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Thermal gas mass flowmeter AI-FC proportional valve control type Manual



Application area:

Aerospace、 Semiconductor processing、
Medical biochemistry、
Electronic powered automobile、
Ferrous metallurgy、 VEIS、
the industrial gas production and related industries.



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I、 Product Introduction

The AI-FC proportional valve controlled thermal gas mass flow meter is a thermal gas flow sensor with proportional valve flow control designed and developed using an advanced microelectromechanical system (MEMS) flow sensing chip. It combines digital signal processing technology and flow control algorithms to achieve precise control and intelligent processing of the flow rate of various gases .

Proportional valve-controlled flow meters are characterized by high accuracy and strong anti-interference capabilities. The bypass fluid in the distributor is in a laminar flow state, which makes the measurement and control more stable and accurate, making it suitable for the measurement and process control of various small-flow clean gases.

II、 Features

- using a microelectromechanical system (MEMS) flow sensor chip , a bypass shunt, and an electromagnetic proportional valve.
- Electromagnetic proportional valves are characterized by long service life and high sensitivity .
- Zero-point stability of the sensor.
- It has high accuracy and good repeatability within its measurement range .
- Fast response time.
- Standard mechanical interface, easy to install .
- RS485 communication output, standard MODBUS RTU protocol .
- The LCD displays instantaneous and cumulative flow rates, providing a clear and intuitive reading experience . Flow rates can be controlled via button input, and the controlled and real-time flow rates are directly displayed on the LCD screen.
- Standard configuration includes 4-20mA input/output control .
- Customizable 0-5V or 0-10V input/output control



III、 Technical parameters

working power supply	DC24V/12W
Accuracy (%)	Control accuracy: $\pm 1.0\%$ SP, Measurement accuracy: 1% fs
Control and measurement range ratio	1:100
Valve type	Normally closed type
Operating temperature	-10~55°C
humidity	<95%RH (no frost, no ice, no condensation)
Flow Specifications	(0~10, 20, 30, 50, 100, 200, 300, 500) SCCM (0~1, 2, 3, 5, 10, 20, 30)SLM (0~50, 100) SLM (0-200, 300) SLM
Working pressure range	Measurement: 0-1.5MPa Control: 10SCCM-30SPLM Pressure: 0.1-1.0MPa 100 SPLM pressure: 0.1-0.65 MPa 300SPLM Pressure: 0.1-0.5MPa
Typical control response time	Less than 1.5 seconds (T90)
Measure response time	<50ms
Output method	4-20mA (1-5V), 0-5V and 0-10V can be customized.
Communication methods	RS485 (Modbus RS485 protocol)
Control method	Button operation, Modbus, 4-20mA (1-5V), 0-5V and 0-10V can be customized.
Mechanical connection	G1/4, PT1/2 internal threads; other threads can be customized.
Protection level	IP40



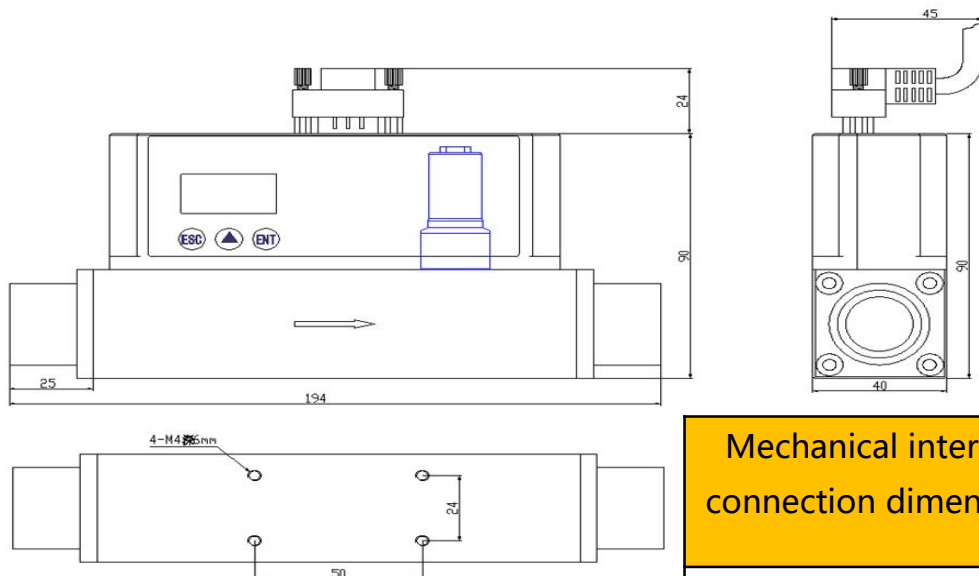
were measured at 25 °C, 101.32 kPa, and in dry air .

