Siargo Ltd.



Gas Mass Flow Meter VB.0

Model MF3000

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Gas Mass Flow Meter

with MEMS Thermal-D sensing technology

MF3000 Series

User Manual

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Attention!

- Please carefully read this manual before operating this product.
- Do not open or modify any hardware that may lead to irrecoverable damage.
- Do not use this product if you suspect any malfunctions or defects.
- Do not use this product for corrosive media or in an environment with strong vibrations.
- Use this product according to the specified parameters.
- Only the trained or qualified personnel shall be allowed to perform product services.

Use with caution!

- Be cautious of electrical safety, even if it operates at a low voltage, any electrical shock might lead to some unexpected damages.
- The gas to be measured should be clean and free of particles.
  Do not apply this meter to a liquid medium.
- Do not apply for any unknown or non-specified gases that may damage the product.
- For remote data, please be sure the meter is properly configured.

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1. Overview

All contact information can be found at the end of this manual.

This manual provides essential information for the MF3000 series of gas mass flow sensors, designed for general-purpose gas flow monitoring and control applications, with a full-scale mass flow rate ranging from 2 SLPM to 1500 SLPM and featuring both analog and digital outputs. For the flow rate ranging from 50 SLPM to 200 SLPM, manual control is optional. The product's performance, maintenance, troubleshooting, as well as information for product ordering, technical support, and repair, are also included.

MF3000 mass flow sensors are designed for general-purpose, precise gas metering, processing, monitoring, and/or control. The enhanced flow conditioning allows more flexibility during installation. It can be applied for pneumatic control, process automation, and other industrial applications where the pressure drop is not a critical parameter. The series offers a wide dynamic flow range with a working pressure rating of up to 0.8 MPa (8 bar or 120 PSI), and a compensated temperature range of -10 to 55°C.

The products are designed for an easy change of mechanical connectors. For the 2 to 50 models, the standard connectors are BSPT 1/4"-male or 4 mm / 6 mm / 8 mm One-touch connector. For the 100 to 200 models, the standard connectors are BSPT 1/4"-male or 8 mm One-touch connector. For the 500 to 1500 models, the connector is BSPT 1/2"-female, and other customized connectors are available upon request.

The sensing elements are manufactured using Siargo's proprietary MEMS (micro-electro-mechanical systems) thermal mass flow sensing technologies (*Thermal-D*®), which measure the calorimetry and diffusivity of the flow medium. The sensor surface is passivated with silicon nitride ceramic and a water- and oil-proof nano-coating to enhance performance and reliability. Compared to conventional calorimetric flow-sensing technology, this unique sensing approach offers improved linearity, removes sensitivity to gases with similar thermal diffusivities, and improves temperature performance. It can also auto-recognize pre-programmed gases that differ significantly in thermal diffusivity. It is the first of its kind in the industry. It senses the mass flow of multiple gases with similar diffusivity without a gas conversion factor. As such, it ensures high precision for gas measurements with air calibration.

Thermal-D ® is a trademark of Siargo's thermal sensing technology.

2. Receipt / unpack of the products

Upon receipt of the products, please check the packing box before dismantling the packing materials. Ensure no damage during shipping. If any abnormality is observed, please contact the carrier that shipped the product and inform the distributors or sales representatives if the order was not placed directly with the manufacturer. Otherwise, the manufacturer should also be notified. For any further actions, please refer to the return and repair section in this manual.

If the packing box is intact, proceed to open it. You will find the product, power supply, and data cable, as shown below.



Figure 2.1: MF3000S flow sensor
Full scale <= 200 SLPM



Figure 2.2: MF3000S flow sensor
Full scale > 200 SLPM



Figure 2.3: MF3000M flow meter
Full scale <= 200 SLPM



Figure 2.4: MF3000M flow meter
Full scale > 200 SLPM



Figure 2.6: data cable
DF51K6-100





Figure 2.5: MF3000V flow meter, Full scale 50 ~ 200 SLPM

Please immediately check the product's integrity, as well as the power and data cables. If any abnormality is identified, please notify the distributor/sales representative or manufacturer as soon as you can. If any defects are confirmed, an exchange shall be arranged immediately via the original sales channel. This user manual shall either be included in the packing box, or an electronic version

will be provided upon request online. In most cases, this manual will be made available to the customer before the order is placed.

The standard cable (part number: DF51K6-100) is an HRS: DF51K-6S-2C (6-position) compatible connector with a length of 1.0 meters.

