吉思特仪器
GAS TOOL

G300 Series

Flow Controllers & Meters

User Manual

吉思特仪器
GAS TOOL
Mass Flow Controller
G300C
G300C-500
吉思特仪器
GAS TOOL
Mass Flow Meter
G300
G300-50
GASTOOL

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1. Overview

Introduction

Tianjin GASTOOL Instrument Co., Ltd. is a manufacturer specializing in flowmeters/controllers and pressure controllers. Providing reliable solutions for various applications, widely used in gas chromatography, analytical equipment, material equipment, biomedicine, semiconductors and other fields.

Features

- High-precision, high-resolution control
- Low power, power < 2 W
- Integrated 20 basic gas types
- 10 kinds of customizable mixed gases
- Control parameter self-tuning function
- Digital control, RS-485 Modbus RTU communication mode
- Wide flow range
- No preheating required
- No installation direction restrictions
- High repeatability and reliability
- Using electromagnetic proportional valve, long service life and fast response speed
- Compensation range 0-50 ℃
- Small package size

Measuring Range and Accuracy

- Available measuring range:
    - Max 0-200 SLPM
    - Minimum 0-10 SCCM
    - Please refer to the selection table for the standing range.
- Turndown ratio: 1000 : 1
- Full scale accuracy: ± 0.2 %
- Reading accuracy: ± 0.8 %
- Repeatability: ± 0.2 % FS
- Response time: <100 ms (modified by adjusting parameters)

Introduction to Digital Design

The G300 series can complete all functions required for measurement and control. It adopts the standard RS-485 Modbus RTU communication mode, which can be expanded to multiple devices for simultaneous use.

Application Areas

- Gas and liquid chromatographs
- Semiconductor Process
- Environmental monitoring equipment
- Chemical Vapor Deposition
- Gas generator
- Gas mixing system

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2. Features

Function	Illustrate
Flow Control	It can achieve high-precision, high-repeatability, and mass flow control of multiple gases.
Accumulated flow	It can be read via Modbus- RTU protocol.
Standalone	There is no need to connect any device, and most functions can be operated through buttons and display.
Multiple Ranges	The minimum range is 10 SCCM and the maximum range is 100 SLPM.
Built-In 20 Basic Gases	Built-in 20 basic gases, the gas types can be customized.
10 Custom Mixtures	The gas mixture can be customized according to usage requirements.
Multiple Electrical Interfaces	Standard configuration: one DC socket, two RJ45 interfaces, and one DB9 interface.
Analog Control	0-5V analog control signal input and output.
Digital Control	Button control or use RS -485 communication control.
Standard Modbus-RTU	RS-485 communication adopts the standard Modbus-RTU communication protocol.
Parameter self-tuning	The control parameters can be automatically adjusted to the optimal PID control parameters through protocols or buttons.
Setpoint Memory	After turning on this function, MFC can record the last set value before power outage, and directly execute the set value when power is turned on again.
Valve Control Function	It can realize valve fully open, valve fully closed and valve automatic closed-loop control functions.
Multiple Devices Connected	By changing the communication address, multiple devices can be controlled in series.
Custom Baud Rate	Custom baud rate can be set via Modbus-RTU.

3. Technical Parameters

Operating Parameters

Reading Accuracy	± 0.8％Rdg
Full Scale Accuracy	± 0.2％FS
Repeatability	＜± 0.2％FS
Zero Point Drift and Full-Scale Drift	＜±0. 02％FS/ ℃ / Atm
Measurement Range	1000:1
Typical Response Time	<100 milliseconds
Start Warm-up Time	<1 second
Standard Working Conditions	20℃ & 101.325 kPa (standard operating temperature can be adjusted through RS485)
Withstand Pressure	1 MPa
Installation Direction Requirements	none

Electrical Parameters

Operating Voltage	DC 24V ±10% / DC12V ± 10％
Power	＜ 2W
Digital Control Signal	RS-485 Modbus- RTU/ key operation
Analog Control Signal	0-5V
Electrical Signal Interface	DB9 × 1 /RJ45 × 2

Physical Parameters

Valve	proportional valve (normally closed)
Medium	gas
Operating Temperature	0-50 ℃
Sensor Temperature Compensation Range	0-50℃
Working Humidity	0-100％(non-condensing)
Storage Temperature	- 40~85 ℃
Leak Rate	< 0.020 SCCM He (differential pressure 150 PSI)

Mechanical Parameters

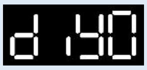
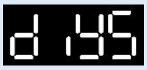
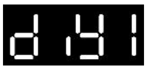
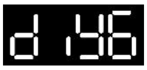
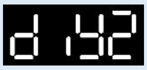
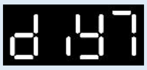
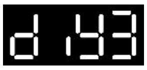
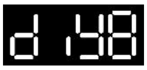
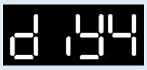
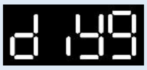
Flow Controller Range	Mechanical Dimensions (length × width × height mm)	Air Connection Interface
1 SCCM to 100 SCCM	80.8×28×85.5	M5
500 SCCM to 10 SLPM	8 4.3×28×88	G1/8
20 SLPM	8 4.3×28×96	G1/8
50 SLPM to 200 SLPM	94×40×112	G1/4

4. Gas Type

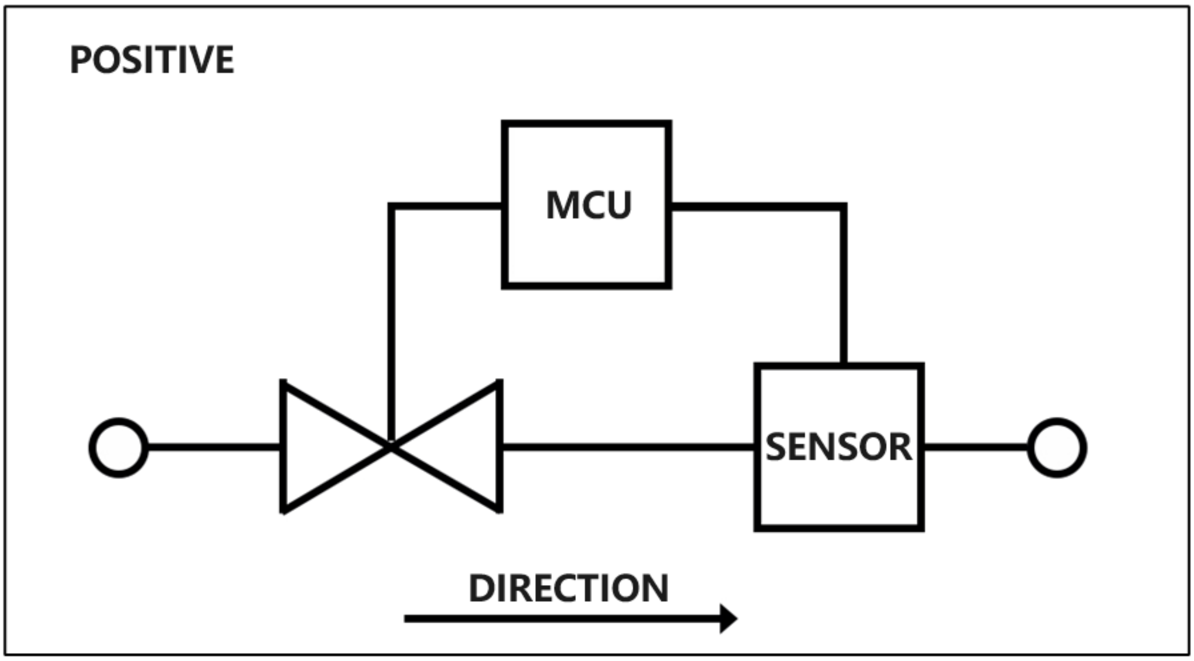
4.1 Basic gas types

No.	Symbol	Name	No.	Symbol	Name
0	Air	Air	**10**	C2H4	Ethylene
1	N2	Nitrogen	**11**	C2H6	Ethane
2	Ar	Argon	**12**	C3H8	Propane
3	H2	Hydrogen	**13**	iC4H10	Isobutane
4	He	Helium	**14**	nC4H10	N-Butane
5	O2	Oxygen	**15**	N2O	Nitrous Oxide
6	CH4	Methane	**16**	SF6	Sulfur Hexafluoride
7	CO	Carbon Monoxide	**17**	Xe	Xenon
8	CO2	Carbon Dioxide	**18**	Ne	Neon
9	C2H2	Acetylene	**19**	Kr	Krypton Gas

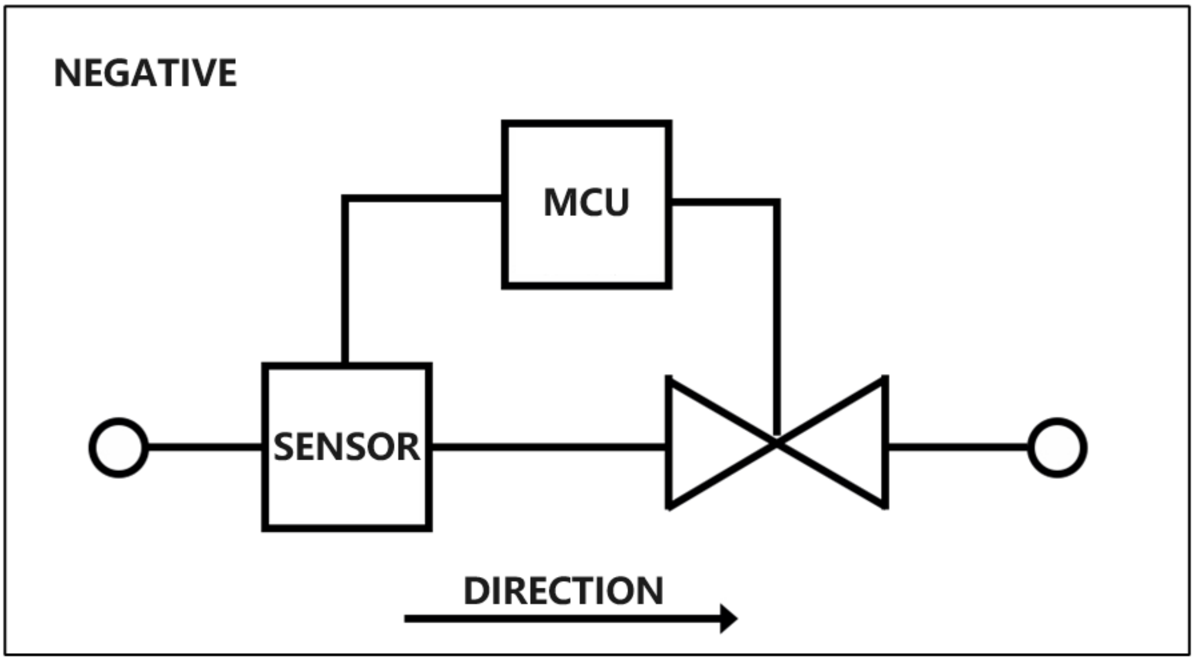
4.2 Custom mixed gas types

No.	Name	Display	**No.**	Name	Display
20	Custom mixture 0		**25**	Custom mixture 5	
21	Custom mixture 1		**26**	Custom mixture 6	
22	Custom mixture 2		**27**	Custom mixture 7	
23	Custom mixture 3		**28**	Custom mixture 8	
24	Custom mixture 4		**29**	Custom mixture 9	