Other features

Selectable standard temperature conditions	0°, 20°, 25°, adjustable by the user, default is 25°
Selectable gas type	Air, N2, O2, CH4, Ar, CO2, He, H2 , C3H8
Normal operating pressure difference	0.1-0.8 MPa, flow rate <= 30 SLM 0.1MPa-0.6MPa 30SLM < Flow Rate Specification <= 100SLM 0.1MPa -0.4MPa 100SLM < Flow Specification < 300SLM
Unconventional working pressure difference	Customized consultation available

IV、 Mechanical dimensions

0-30SLPM Standard Differential Pressure Flow Rate Specifications and Dimensions



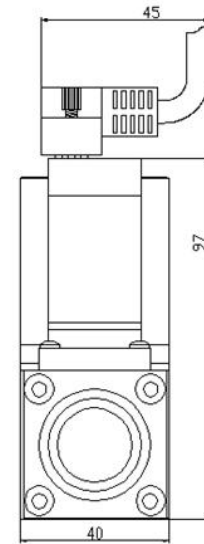
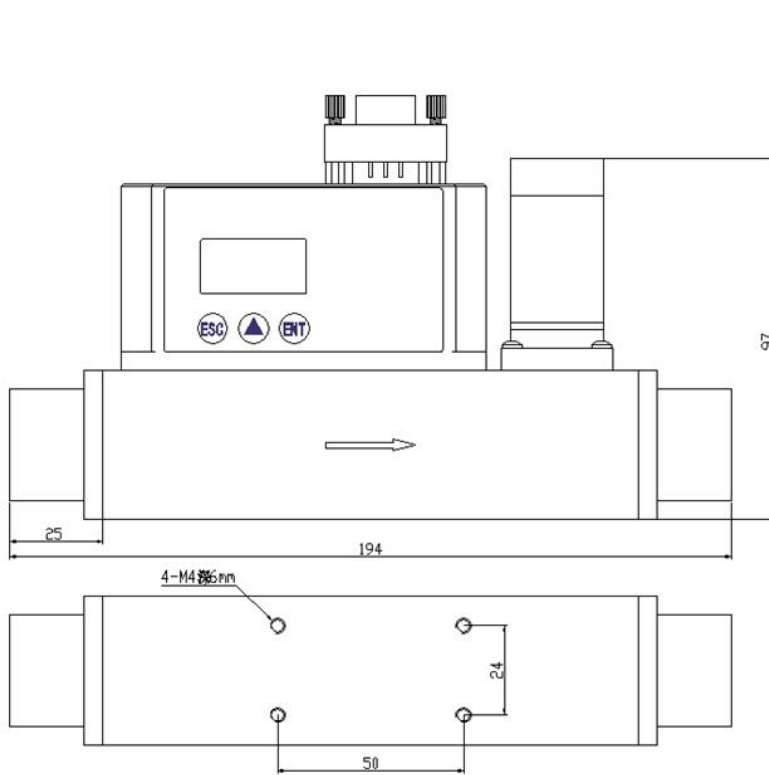
Mechanical interface connection dimensions

G1/4 internal thread

PT1/2 internal thread-1

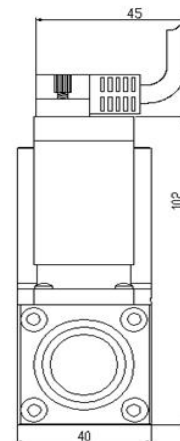
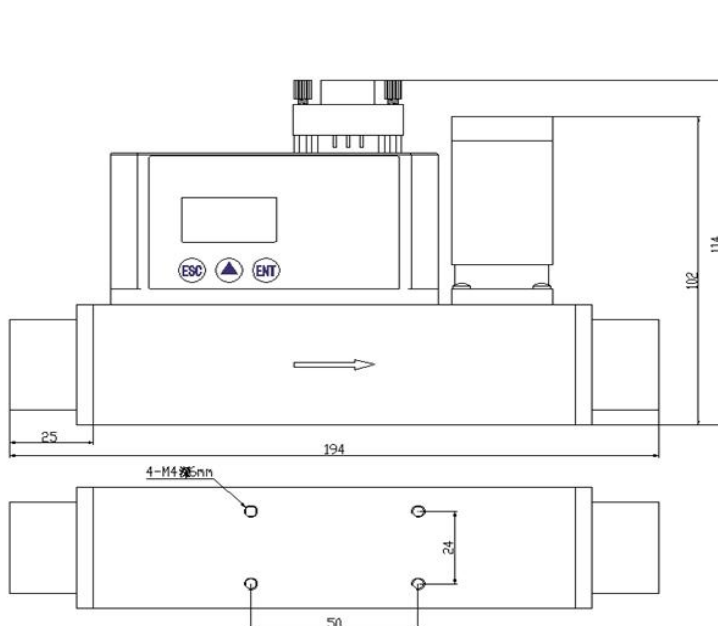