3. Knowing the products

3.1. Product description

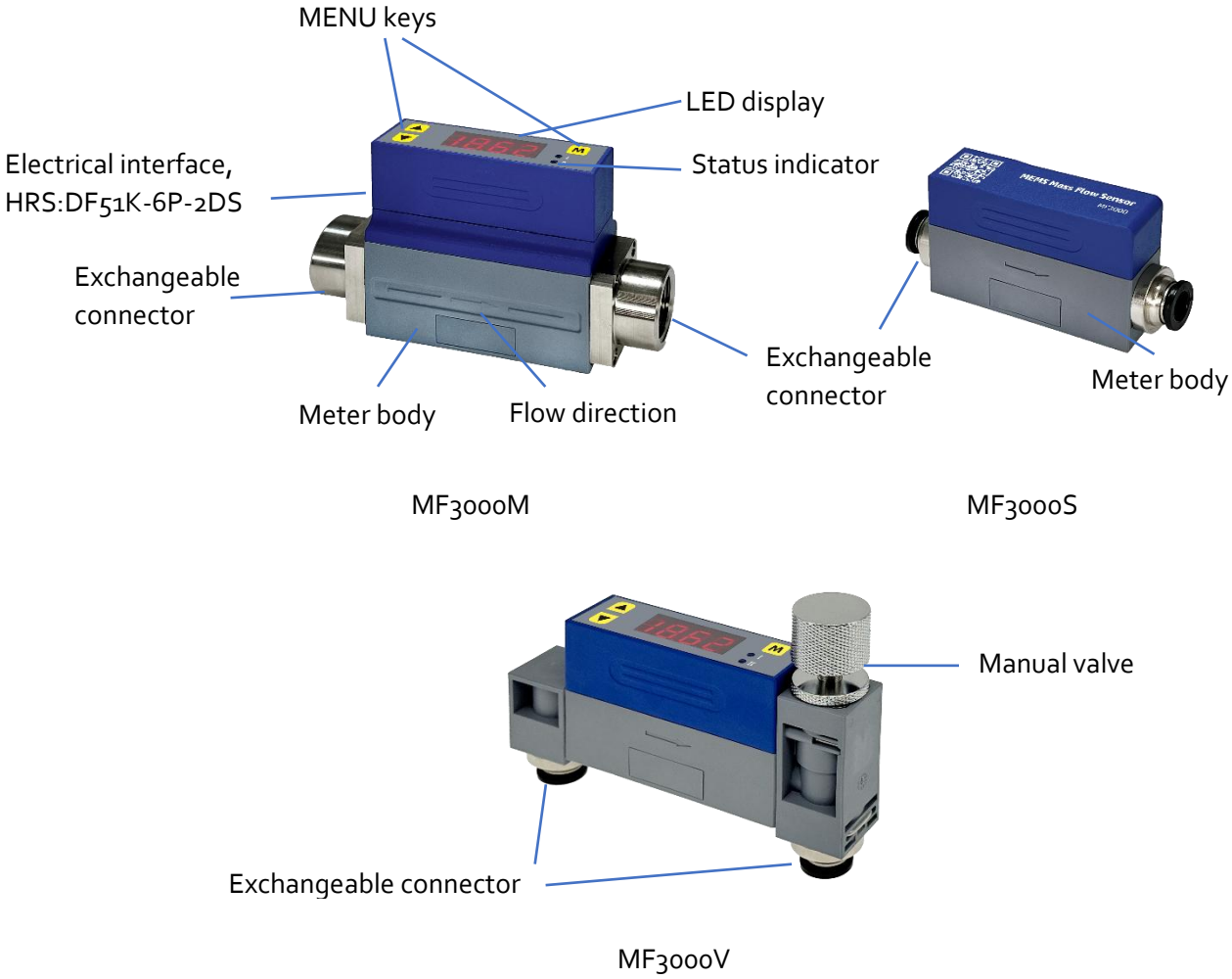


Figure 3.1: MF3000 product description

3.2. Power and data cable description

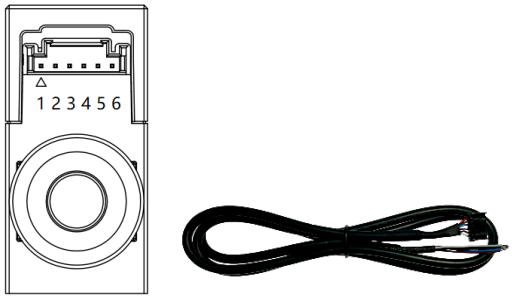


Figure 3.2: MF3000 connector and cable

(Part number: DF51K6-100)
The connector is HRS: DF51K-6P-2DS.
Pin 1 has the triangle mark.

Table 3.1: MF3000 pin/wire assignments.

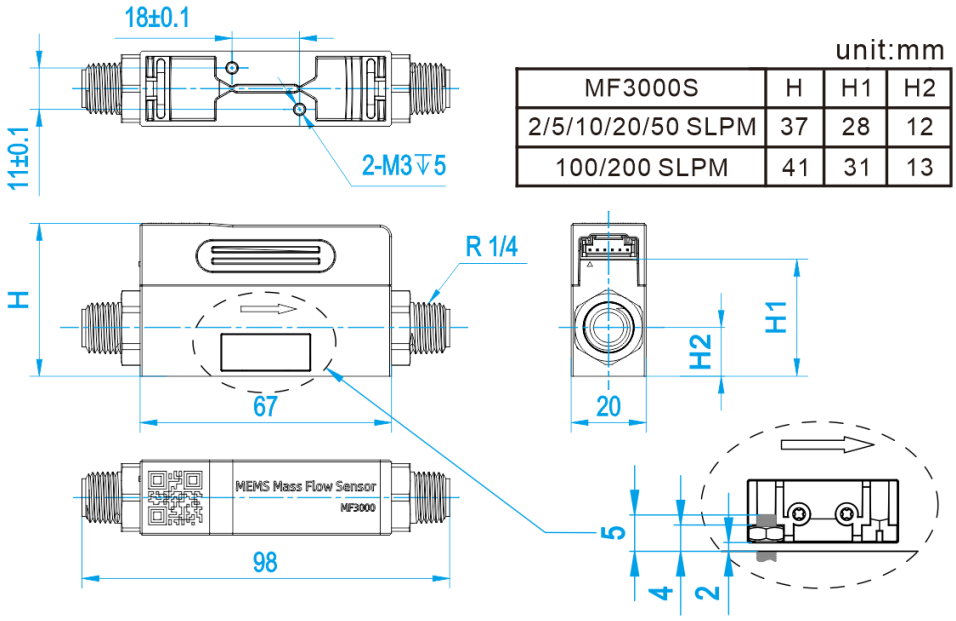
Wire	Color	Definition
1	Red	Output 3: NPN / PNP
2	Gray	Output 2: 4 ~ 20 mA / 1 ~ 5 Vdc / NPN / PNP
3	Blue	Ground
4	Brown	Power supply, 8~24Vdc
5	Black	Output 1, digital: RS485A (+) / SCL, I²C clock
6	White	Output 1, digital: RS485B (-) / SDA, I²C data

Note: 1. The standard cable (Part number: DF51K6-100) is an HRS: DF51K-6S-2C (6 positions) compatible connector with a length of 1.0 meters.

