AFM0725 Instruction Manual

Gas Mass Flow Meter

ÿ Integrated mass flow and temperature

measurement ÿ Good repeatability ÿ Supports

multiple gas measurements ÿ Standard Modbus-

RTU communication ÿ 2 NPN open collector

outputs (for upper and lower limit alarms) ÿ 1~5V linear voltage output 9ÿ24V DC power

supply

Product description

The AFM0725 is a thermal mass flow sensor that calculates the mass flow of the gas being measured by measuring the change in resistance. The sensor adopts

the self-developed MEMS mass flow chip, which has the characteristics of intuitive, accurate, stable, high and low temperature resistance, good linearity, and short response

time.

The range, accuracy, repeatability and response time of AFM0725 have been strictly calibrated before leaving the factory.

Scope of application

AFM0725 is suitable for mass flow monitoring of air, nitrogen, argon, carbon dioxide, helium, oxygen and other dry, clean and non-corrosive gases (except flammable

and explosive gases). It has been widely used in university scientific research, fire protection, environmental monitoring, tobacco, smart agriculture, food, medicine and other

industries.

Figure 1. AFM0725

1. Appearance structure and interface definition

1.1 Appearance structure

Figure 2 shows the appearance structure and working interface of AFM0725, including the sensor air duct and working interface. The working interface includes an LCD display screen and operation buttons. The contents displayed on the LCD include the Modbus communication address of the flowmeter, gas temperature, cumulative flow and instantaneous flow. The buttons include up, down and set buttons, and the LCD lights 1 and 2 are the upper limit warning light and the lower limit warning light respectively. The sensor air duct is below the working interface, including the air inlet and the air outlet.

Figure 2. AFM0725 Block Diagram

1.2 Device 8Pin female socket

The pin definition of the device's 8Pin female socket is shown in Figure 3 and Table 1.
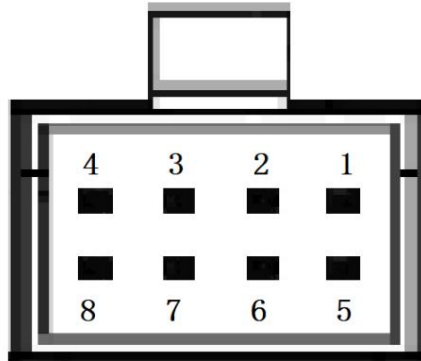

Figure 3. Schematic diagram of device 8Pin female socket

Table 1. Device 8Pin female header pin definition

pin	definition
1	power cable
2	GND
3	Voltage output
4	RS485A
5	External output 1
6	External output 2
7	GND
8	RS485B

1.3 AFM0725 pinout

The pinout definitions are shown in Table 2.

Table 2. Pinout Definitions

pinout	definition
white line	power cable
black line	GND
yellow line	Voltage output
red line	RS485A
grey line	External output 1
brown wire	External output 2
orange line	GND
green line	RS485B

length	30cm
material	UL2464

2. AFM0725 technical indicators and mechanical parameters

Table 3. AFM0725 Specifications and Mechanical Parameters

parameter	describe
model	AFM0725
range	0~25L/min
precision	±3%FS
output method	RS485, NPN open collector output, 1~5V linear voltage output
Repeatability	±1%FS
Response time	50ms
Power supply	9ÿ24V DC
Display method	LCD display
Display unit cumulative flow: L (ft3×10-1) Instantaneous flow: L/min (CFM×10-2)	
maximum work Pressure	0.8MPa
Standard Calibration gas	Air (25°C, 1 standard atmosphere)
Operating temperature	-10~+60ÿ
pinout	AFM0725 pinout
Power consumption	0.85W (typ.)
product weight	56g
Shell material	PBT
Duct material	PBT