30-100SPLM External Valve Standard Differential Pressure Dimensions



Mechanical interface connection dimensions
G1/4 internal thread
PT1/2 internal thread-1

200-300SPLM External Valve Standard Differential Pressure Dimensions



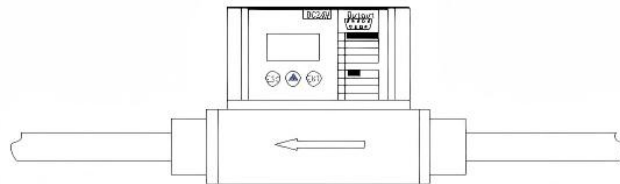
Mechanical interface connection dimensions
G1/4 internal thread
PT1/2 internal thread-1



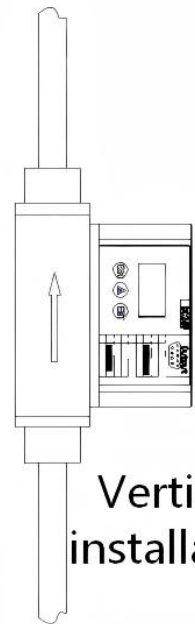
Standard connectors can be used for interface conversion as needed, or custom connectors can be used.

Adapter	quick-connector	Pagoda connector
		

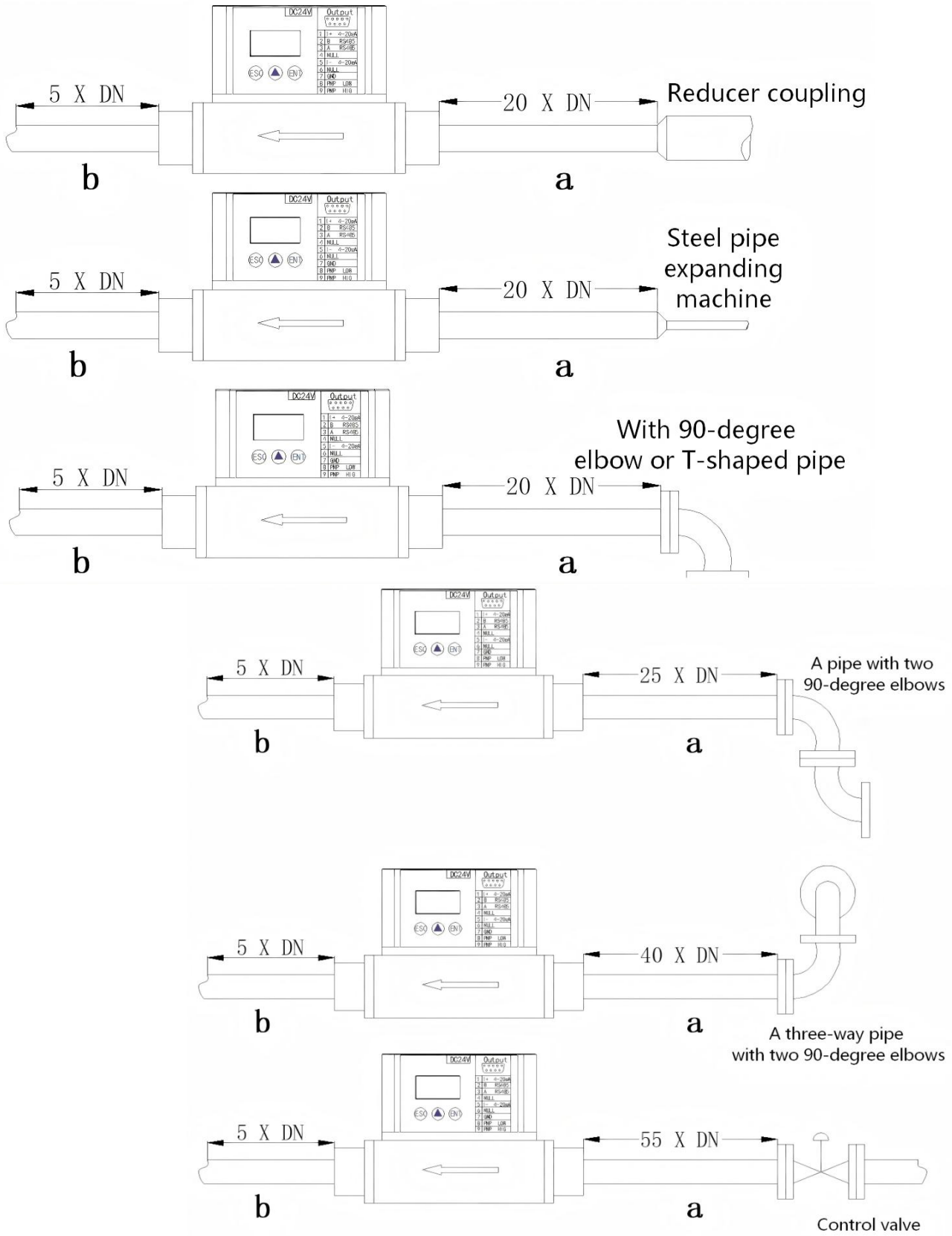
V、Installation method



Horizontal installation



Vertical installation





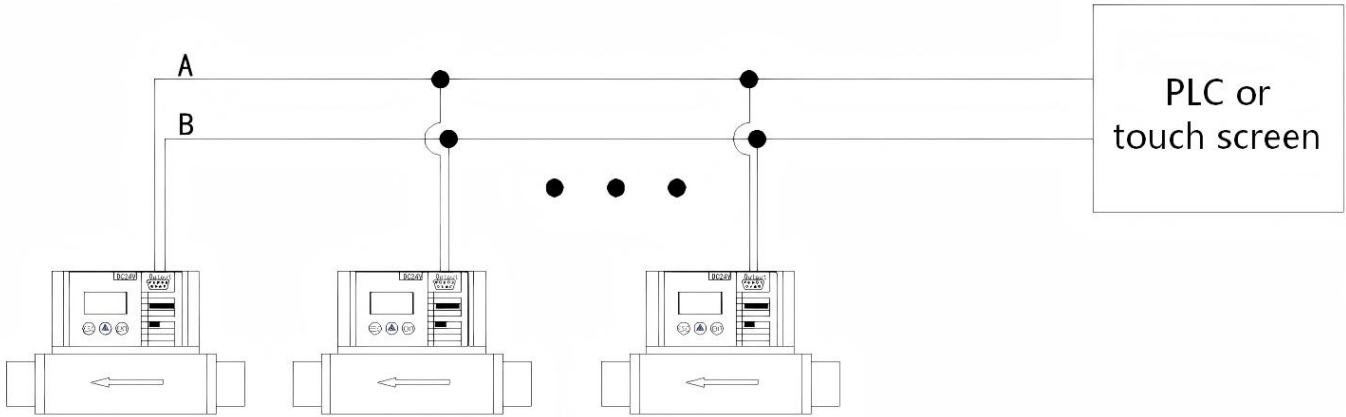
a = upstream straight pipe section b = downstream straight pipe section

VI、 Wiring instructions

DB9 Interface Definition	
PIN	meaning
1	4-20mA output current I+
2	RS485 communication output B
3	RS485 communication output A
4	PNP LOW (optional)
5	4-20mA current I-
6	24V power supply positive
7	GND power supply negative
8	4-20mA current input I-
9	4-20mA current input I+

DB9 Lead Specifications	
color	meaning
green	Positive power supply
blue	negative terminal of power supply
red	RS485 communication output A
brown	RS485 communication output B
black	4-20mA current I+ output/voltage controlled output
White	Current 4-20mA, I+ input control/voltage control input
yellow	4-20mA current output I- / voltage output -
grey	4-20mA input current I- / voltage input-
orange color	PNP optional