5. Schematic Diagram


POSITIVE
MCU
SENSOR
DIRECTION

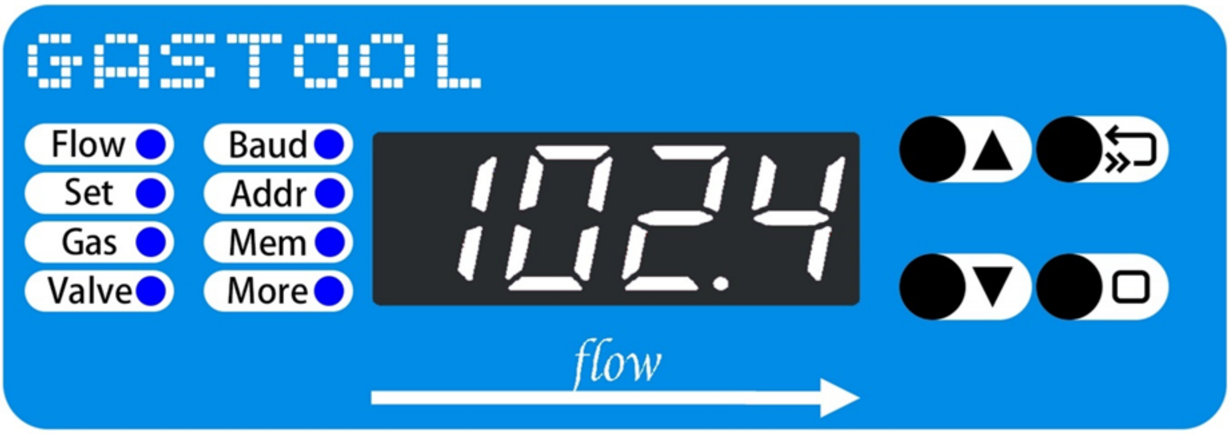
G300C positive pressure flow controller

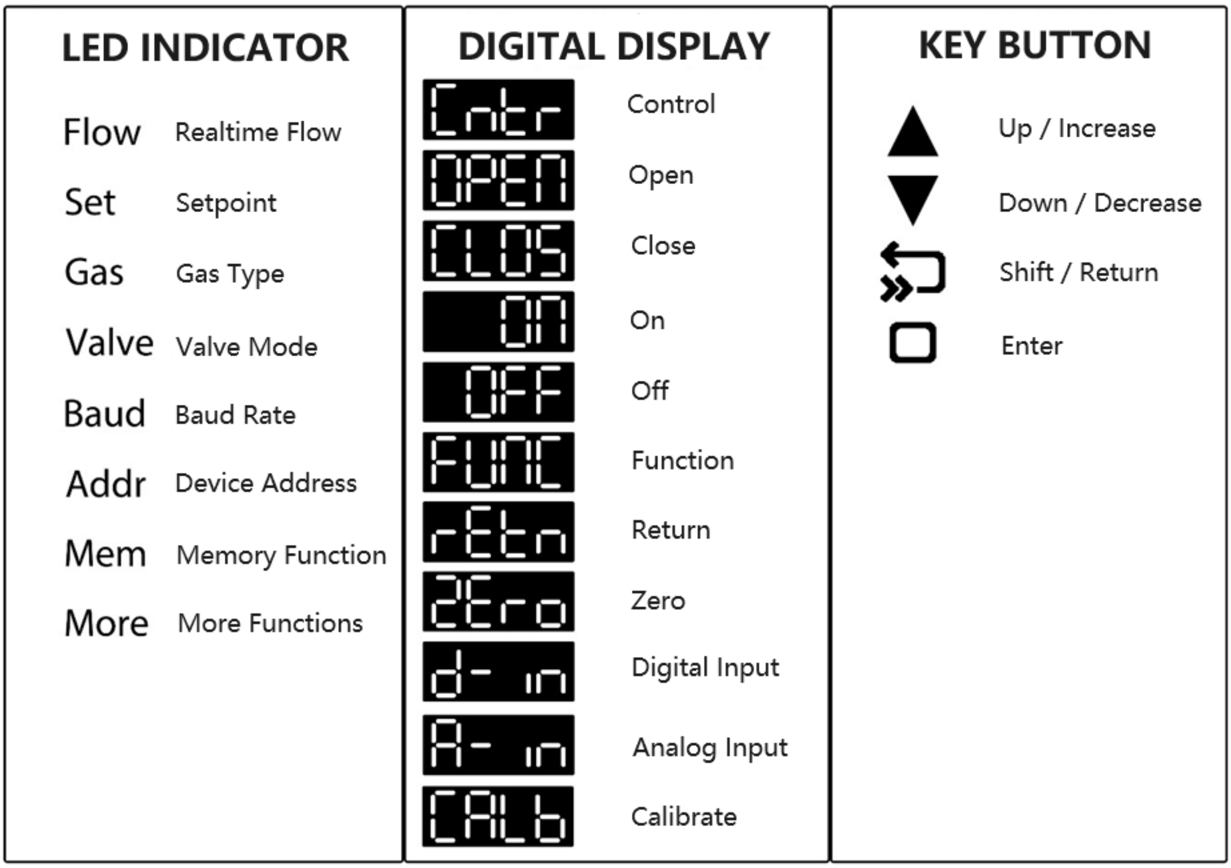

NEGATIVE
MCU
SENSOR
DIRECTION

G300C negative pressure flow controller

6. Display and Key Operation

6.1 Interface Description


GASTOOL
Flow
Set
Gas
Valve
Baud
Addr
Mem
More
102.4
▲
▼
flow



LED INDICATOR	
Flow	Realtime Flow
Set	Setpoint
Gas	Gas Type
Valve	Valve Mode
Baud	Baud Rate
Addr	Device Address
Mem	Memory Function
More	More Functions

DIGITAL DISPLAY	
Cntr	Control
OPEn	Open
CLOS	Close
On	On
OFF	Off
FUNC	Function
rEtn	Return
ZEro	Zero
d- in	Digital Input
A- in	Analog Input
CALb	Calibrate

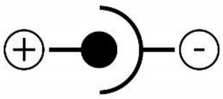
KEY BUTTON	
▲	Up / Increase
▼	Down / Decrease
⮌	Shift / Return
□	Enter

6.2 Buttons and display menu

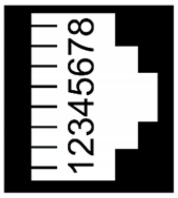
No.	Name	Function	Illustrate
1	Realtime Flow	Show real-time traffic	Displays the current real-time mass flow through the flow controller.
2	Setpoint	Display and update traffic settings	Set the desired setting value of the flow controller by pressing the button.
3	Gas Type	Display and change gas type	Use the buttons to adjust the type of gas passing through the flow controller.
4	Valve Control Mode	Automatic control	The valve and flow measurement system are closed-loop controlled to achieve set value control.
		Valve fully open	The flow controller control valve is fully open.
		Valve fully closed	The flow controller control valve is fully closed.
5	Baud-Rate	Display and change the baud rate	Change the flow controller RS485 communication baud rate by pressing the button.
6	Address	Display and change the mailing address	Change the RS485 communication address of the flow controller by pressing the button.
7	Memory Function	Memory function on	The flow controller records the last set value before power failure, and directly controls to the recorded set value when power is restored.
		Memory function off	The flow controller does not record the set value, and the set value is 0 when it is powered on again.
8	More Features	Return to main menu	Return to the real-time traffic interface.
		Equipment zeroing	Adjust the flow controller zero point (please operate under no flow condition).
		Digital control	The flow control setting value is executed by key setting value or RS485 communication setting value.
		Analog control	The flow controller setpoint executes the analog port input setpoint.
		Parameter self-tuning	PID control parameters suitable for the current system .
9	Reset	Reset	Press the four buttons simultaneously for 5 seconds to restore to factory settings.

7. Electrical configuration

7.1 DC socket (5.5 mm)



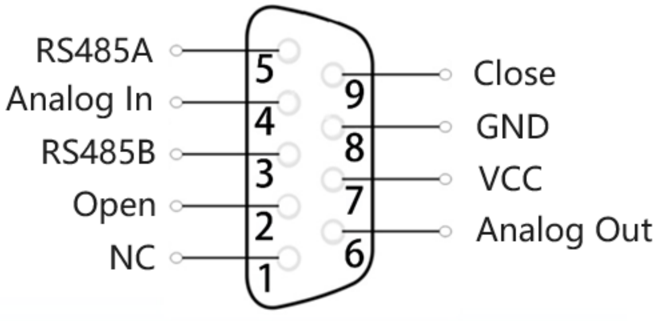
7.2 RJ45 socket



1 GND
2 VCC
3 RS485-B
4 RS485-A
5 Analog Input
6 Analog Output
7 Valve Opened
8 Valve Closed

Pin	Definition	Description
1	GND	Ground (common for power, digital communications, analog signals)
2	VCC	Power in
3	RS485B	Digital Signal RS485B/-
4	RS485A	Digital Signal RS485A/+
5	Analog Input	Analog Setpoint Input 0-5V
6	Analog Output	Analog Output 0-5V
7	Valve Opened	Valve Fully Open (ground for enable, 5V for disable)
8	Valve Closed	Valve Fully Closed (ground for enable, 5V for disable)
⚠ Please note that using standard network cable can damage device, please check the pin map before connection!		