3. Product dimension drawing and piping method

3.1 The dimensions of AFM0725 are shown in Figure 4.
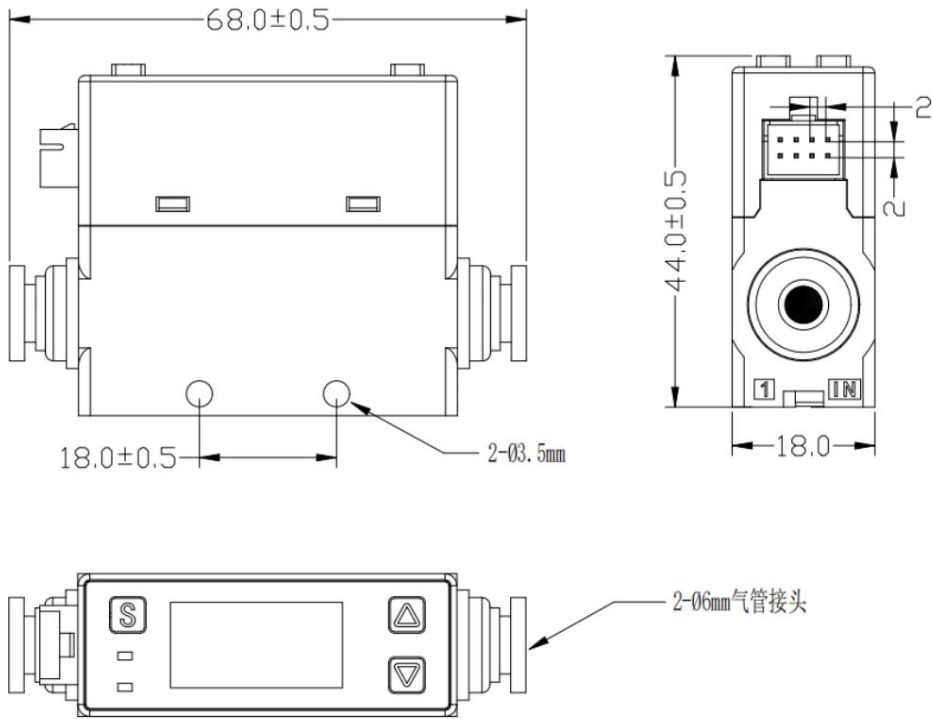

Figure 4. AFM0725 Dimensions (Unit: mm)
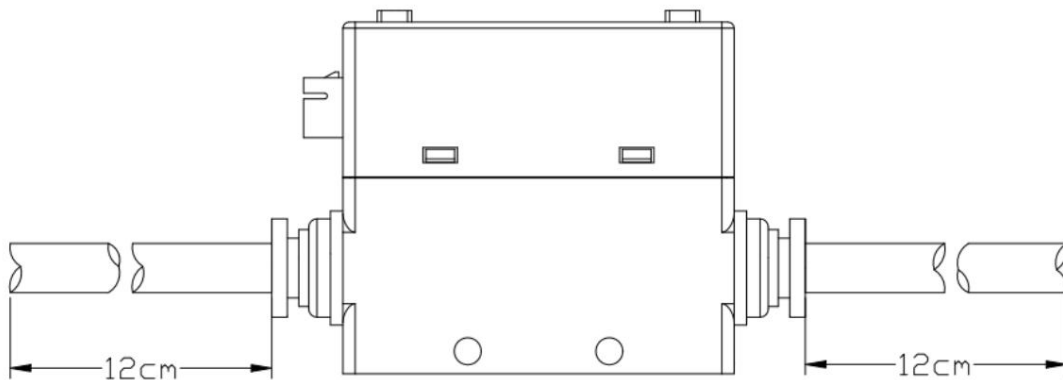
3.2 Piping method, as shown in Figure 5.

Figure 5. Piping Diagram

(1) For the piping of the product inlet/outlet, please reserve a straight pipe part with a length of more than 12cm, and the inner diameter of the straight pipe is less than 4mm (including 4mm).

, otherwise the accuracy may be affected by ±2%FS or more.

(2) Please avoid installation with the display face down.

