EDC-300 Series Instruction Manual

Biosflow®

Contents

【Instructions before use】

- Please read this manual carefully and understand it before use.
- Our company reserves the right not to be held responsible for losses or personal injuries caused by failure to follow the user manual.
- Please keep this manual properly for subsequent installation, maintenance, and troubleshooting.
- Please carefully read all contents marked with [Warning] and [Caution] during use.

【Warning】

- This product is suitable for use in flammable and explosive gases but not in flammable and explosive environments.
- Use of dangerous gases: Take precautions when this product is used with dangerous gases.
- Make sure the gas used does not react chemically with the sealing material.
- Gas pipeline leakage check: During the installation of this product, please check all gas pipeline connections to ensure there is no gas leakage.
- Do not use pressure exceeding the maximum working pressure of this product (maximum working pressure reference manual)。
- It is strictly prohibited to open the product shell, replace parts, or modify the product.
- The working environment temperature of this product is 0~50℃.
- This product is not suitable for liquid media.

【Caution】

- This product can be used once it is powered on. For accuracy, please allow the product to preheat for 15 to 30 minutes after powering on before use.
- The product utilizes pressure and pressure differences to ensure consistency with the product specifications.
- The direction of airflow is consistent with the arrow mark.
- Use the signal type to ensure consistency with the product signal type.
- The gas used is different from the calibration gas: confirm that the gas used does not react with the sealing material of this product and needs to be converted through the conversion coefficient and formula in the appendix of the manual.

1、Product Introduction

Gas mass flow controllers (MFC) and mass flow meters (MFM) are used to precisely control and measure the mass flow of gases. Gas mass flow measurement and control are independent of temperature or pressure.

Gas mass flow controllers (MFC) and mass flow meters (MFM) have important applications in scientific research and production in various fields such as semiconductor and integrated circuit technology, special materials disciplines, chemical industry, petroleum industry, medicine, environmental protection, and vacuum. Its typical applications include coating equipment, microelectronic process equipment, such as diffusion furnaces, oxidation furnaces, epitaxial furnaces, CVD, plasma etching machines, sputtering tables, ion implanters, etc.; optical fiber melting, micro-reactors, gas mixing Gas distribution systems, biological fermentation systems, petrochemical equipment, gas chromatograph, and other analytical instruments.