7.3 DB9 socket

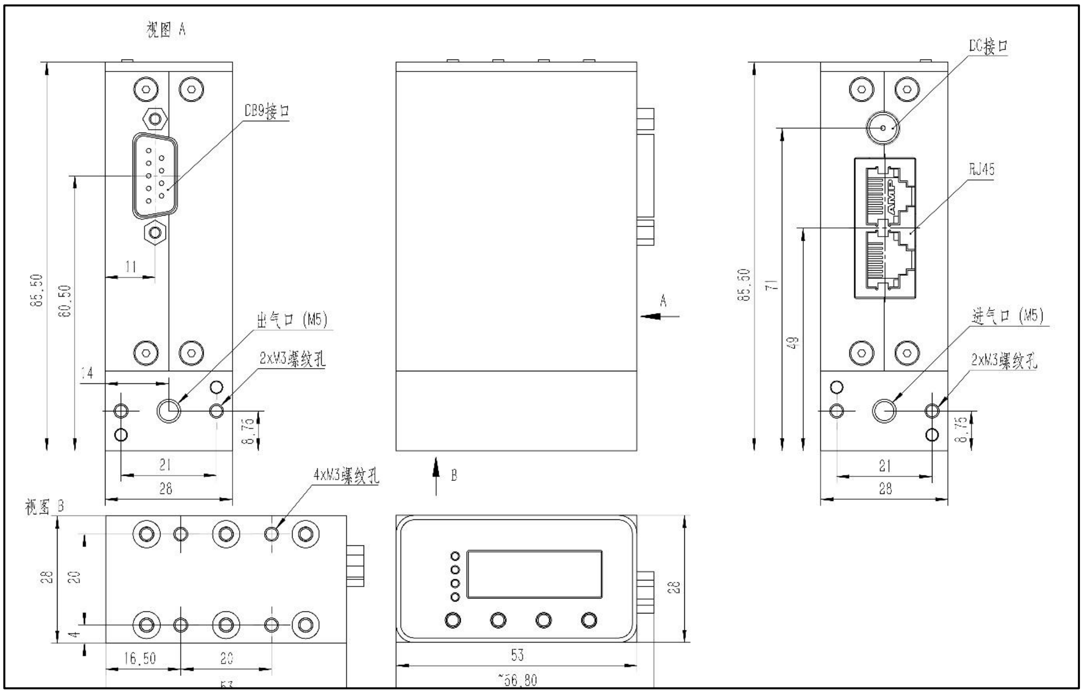

RS485A
Analog In
RS485B
Open
NC
5
4
3
2
1
9
8
7
6
Close
GND
VCC
Analog Out

Pin	Definition	Description
1	NC	Not Connected
2	Open	Valve Fully Open (ground for enable, 5V for disable)
3	RS485B	Digital Signal RS485B/-
4	Analog Input	Analog Setting Signal Input 0-5v
5	RS485A	Digital Signal RS485A/+
6	Analog Output	Analog Read Signal Output 0-5V
7	VCC	Power In
8	GND	Ground (common for power, digital communications, analog signals)
9	Close	Valve Fully Closed (ground for enable, 5V for disable)
⚠ Please note that using standard network cable can damage device, please check the pin map before connection!		

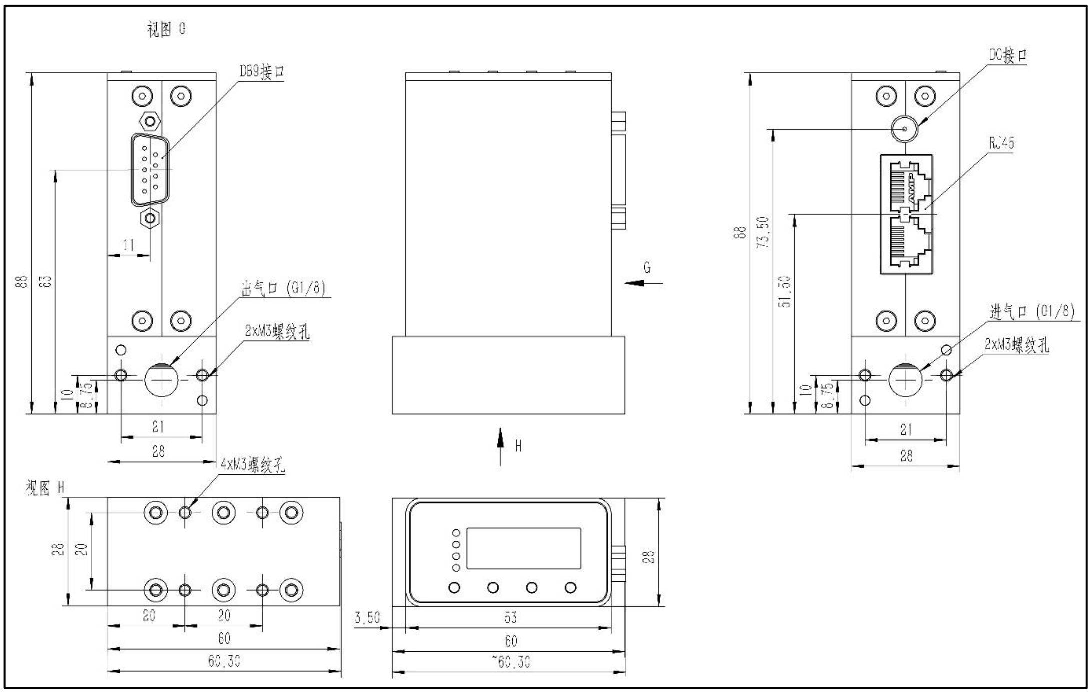
8. Dimension

8.1 G300 Flow Meter

Unit： mm

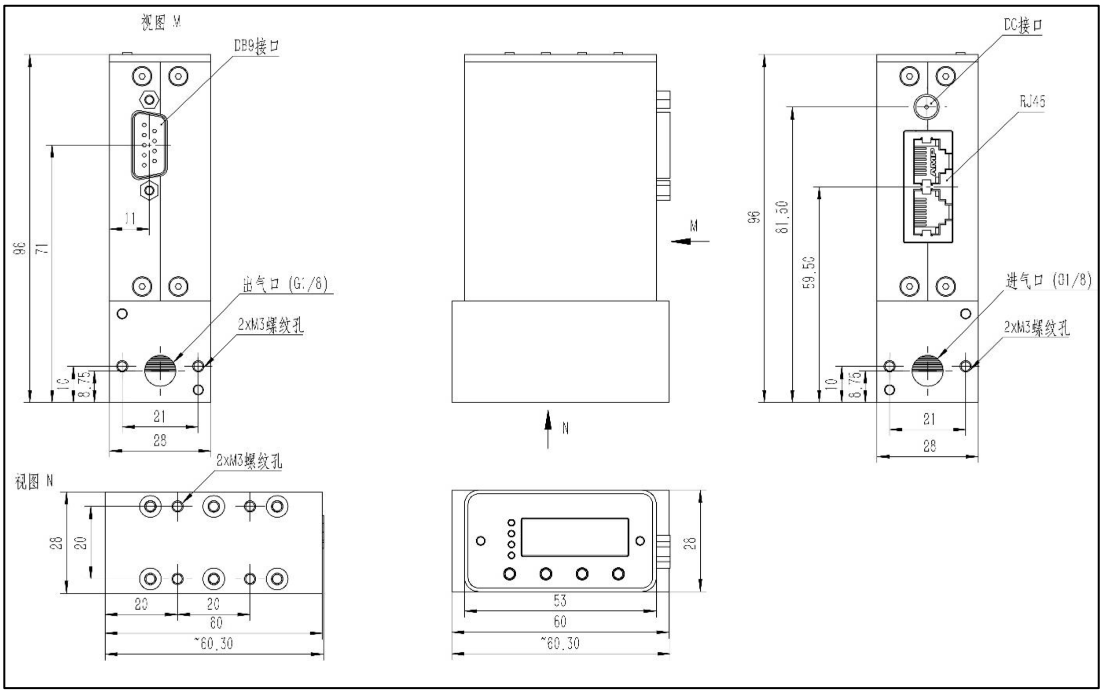

视图 A
DB9接口
DC接口
RJ45
出气口 (M5)
进气口 (M5)
2xM3螺纹孔
4xM3螺纹孔
视图 B
A
B
65.50
60.50
71
49
11
14
8.75
21
28
20
4
16.50
53
56.80

≤100 SCCM G300

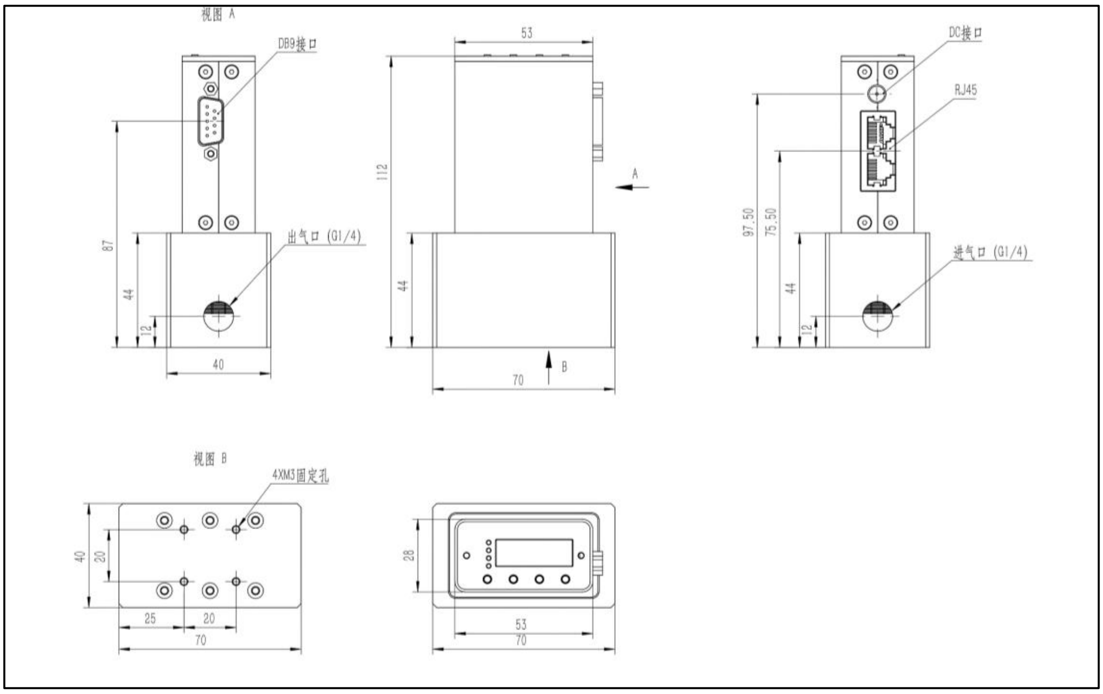

视图 G
DB9接口
DC接口
RJ45
出气口 (G1/8)
进气口 (G1/8)
2xM3螺纹孔
4xM3螺纹孔
视图 H
G
H
88
63
73.50
51.50
11
10
8.75
21
28
20
3.50
53
60
60.30