2. The product offers two digital communication options, RS485 and I²C, that can be selected at the time of order. These two communication protocols share the ports as defined in Table 3.1. For the detailed protocols of the corresponding option, please refer to Section 5.

3. The RS485 Modbus is asynchronous, half-duplex communication. When data is transmitted or received from the product, the other pin is the ground.

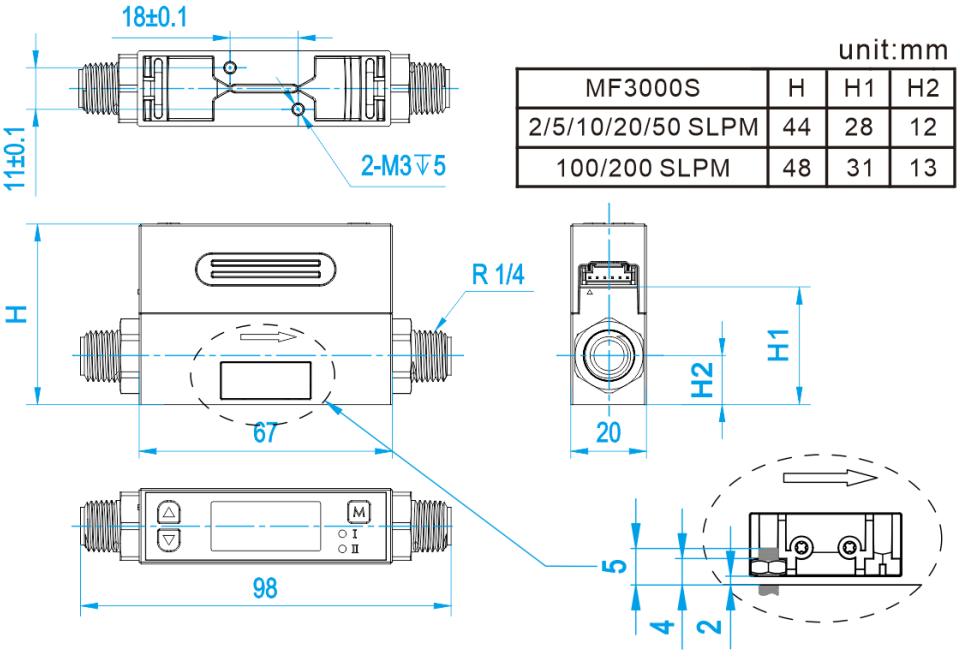
3.3. Mechanical dimensions



unit:mm

MF3000S	H	H1	H2
2/5/10/20/50 SLPM	37	28	12
100/200 SLPM	41	31	13

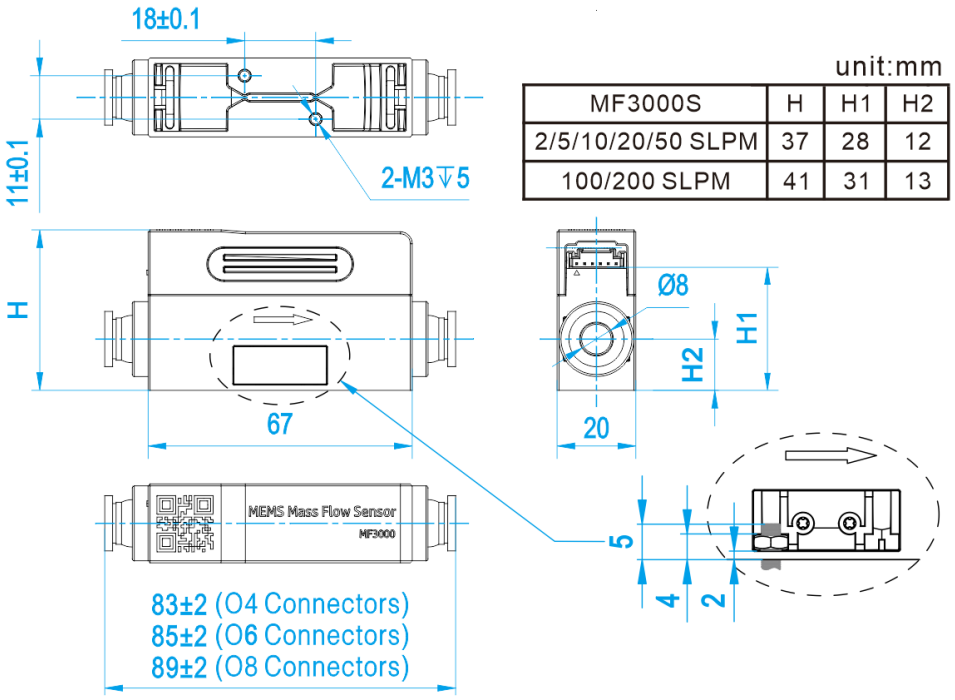
Figure 3.3: MF3000S (without display) dimensions:
R connectors, full-scale of 2, 5, 10, 20, 50, 100, and 200 SLPM.