2、Product Principle

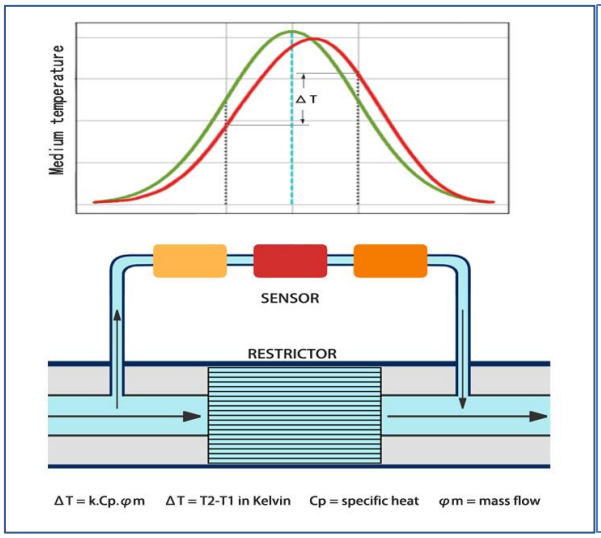


Figure 1. Sensor schematic diagram

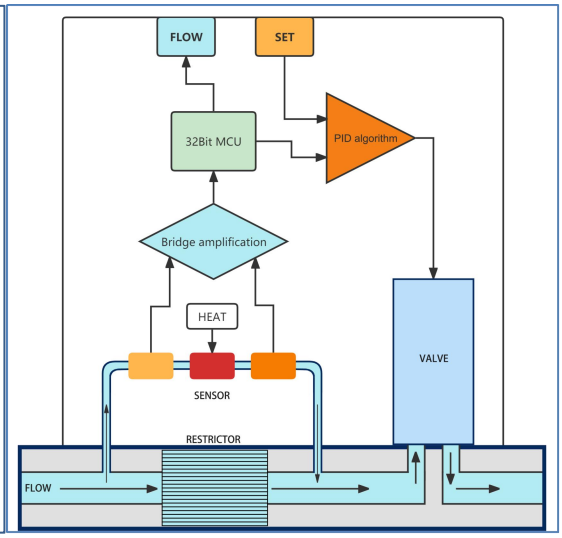


Figure 2. Schematic diagram of MFC structure

The core sensor of the thermal mass flow meter (MFM) is the capillary thermal temperature difference principle, which is composed of a stainless steel capillary tube with a thermal sensor and a heating element. A part of the gas flows through the bypass sensor and is heated by the heating element. The gas flow causes an asymmetric temperature distribution so that the temperature difference between the two thermal elements can be measured. This temperature difference is proportional to the mass flow rate through the sensor. The main flow channel is perfectly diverted by the laminar flow element so that the output of the sensor is linearly related to the total mass flow rate.

The thermal mass flow controller (MFC) amplifies the output signal of the sensor compares it with the user-set signal, and controls the opening of the solenoid valve through the PID algorithm to adjust the flow rate to achieve closed-loop control of the mass flow rate.

3、Product Features

- EDC-300 series adopts a capillary thermal temperature difference sensor, which has high measurement accuracy, is not affected by temperature and pressure, and can be installed and used at any angle.

- The sensor and valve body of the EDC-300 series are made of 316L stainless steel, suitable for toxic and corrosive gases, and the maximum working pressure can reach 1500 Psi.
- The digital measurement control circuit of the EDC-300 series has stronger anti-interference ability, a variety of communication signals are optional, and digital communication is compatible with analog signals 0~5V/4~20mA.
- The EDC-300 series is equipped with a proportional solenoid control valve, which has very fast and smooth control characteristics. The optional high-pressure differential solenoid valve can accommodate extremely high-pressure differentials of 2 to 50 Bar.
- EDC-300 series has passed CE and Rohs certification.

4、Specifications

4.1、Flow range and maximum working pressure

Model	Maximum full scale （N2 standard）	Minimum full scale (N2 standard)	Maximum working pressure
EDC-32x	30 slm	10 sccm	1500Psi/ 100 Bar
EDC-33x	100 slm	30 slm	1500 Psi/ 100 Bar
EDC-34x	200 slm	100 slm	500 Psi / 30 Bar
EDC-35x	400 slm	200 slm	500 Psi / 30 Bar
EDC-36x	1000 slm	400 slm	500 Psi / 30 Bar

Note: SCCM (standard milliliters per minute) SLM (standard liters per minute) standard conditions (20℃, 101.3Kpa)

4.2、Performance parameters

Flow Accuracy	±%1 F.S
Repeatability	±0.2% F.S
Control Range	1%~100% F.S
Response Time	<2s
Temperature Coefficient	Zero: <0.05% of F.S./℃. Span: <0.1% of S.P. /℃
Pressure Coefficient	0.2% of S.P. / Bar
Operating Temperature	0~50℃
Leak Rate	1x10-9 atm. cc/sec He
Preheat Time	5 min accuracy to ±2% F.S (30 min to achieve the best accuracy)

