
The sent command：01 03 0101 0002 9437
The format of the received command:
(Meter Address) + (Function Code) + (Data Digit) + (Register Data) + (CRC Check Code)
01 03 04 3F12 61BE Automatic generation
The received command: 01 03 04 3F12 61BE FFC2

Convert 3F12 61BE in hexadecimal into a floating point value of 0.5 Nm^3/hr.