unit:mm

MF3000S	H	H1	H2
2/5/10/20/50 SLPM	44	28	12
100/200 SLPM	48	31	13

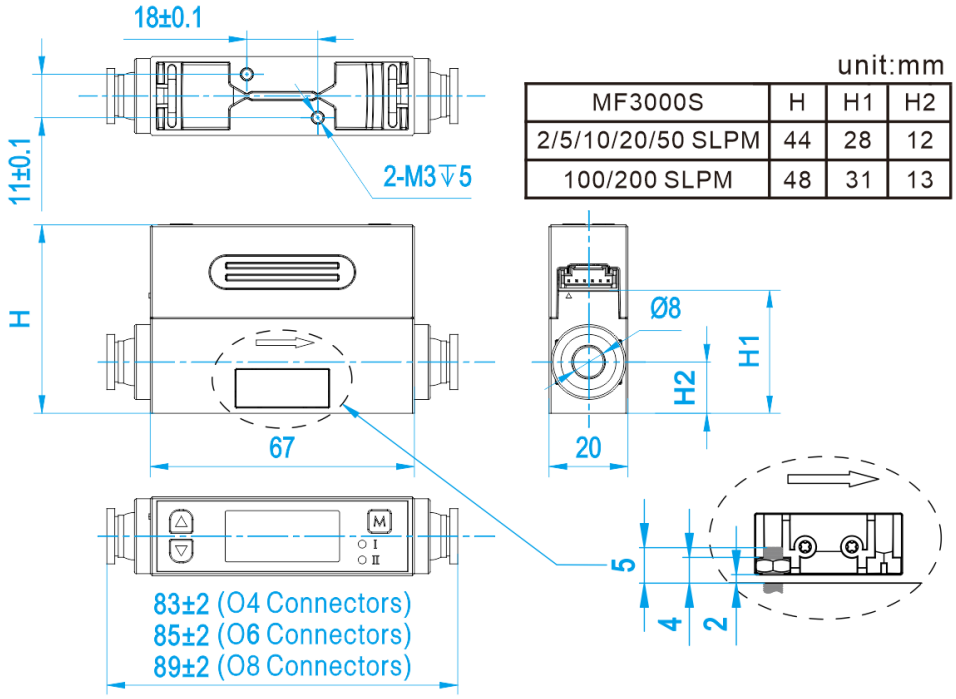
Figure 3.4: MF3000M (with display) dimensions:
R connectors, full-scale of 2, 5, 10, 20, 50, 100, and 200 SLPM.



unit:mm

MF3000S	H	H1	H2
2/5/10/20/50 SLPM	37	28	12
100/200 SLPM	41	31	13

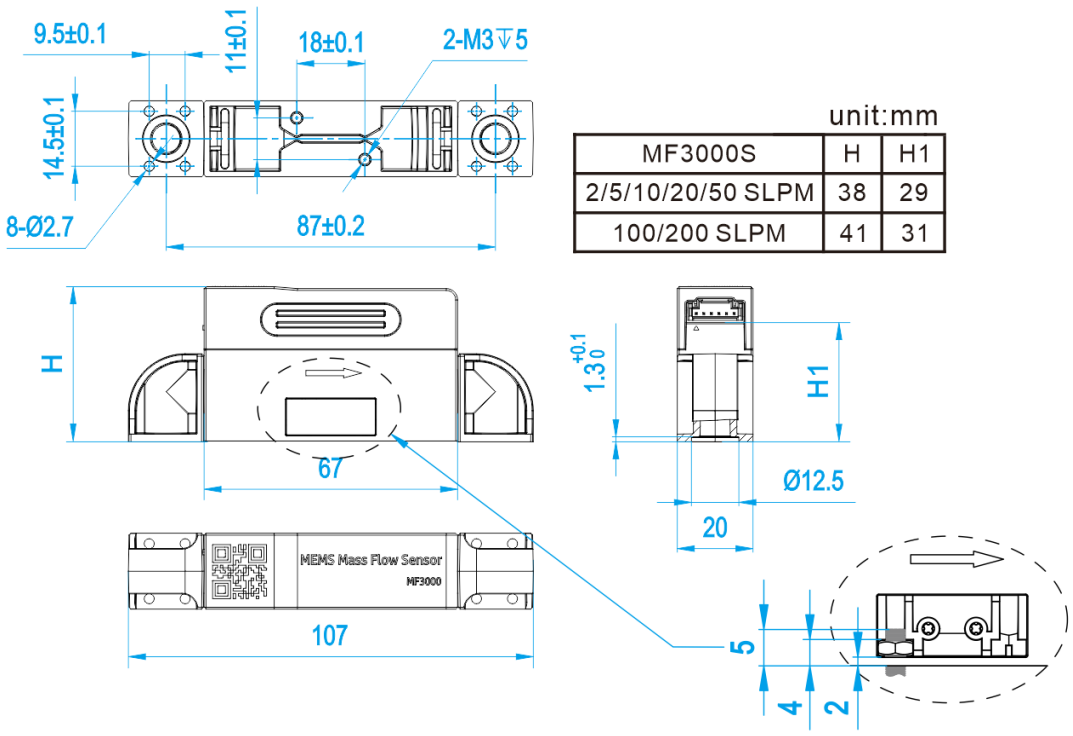
Figure 3.5: MF3000S (without display) dimensions:
4mm/6mm/8mm One-touch connectors, full-scale of 2, 5, 10, 20, and 50 SLPM;
with 8mm One-touch connectors, a full-scale of 100 and 200 SLPM.



