Split Micro
Thermal Gas Mass Flow Meter
Manual

Catalogue

Ⅰ、Product Introduction

Micro gas mass flowmeter is specially designed for the measurement and process control of various small flow gases. This series of sensors are made of advanced micro-electromechanical system (MEMS) flow sensor chips and are suitable for all kinds of clean gases. The unique packaging technology makes it applicable to various pipe diameters, low cost, easy to install, no need for temperature and pressure compensation, and can replace traditional volumetric or differential pressure flowmeters.

Ⅱ、Features

- Using micro-electromechanical system (MEMS) flow sensor chip, the sensor has the characteristics of high precision, high sensitivity and strong anti-interference.
- This product has a display screen and setting buttons for simple operation and direct reading. (Optional)
- The zero point stability of the sensor is greatly improved compared to general thermal flow meters.
- High stability over the entire range.
- High accuracy and excellent repeatability over the entire range.
- Combined with structural optimization, the flow meter has significantly reduced pressure loss and lowered energy consumption compared to traditional mechanical meters.
- LCD is used to display instantaneous flow and accumulated flow, which is clear and intuitive and easy to read.
- 4~ 20mA standard current signal output and alarm output.

Ⅲ、Technical Parameters

Model	xx-xx	xx-xx	Unit
Flow Range	0-500	0-1000	L/min
Range Ratio	100:1		
Accuracy	±1.5FS		%
Repetition Rate	< 1.0		%
Working Power Supply	DC12-24V		
Output	4-20mA , Flow Alarm , RS485		

Method	(Modbus Protocol)		
Display Mode	LCD Screen		
Maximum Working Pressure	1.0		Mpa
Medium Temperature	-10~55 (High temperature can be customized)		℃
Humidity	<95%RH (No Frost, No Ice)		
Calibration Conditions	Air (20 °C , 101.325kPa)		
Protection Level	IP40		
Diameter	DN 8-DN15	DN20	
Mechanical Interface	G1/ 4 G3/8 G1/2 (Internal) External Thread	G3/4 External Thread	

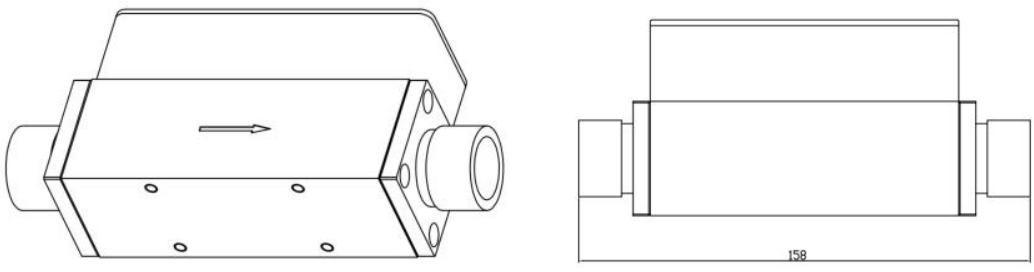
Ⅳ、Unboxing Instructions

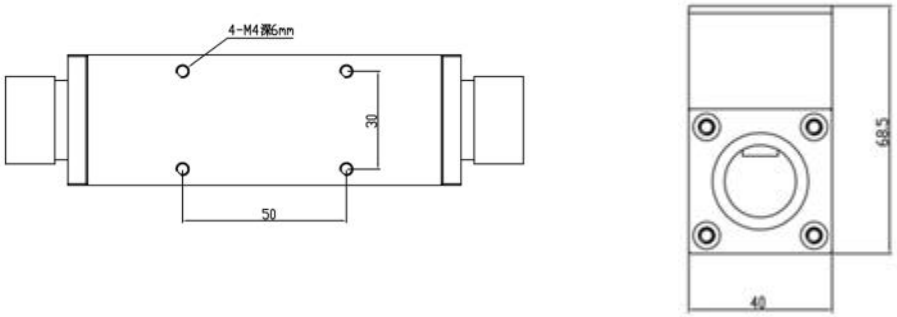
1. Open the product box, the box should contain the following items
   a) Main Body Base one piece
   b) Display Module one piece
   c) Product Manual one piece
   d) Aviation Cable (4 cores length 1.0m) one piece
   e) Aviation Cable (7 cores length 1.0m) one piece
   f) Certificate one piece

After confirming that there is no mechanical damage to the main body, tear off the protective film outside the display