4.3、Electrical parameters

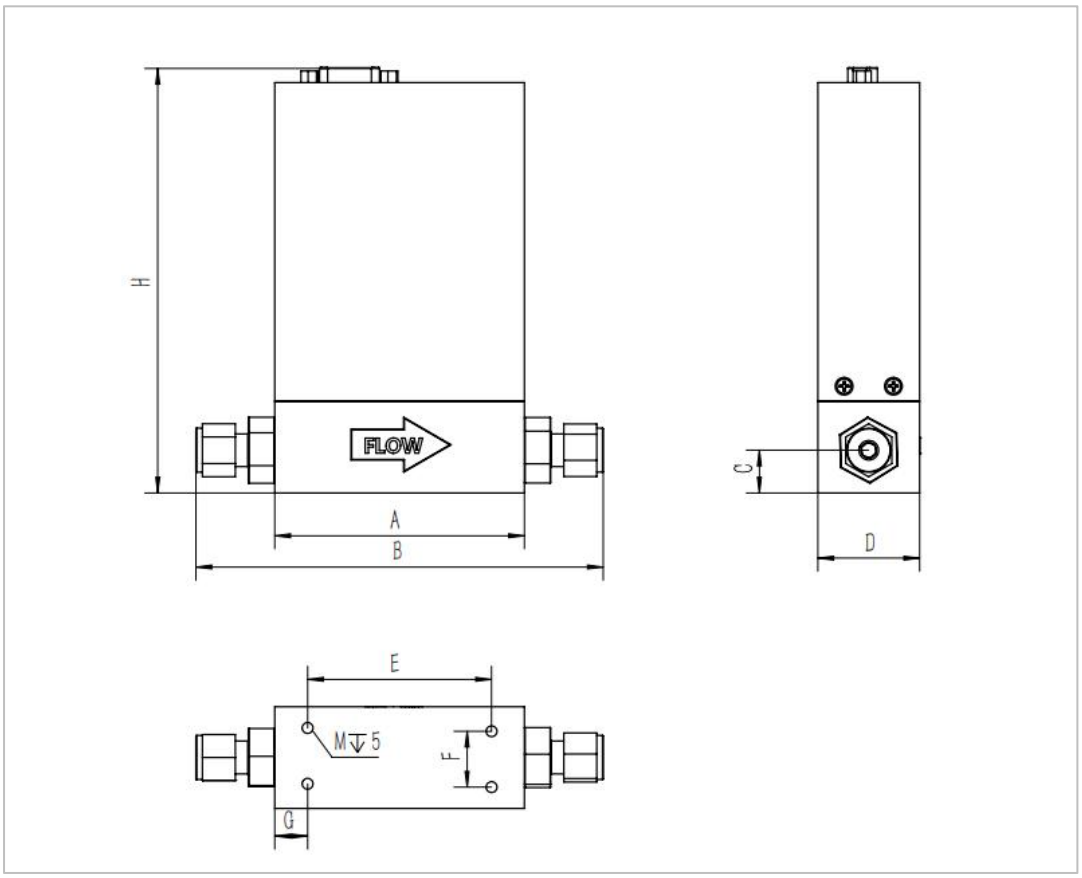
Power Supply	+15～24 V dc
Maximum Power Consumption	10W（MFC）；3W（MFM）
Digital Communication	RS-485(modbus Rtu)
Analog Communication	0～5 V / 4～20mA
Electrical Interface	9-pin D-connector (male)

4.4、Mechanical parameters

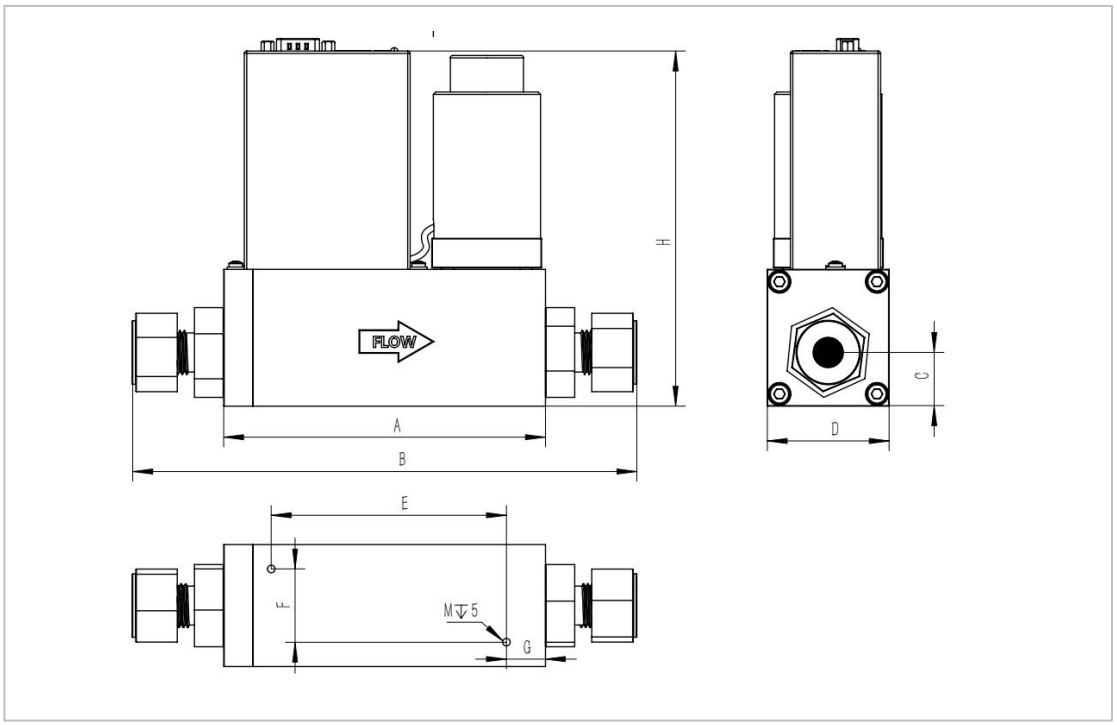
Valve Type	Normally closed (MFM meaningless)
Substrate Material	316L stainless steel
Sealing Material	FKM, EPDM, BUNA
Process connections	Tube/VCR Fittings

