

Product Manual

FAC-300 Series Mass Flow Controller



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【Information before use】

-  Please be sure to carefully read and understand this manual before use;
-  The company reserves the right not to be held liable for any losses or personal injuries resulting from failure to operate the product in accordance with this manual;
-  Please keep this manual in a safe place for future reference during installation, maintenance, and troubleshooting;
-  During operation, please carefully read all information marked with WARNING and CAUTION symbols.

【Warning】

-  This product is suitable for use with flammable and explosive gases, but is not suitable for use in a flammable or explosive environment;
-  Hazardous Gas Usage: When this product is used with hazardous gases, appropriate safety precautions must be taken;
-  Confirm that the gas being used will not chemically react with the sealing materials;
-  Gas Line Leak Check: During installation of this product, please inspect all gas line connections to ensure there are no gas leaks.;
-  Do not exceed the maximum operating pressure of this product (refer to the manual for the maximum operating pressure);
-  Do not open the product housing, replace components, or modify the product;
The operating ambient temperature for this product is 0~50°C;
-  This product is not suitable for use with liquid media.

【Caution】

-  This product is ready for use upon startup. However, to ensure accuracy, it must be warmed up for 15 to 30 minutes after powering on before use;
-  Ensure that the operating pressure and differential pressure of the product are consistent with its specifications;
-  Ensure the gas flow direction matches the arrow marking;
-  Ensure that the signal type used matches the product's signal specifications;
-  If the gas used is different from the calibration gas, confirm that it will not react with the product's sealing materials. Additionally, conversion must be performed using the conversion factors and formulas provided in the appendix of the manual.

1. Product Introduction

Gas Mass Flow Controllers (MFC) and Mass Flow Meters (MFM) are used for the precise control and measurement of gas mass flow. The measurement and control of gas mass flow are not affected by temperature or pressure variations.

MFC and MFM have important applications in scientific research and production in various fields such as semiconductor and integrated circuit technology, special materials science, chemical industry, petroleum industry, medicine, environmental protection and vacuum. Typical applications include: coating equipment, microelectronic process equipment such as diffusion furnaces, oxidation furnaces, epitaxial furnaces, CVD, plasma etching machines, sputtering stations, ion implanters, etc.; optical fiber melting, microreactors, gas mixing and distribution systems, bio-fermentation systems, petrochemical equipment, gas chromatographs and other analytical instruments.

2. Overview of Principles

The core sensor of a thermal mass flow meter (MFM) utilizes the capillary thermal differential principle and consists of a stainless steel capillary tube with integrated heating and temperature-sensing elements. During MFM operation, a portion of the gas flows through the bypass sensor and is heated by the heating element. The gas flow creates an asymmetry in the temperature distribution, allowing the temperature difference between the two sensing elements to be measured. This temperature difference is proportional to the mass flow rate passing through the sensor. The main flow channel is perfectly split via a laminar flow element, ensuring a linear relationship between the sensor's output and the total mass flow rate.

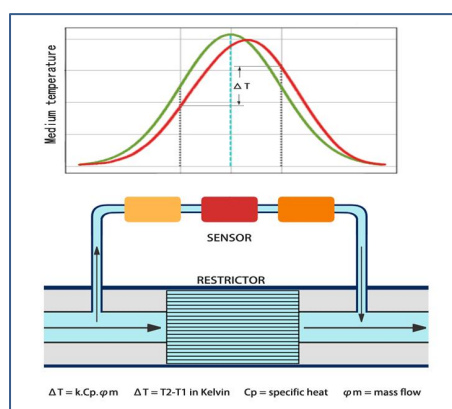


Figure 1 Sensor Operating Principle

A thermal mass flow controller (MFC) amplifies the sensor's output signal, compares it with the user's setpoint, and then uses a PID algorithm to control the valve opening, thereby regulating the flow and achieving closed-loop control of the mass flow.

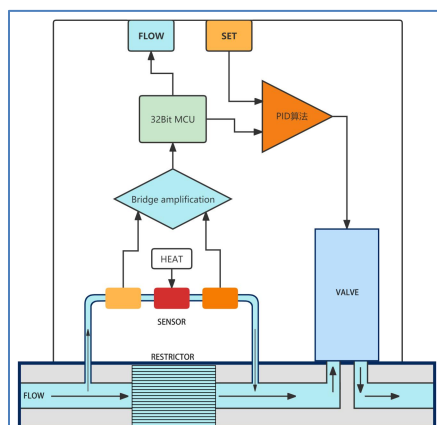


Figure 2 MFC Functional Block Diagram

3. Product Features

- ▲ FAC-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 are constructed from 316L stainless steel, making them suitable for use with toxic and corrosive gases;
- ▲ Analog measurement and control circuit, analog signal 0-5V or 4-20mA;
- ▲ Equipped with a proportional solenoid control valve, which features very fast and smooth control;
- ▲ Has passed CE and RoHS certification.