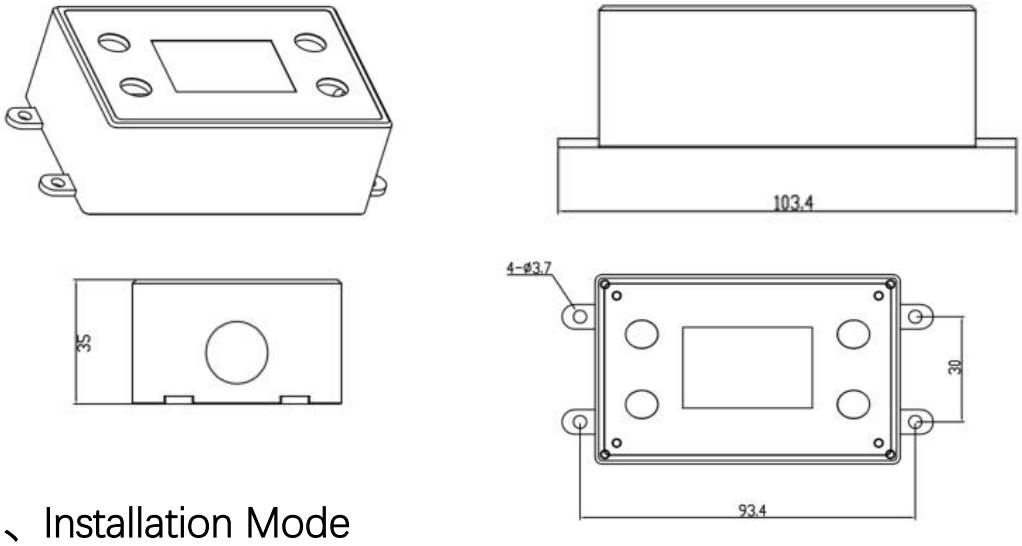
Ⅴ、Mechanical and Installation Dimensions