4. Product Communication Protocol and Output

4.1 RS485 communication

The digital output communication mode of AFM0725 gas mass flowmeter is RS485 communication, and the communication parameters are shown in Table 4.

Table 4. RS485 Communication Parameters

Communication parameters	describe
Protocol format	RTU
communication rate	4800/9600/19200/115200bps
start bit	1 person
data bits	8 bits
stop bit	1 person
parity	none

The communication protocol is standard Modbus RTU. The host can be a computer, RS485 receiver and MCU controller, etc. AFM0725

As a slave, the default address is 0x01, which supports address modification and can be connected to the bus of multiple slaves.

The Modbus RTU communication register definition of AFM0725 is shown in Table 5.

Table 5. Modbus RTU Communication Register Definitions

register address	Value range	Read and write attribute	function code	multiple	register information	Remark
0x0000	0~65535	read only	03	10	Instantaneous flow	Example: 157.8L/min 0x062a
0x0001	0~65535	read only	03	10	Cumulative flow (higher 16 bits)	Example: 123456789.5L High bit: 0x4996 Low bit: 0x02d7
0x0002	0~65535	read only	03	10	Cumulative flow (lower 16 bits)	
0x0003	0~65535	read only	03	10	temperature	Example: 27.7ÿ 0x0115
0x0004	0~3	read only	03	1	Device status information	0: The flow meter is normal 1: The sensor is abnormal 2: EEPROM abnormal 3: Both the sensor and EEPROM are abnormal
0x0005	0~1	read only	03	1	Upper limit alarm flag	0: No alarm for upper limit 1: Upper limit alarm
0x0006	0~1	read only	03	1	Lower limit alarm flag	0: No alarm for lower limit 1: Lower limit alarm
0x0030	0~65535	read only	03	1	model	The number of the model is directly converted to 16 base number Such as AFM0725 —> 0x02d5
0x0031	0~9999	read only	03	1	Software version such as V0001—>0x0001	
0x0032	0~1	Read and Write	03/06	1	flow unit	0: L/min 1: CFM×10-1
0x0033	/	/	/	/	/	/
0x0034	0~1	Read and Write	03/06	1	language device	0: Chinese 1: reserved
0x0035	1~32	Read and write	03/06	1	slave address slave address, only supports 1-32	
0x0036	480 or 960 or 1920 or 11520	Read and write	03/06	1/10	baud rate	4800, 9600, 19200, 115200 Such as: baud rate 115200 —> 0x2d00
0x0037	0~1	Read and Write	03/06	1	Accumulated flow reset	0: The cumulative flow remains unchanged 1: The accumulated flow is reset to zero
0x0038	1~6	Read and Write	03/06	1	Gas fluid type	1: Air (AIR) 2: Nitrogen (N2) 3: Argon (Ar) 4: Carbon dioxide (CO2) 5: Helium (He) 6: Oxygen (O2)
0x0039	0~1	Read and Write	03/06	1	Alarm switch	0: Alarm off 1: Alarm on
0x003A	0~2000	read and write	03/06	10	Alarm upper limit value (L/min)	For example: set 25L/min —> 0x00Fa
0x003B	0~2000	read and write	03/06	10	Alarm lower limit value (L/min)	For example: set 5L/min —> 0x0032

When the host reads the instantaneous flow value of AFM0725 (the default slave address of the device is 0x01), the host sends a command to AFM0725.

The data format is shown in Table 6.

Table 6. Format table for host to send read register command

Number of bytes of information sent by the host		Sending information example (Hex)	Description of the meaning of the information
slave address	1	01	Communication slave address
function code	1	03	read multiplex register
register start address	2	0000	Register 0x0000 stores the instantaneous flow value
Read the number of registers	2	0001	read 1 register
CRC code	2	840A	CRC code is used for verification

When the host receives the data returned by AFM0725, the data format is shown in Table 7.