unit:mm

MF3000S	H	H1	H2
2/5/10/20/50 SLPM	44	28	12
100/200 SLPM	48	31	13

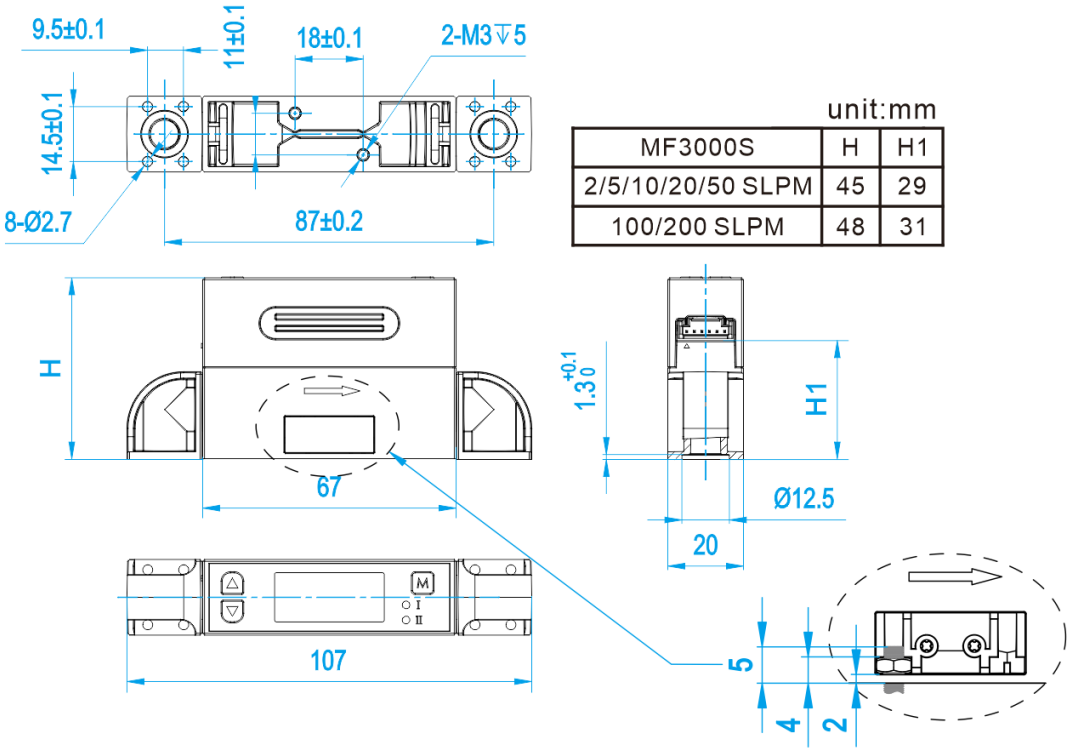
Figure 3.6: MF3000M (with display) dimensions:
4mm/6mm/8mm One-touch connectors, full-scale of 2, 5, 10, 20, and 50 SLPM;
8mm One-touch connectors, full scale of 100-200 SLPM.



unit:mm

MF3000S	H	H1
2/5/10/20/50 SLPM	38	29
100/200 SLPM	41	31

Figure 3.7: MF3000S (without display) dimensions:
L connectors, full-scale of 2, 5, 10, 20, 50, 100, and 200 SLPM.



unit:mm

MF3000S	H	H1
2/5/10/20/50 SLPM	45	29
100/200 SLPM	48	31

Figure 3.8: MF3000M (with display) dimensions:
L connectors, full-scale of 2, 5, 10, 20, 50, 100, and 200 SLPM.

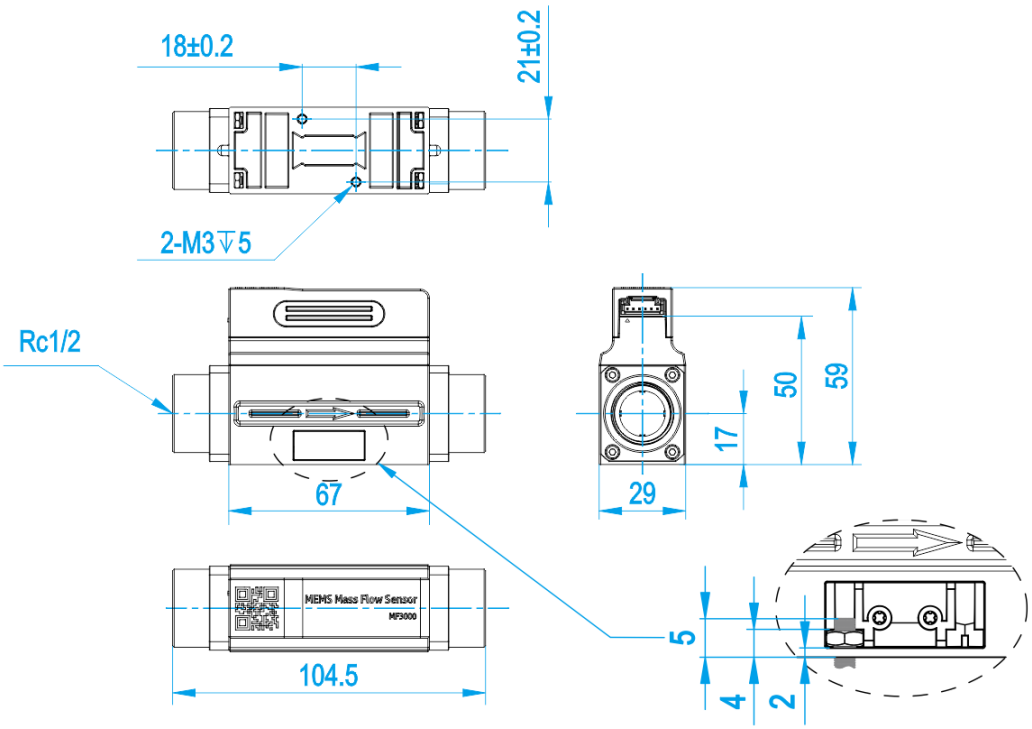


Figure 3.9: MF3000S (without display) dimensions, full-scale of 500, 1000, and 1500 SLPM.