Main Body Base

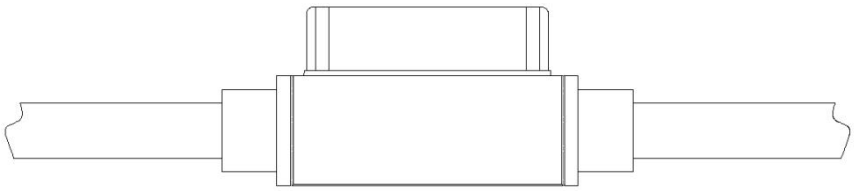




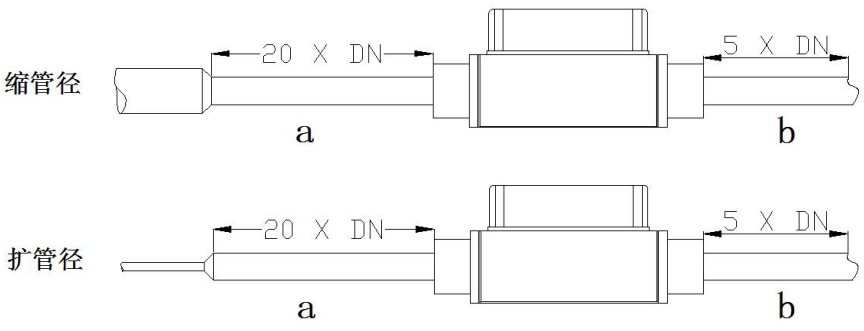
Split Display Part

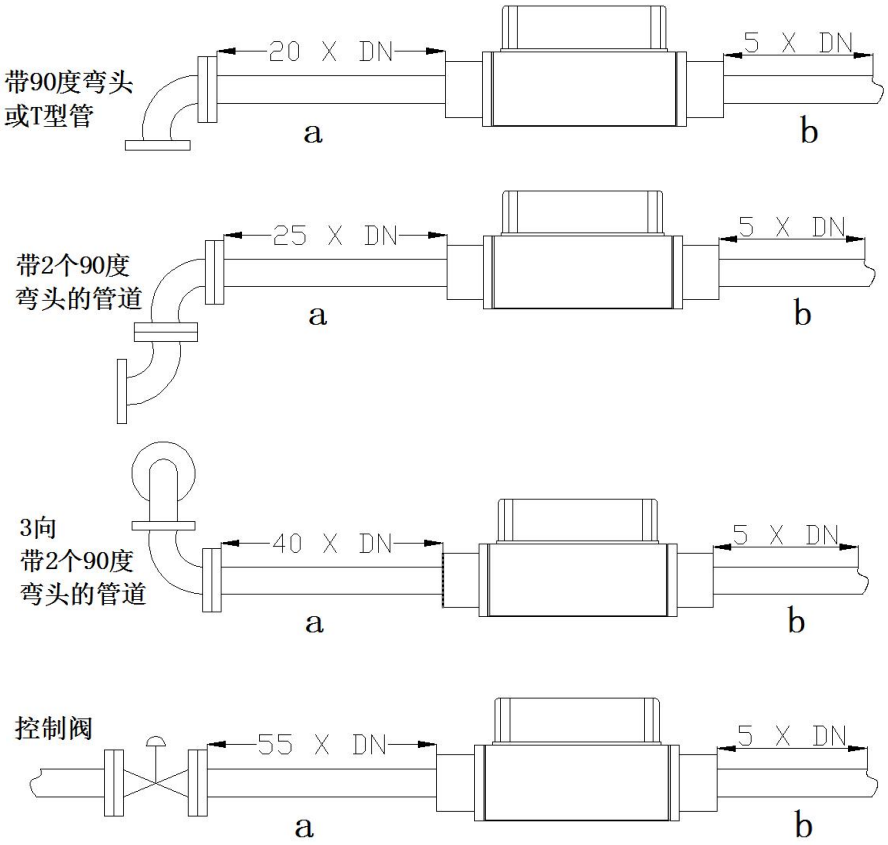


VI、Installation Mode



VII、Installation Notes





⚠Note: When installing and using, be sure to ensure that the front and rear pipe ends are within the above distance, and the straight pipe section is concentric with the pipe on the flow meter, and the flow meter is fixed reliably. If the straight pipe section cannot be guaranteed, the accuracy of the flow meter cannot be guaranteed.

Ⅷ、Wiring

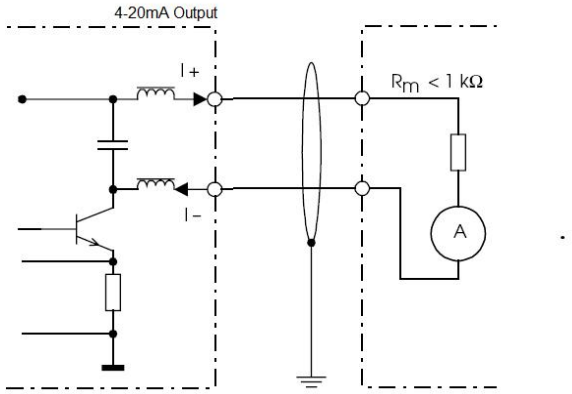
1) **Terminal Block Description** :

7 -core aviation cable 1 meter long for user input/output interface

Logo	Meaning
1-Red	Current Output I+
2-Yellow	High Flow Alarm Output+
3-Green	RS485 Communication Output A
4-Black	RS485 Communication Output B
5-Brown	Low Flow Alarm Output+
6-White	DC24V
7-Blue	GND/ I-

4-core aviation cable, 1 meter long, used for connection with the display module.

2) **Wiring Connection** :

Current Output Wiring	

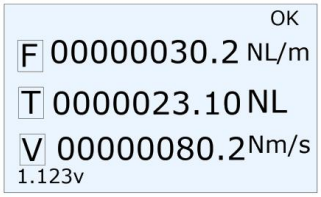
IX、Instructions :

1. Key Description

Logo	Meaning
ESC	Cancel / Exit Key
ENT	Confirm/Enter Key
◀	Shift Key
▲	Edit/Page Key