Table 7. Format table for host to receive AFM0725 register data

The number of bytes of information sent by the slave		receive information (Hex)	Description of the meaning of the information	According to the above example, the host sends the The meaning of the received data
slave address	1	01	Communication slave address	-
function code	1	03	read multiplex register	-
Receive data bytes 1		02	Received data bytes = Number of read registers × 2	-
register data	2	062A	1 register read	Convert to decimal and divide by 10, the final result is 157.8L/min
CRC code	2	B84B	CRC code is used for verification	-

When the host needs to change the slave address of AFM0725 to 0x02, it needs to rewrite the value of the 0x0035 register. Host write register value

The command format is shown in Table 8.

Table 8. Format Table for Host Send Write Register Command

Number of bytes of information sent by the host		Sending information example (Hex)	Description of the meaning of the information
slave address	1	01	Communication slave address
function code	1	06	write a single register
register address	2	0035	Register 0x0035 holds the slave ground site
data input	2	0002	write data 0002
CRC code	2	1805	CRC code is used for verification

The C language code for calculating the CRC code is as follows:

```c
// *ptr communication send or receive data byte
array, // len send or receive data byte length (excluding
CRC code) // return the calculation result of CRC code,
high byte first unsigned int CRC16(unsigned char * ptr, unsigned char len) {

        unsigned int crc= 0xFFFF;//initialize initial value
        unsigned char i; while(len--) {


            crc ^=*ptr++;
            for(i=0;i<8;i++){ if(crc &
                0x1){ crc>>=1;
                    crc^=0xA001;


            } else crc>>=1;
            }

        } return crc;
}
```

4.2 NPN open collector output

AFM0725 has 2 NPN open collector output ports, 2 NPN open collector output ports correspond to external output 1 and external output respectively

Output 2, external output 1 controls the upper limit alarm, and external output 2 controls the lower limit alarm. If the AFM0725 lead wire is purchased, the external output 1 (NPN1) corresponds to the

gray wire, the external output 2 (NPN2) corresponds to the brown wire, and the GND corresponds to the black wire and the orange wire. The wiring diagram is shown in Figure 6.
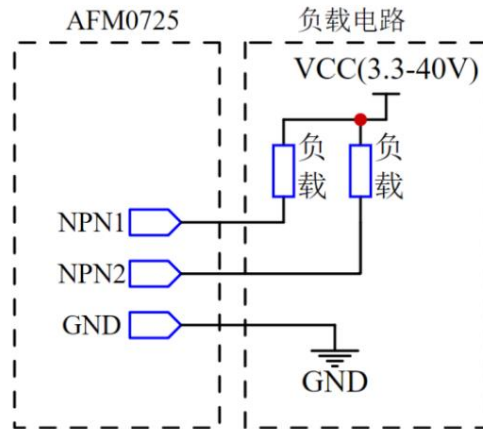

Figure 6. Schematic diagram of NPN control upper and lower limits

The load in Figure 6 may be an alarm device, such as a warning light. By default, the alarm function is turned off, there is no upper and lower limit alarm, the two NPNs (equivalent to switches)

are in the open state, the load circuit is open, and no current flows. Turn on the alarm function, after setting the upper limit and lower limit of flow, when the flow value is higher than the upper limit or lower

than the lower limit, the corresponding NPN is closed, the current flows through the load, and then the alarm device can start to work. When the upper and lower limit alarms are turned on, an alarm will be

issued when the instantaneous flow value is higher than the upper flow limit value or lower than the flow lower limit value. For example, if the upper limit is set to 20 and the lower limit is set to 5, when the

instantaneous flow value is lower than 5L/min, the NPN open collector output port corresponding to external output 2 is closed, and when it is higher than 20L/min, the NPN open collector output

port corresponding to external output 1 is closed. closed, alarm.