RS485 bus wiring instructions




The default configuration for 485 bus communication is 32 units

VII、 Interface Description

Button Instructions		
logo	meaning	
	Short press (press and release immediately)	Press and hold (for more than 1.2 seconds)
ESC	quit	Enter system configuration
▲	Shift/Select	Enter communication configuration
ENT	Adjust upwards	Confirm configuration

Display and control interface	
 <p>The first line displays the flow rate at the setting point.</p> <p>The second line displays the measured flow rate and unit.</p>	



	The second line displays the cumulative flow and unit.
	<p>Press ENT to enter the control interface, and press ESC to return.</p> <p>SP is used to set the flow point.</p> <p>F represents the test traffic value.</p> <p>V represents the sensor voltage, and K represents the solenoid valve current (percentage).</p>

System configuration menu (press and hold the ESC key for more than 1.2 seconds to enter)

Communication Menu	
Device ID > 001	MODBUS communication device ID, 0-255
Baud rate 9600	Baud rate selection: 4800/9600/19200/38400
Parity None	Checksum: None/Odd/Even
Stop bits 1 bit	Stop bits: 1 bit / 2 bits

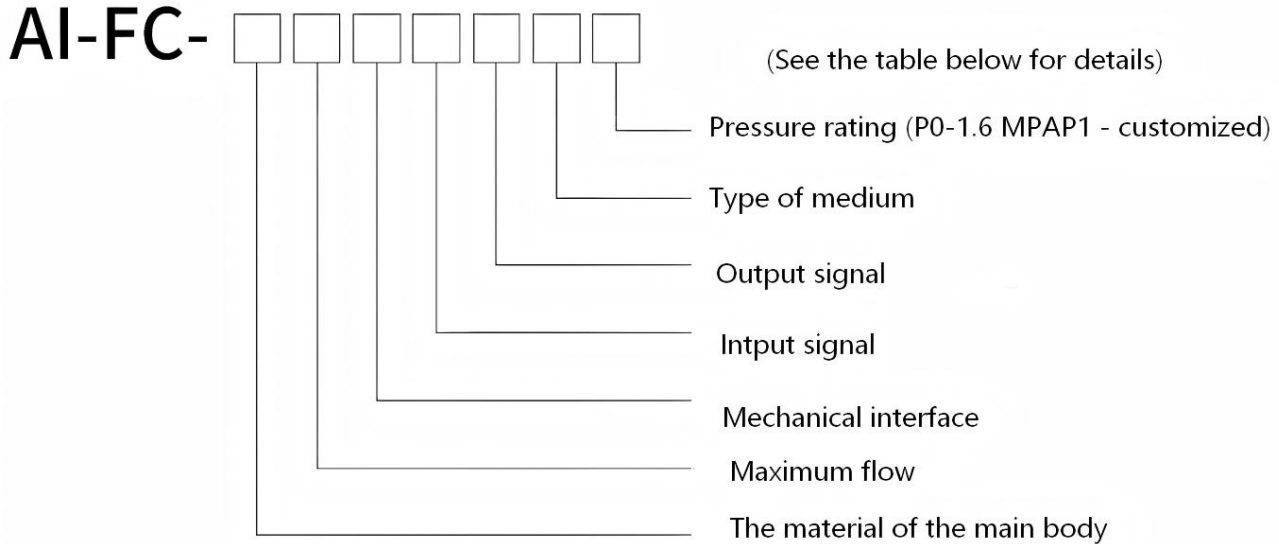
VIII 、 Troubleshooting

Please troubleshoot according to the table below.

Serial	Fault	Possible causes of	processing method
1	When there is no ventilation,	The gas is still	Check if the shut-off valve is closed.
		Zero Drift	Reset to zero
		Other faults	Please contact the manufacturer.
2	Unable to control traffic	Incorrect gas line	Check that the MFC is connected
		Differential pressure	Check pressure
		Power supply	Check if the power supply and
		Incorrect signal	There are priorities; button and
		Sensor problems	Please contact the manufacturer.