2. Menu Description

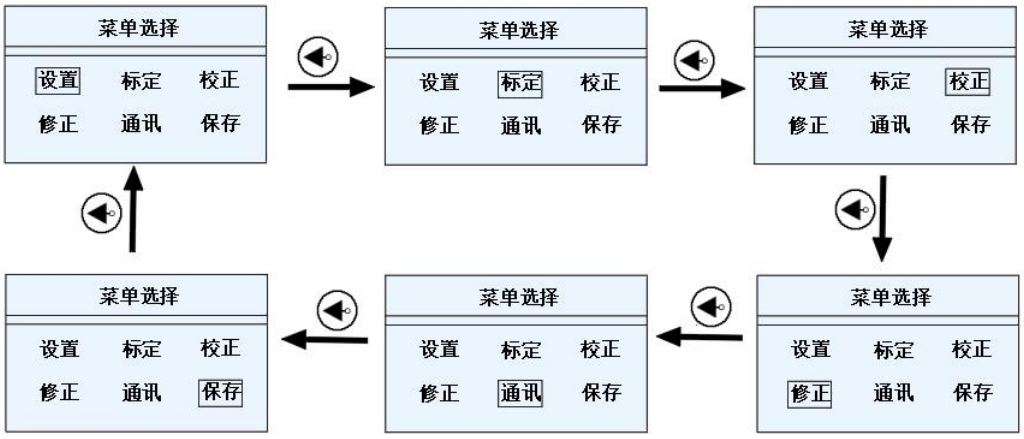
a) Flow Display

 Display instantaneous flow rate and instantaneous flow rate unit Cumulative flow and unit, according to access the detailed display window	 All information display windows First row: The boxes are status indicators. OK means the communication is normal, err means the communication is wrong The second line is the instantaneous flow The third line is the cumulative flow The fourth line is the flow rate The fifth line is the real-time voltage

b) Menu Display

Press ENT menu to enter 	Menu Selection Settings：Basic parameter settings Calibration：Calibration settings Calibration：Set zero voltage, current calibration, and clear accumulated flow Communication：RS485 communication parameter setting Save: Parameter save and restore Correction：Secondary correction of flow
	Setup, Calibration, Communication, Save, Password：1000 Calibration, Correction Password: 0603

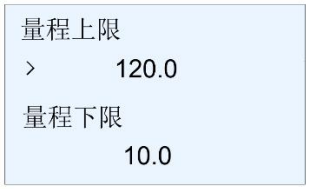
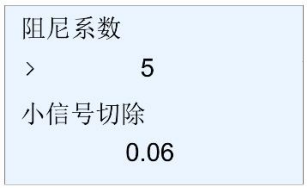
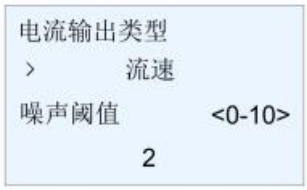
Use the shift key to select the function menu you want to enter.



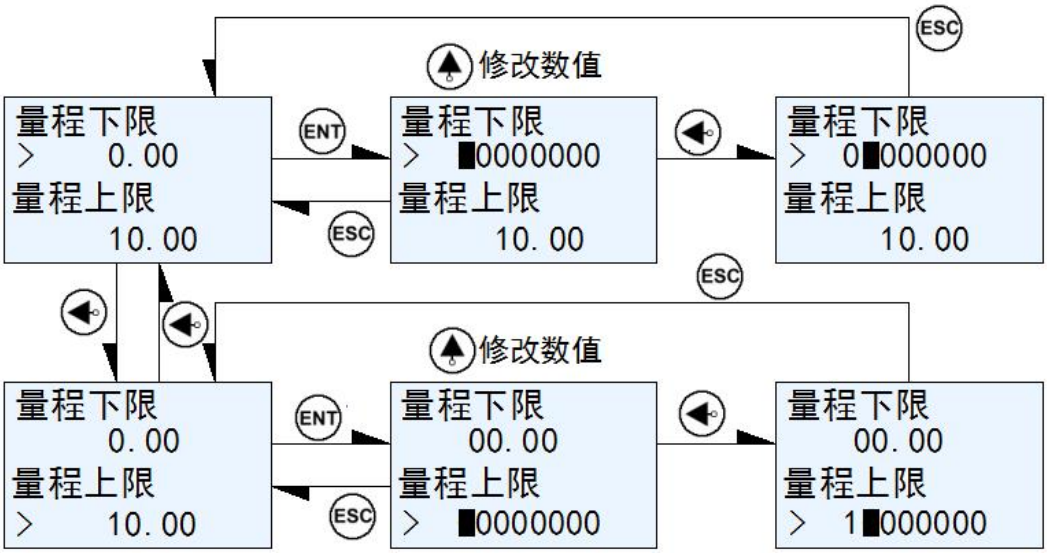
Set the basic parameter menu, move the black rectangle to "Settings", press ENT key, the password input menu appears, then press ENT A flashing cursor appears, enter the password, and after entering the password, press ENT If the password is correct, the system will directly enter the parameter setting menu. If the password is incorrect, the character “Error” will appear. Press again to confirm. ENT key to re-enter.