4. Specification

Measuring range (N2 standard) and working pressure

Model	Max Full Scale	Min Full Scale	Withstand Pressure	Max Operating Pressure	Max Operating Differential Pressure
FAC-320	30 SLM	10 SCCM	1500 Psi/100 Bar	450 Psi/30 Bar	150 Psi/10 Bar

Note: SCCM (Standard milliliters per minute) and SLM (Standard liters per minute) are based on the default standard conditions (0°C, 101.3 KPa), and support (20°C, 101.3 KPa) or other standard conditions.

4.1 Performance Specifications

Item	Parameter
Flow Accuracy	$\pm 1\%$ F.S
Repeatability	$\pm 0.2\%$ F.S
Control Range	2%~100% F.S
Response Time	<2s
Temperature coefficient	Zero: <0.05% of F.S./°C. Span: <0.1% of S.P. /°C
Pressure coefficient	0.2% of S.P. / Bar
Operating temperature	0~50°C
Leakage rate	1x10 ⁻⁹ atm. cc/sec He
Warm-up time	5 min accuracy: $\pm 5\%$ F.S (30 min to achieve the best accuracy)

4.2 Electrical Parameters

Item	Parameter
Power Supply	+15~24 V dc
Max. Power Consumption	10W (MFC) ; 3W (MFM)
Analog Communication	0~5 V / 4~20mA
Electrical Interface	9-pin D-connector (male)

4.3 Mechanical Parameters

Item	Parameter
Valve Type	Normally Closed (MFM is irrelevant)
Base Material	316L Stainless Steel
Seal Material	FKM, EPDM, NBR
Gas Port Connection	American / National Standard Ferrule or VCR Fitting