500 SCCM - 10 SLPM G300

Unit： mm


视图 M
DB9接口
DC接口
RJ45
96
71
11
出气口 (G1/8)
2xM3螺纹孔
10
8.75
21
28
M
N
96
81.50
59.50
进气口 (G1/8)
2xM3螺纹孔
10
8.75
21
28
视图 N
2xM3螺纹孔
28
20
20
20
60
~60.30
28
53
60
~60.30

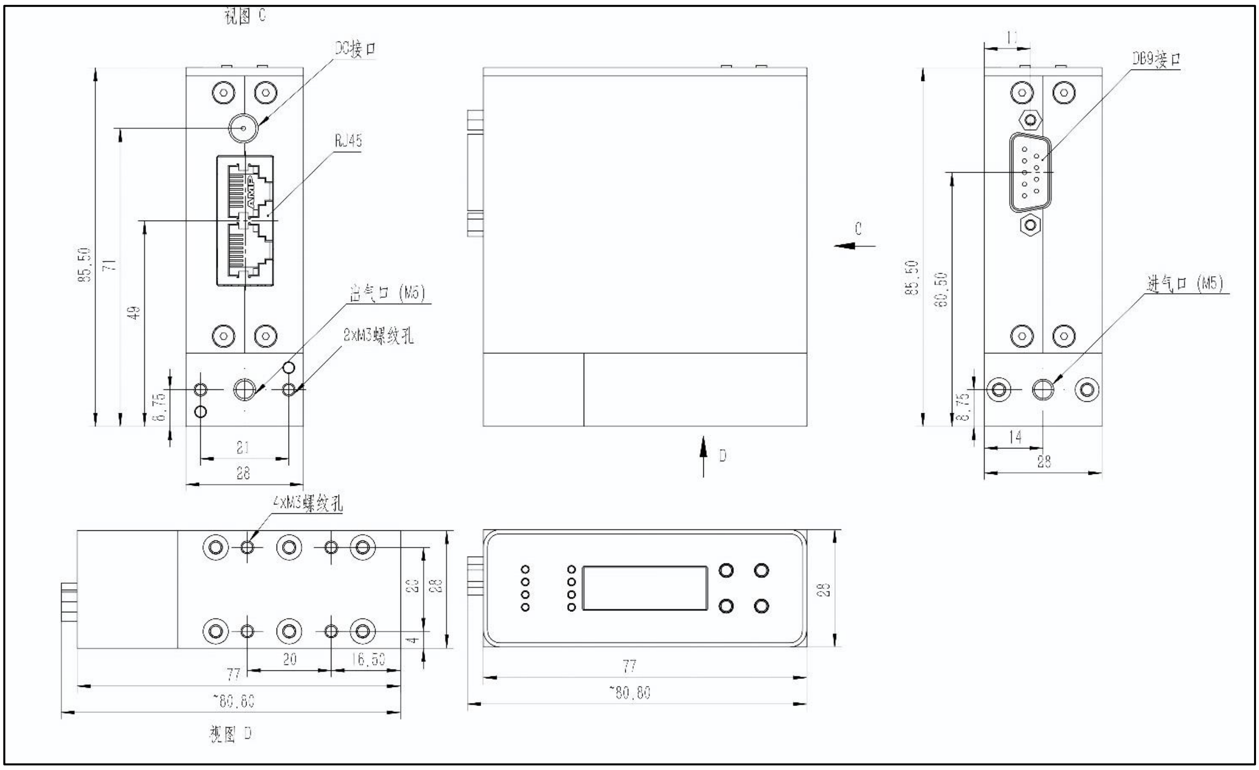
20 SLPM G300


视图 A
DB9接口
53
DC接口
RJ45
87
44
12
出气口 (G1/4)
40
112
44
A
B
70
97.50
75.50
44
12
进气口 (G1/4)
视图 B
4XM3固定孔
40
20
25
20
70
28
53
70

50 SLPM - 200 SLPM G300

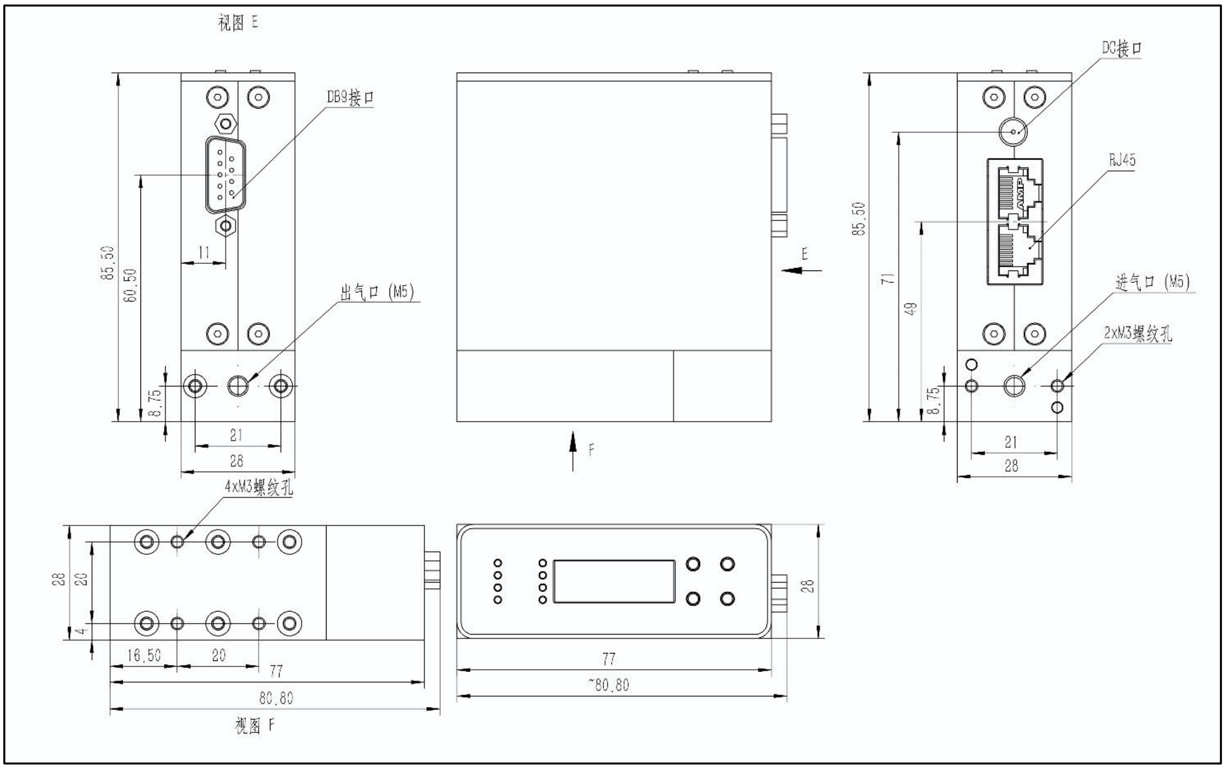
8.2 G300C Flow Controller

Unit：mm



视图 C
DC接口
RJ45
出气口 (M5)
2xM3螺纹孔
85.50
71
49
8.75
21
28
C
D
11
DB9接口
进气口 (M5)
85.50
60.50
8.75
14
28
4xM3螺纹孔
20
28
4
77
20
16.50
~80.80
视图 D
28
77
~80.80