IX、 Product Selection



Product Series	Body material	Flow range	Mechanical interface	Input signal	Output signal	medium	Pressure level
AI-FC	F1	S0	GN0	P0	N0	AIR	P0

For example:

Model: AI-FC -F1S0GN0P0N0AIR Parameters: **AI-FC** : Proportional valve; **Body material** : 304 stainless steel; **Measuring range** : 1~100SCCM ; **Mechanical interface** : G3/4 internal thread ; **Input control signal** : 4-20mA ; **Output signal** : 4-20mA+RS485 ; **Measuring medium** : Air ; **Pressure rating** : Less than 1.5 MPa



Body material	F0 - Anode Aluminum, F1 - 304, F2 - 316	
Flow range	S0	1~100SCCM
	S1	5~500SCCM
	S2	10~1000SCCM
	S3	0.1~10 SLPM
	S4	0.3~30 SLPM
	S5	0.5~50 SLPM
	S6	1~100 SLPM
	S7	2~200 SLPM
	S8	3~300 SLPM
Mechanical interface	GN0	G1/4 Internal Thread
	PT2	PT1/2 internal thread
	NT stands for custom thread;	
Input/output signals	P0	4-20mA (default) 485
	P1	1-5V 485
	P2	0-5V 485
	P3	0-10V 485
Output signal	N0	RS485 and 4-20mA (default)
	N1	RS485 and 1-5V
	N2	RS485, 0-5V
	N3	RS485, 0-5V
Media type	The measurement medium type is specified as follows: AIR for	
Pressure level	P0 represents <1.5 MPa (default); P1 represents 2-3 MPa	

Note: Flow rate measurement ranges are all based on air measurements.



X、Appendix 1 MODBUS Register Address Table

Communication baud rate: 9600, 8, 1, NONE; Floating-point data arrangement: 2[^]143

Read data function code: 03 (HOLDING REGISTER)

Instrument address: can be set via menu, 0-255

Register address	Register Name	Number of registers	Data types	Data format
4x0001-4x0002	Instantaneous flow	2	float	IEEE754
	send	01 03 00 00 00 02 C4 0B		
	take over	01 03 04 00 00 00 00 FA 33		
4x0003-4x0004	Traffic settings	2	float	IEEE754
	send	01 03 00 02 00 02 65 CB		
	take over	01 03 04 00 00 00 00 FA 33		
4x0005	Zero point calibration	1	Unsigned int	Unsigned integer
	send	01 0 6 00 04 55 AA 77 24		
	take over	01 0 6 00 04 55 AA 77 24		
4x0007-4x0008	Cumulative integers	2	Unsigned long	Unsigned long integer
	send	01 03 00 06 00 02 24 0A		
	take over	01 03 04 00 00 00 00 FA 33		
4x0009-4x0010	Cumulative decimals	2	float	IEEE754
	send	01 03 00 08 00 02 45 C9		
	take over	01 03 04 00 00 00 00 FA 33		
4x0011-4x0012	Cumulative floating-point number	2	float	IEEE754
	send	01 03 00 0A 00 02 E4 09		
	take over	01 03 04 00 00 00 00 FA 33		
4x0013-4x0014	Negative cumulative	2	float	IEEE754



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	floating-point number			
	send	01 03 00 0C 00 02 04 08		
	take over	01 03 04 BA 4A 41 F8 CF 2F		
4x0015-4x0016	Current acquired signal value	2	float	IEEE754
	send	01 03 00 0E 00 02 A5 C8		
	take over	01 03 04 82 1F 40 36 52 5B		
4x0021	Register write protection	1	Unsigned int	Unsigned integer
	send	01 06 00 16 55 AA D 7 21		
	take over	01 06 00 16 55 AA D 7 21		
	illustrate	Write 0x55AA to this register to unlock the write protection, at which point you can write to other registers. The write protection will automatically lock after 10 seconds, and you will need to unlock it again before you can continue writing.		



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XV、Quality Assurance and After-Sales Service



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Within one year from the date of product delivery, if the product you purchased malfunctions during normal use due to reasons other than improper use or human error...

We will repair any product damage caused by any factors free of charge.

Damage to the equipment caused by the following reasons during use is not covered by the free replacement or repair policy:

- Installation or use conditions that violate the relevant requirements and regulations in this manual;
- Incorrect or contrary to the relevant instrument installation, wiring, or usage specifications of the country in which it is located;
- This product may not be used in conjunction with other products that are electrically incompatible with it or that lack reliable quality assurance and valid certification.
- Self-disassembly or repair;
- Equipment that has been in use for more than one year may experience natural aging or wear and tear.
- Force majeure as defined by applicable law

For products within the warranty period, the user shall bear the cost of sending the product out, and we shall bear the cost of replacement or repair and return of the product.

If the product sent by the user is confirmed by us to be free from defects or damage, the user shall bear the relevant shipping and insurance costs.