4.4 Dimensions (mm) and Weight (kg)

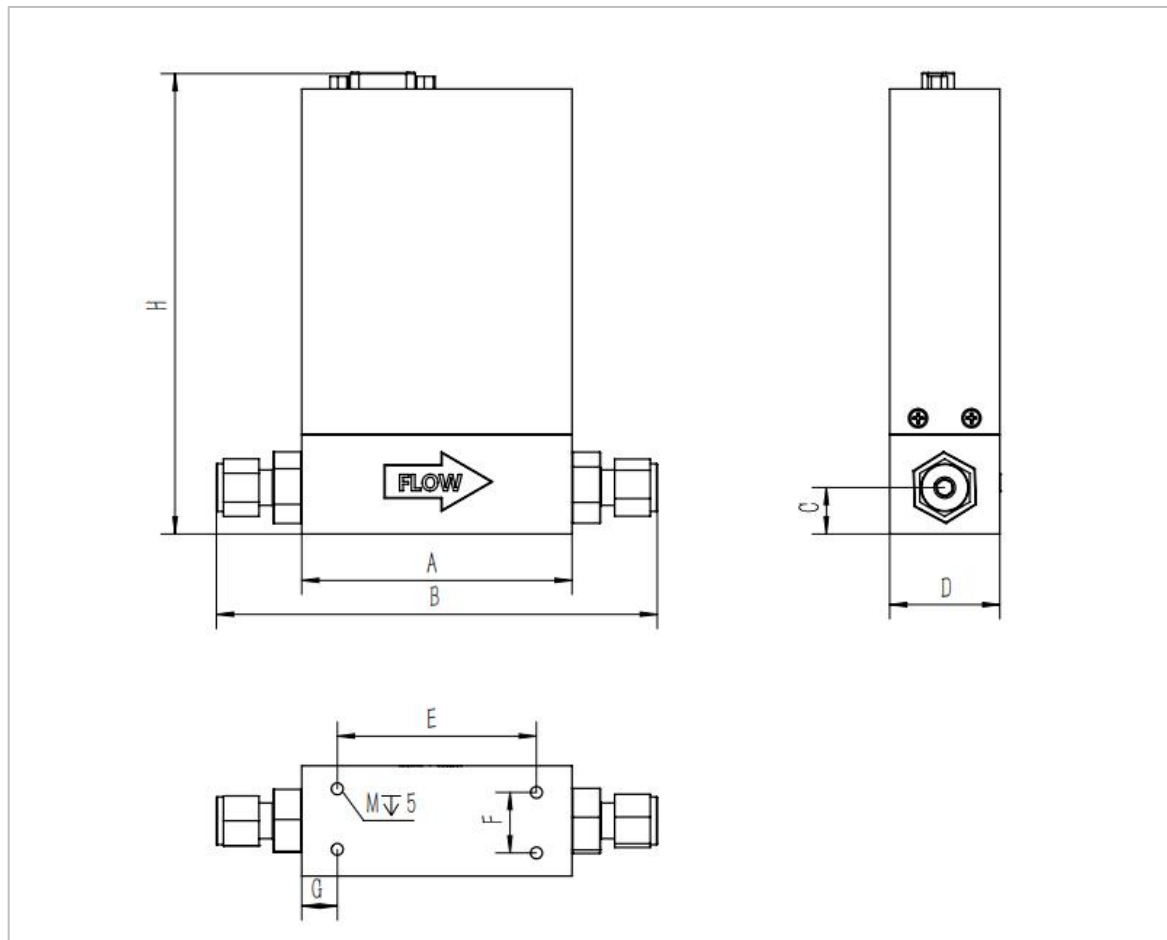


Figure 3 Dimension Drawing

Table 1 Model Size & Weight Corresponding Table

Code	A	B	C	D	H	E	F	G	M	Weight
FAC-320/1	76	124	13	31	125	56	16	10	M4	0.95

5. Electrical Connection

Analog Communication Connection Method

Analog communications use external power supplies and signals

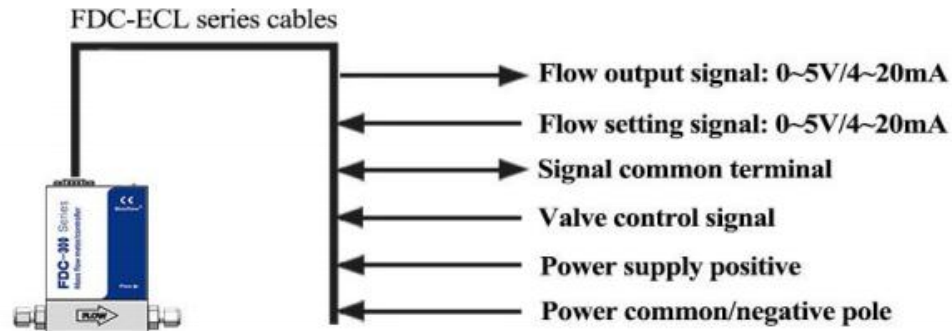


Figure 4 External Communication

Analog communication using flow control unit



Figure 5 Connected to the Flow Control Unit

Table 2: DB9 Analog Communication Electrical Pin Assignment Table

Pin No	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. It is factory-calibrated in the horizontal position by default. If the actual installation position differs from the factory calibration position, zero offset may occur. In this case, adjust the zero point before operation. The air flow direction is indicated by the product arrow, which must be correctly connected into the pipeline.

6.2 Notes on Use

- ▲ The gas used must be dry, clean and non-polluting. Install a filter if necessary;
- ▲ If using easily liquefied or crystallized gas, install a check valve at the MFC outlet to prevent backflow damage to the equipment.

7. Function operation

7.1 Peripheral description

- ▲ ZERO Knob: Device Zeroing;
- ▲ SPAN Knob: Flow Adjustment.

7.2 Device Zeroing

- ▲ Prior to performing device zeroing, the residual gas inside the MFC must be purged to ensure that there are no gas leaks.;
- ▲ Preheat thoroughly for 15 – 30 minutes.
- ▲ Simply rotate the knob to adjust the output signal to zero.

7.2 Flow Adjustment

- ▲ Equipment pneumatic connections are correct.
- ▲ Fully preheat for 15-30 minutes.
- ▲ Adjust the output value by rotating the knob, in accordance with the standard equipment.

8. Troubleshooting

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

- ▲ Incorrect gas source or air flow direction;
- ▲ The control signal mode is inconsistent with the use signal;;
- ▲ Incorrect electrical connection of power supply or setting signal;
- ▲ Zero offset;
- ▲ 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 offset;
- ▲ The valve is leaking.

8.4 Inaccurate output flow rate

- ▲ Zero-point deviation;
- ▲ Inconsistent standard temperature;
- ▲ Excessive measuring range of the testing equipment;
- ▲ Product malfunction.

9. Product Guarantee and Service

9.1 Warranty Description

- ✓ The warranty period for new products is one year after leaving the factory;
- ✓ The product warranty period after repair is 90 days
- ✓ 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 ;
- ✓ If toxic or corrosive gases, or other contaminants are used in the product, please completely remove all residues and contaminants before maintenance, and notify our company personnel accordingly.

9.2 Not covered by warranty

Product failures caused by the following reasons are not covered under warranty:

- ✗ Mechanical failures caused by product dropping or external impact;
- ✗ Damage to internal electronic components caused by incorrect electrical connections;
- ✗ Degradation of sealing materials caused by inconsistency between the gas used and the equipment parameters;
- ✗ Damage caused by gas pressure exceeding the equipment rating
- ✗ Blockage of precision internal components caused by unclean gas containing particles or other contaminants.
- ✗ Blockage of the gas flow path caused by gas crystallization as a result of failure to purge promptly after using easily crystallized gas.
- ✗ Unauthorized disassembly or modification of the product without the company's permission.

9.3 Product Service

Our company provides free product operation instructions and technical support.

10. Contact Us

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