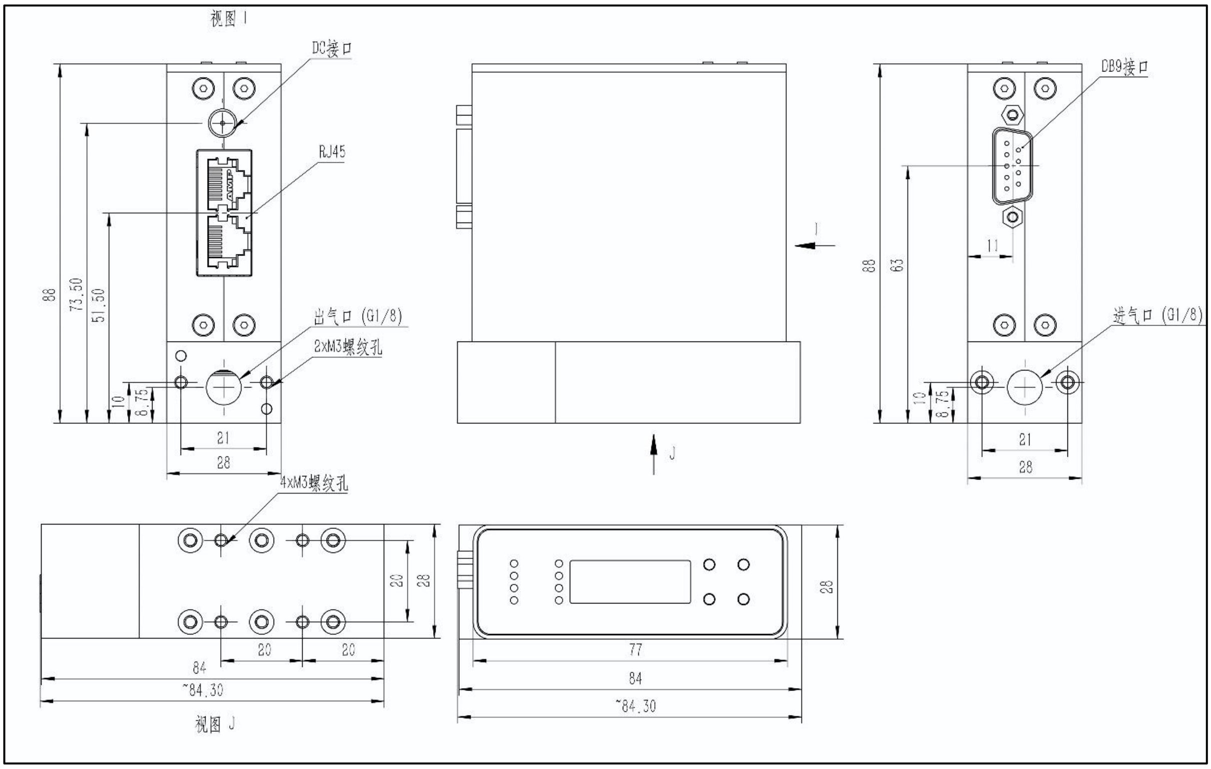
≤ 100 SCCM Positive Pressure G300C



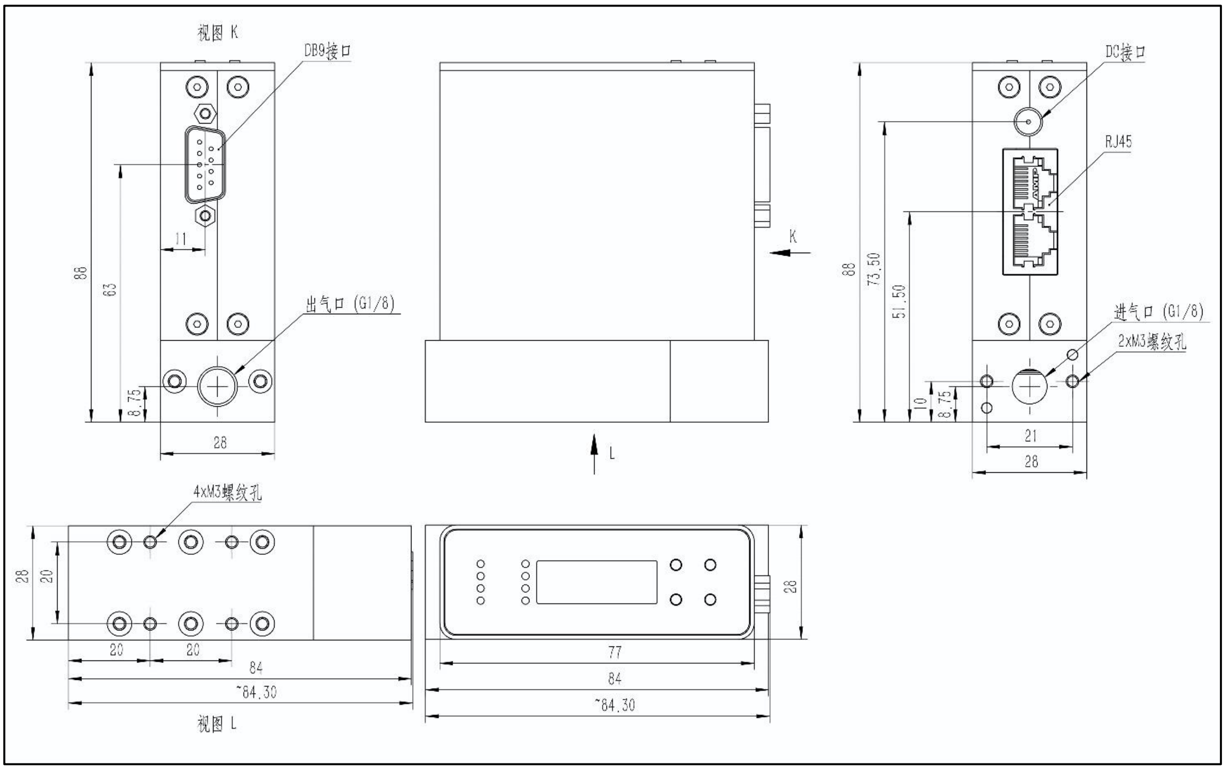
视图 E
DB9接口
85.50
60.50
11
出气口 (M5)
8.75
21
28
E
F
DC接口
RJ45
85.50
71
49
进气口 (M5)
2xM3螺纹孔
8.75
21
28
4xM3螺纹孔
28
20
4
16.50
20
77
80.80
视图 F
28
77
~80.80

≤ 100 SCCM Negative Pressure G300C

Unit： mm

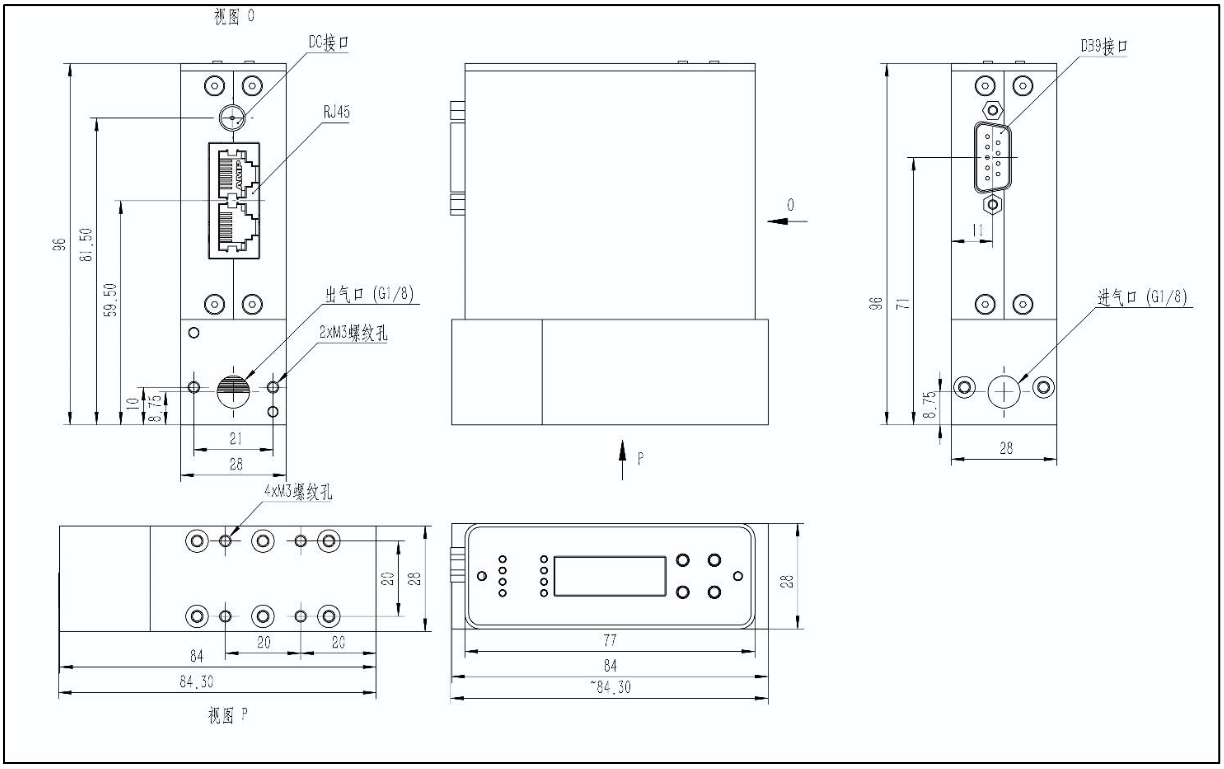

视图 I
DC接口
RJ45
88
73.50
51.50
10
8.75
21
28
出气口 (G1/8)
2xM3螺纹孔
4xM3螺纹孔
I
J
DB9接口
11
63
进气口 (G1/8)
20
28
84
~84.30
视图 J
77

500 SCCM - 10 SLPM Positive Pressure G300C

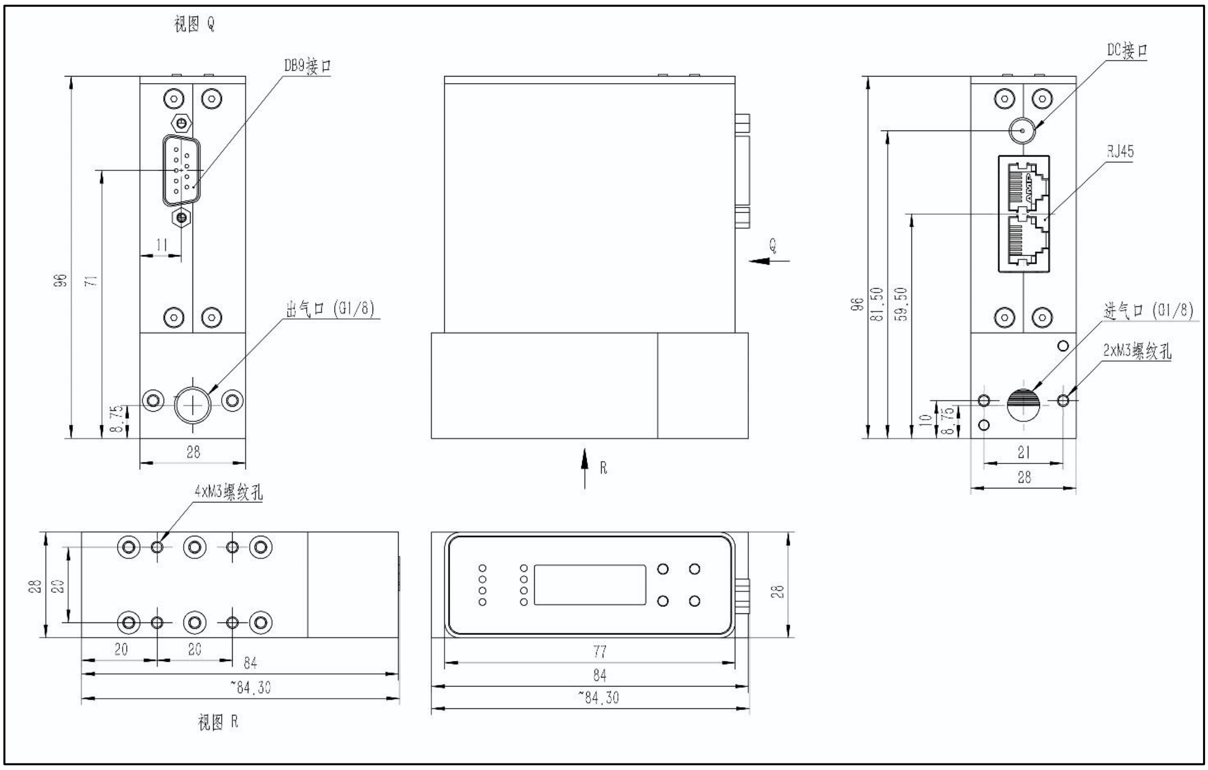

视图 K
DB9接口
11
88
63
8.75
28
出气口 (G1/8)
K
L
DC接口
RJ45
73.50
51.50
10
21
进气口 (G1/8)
2xM3螺纹孔
4xM3螺纹孔
20
84
~84.30
视图 L
77