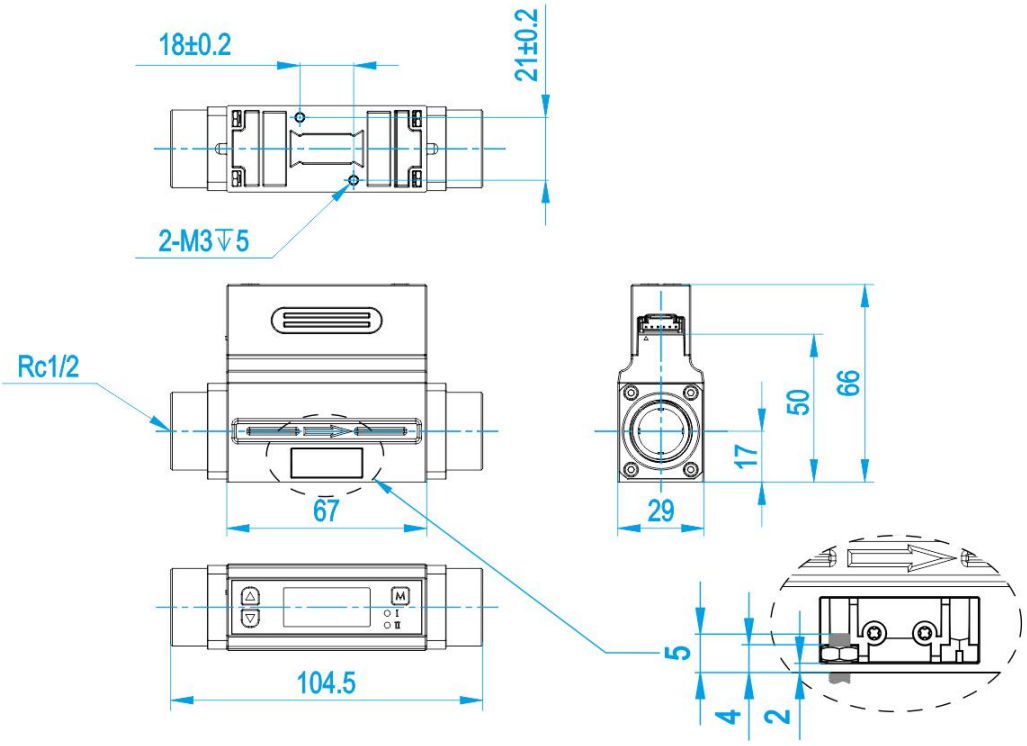


Figure 3.10: MF3000M (with display) dimensions, full-scale of 500, 1000, and 1500 SLPM.

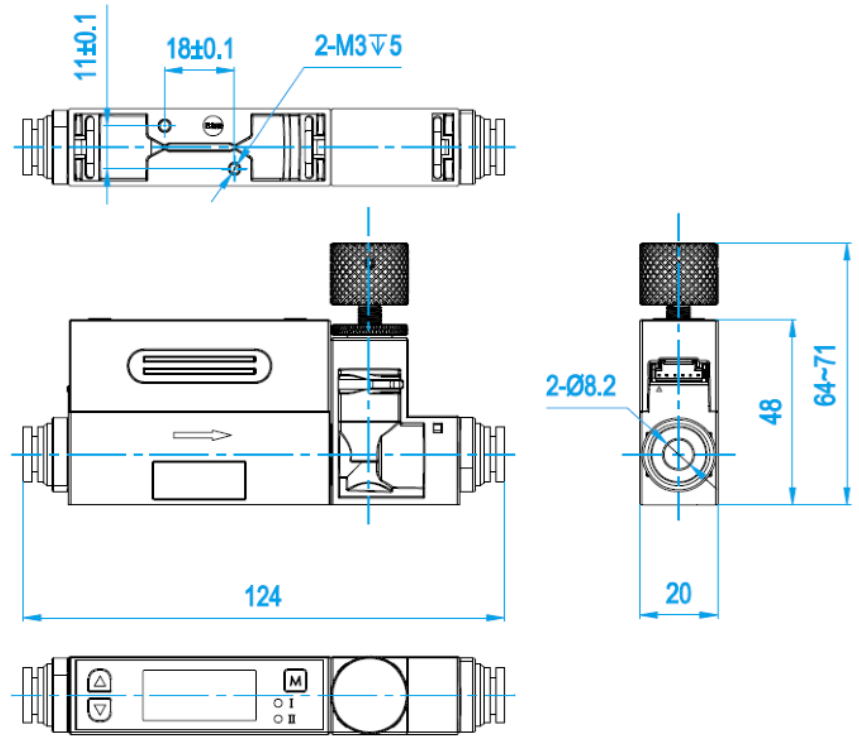


Figure 3.11: MF3000V (manual valve) with O8 connectors dimensions, full-scale of 50, 100, and 200 SLPM.

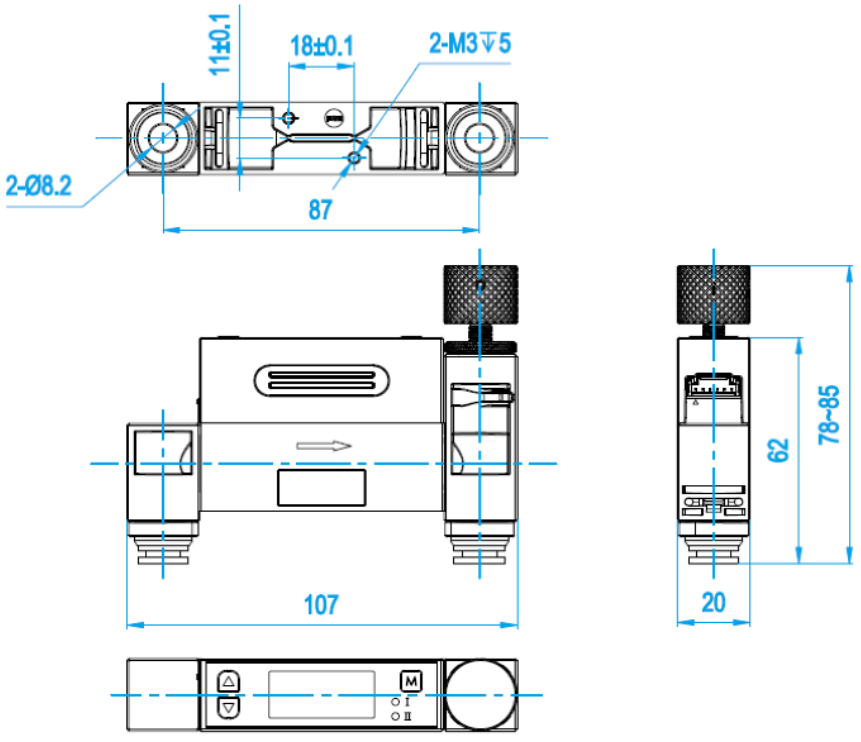


Figure 3.12: MF3000V (manual valve) with OL8 connectors dimensions, full-scale of 50, 100, and 200 SLPM.