4.5、Size (mm) and weight (kg)

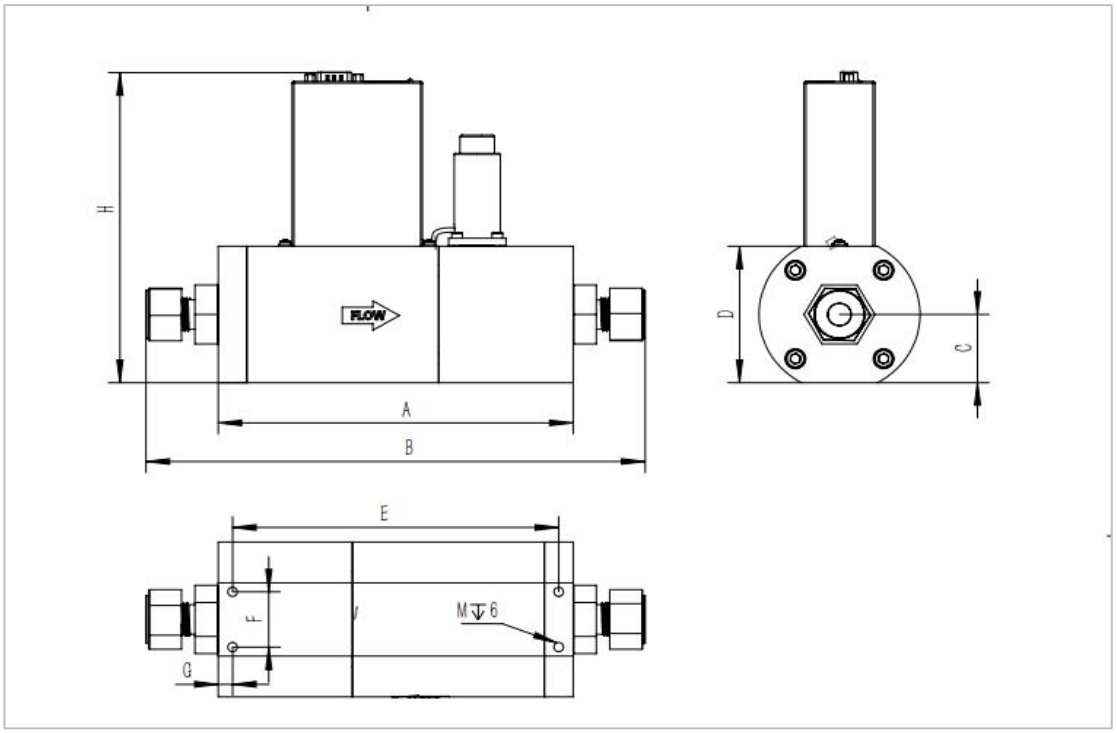
EDC-32x/33x/34x



EDC-35x



EDC-36x



Model size & weight correspondence table

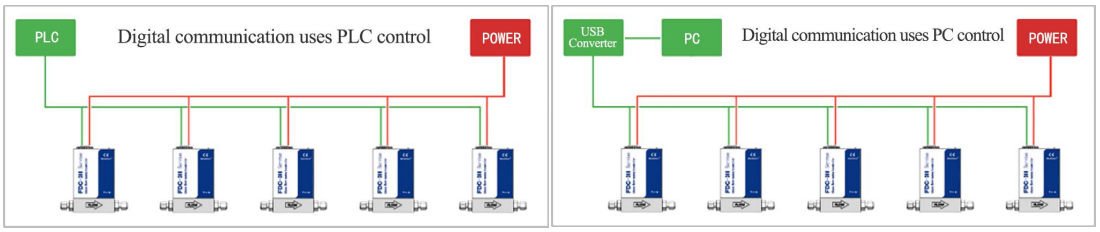
Model	A	B	C	D	H	E	F	G	M	Weight
EDC-32x	76	124	13	31	125	56	17	10	M4	0.6
EDC-33x	98.5	147	17	45	135	66.5	25	16	M4	0.8
EDC-34x	98.5	147	17	40	135	66.5	20	16	M4	1.0
EDC-35x	132	208	22	50	150	96.5	30	16	M4	1.5
EDC-36x	185	260	37	85	170	170	30	7.5	M6	2.5

4.6、Model configuration

Code	EDC-3x	0	1	5	6
Selection	Series	Controller	Flow meter	Controller with display	Flow meter with display

5、Electrical connections

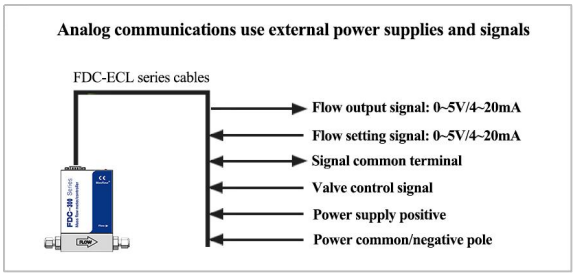
5.1、Digital communication

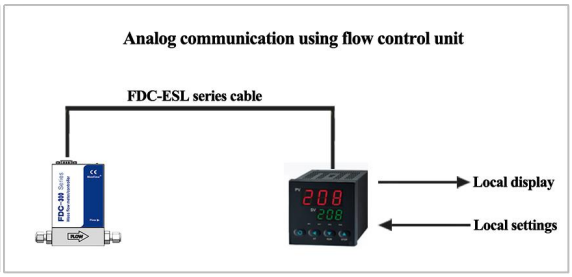


DB9 digital communication electrical connection pin correspondence table

Pin number	Signal name
1	Chassis ground
2	Power supply positive[15～24V DC]
3	RS485 B-
7	Power supply negative（Power common terminal）
9	RS485 A+
Note: DB9 Male connector, the remaining pins are not connected	

5.2、Analog communication





DB9 analog communication electrical connection pin correspondence table

Pin number	Signal name
1	Chassis ground
2	Power supply positive[15～24V DC]
4	Input and output signal common terminal
5	Valve control (connected to positive power: cleaning; not connected or connected to negative power: normal control)
6	Flow feedback signal output
7	Negative power supply (power common terminal)
8	Flow setting signal input
Note: DB9 Male connector, other pins are not connected.	

6、Install and use

6.1、Installation direction

The product can be installed at any angle and is calibrated horizontally by factory default. If the actual installation position is inconsistent with the calibrated position of the product when it leaves the factory, the product may have a zero point offset. In this case, the zero point can be adjusted before working. The air flow direction is marked with an arrow on the product and is correctly connected to the pipeline.

6.2、Note on usage

▲ Since the MFC valve is a regulating valve with a high leakage rate, it cannot be used as a stop valve. Users need to equip an additional stop valve.