c) Settings Menu

语言 > 中文 背光 常亮	Language Selection: Chinese or English Backlight Options: Automatic and Always On
流量单位 > Nm3/h 累计单位 Nm3	> Indicates that it can be set The flow units are as follows: g / min, g/s, Kg / min , Kg / h, Nm3/ h, Nm3 / min, N L/ h, N L/ min, mL/ min Cumulative units are: g, Kg, Nm3, NL The cumulative unit changes with the flow unit and does not need to be set separately

	Instrument coefficient: The calibration correction coefficient can be changed to compensate for the disturbance of fluid cross-sectional velocity distribution and the influence of specific application environment. The instrument factor is a multiplication factor of the linear flow signal. Display value = instrument factor x actual measured value Pipe inner diameter: input according to actual application, unit is mm
	＞ means it can be set. Press the shift key to move '＞' between the upper and lower limits of the range. according to ENT Press key to enter the setting, the first character will flash after entering
	Damping coefficient: Default 10 , Range 0-50 Reducing the damping coefficient can quickly detect the jump in flow rate. Increasing the damping factor can smooth the current flow display value. Small signal cutoff: eliminate zero fluctuations, as a percentage of the range
	Current output type: You can choose flow rate and flow rate, and decide whether the upper and lower limits of the range are converted by flow rate or flow rate. Noise threshold: The value is 0-10, used to eliminate noise signals. The larger the value, the larger the noise signal eliminated.
	Medium density: unit Kg/m3 When the density of the measured medium is different from that of the calibration medium, it can be used to make density corrections. Also used for conversion between volume units and weight units. Conversion factor: The conversion factor between the calibration gas and the measured gas.

After entering the settings menu, press the key to return to the menu selection interface, ESC ENT and press the key to enter the value setting interface.



d) Correction

电流输出模式 > 4-20mA 固定电流输出值 20.0	Current output mode: 4-20mA and fixed current output. Select fixed current output to set the fixed current output value. Fixed current output values: 0 mA, 4 mA, 8 mA, 12 mA, 16 mA, 20 mA
调整电流输出零点 > 4.0 调整电流输出满点 20.0	Example: Current output mode is 4-20mA When there is no flow, the output current value measured by a multimeter is 3.89 mA Then adjust the current output zero point to: 3.89 mA At maximum flow, the output current value measured by a multimeter is 19.75 mA Then adjust the current output zero point to: 19.75 mA

Method for calibrating current output in fixed current output mode:

Step 1.connect the multimeter in series into the current loop;

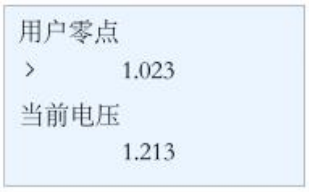
Step 2.set the current output mode to fixed current output (Fixed);

Step 3.Press the shift key to move '>' to the next line, press the confirm key to enter the setting state, press the modify/page key to select the output current value, select 4mA output, and press the confirm key to exit the setting state;

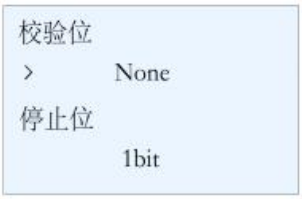
Step 4. Observe the multimeter display. If it is 4mA, no calibration is required. If it is 3.90mA, press the Modify/Page key to enter the calibration menu, move the '>' to before zero current adjustment (Adjust Iout Zero), press the Confirm key to enter the setting, enter 3.90, and press the Confirm key to exit the setting.

Step 5. Press the Shift key and the Modify/Page key at the same time, the menu returns to the previous level, move the '>' to the next line, press the Confirm key to enter the setting state, press the Modify/Page key to select the output current value, select 20mA output, and press the Confirm key to exit the setting state;

Step 6. Observe the multimeter display. If it is 20mA, no calibration is required. If it is 19.90mA, press

<table>
<tr><td colspan="2">the Modify/Page key to enter the calibration menu, move the '>' to before zero current adjustment (Adjust Iout Span), press the Confirm key to enter the setting, enter 19.90, and press the Confirm key to exit the setting.
Step 7. Press the Shift key and the Modify/Page key at the same time. The menu returns to the previous level and moves the '>' to the next line.
Press the confirm key to enter the setting state, press the modify/page key to select the output current value, and observe the displayed value on the multimeter at the same time. If they are consistent, it means the calibration is successful. If there is still a difference, recalibration is required. The recalibration steps are the same as above.</td></tr>
<tr><td> 
</td><td>User zero point and current voltage settings
When there is no flow in the pipeline, the flow displayed on the meter is not zero and can be adjusted by modifying the user zero point.
To set the user zero point with one key, move the arrow to the current voltage item and press the E NT key twice to set the zero point voltage to the current voltage.</td></tr>
<tr><td> 
</td><td>Clear the accumulated flow.</td></tr>
</table>