Note: * Other threads or compressive types can be customized.

4. Installation

Do not open or alter any part of the product that would lead to malfunction and irrecoverable damage. It will forfeit the warranty terms and expose the party to liability.

The product at the time of shipment is fully inspected for quality and meets all safety requirements. Additional safety measures should be applied during installation. This includes, but is not limited to, the leakage verification procedures, standard EDS (electrostatic discharge) precautions, and DC voltage precautions. Other tasks, such as calibration, part replacement, repair, and maintenance, must only be performed by trained personnel. Upon request, the manufacturer will provide necessary technical support and/or training for the personnel.

There are no preferred space directions for the installation. The flow direction should align with the arrow on the meter body. If the flowing fluid may have particles or debris, a filter is strongly recommended to be installed upstream of the meter.

Please follow the following steps to complete the installation:

a) Upon opening the package, the product's physical integrity should be inspected to ensure no visual damage.

b) Before installation of the product, please ensure that the pipe debris or particles, or any other foreign materials, are completely removed.

c) Close the upstream valve, if any, completely.

d) During installation, please make sure no foreign materials (such as water, oil, dirt, particles, etc.) enter the installation pipeline.

e) Connect electrical wires per the wire definition in Table 3.1. Please ensure the power supply range (i.e., 8~24 Vdc) and power supply polarization. If an adapter is used, it must meet industrial standards and have all safety certifications. Alternatively, this product can also be powered by a 9Vdc battery.

f) For the data communication wire connection, please follow the description in Table 3.1 and make sure that the wires are correctly connected to the proper ports on your data device/equipment. Please ensure the data cable meets industrial standards with shielding.

g) Once the external power is successfully connected, for the MF serial of meters, the LED should be lit up with the proper information displayed.

h) Slowly open the valve(s) of the gas supply, if any, upstream or downstream, or both of the pipelines. The product should then begin measuring the flow in the pipeline. Note: The meter has an extensive dynamic measurement range. It is normal to see a small instantaneous flow

rate, even if there is "no flow" in the pipeline. If the value is consistently present, double-check for pipe leakage, then reset the offset if you are sure there is no leakage or flow.

i) This will conclude the installation.



Cautions:

a) Don't alter any parts of the product.

b) Ensure the electrical connection is done correctly per the instructions.

c) Make sure no mechanical stresses in the connections.

d) The strong electromagnetic interference sources close by or any mechanical shocks at the pipeline may also lead to malfunction of the product.

e) Slowly open/close valves at the gas supply piping to prevent abrupt pulse flow impact.

5. Operation and MENU description

5.1 Check the product specifications

Before using this product, verify the product specifications in this manual or the basic information in the datasheet on the company's website www.Siargo.com.

The detailed product technical specifications are in Section 7. For a specific application, the pressure rating must be lower than the system pressure. The flow range should also be within the specified range. The gas medium for the controller must also be consistent with the specification of the product. Be particularly cautious about the supplied voltage indicated in the specification. A higher voltage may lead to irreparable damage. A lower voltage will not power the product for any desired functions.

For the product's optimal performance, the gas to be applied must be clean and free of particles or other foreign materials.

5.2 Check the leakage

Check for gas leaks in the piping system before the operation. Pressurized nitrogen or air can be used for the leakage check.

5.3 Power the product and digital data connection

Although this product complies with the CE-required EMC regulations, it also requires that its use follow standard electrical device practice. Before connecting the product to external DC power, make sure the supply voltage is within the range specified in Section 7. Be cautious of standard electrical device precautions, such as ESD(electrostatic discharge) and DC voltage, which are observed. Excessive electrostatic discharge may damage the product.

The manufacturer-supplied power and data cable has a locking fixture. Fasten the cable until it is properly engaged and will not be accidentally unplugged.

Half-duplex RS485 Modbus or I^2C is used for digital data communication. Make sure the wires are correctly connected to the receiver side.

5.4 Meter display and MENU descriptions

Please skip this section for flow sensor products.

5.4.1 Meter display and function keys



Figure 5.1: MF3000 display and function keys

A front 3-key board is used to program the desired functions, access data, and check the status. The Menu key (M) is in the upper-right position. It is used to select a function and confirm or execute other related actions, as detailed in the MENU key sequence graphic presentation. Two keys ("Up" and "Down") are used to select the functions. The two LED lights (I and II) are used to indicate the contents of the display. For the default instant flow rate display, both LEDs will be off. Please refer to the detailed information below.

The default instant flow rate is SLPM with four digits, one of which is a decimal. When the flow rate exceeds the specified range, LED I will flash for rates above the upper limit, and LED II will flash for rates below the lower limit. If both LEDs are flashing, the displayed values are incorrect.

Once power is supplied and no abnormal issues are observed, the meter is ready to take measurements. While the LED displays the instant mass flow rate, the accumulated or totalized flow rate can be accessed by pressing the "Up" or "Down" key. The accumulated flow rate is registered in "standard liter" (SL), with a maximum capacity of 99,999,999 SL. The first four digits of the accumulated flow rate are indicated by the "I" LED light, and the last four digits are represented when the "II" LED light is on. The "I" and "II" LED lights will automatically switch on when the accumulated flow rate is displayed. The accumulated flow rate will be automatically saved every three minutes. At the time of the power failure or cut-off, the value will represent the latest saved ones.

5.4.2 MENU function input sequence

At the flow measurement (primary) display, press the three MEMU keys, which will allow the user to perform a variety of settings of the product. The following graph is the detailed key sequence for each function. Additional explanations are provided after the graphic presentation.