▲ The gas used must be dry, clean, and pollution-free, and a filter must be installed if necessary.

▲ If gases that are easy to liquefy or crystallize are used, a one-way valve should be installed at the MFC outlet to prevent backflow from damaging the equipment.

7、Function operation

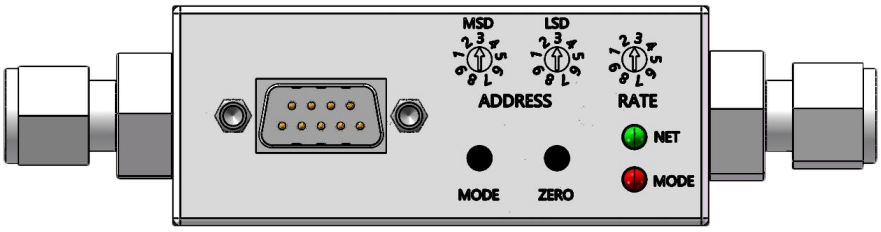


Figure 3. Schematic diagram of top peripherals

7.1、Peripheral description

- Button ZERO: Zero the device.
- Button MODE: Switching between digital and analog communications.
- Bi-color LED light-MODE: Digital/analog communication display, blue - digital communication; green - analog communication.
- Bi-color LED light-NET: Communication abnormality/fault display.
- Knob ADDRESS-LSD: Set the ten-digit number of the communication address.
- Knob ADDRESS-LSD: Set the individual digit of the communication address.
- Knob RATE: Set the communication baud rate.

7.2、Equipment zeroing

- Before performing equipment zero adjustment, the residual gas inside the MFC must be evacuated to ensure that there is no gas leakage.
- Fully preheat for 15 ~ 30 minutes.
- Press and hold the ZERO button for about 3 seconds, wait until the NET light flashes red at a high frequency and release it. When the flashing ends, the zero adjustment is completed.

7.3、Communication mode switching

- Touch the MODE button to switch the communication mode.

- MODE-LED light display, blue: digital communication; green: analog communication。
- Analog quantities cannot be controlled in digital communication mode and vice versa.

7.4、Correspondence address settings

- Turn the ADDRESS knob to the specified number.
- MSD is the ten-digit number of the communication address, LSD is the single-digit number, and the communication address range is: 1~99.

7.5、Communication baud rate setting

- Turn the RATE knob to the specified number.
- The numbers and baud rates correspond to the following table:

Knob numbers	0	1	2	3	4	5
Baud rate (Bps)	9600	4800	19200	38400	57600	115200

7.6、NET-LED light status description

LED light shows status	Status description
NET-off	Communication failure or flow setting signal is zero
NET - Steady green	The flow setting signal is valid
NET-red flashing at high frequency	Performing device zeroing
NET-red flashing 1T/s	Sensor abnormality/valve leakage
NET-red flashing 2T/s	Abnormal air source
NET-red flashing 3T/s	Abnormal power supply voltage

8、Troubleshooting

8.1、The device has no gas output and the feedback signal is zero.

- The air source or airflow direction is incorrect;
- The control signal mode is inconsistent with the use signal;
- Incorrect electrical connections for power or setup signals;
- Zero point deviation;
- The circuit board or sensor failure;

8.2、The setting signal is inconsistent with the feedback signal

- The use pressure is too low;
- The setting signal is inconsistent with the actual input signal;
- There is an error between the user output signal and the collected signal.

8.3、No setting signal, feedback signal does not return to zero

- Zero point deviation;
- The valve is leaking.

8.4、Device cannot communicate

- Incorrect electrical connections;
- Correspondence addresses are incorrect or conflicting;
- The communication format or communication protocol is incorrect;

8.5、Output flow is inaccurate

- Zero point deviation;
- The standard temperature is inconsistent;
- The measuring range of the testing equipment is too large;
- Product failure.

9、Product Guarantee and Service

9.1、The warranty period for new products is one year after leaving the factory.

9.2、The product warranty period after repair is 90 days.

9.3、During the warranty period, repairs due to product quality problems are free of charge. Repair fees for products beyond the warranty period are charged according to the company's standards.