e) Communications Menu

<table>
<tr><td> 
</td><td>Device ID for MODBUS communication, 0-255
Baud Rate Selection: 4800/9600/19200/38400/57600</td></tr>
<tr><td> 
</td><td>Check Digit: None/Odd/Even
Stop Bit: 1 bit / 2 bit</td></tr>
</table>

f) Save Recovery Menu

Password 0603 can enter the save and restore menu. Saving parameters can be used as a backup of the current parameters. Generally, the factory will use the factory settings. Users should not overwrite the factory configuration unless necessary. Restoring parameters can restore the backup parameters, which is generally used to restore the factory configuration.

		
Save Parameters	Saved successfully	Save failed
		
Restore Parameters	Recovery Success	Failed recovery

X . Quality Assurance and After-Sales Service

Following the ISO9001:2000 quality management and control system, this product is produced with brand new raw materials and components and has undergone strict factory testing. The product quality and performance meet the relevant standards and technical specifications. However, due to the uncertainty that may arise during transportation or use, we promise the following service guarantee terms:

- Within two weeks from the date of delivery, if the product you purchased has a recognized quality defect, we will replace it free of charge;
- Within one year from the date of product delivery, if the product you purchased is damaged during normal use and not caused by improper use or human factors, we will repair it free of charge;
- Equipment damage caused by the following reasons during use is not within the scope of free replacement or repair:
  - ↗ Installation or use conditions that violate the relevant requirements and regulations of this manual;
  - ↗ Incorrect or violation of relevant instrument installation, wiring or usage regulations of the country;
  - ↗ Use with other products that are electrically incompatible with this product or have no definite quality assurance and valid certification;
  - ↗ Dismantle or repair by yourself;
  - ↗ Natural aging or loss of equipment that is more than one year old;
  - ↗ Force majeure as defined by applicable law
- For products within the warranty period, the user shall bear the shipping cost of the product, and we shall bear the replacement or repair and return costs of the product;
- When the products sent by the user are confirmed by us to be free of defects or damage, the relevant shipping and insurance costs incurred shall be borne

by the user;

- Once the product sent by the user is confirmed, unless there are special circumstances, we will send out the new or repaired product within 48 hours or two working days;
- If you find any defective or damaged product, please contact your local supplier or us.

Appendix 1 Modbus Protocol Description

Communication Baud Rate: 38400,8,1 ,NONE.

Instrument Address: The default is 255 , which can be set through the menu (1-255) .

Protocol Selection: MODBUS RTU.

Register

Parameter Name	Parameter Description	Register Address
Mod Bus Address	RS485 Modbus Address (R/W)	0x0081
Flow	The instantaneous flow rate of the current gas (R)	0x003A ~0x003B
Total	Total amount of gas flowing (R)	0x003C ~0x003E
Baud Rate	RS485 communication baud rate (R /W)	0x0082
GCF	Gas correction factor (R/W)	0x008B
Unit	Instantaneous flow and total volume unit (R/W)	0x0090
High Flow Alarm Value	Set the instantaneous flow upper limit alarm value (R/W)	0x0098 ~0x0099
Low Flow Alarm Value	Set the instantaneous flow lower limit alarm value (R/W)	0x009A ~0x009B
Password	Set user password (R/W)	0x00AE ~0x00AF
Automatic Zero Calibration	Forced automatic zeroing operation (W)	0x00F0
Total Removal	Clear cumulative total (W)	0x00f2
Write Protection	Temporarily disable write protection (W)	0x00FF

Illustrate:

1. R - read only, W - write only, R/W - read and write.
2. For parameters marked with * , write protection needs to be disabled before modification.