500 SCCM - 10 SLPM Negative Pressure G300C

Unit: mm

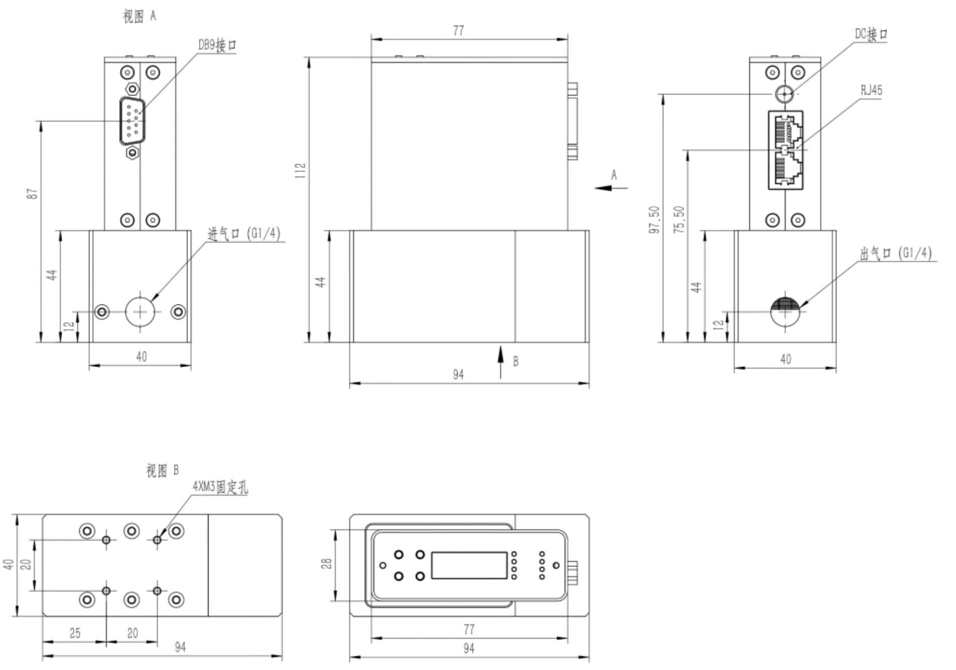

视图 O
DC接口
RJ45
出气口 (G1/8)
2xM3螺纹孔
96
81.50
59.50
10
8.75
21
28
O
P
D39接口
进气口 (G1/8)
11
71
4xM3螺纹孔
20
84
84.30
77
~84.30
视图 P

20 SLPM positive pressure G300C


视图 Q
DB9接口
出气口 (G1/8)
96
71
11
8.75
28
Q
R
DC接口
RJ45
进气口 (G1/8)
2xM3螺纹孔
81.50
59.50
10
21
4xM3螺纹孔
20
84
~84.30
77
视图 R

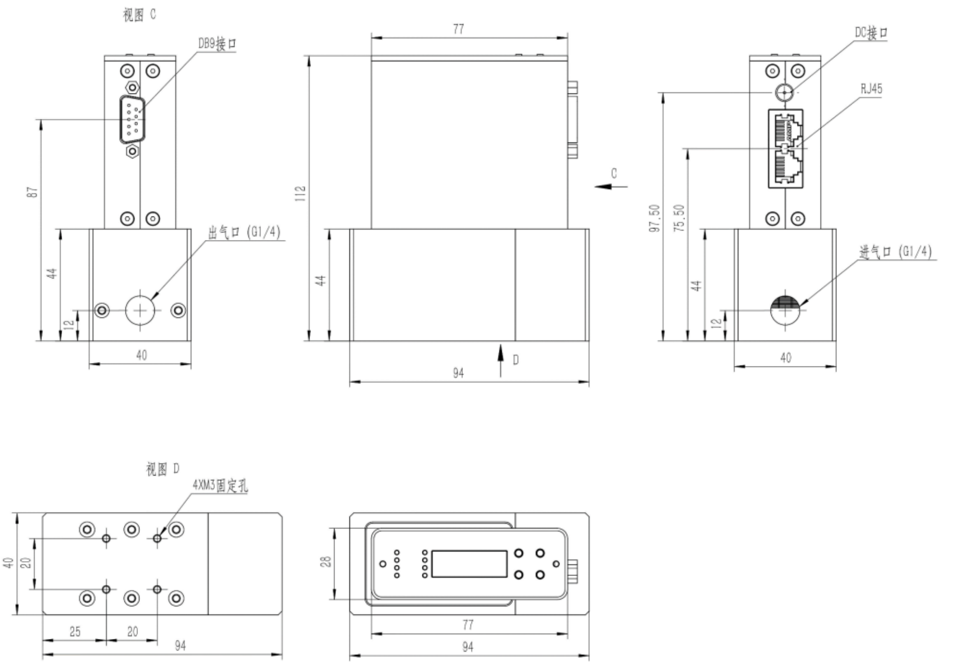
20 SLPM Negative Pressure G300C

Unit: mm



视图 A
DB9接口
87
44
12
40
进气口 (G1/4)
77
112
44
94
A
B
DC接口
RJ45
97.50
75.50
44
12
40
出气口 (G1/4)
视图 B
4XM3固定孔
40
20
25
20
94
28
77
94

50 SLPM - 200 SLPM Positive Pressure G300C



视图 C
DB9接口
87
44
12
40
出气口 (G1/4)
77
112
44
94
C
D
DC接口
RJ45
97.50
75.50
44
12
40
进气口 (G1/4)
视图 D
4XM3固定孔
40
20
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50 SLPM - 200 SLPM Negative Pressure G300C

9. Modbus communication protocol

9.1 Quick Start

Using Modbus - RTU standard communication protocol, including CRC-16 checksum. This section is about getting started quickly with the communication protocol. For detailed communication protocols, please refer to 9.1 .

Baud rate: Depends on the device settings, the product default baud rate is 9600
Check digit: none
Data bits: 8 bit
Stop bit: 1 bit
Data communication format: hexadecimal

Commonly used communication protocols are as follows:

- **Read Flow**

Send Data	Address	Function Code	Starting Register Address	Number of Registers		CRC-16
	0xXX	0x04	0x0001	0x0002		0xXXXX
Return Data	Address	Function Code	Number of Bytes	Low Byte	High Byte	CRC-16
	0xXX	0x04	0x04	0xXXXX	0xXXXX	0xXXXX

Note: This command can be used to obtain the actual traffic of the current MFC. The value is a hexadecimal floating-point number.

Example: Read the current flow value of MFC with address 1, 20 (hexadecimal floating point number: 41 A0 00 00):

Send data: 01 04 00 01 00 02 20 0B
Return data: 01 04 04 00 00 41 A0 CB AC

- **Write Setpoint**

Send Data	Address	Function Code	Starting Register Address	Number of Registers	Number of Data Bytes	Low Byte Data	High Byte Data	CRC-16
	0xXX	0x10	0x000B	0x0002	0x04	0xXXXX	0xXXXX	0xXXXX
Return Data	Address	Function Code	Starting Register Address	Number of Registers				CRC-16
	0xXX	0x10	0x000B	0x0002				0xXXXX

Description: This command can be used to set the flow setting value, which is a hexadecimal floating-point number.

- ✱ When the memory function is turned on, a configuration information burning command needs to be issued, and the MFC will burn and save the configuration information.

MFC flow value with address 1 to 30 (hexadecimal floating-point number: 41 F0 00 00):

Send data: 01 10 00 0B 00 02 04 00 00 41 F0 82 08

Return data: 01 10 00 0B 00 02 30 0A

- **Zero Setting**

Send Data	Address	Function Code	Starting Address	Number Of Registers	Number Of Data Bytes	Data	CRC-16
	0xXX	0x10	0x0006	0x0001	0x02	0x0001	0xXXXX
Return Data	Address	Function Code	Starting Address	Number of Registers			CRC-16
	0xXX	0x10	0x0006	0x0001			0xXXXX

Description: Issue this command and the device will adjust the zero point by itself. When using this command, you first need to confirm that no gas passes through the product.

the MFC with address 01 to zero :

Send data: 01 10 00 06 00 01 02 00 01 67 F6

Return data: 01 10 00 06 00 01 E1 C8

- **Read the type of gas currently in use**

Send Data	Address	Function Code	Starting Register Address	Number Of Registers	CRC-16
	0x XX	0x03	0x0002	0x0001	0xXXXX
Return Data	Address	Function Code	Number Of Bytes	Data	CRC-16
	0xXX	0x03	0x02	0xXXXX	0xXXXX

illustrate: This command can be used to obtain the current gas type used by MFC. The gas type data is a hexadecimal integer.

Example: Read the current gas type of the MFC with address 1 as No. 1 gas nitrous oxide (hexadecimal floating point number: 00 0F):

Send data: 01 03 00 02 00 01 25 CA

Return data: 01 03 02 00 0F F8 40

- **Flow Reading**

Send Data	Address	Function Code	Register Address	Number of Registers		CRC-16
	0xXX	0x04	0x0003	0x0002		0xXXXX
Return Data	Address	Function Code	Number Of Bytes	Low Byte Data	High Byte Data	CRC-16
	0xXX	0x04	0x04	0xXXXX	0xXXXX	0xXXXX

illustrate: This command can be used to obtain the current M FC cumulative flow. The cumulative flow value is a hexadecimal floating point number.

Example: Read the current cumulative flow value of the MFC with address 1, 184.92 (hexadecimal floating point number: 43 38 EB 85):

Send data: 01 04 00 03 00 02 81 CB

Return data: 01 04 04 EB 89 43 38 2F 68

- **Change Address**

Send Data	Device Address	Function Code	Register Address	Number of Registers	Number of Data Bytes	Data	CRC-16
	0xXX	0x10	0x0003	0x0001	0x02	0xXXXX	0xXXXX
Return Data	**Device Address**	**Function Code**	**Register Address**	**Number of Registers**			**CRC-16**
	0xXX	0x10	0x0003	0x0001			0xXXXX

Note: The factory default address is 01. Use this command if you need to change the address. After receiving the reply, power off and restart the device to complete the address change. If the power is not turned off and restarted, the communication uses the previous address. The address range is 1-255 .