9.4、If you use products with toxic and corrosive gases or other pollutants, please completely remove the residues and pollutants before repairing them, and inform the relevant personnel of the company.

9.5、Product failure due to the following reasons is not covered by the warranty:

- Mechanical failure caused by product falling or external impact;
- Incorrect electrical connections lead to damage to internal electronic components;
- Degeneration of the sealing material caused by inconsistent parameters between the gas used and the equipment used;
- Damage caused by using gas pressure exceeding equipment parameters;
- The gas used is unclean, and particles or other pollutants may cause blockage of the internal precision components of the product;
- Use gas that is easy to crystallize and fail to purge it in time after use, causing gas crystallization to block the airflow channel;
- Unauthorized disassembly and modification of products without the permission of the company.

9.6、The company provides product-related instructions and technical support free of charge.

10、Disclaimer

The company is not responsible for losses caused by the following circumstances:

- Losses caused by natural disasters or other force majeure factors;
- The user failed to operate correctly according to the instructions in the manual;
- Unreasonable use by the user;
- Change the product structure or parts without authorization from the company

Attachment1

EDC-300 Series Communication protocol

- physical connection: RS-485；
- Standard Modbus-RTU protocol;
- Factory default communication format: baud rate: 9600Bps; parity: none; data bit: 8Bit; stop bit: 1Bit;
- Factory default device address: 1;
- All floating point numbers in this protocol are single-precision floating point numbers that comply with the IEEE 754 encoding standard.
- Register address description:

Table 1 Description of flow read and write registers

Register name	Register address	Register number	access type	Data element	Annotation
Communication test	0x01	1	Read only	U16	If data 0x0101 is returned, the communication test is successful.
Read flow rate(actual flow rate)	0x10	2	Read only	Float	The unit defaults to SCCM, and floating point numbers are encoded according to IEEE 754, with the low byte first and the high byte last.
Read flow rate (percentage method)	0x16	1	Read only	U16	0-10000=0-100.00% * full scale.
Set flow rate(actual flow rate)	0x20	2	Read and write	Float	The flow unit defaults to SCCM, and floating point numbers are encoded by IEEE 754, with the low digit first and the high digit last. (You can only choose one of the two traffic setting methods)
Set flow rate(percentage method)	0x26	1	Read and write	U16	0-10000=0-100.00% * full scale (You can only choose one of the two traffic setting methods)

Table 2 Communication register description

Register name	Register address	Register number	access type	Data element	Annotation
Communication address	0x30	1	Read and write	U16	Address range 1-99.
Communication baud rate	0x31	1	Read and write	U16	Baud rate = sent value * 100; such as 96, corresponding baud rate is 9600 Bps.
Communication check bit	0x32	1	Read and write	U16	0: No parity; 1: Odd parity; 2: Even parity.

Table 3 Other register descriptions

Register name	Register address	Register number	access type	Data element	Annotation
Valve control	0x2A	1	Read and write	U16	0: Normal control; 2: Cleaning (open at full power) If the cleaning function is not required, there is no need to perform this operation, and the default is the normal control state.
Communication method	0x2D	1	Read and write	U16	1: Rs485 communication; 2: Analog communication.
Equipment zeroing	0x41	1	Write-only	U16	Send 0xf0 to perform an auto-zero (make sure no gas is passing through to do this).
Accumulated flow rate	0x51	2	Read only	U32	The unit defaults to smL, with low bits in front and high bits in the back.
Accumulation cleared	0x53	1	Write-only	U16	Send data: 0x01, then perform clearing.
Warning code	0x61	1	Read only	U16	See Appendix 1 for the warning code table for details.
calibration gas	0x80	5	Read only	Char	Corresponds to the ASCII code table.
calibrated range	0x87	2	Read only	Float	The unit defaults to SCCM, and floating point numbers are encoded according to IEEE 754, with the low bit first and the high bit last.