Modbus Address	**0x00 81**	**Revise**	allow
		Read	allow
Parameter Description	RS485 Modbus address, default value is 255 .		
Data Types	UINT16		
Data Representation	from 1 to 255 , 0 represents the broadcast address, and this machine cannot be set to 0.		
Baud rate	**0x0082**	**Revise**	allow
		Read	allow
Parameter Description	Modbus communication rate, default 1, is 9600 .		
Data Types	UINT16		
Data Representation	Baud rate index value. 0 is 4800 , 1 is 9600 , 2 is 19200 , 3 is 38400		
flow	**0x003A ~0x003B**	**Revise**	Not allowed
		Read	allow
Parameter Description	Current instantaneous gas flow rate, unit L/min.		
Data Types	UINT32		
Data Representation	0x003A ~0X003B constitute a U INT32 unsigned integer, representing the instantaneous flow rate of the current gas. F = (value (0 x 003A)*65536 + value(0x003B))/1000; For example: read address 0x003A is 0x0000, address 0X003B is 0x4f79, then the flow F = (0*65536 + 320345)/1000 = 20.345		
Total	**0x003C ~0x003E**	**Revise**	Not allowed
		Read	allow
Parameter Description	Total amount of gas flowing through, unitNm^3		
Data Types	UINT32 + UINT16		
Data Representation	A = value (0 x 003C)*65536 + value(0x003D) +value(0x003E)/1000; For example: read address 0 x 003C is 0, 0 x 003D is 3452 , 0x003E is 245 , then the total amount A = 0*65536 + 3452 + 245/1000 = 3452.245		
G CF	**0x008B**	**Revise**	allow
		Read	allow
Parameter Description	Sets the gas correction factor. ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT16		
Data Representation	For example: when the gas factor is 1 000 , the written data is 1 000 (0X03 E 8) .		

Unit	**0x0090**	**Revise**	allow
		Read	allow
Parameter Description	Set the unit for instantaneous flow and total flow. ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT16		
Data Representation	Instantaneous flow and total volume index corresponding units 5 is the instantaneous flow rate m^3/h, total amountm^3 8 is the instantaneous flow rate L/min, total amountm^3		
High Flow Alarm Value	**0x0098 ~0x0099**	**Revise**	allow
		Read	allow
Parameter Description	Set the instantaneous flow upper limit alarm value, unit L/min. ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT32		
Data Representation	High flow alarm value ALAM_H = (value (0 x 0098)*65536+value(0x0099))/1000; For example: read address 0x0098 is 0x0003 , 0x0099 is 0x0D40 , then ALAM_H=(3*65536 + 3392)/1000 = 200.0 L/min.		
Low Flow Alarm Value	**0x009A ~0x009B**	**Revise**	allow
		Read	allow
Parameter Description	Set the instantaneous flow upper limit alarm value, unit L/min. ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT32		
Data Representation	High flow alarm value ALAM_H = (value (0 x 009A)*65536+value(0x009B))/1000; For example: read address 0x009A is 0x0 , 0x009B is 0x1388 , then ALAM_H=(0 * 65536 + 5000)/1000 = 5.0 L/min.		
Password	**0x00AE ~0x00AF**	**Revise**	allow
		Read	allow
Parameter Description	Set User Password ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT32		
Data Representation	The password is 5 digits in decimal, such as 1 2345 , 9 9999 . PASSWD = value (0 x 00AE)*65536+value(0x00AF); For example: read address 0x00AE is 0x0001 , 0x00AF is 0x869F , then PASSWD = 1*65536 + 34463 = 99999 .		
Automatic Zero Calibration	**0x00F0**	**Revise**	allow
		Read	Not allowed
Parameter Description	Forces the zero voltage of the gas to be reset when it is at rest. ⚠Note: When writing, the gas in the flow meter pipeline is at		

	rest. ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT16		
Data Representation	by writing 0 XAA55 to address 0x00F0 .		
Total Amount Removed	**0x00F2**	**Revise**	allow
		Read	Not allowed
Parameter Description	Clear the flow totals. ⚠Note: Turn off the write protection register before writing.		
Data Types	UINT16		
Data Representation	writing 0X0001 to address 0x00F2 .		
Write Protection	**0x00FF**	**Revise**	allow
		Read	Not allowed
Parameter Description	Write protection register, you need to turn off write protection when modifying other registers.		
Data Types	UINT16		
Data Representation	by writing 0X0AA55 to address 0x00FF . ⚠Note: Except for the Modbus address and baud rate, other registers need to be disabled for write protection when they are modified. If there is no other modification within 3 minutes after a modification, the write protection function will be automatically enabled.		

Appendix 2 Conversion Coefficient Table of Gases Relative to Air

At present, laboratories cannot calibrate the mass flow rate according to the gas actually used by users. Usually, the calibration is performed after converting the actual gas flow rate into air flow rate. When the user is using it, the direct output shows the actual mass flow rate or volume flow rate of the gas used.