✱ When the changes are completed and need to be saved, a configuration information burning command needs to be issued, and the MFC will burn and save the configuration information.

Example: Change the MFC address from 01 to 05 :

Send data: 01 10 00 03 00 01 02 00 05 66 60

Return data: 01 10 00 03 00 01 F1 C9

9.2 Complete Modbus communication protocol

9.2.1 Data Format

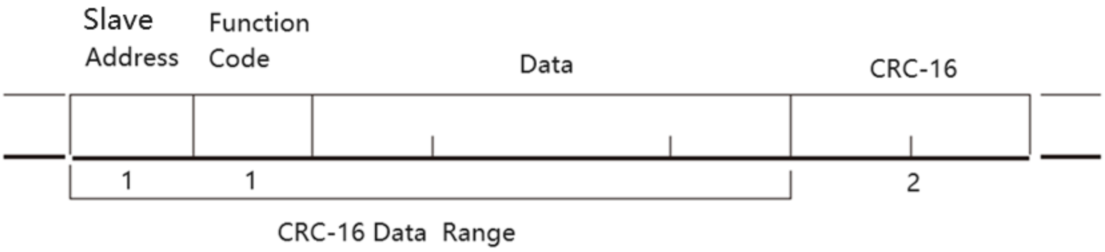
According to the Modbus (RTU) communication procedure, the commands from the host computer and the responses from the G300C are in units of data sets called frames.

The structure of the command frame and response frame is as follows.

In the following descriptions, if a value is preceded by " 0x ", it means a hexadecimal number, such as " 0x02 ".

1. Instruction Frame

RTU mode, the signal must start with a quiet interval of at least 3.5 characters and end with a quiet interval of at least 3.5 characters.



minimum quiet interval of 3.5-character times	
Slave Address	Please specify the "unit number". 0x00 ~ 0x63 (0 ~ 99) can be set in hexadecimal format . When broadcasting uniformly, please specify 0x00 . But no response is returned when broadcasting.

Function Code	The function code is a code indicating the command type of the host device, and is set with 1 byte in hexadecimal format .
Data	The body of text corresponding to the function code. Used to specify variable addresses, parameter values, etc. (Set in hexadecimal format)
CRC-16	Cyclic Redundancy Check A check code calculated based on the value from the slave address to the end of the data. Use 2 bytes in hexadecimal format .
Squelch interval of at least 3.5 character times	

- **CRC Check**

Information is processed byte by byte in the workpiece for calculation (16-bit register: hereafter referred to as CRC register).

（1） Set the initial value of the CRC register to 0xFFFF .

（2） XOR operation on the CRC register and the first byte data of the information , and return the calculation result to the CRC register.

（3） the MSB with " 0 " and shift the CRC register right by 1 bit.

（4） If the bit moved from the LSB is " 0 ", repeat step (3) (processing the next shift) .
If the bit moved from the LSB is " 1 ", perform an XOR operation on the CRC register and 0xA001 , and return the result to the CRC register.

（5） Repeat steps (3) and (4) until 8 bits are moved.

（6） If the information processing has not ended yet, XOR operation is performed on the CRC register and the next byte of the information , and the CRC register is returned, and the execution is repeated from step (3) .

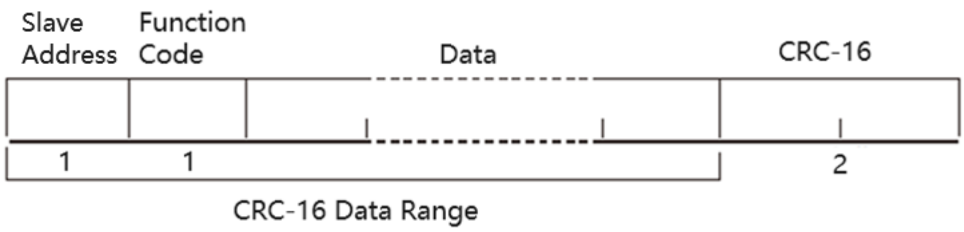
（7） the calculated result (the value of the CRC register) to the message from the low-order byte.

Calculation Example:

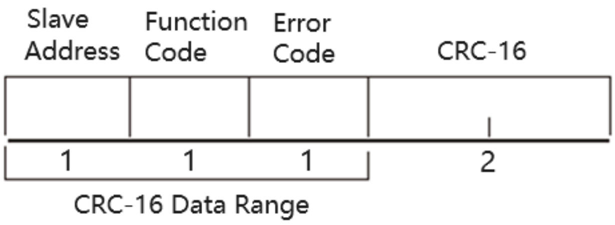
Data to be calculated: 01 03 04 00 00 41 A0
Calculated result: 1B CA
Send data: 01 03 04 00 00 41 A0 CA 1B

2. Response Frame

- **Normal Response Frame**



- **Response Frame When Exception Occurs**



Slave Address	Use the number specified via the command frame directly. The unit number of the response was returned.
Function Code	The function code of the received signal. However, the response frame in case of exception is the value of " 0x80 " added to the function code that received the signal, indicating an abnormal response. example: Receive function code = 0x03 Function code in the response frame when responding to exception = 0x83
Error Code	An end code indicating the content of the exception.
CRC-16	Cyclic Redundancy Check A check code calculated based on the value from the slave address to the end of the data. Use 2 bytes in hexadecimal format .

3. Error Code

Error Code	Name	Error Level	Illustrate
0x01	Configuration Data Exception	Generally	Configuration data is abnormal
0x02	Configuration Data Exception	Serious	Configuration data is abnormal
0x07	Flow Setting Value Exceeds the Limit	Generally	If the flow setting value exceeds the maximum range, the value will be refreshed to the maximum range value.
0x08	Traffic Exceeds the Limit	Generally	The current flow exceeds the maximum range of the device hardware

0x09	Wrong Direction	Generally	Flow rate less than - 5%* maximum range
0x0B	Configuration Register Programming Error	Generally	Configuration register programming error
0x0D	Cache Register Programming Error	Generally	Cache register programming error
0x10	Sensor Reading Error	Serious	Sensor communication abnormality

- **No Response**

In the following cases, the received command is not processed and no response is returned. Therefore, the host device is in timeout state.

· When the slave address receiving the instruction is inconsistent with the communication address number;

· When parity error or frame error occurs due to transmission error, etc.

· When a CRC-16 code error occurs in the received command frame ;

· When the reception time interval of each data constituting the command frame is greater than 3.5 character time.

In addition, in the following cases, although the processing (for the target function) is executed , there is no response.

· When specifying broadcast (slave address: 0x00) .

9.2.2 Function Code

The function codes are shown in the table below.

Function Code	Name	Description
0x03	Read Configuration Registers	Read the configuration register area. Multiple contiguous configuration register regions can be read.
0x04	Read Status Register	Read the status register area. Multiple consecutive status register areas can be read
0x06	Writing to a Single Configuration Register	Writes to a single configuration register area.
0x10	Writing to Multiple Configuration Registers	Write to the configuration register area. Multiple contiguous configuration register areas can be written.

1. Read Configuration Register Operation (0x03)

Instruction Frame

Slave Address	Function Code	Starting Register Address	Number of Registers	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x03	Read the configuration register function code.
Starting Register Address	2	0x0000-0xFFFF	The address of the first configuration register in the configuration register that needs to be read.
Number of Registers	2	0x0000-0x00FF	The number of configuration registers that need to be read.
CRC-16	2	0x0000-0xFFFF	Check code calculated based on the value from the slave address to the end of the data.

Response Frame

Slave Address	Function Code	Number of Bytes	Register Data Value	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x03	Read configuration register function code.
Number of Bytes	1	0x00-0xFF	The total number of bytes of configuration register data read.
Register Data Value	Number of bytes	-	The configuration register data to be read.
CRC-16	2	0x0000-0xFFFF	The checksum is calculated from the value from the slave address to the end of the data.

Error response frame

Slave Address	Error Function Code	Error Code	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Error Function Code	1	0x83	Read configuration register error function code.

Error Code	1	0x00-0xFF	Query the error condition based on the error code.
CRC-16	2	0x0000-0xFFFF	The checksum is calculated from the value from the slave address to the end of the data.

2. Read Status Register Operation (0x04)

Instruction frame

Slave Address	Function Code	Starting Register Address	Number of Registers	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x04	Read status register function code.
Starting Register Address	2	0x0000-0xFFFF	The address of the first status register in the status register that needs to be read.
Number of Registers	2	0x0000-0x00FF	The number of status registers that need to be read.
CRC-16	2	0x0000-0xFFFF	The checksum is calculated from the value from the slave address to the end of the data.

Response Frame

Slave Address	function code	Number of bytes	Register data value	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x04	Read the status register function code.
Number Of Bytes	1	0x00-0xFF	The total number of bytes of status register data read.
Register Data Value	Number of bytes	-	The status register data to be read.
CRC-16	2	0x0000-0xFFFF	The checksum is calculated from the value from the slave address to the end of the data.

Error Response Frame

Slave Address	Error Function Code	Error Code	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Error Function Code	1	0x84	Read status register error function code.

Error Code	1	0x00-0xFF	Query the error situation based on the error code.
CRC-16	2	0x0000-0xFFFF	Check code calculated based on the value from the slave address to the end of the data.

3. Write single register operation (0x06)

Instruction Frame

Slave Address	Function Code	Register Address	Register Data Value	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x06	Write a single configuration register function code.
Register Address	2	0x0000-0xFFFF	The address of the configuration register that needs to be written.
Register Data	2	0x0000-0xFFFF	The data value that needs to be written to the configuration register.
CRC-16	2	0x0000-0xFFFF	Check code calculated based on the value from the slave address to the end of the data.

Response Frame

Slave Address	Function Code	Register Address	Register Data Value	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x 06	Write a single configuration register function code.
Bytes	2	0x0000-0xFFFF	The configuration register address to be written.
Register Data	2	0x0000-0xFFFF	The data value to be written to the configuration register.
CRC-16	2	0x0000-0xFFFF	The checksum is calculated from the value from the slave address to the end of the data.

Error Response Frame

Slave Address	Error Function Code	Error Code	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x86	Write configuration register error function code.
Error Code	1	0x00-0xFF	Query the error situation based on the error code.
CRC-16	2	0x0000-0xFFFF	Check code calculated based on the value from the slave address to the end of the data.