- **Core register example (example data type: hexadecimal):**

Example 1: Read actual traffic (default unit SCCM)

The host sends data:

Device address	Function code	Starting address high	Starting address low	High register count	Low register count	CRC high	CRC low
01	03	00	10	00	02	C5	CE

Data returned by the device: (For example, the return traffic is: 1000 SCCM)

Device address	Function code	Number of bytes	data 1 high	data 1 low	Data 2 high	Data 2 low	CRC high	CRC low
01	03	04	00	00	44	7A	48	D0

Example 2: Read traffic percentage (0~10000=0~100.00%)

The host sends data:

Device address	Function code	Starting address high	Starting address low	High register count	Low register count	CRC high	CRC low
01	03	00	16	00	01	65	CE

Device return data: (if the return flow is 100% of full scale)

Device address	Function code	Number of bytes	High data	Low data	CRC high	CRC low
01	03	02	27	10	A2	78

Example 3: Set the actual flow rate (the default unit is SCCM, only one can be selected compared to Example 4)

The host delivers data: (Set the traffic to 1000 SCCM)

Device address	Function code	Register address high	Register address low	High register count	Low register count
01	10	00	20	00	02
#01	#02	#03	#04	#05	#06

Number of bytes	Data 1 high	Data 1 low	Data 2 high	Data 2 low	CRC high	CRC low
04	00	00	44	7A	43	54
#07	#08	#09	#10	#11	#12	#13

Device returns data:

Device address	Function code	Register address high	Register address low	High register count	Low register count	CRC high	CRC low
01	10	00	20	00	02	40	02

Example 4: Set the traffic percentage (0~10000=0~100.00%, only one can be selected from Example 3)

The host sends data: (Set the flow rate to 100% full scale)

Device address	Function code	Register address high	Register address low	High register count	Low register count
01	10	00	26	00	01
#01	#02	#03	#04	#05	#06

Number of bytes	High data	Low data	CRC high	CRC low
02	27	10	BB	6A
#07	#08	#09	#10	#11

Device returns data:

Device address	Function code	Register address high	Register address low	High register count	Low register count	CRC high	CRC low
01	10	00	26	00	01	E0	02

Example 5: Correspondence address settings

The host sends data: (Set the communication address to: 2)

Device address	Function code	Register address high	Register address low	High register count	Low register count
01	10	00	30	00	01
#01	#02	#03	#04	#05	#06

Number of bytes	High data	Low data	CRC high	CRC low
02	00	02	22	61
#07	#08	#09	#10	#11

Device returns data:

Device address	Function code	Register address high	Register address low	High register count	Low register count	CRC high	CRC low
01	10	00	30	00	01	01	C6

Example 6: Communication baud rate setting (Bps = sent data *100)

The host sends data: (Set the baud rate: 9600, and send the data to 96)

Device address	Function code	Register address high	Register address low	High register count	Low register count
01	10	00	31	00	01
#01	#02	#03	#04	#05	#06

Number of bytes	High data	Low data	CRC high	CRC low
02	00	60	A2	59
#07	#08	#09	#10	#11

Device returns data:

Device address	Function code	Register address high	Register address low	High register count	Low register count	CRC high	CRC low
01	10	00	31	00	01	50	06

Example 7: Communication check bit setting (0: no check; 1: odd check; 2: even check)

The host sends data: (Set the checksum to: even checksum)

Device address	Function code	Register address high	Register address low	High register count	Low register count
01	10	00	32	00	01
#01	#02	#03	#04	#05	#06

Number of bytes	High data	Low data	CRC high	CRC low
02	00	02	23	83
#07	#08	#09	#10	#11

Device returns data:

Device address	Function code	Register address high	Register address low	High register count	Low register count	CRC high	CRC low
01	10	00	32	00	01	A0	06

Appendix 1 Fault warning code table

Error code	**Failure analysis**	**Troubleshooting**
01	Sensor abnormality/valve leakage	In the non-ventilated state, zero adjustment is completed after preheating.
02	Abnormal air source	Check air source
03	Abnormal power supply voltage	Check supply voltage
04	Set signal over the limit	Check the set signal value
If the problem still cannot be solved according to the above process, you need to contact the manufacturer's technical personnel to investigate and solve the problem.		