The conversion of different gases is done through conversion coefficients. The conversion coefficients of single-component gases can be found in the table. See the table below:

	Gas	Specific Heat (cal / g ℃)	Density (g / L 0 ℃)	Conversion Factor
00	Air	0.24	1.2 93	1.0000
01	Argon	0.125	1.6605	1.4066
02	Arsenic AsH 3	0.1168	3.478	0.6690
03	Boron tribromide BBr 3	0.0647	11.18	0.3758
04	Boron trichloride BCl 3	0.1217	5.227	0.4274

05	Boron trifluoride BF 3	0.1779	3.025	0.4384
06	Borane B 2 H 6	0.502	1.235	0.5050
07	Carbon tetrachloride CCl 4	0.1297	6.86	0.3052
08	Carbon tetrafluoride CF 4	0.1659	3.9636	0.4255
09	Methane CH 4	0.5318	0.715	0.7147
10	Acetylene C 2 H 2	0.4049	1.162	0.5775
11	Ethylene C 2 H 4	0.3658	1.251	0.5944
12	Ethane C 2 H 6	0.4241	1.342	0.4781
13	Propylene C 3 H 4	0.3633	1.787	0.4185
14	Propylene C 3 H 6	0.3659	1.877	0.3956
15	Propane C 3 H 8	0.399	1.967	0.3459
16	Butyne C 4 H 6	0.3515	2.413	0.3201
17	Butene C 4 H 8	0.3723	2.503	0.2923
18	Butane C 4 H 10	0.413	2.593	0.2535
19	Pentane C 5 H 12	0.3916	3.219	0.2157
20	Methanol CH 3 OH	0.3277	1.43	0.5805
21	Ethanol C 2 H 6 O	0.3398	2.055	0.3897
22	Trichloroethane C 3 H 3 Cl 3	0.1654	5.95	0.2763
23	Carbon Monoxide (CO)	0.2488	1.25	0.9940
24	Carbon dioxide CO 2	0.2017	1.964	0.7326
25	Cyanide gas C 2 N 2	0.2608	2.322	0.4493
26	Chlorine Cl 2	0.1145	3.163.	0.8529
27	Deuterium D 2	1.7325	0.1798	0.9921
28	Fluorine gas F 2	0.197	1.695	0.9255
29	Germanium tetrachloride GeCl 4	0.1072	9.565	0.2654
30	Germane GeH 4	0.1405	3.418	0.5656
31	Hydrogen H2	3.4224	0.0899	1.0040
32	Hydrogen bromide HBr	0.0861	3.61	0.9940
33	Hydrogen chloride HCl	0.1911	1.627	0.9940
34	Hydrogen fluoride HF	0.3482	0.893	0.9940
35	Hydrogen iodide HI	0.0545	5.707	0.9930
36	Hydrogen sulfide H 2 S	0.2278	1.52	0.8390
37	Helium	1.2418	0.1786	1.4066
38	Krypton	0..0593	3.739	1.4066
39	Nitrogen N 2	0.2486	1.25	0.9940
40	Neon	0.2464	0.9	1.4066
41	Ammonia NH 3	0.5005	0.76	0.7147

42	Nitric Oxide NO	0.2378	1.339	0.9702
43	Nitrogen dioxide NO 2	0.1923	2.052	0.7366
44	Nitrous Oxide N 2 O	0.2098	1.964	0.7048
45	Oxygen O 2	0.2196	1.427	0.9861
46	Phosphorus trichloride PCl 3	0.1247	6.127	0.3559
47	Phosphine PH 3	0.261	1.517	0.6869
48	Phosphorus Pentafluoride PF 5	0.1611	5.62	0.3002
49	Phosphorus oxychloride POCl 3	0.1324	6.845	0.3002
50	Silicon tetrachloride SiCl 4	0.127	7.5847	0.2823
51	Silicon Tetrafluoride SiF 4	0.1692	4.643	0.3817
52	Silane SiH 4	0.3189	1.433	0.5954
53	Dichlorosilane SiH 2 Cl 2	0.1472	4.506	0.4095
54	Trichlorosilane SiHCl 3	0.1332	6.043	0.3380
55	Sulfur hexafluoride SF 6	0.1588	6.516	0.2624
56	Sulfur dioxide SO 2	0.1489	2.858	0.6829
57	Titanium Tetrachloride TiCl 4	0.1572	8.465	0.2048
58	Tungsten Hexafluoride WF 6	0.0956	13.29	0.2137
59	Xenon	0.0379	5.858	1.4066