4.3 Voltage output

The voltage output of the AFM0725 is a linear output. The relationship between voltage and flow is: Voltage (V)

= 1 + Instantaneous flow (L/min) × 0.16
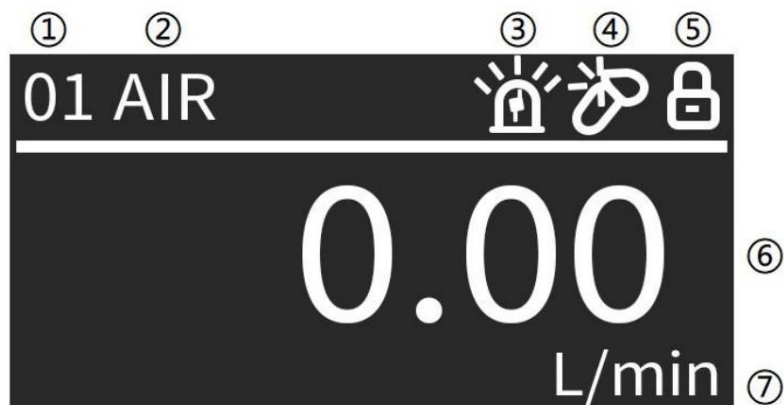
5. Work interface and interface operation

Figure 7. Introduction to screen icons

ÿ is the 485-communication address; ÿ is the fluid type; ÿ is the alarm switch status; ÿ is the 485 communication

status; ÿ is the lock screen icon; ÿ is the instantaneous flow; ÿ is the instantaneous flow unit.

When the lock screen icon (ÿ in Figure 7) is on, press and hold the setting key for 5 seconds to unlock and enter the menu page, and press the up and down keys to select the parameters to

be set. If there is no operation within 30 seconds, the system enters the lock screen state. When the alarm switch status icon (ÿ in Figure 7) is on, it means the alarm function is turned on, and when

there is no icon, it means the alarm is turned off. To view the cumulative flow, on the main page, press the down key to jump to the cumulative flow display interface, as shown in Figure 8.

Figure 8. The cumulative flow

interface menu page has 4 levels, and the function description of each level is shown in Table 9.

Table 9. Function introduction

Level 1 menu Level 2 menu Level 3 menu			Function
parameter settings	Fluid selection	/	Select the type of gas to be tested (Available for AIR, N2, Ar, CO2, He, O2 gases)
	Alarm system	Alarm switch	Alarm function on or off
		Traffic cap	Set the upper limit of the flow rate, when the alarm function is turned on, the flow rate is higher than the flow rate Upper limit alarm
		Lower flow limit	Set the lower limit of flow, when the alarm function is turned on, the flow is lower than the flow Lower limit value alarm
		quit	Back to secondary menu
	Flow reset	/	Accumulated flow value reset to zero
	quit	/	Back to one level menu
Communication settings	baud rate	/	Set the baud rate of the transmitted data (4800, 9600, 19200, 115200 four baud rates can be selected)
	485 address	/	Select the communication address of 485 (1-32)
	quit	/	Back to one level menu
system settings	language settings	/	Reserved, the default is Chinese
	flow rate unit	/	Unit switching between L/min and CFM
	Restore Factory	/	Factory reset the product
	Device Information	/	View the model, range, version, and SN code of the device
	quit	/	Back to one level menu
quit	/	/	back to main interface

6. Packing List

packing list

name	quantity
AFM0725	1 set
AFM0725 pinout	1
Product Manual	1 serving
certificate	1 piece

Warning and Personal Injury

Do not use this product in safety protection devices or emergency stop equipment, or in any other application where personal injury may result from failure of this product, unless there is a specific purpose or authorization for use. Refer to the product data sheet and instructions before installing, handling, using or maintaining this product. Failure to follow the recommendations could result in death or serious personal injury. The company will not

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Warranty Period Description

Product Category	warranty period
AFM0725 Gas Mass Flow Meter	12 months
Wire or other parts	6 months

The company is only responsible for products that are defective when used in applications that meet the technical conditions of the product. The company should No guarantee is made for use in non-recommended special scenarios. The company also does not make any commitment to the reliability of the product applied to other non-company supporting products or circuits.

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