4. Write Multiple Register Operations (0x10)

Command Frame

Slave Address	Function Code	Register Address	Number of Registers	Bytes	Register Data Value	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x10	Write multiple configuration register function codes.
Starting Register Address	2	0x0000-0xFFFF	The first register address of the configuration register to be written.
Numbers	2	0x0000-0xFFFF	The number of configuration registers to be written.
Bytes	1	0x00-0xFF	The total number of bytes of register data to be written.
Register Data	2	0x0000-0xFFFF	The data value to be written to the configuration register.
CRC-16	2	0x0000-0xFFFF	The checksum is calculated from the value from the slave address to the end of the data.

Response frame

Slave Address	function code	Starting register address	Number of registers	C RC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Function Code	1	0x 10	Write multiple configuration register function codes.
Register Address	2	0x0000-0xFFFF	The first register address of the configuration register to be written.
Numbers	2	0x0000-0xFFFF	The number of configuration registers that need to be written.
CRC-16	2	0x0000-0xFFFF	Check code calculated based on the value from the slave address to the end of the data.

- **Error Response Frame**

Slave Address	Error Function Code	Error Code	CRC-16

Name	Length (Bytes)	Range	Illustrate
Slave Address	1	0x01-0xFF	Device address.
Error Function Code	1	0x90	Write configuration register error function code.
Error Code	1	0x00-0xFF	Query the error situation based on the error code.
CRC-16	2	0x0000-0xFFFF	Check code calculated based on the value from the slave address to the end of the data.

9.2.3 Register

9.2.3.1 Status Register (Read Only)

Register Address	Name	Type of Data	Illustrate
0x0001-0x0002	Real-Time Flow	32-bit floating point	Real-time flow data.
0x0003-0x0004	Accumulated Flow	32-bit floating point	Current accumulated traffic data.
0x0005-0x0006	Absolute Pressure	32-bit floating point	Relative vacuum pressure at the outlet.
0x0007-0x0008	Temperature	32-bit floating point	Flow channel gas temperature.

9.2.3.2 Configuration Register (Read/Write)

The data in the configuration register is executed immediately after being sent. If you need to save the sent configuration data, you need to send the configuration register burn command after sending the data. If the configuration register burn command is not sent, the device will restore the original data after power failure. (Except for 0x0002 gas type.)

* **If the register address is marked and needs to be saved, the configuration register burning command needs to be executed!**

Register Address	Name	Type of Data	Illustrate
0x0002	Gas Type	16-bit integer	Gas type number.
* 0x0003	Contact Address	16-bit integer	Correspondence address, address range 1-255 . After changing the communication address, you need to power off and restart the device before the change can be completed. The communication address before the power outage remains the address before the change.
* 0x0004	Baud Rate	16-bit integer	Communication baud rate, baud rate range 9 600 - 614400 . After changing the baud rate, you need to power off and restart the device before the change can be completed. The communication baud rate before power failure maintains the baud rate before change. Send data = actual baud rate / 100.

			Example: Set the baud rate to 115200 and send data to 1152.
✱ 0x0005	Control Signal	16-bit integer	Digital signal control and analog signal control options, digital signal control includes digital communication RS485 control and key control. send data: 0x0000 — Analog Control 0x0001 — Digital Control
0x0006	Function Commands	16-bit integer	Device needs a certain amount of running time to execute the following functions. During the execution, the device cannot communicate. After the execution is completed, it can be used normally and the register data is restored to the normal working state (0x 0000). You can check whether the function command is executed by reading the register data. 0x0000 —Normal working status 0x0001 —Device Zeroing 0x0002 —Cumulative flow is cleared ✱ 0x0003 — PID parameter auto-tuning 0x0004 —Configuration register burn 0x0005 —Factory Reset
0x000B - 0x000C	Flow Setting	32-bit floating point	Flow setting value. After setting, G300C will control the flow to the setting value. ✱ When the memory function is turned on, the configuration register burn command must be executed, otherwise the set value data will not be saved.
0x000D	Valve Controlled Switch	16-bit integer	The valve fully closed, valve fully opened, and automatic control functions can be realized by configuring this register. send data: 0x0000 —Valve fully closed 0x0001 —Valve fully open 0x0002 —Automatic control
✱ 0x000E	Memory Function	16-bit integer	The memory function can be turned on and off by configuring this register. send data: 0x0000 —Memory function disabled 0x0001 —Memory function enabled
✱ 0x000F	Traffic Type	16-bit integer	The mass flow rate and volume flow rate can be switched by configuring this register. send data: 0x0000 —Mass flow rate

			0x0001 —Volume flow rate
0x 0010	Error Code	16-bit integer	0x0000 indicates no error. For other data, see the error code table.
✱ 0x0011-0x0012	Standard Temperature	32-bit floating point	Standard condition temperature in degrees Celsius.
✱ 0x0016-0x0017	Proportional Coefficient	32-bit floating point	It is not recommended to adjust this data. If you need to make changes, it is recommended to use the product supporting software, or call for consultation. Software download website www.gastool.cn .
✱ 0x0018-0x0019	Integration Coefficient	32-bit floating point	It is not recommended to adjust this data. If you need to make changes, it is recommended to use the product supporting software, or call for consultation. Software download website www.gastool.cn .
✱ 0x001A-0x001B	Points Limit	32-bit floating point	It is not recommended to adjust this data. If you need to make changes, it is recommended to use the product supporting software, or call for consultation. Software download website www.gastool.cn .
✱ 0x001C-0x001D	Differential Coefficient	32-bit floating point	It is not recommended to adjust this data. If you need to make changes, it is recommended to use the product supporting software, or call for consultation. Software download website www.gastool.cn .
✱ 0x001E-0x001F	Differential Filtering	32-bit floating point	It is not recommended to adjust this data. If you need to make changes, it is recommended to use the product supporting software, or call for consultation. Software download website www.gastool.cn .
✱ 0x0020	Control Cycle	16-bit integer	It is not recommended to adjust this data. If you need to make changes, it is recommended to use the product supporting software, or call for consultation. Software download website www.gastool.cn .

9.2.3.3 Custom mixture configuration register

G300C can be configured with 10 kinds of mixed gases, each of which is the basic gas ratio inside the device, with a ratio resolution of 1 ‰. It can be configured through communication commands.

It is recommended to visit www.gastool.cn to download the product supporting software for configuration.

The custom gas mixture configuration registers are shown in the following table:

- **After configuring the custom gas mixture, if you need to save it, you need to execute the configuration register burn command!**
- **In the table, n represents the mixed gas number, and the range of n is 0-9 .**

Gas Type No.	Gas Type	Customized mixed gas n gas ratio register address
0	Air	0x003A+20×n
1	N2	0x003B+20×n
2	Ar	0x003C+20×n
3	H2	0x003D+20×n
4	He	0x003E+20×n
5	O2	0x003F+20×n
6	CH4	0x0040+20×n
7	CO	0x0041+20×n
8	CO2	0x0042+20×n
9	C2H2	0x0043+20×n
10	C2H4	0x0044+20×n
11	C2H6	0x0045+20×n
12	C 3H8	0x0046+20×n
13	iC4H10	0x0047+20×n
14	nC4H10	0x0048+20×n
15	N2O	0x0049+20×n
16	SF6	0x004A+20×n
17	Xe	0x004B+20×n
18	Ne	0x004C+20×n
19	Kr	0x004D+20×n

- **The data sent is a 16-bit integer, and the data is in thousandths. For example: if N2 accounts for 66.6 %, then 666 (hexadecimal 029A) is sent.**
- **After configuring the custom gas mixture, if you need to save it, you need to execute the configuration register burn command!**
- **In the table, n represents the mixed gas number, and the range of n is 0-9 .**

10. Selection reference

G300C – XXX – X – XX

Model:

G300 Mass Flow Meter

G300E Mass Flow Meter with Battery

G300C Mass Flow Controller

Range:

010=10 SCCM
050=50 SCCM
100=100 SCCM
500=500 SCCM
1L=1 SLPM
5L=5 SLPM
10L=10 SLPM
20L=20 SLPM
50L=50 SLPM
100L=100 SLPM
200L=200 SLPM

Pressure：

P=Positive
N=Negative

Power Supply：

24=DC 24V
12=DC 12V

11. Other

Thank you for purchasing a GASTOOL mass flow controller (MFC).

This manual describes the product functions, performance and application methods to achieve the best use of the product.

Please pay attention to the following when using this product:

- This manual should be read and understood thoroughly before using this product to ensure correct use.
- Personnel using this product should have basic knowledge of electrical systems.
- Please keep this manual in a safe place so that you can refer to it whenever you need it.

Precautions

- Do not touch the terminals while power is on.
- Do not allow metal objects, wires, liquids, etc. to enter the controller, otherwise it may cause dangerous events such as equipment short circuit, electric shock or fire.
- Do not place this product in flammable or explosive places.
- Never disassemble, modify, or repair this product or remove any internal components.
- Please set the product parameters suitable for system control. Improper settings may cause property damage or accidents due to unexpected operations.
- Please calibrate the device within the specified time to ensure the accuracy of the device.
- Before powering on the device, please confirm whether the wiring is correct and whether the power supply voltage meets the requirements of the user manual.
- The gas used must be purified and dust, liquid and oil must be avoided. If necessary, a filter must be installed in the gas line.
- Before use, please confirm whether the gas used is consistent with the calibration gas to avoid flow data errors.
- Do not use corrosive gases to avoid damage to the MFC gas circuit.

Warranty and Service

- Our company's MFC products will be repaired free of charge if there are any problems within one year after delivery, provided that the user uses them normally according to the instruction manual and the products have not been physically damaged, contaminated, modified or refurbished.
- The free repair scope does not include gas circuit joints and gas circuit joint sealing rings.
- Please check the product in time after receiving it. If there is any problem, please report it to the sales staff in time.

- During the warranty period, the product must be repaired by our company or an authorized service center.
- If the user has used products with toxic, polluting or corrosive gases, our company will not be responsible for repairs or warranty.
- The input gas pressure must comply with the pressure resistance standard of the product and cannot exceed the maximum pressure required by the product.
- The gas used in the product must be compatible with the sealing material selected by the user . It is the user's responsibility to use each gas in accordance with available safety regulations. Improper use of the product will invalidate the warranty, and the company cannot be blamed for any damage caused by incorrect use.
- It is prohibited to disassemble the product yourself. If damage is caused by self-disassembly, the warranty promised by the company will be invalid.

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