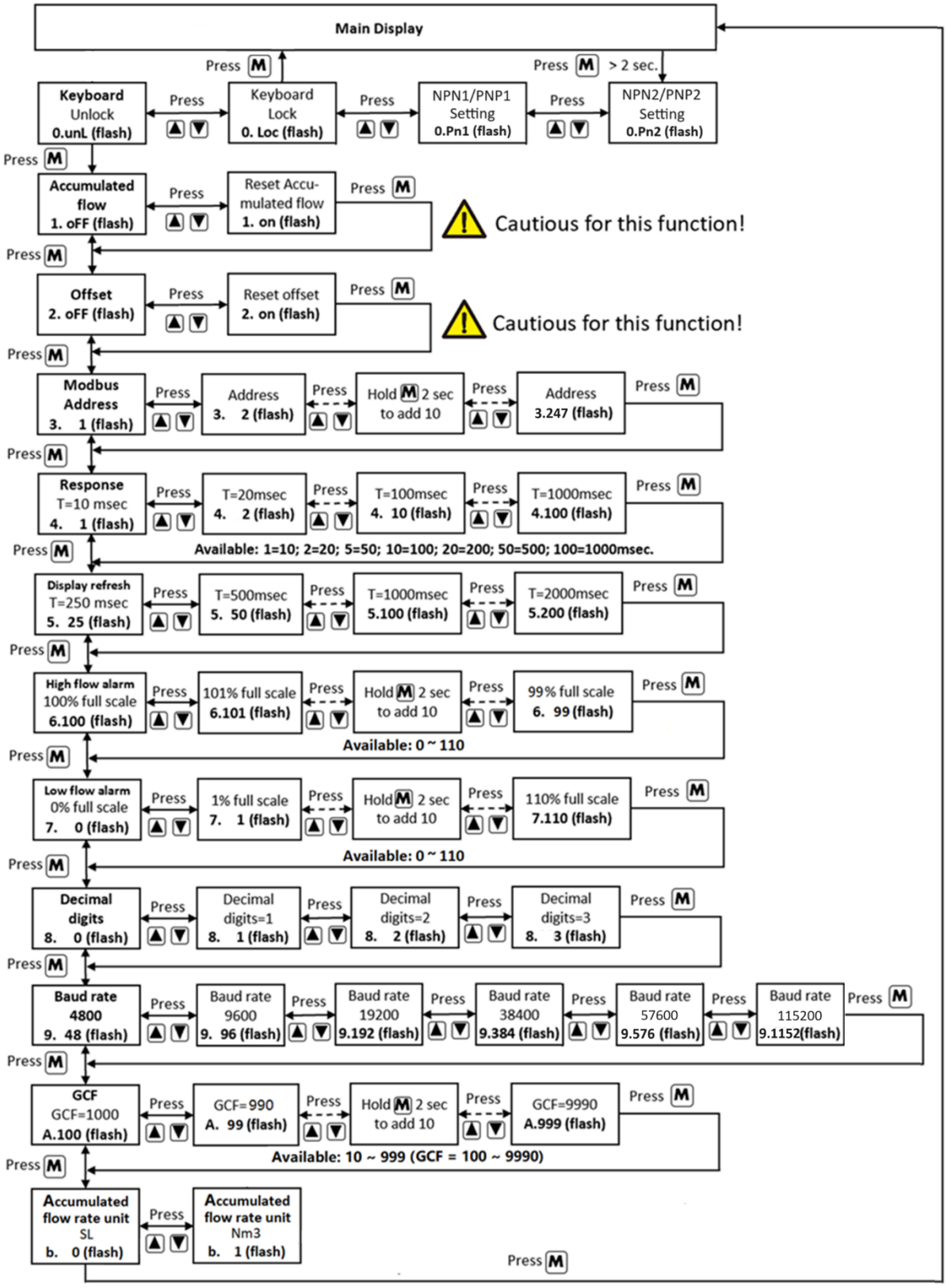
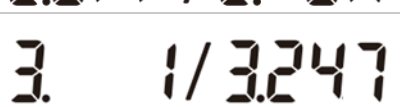


Figure 5.2: MF3000 menu flow chart

Table 5.1: On-screen characters and their corresponding functions

On-screen character	Symbol	Functions
	o.Pn1 / Pn2	PNP1/NPN1, PNP2/NPN2 setting
	o.unL / Loc	Unlock/lock the keyboard.
	1.oFF / 1. on	Reset the accumulated flow.
	2.oFF / 2. on	Reset or calibrate the offset.
	3. 1 / 3.247	Set the Modbus address Available: 1 ~ 247, The default address is 1.
	4. 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9	Set the filter depth **Available:** 1 ~ 9, The default filter depth is 3.
	5. 25 / 50 / 100 / 200	Set the display refresh rate. **Available:** 25, 50, 100, 200, with display refresh rates of 250, 500, 1000, 2000 ms.
	6. 0 … 110	Set the upper flow rate alarm **Available:** 0 ~ 110, meaning 0% ~ 110% full scale. The default value is 100 (100% full scale).
	7. 0 … 110	Set the lower flow rate alarm **Available:** 0 ~ 110, meaning 0% ~ 110% full scale. The default value is 0 (0% full scale).
	8. 0 / 1 / 2 / 3	Set the display decimal.
	9. 48/ 96/192/384	Set the communication baud rate. **Available:** 48, 96, 192, 384, 576, 1152, with baud rates of 4800, 9600, 19200, 38400, 57600, 115200. The default value is 384 (baud rate 38400).
	A. 10 … 999	Set the GCF (the gas conversion factor) **Available:** 10 ~ 999, means of GCF = 100 ~ 9990. The default value is 100, which means GCF = 1000.
	b. 0 / 1	Set the accumulated flow rate unit: ➢ b. 0 - SL, b. 1 - Nm^3.

Note: During this process, the meter will continue to measure the flow without being interrupted.

5.4.3 Detailed descriptions of the functions

0) PNP/NPN setting and keyboard security

This function allows the user to set PNP and NPN and to disable keyboard entry after the meter is set as desired.

- In NPN and NPN settings, the sub-menu will be activated.
- The keyboard lock will prevent accidental key presses that could alter settings. At the MENU, select "lock" to lock the keyboard.

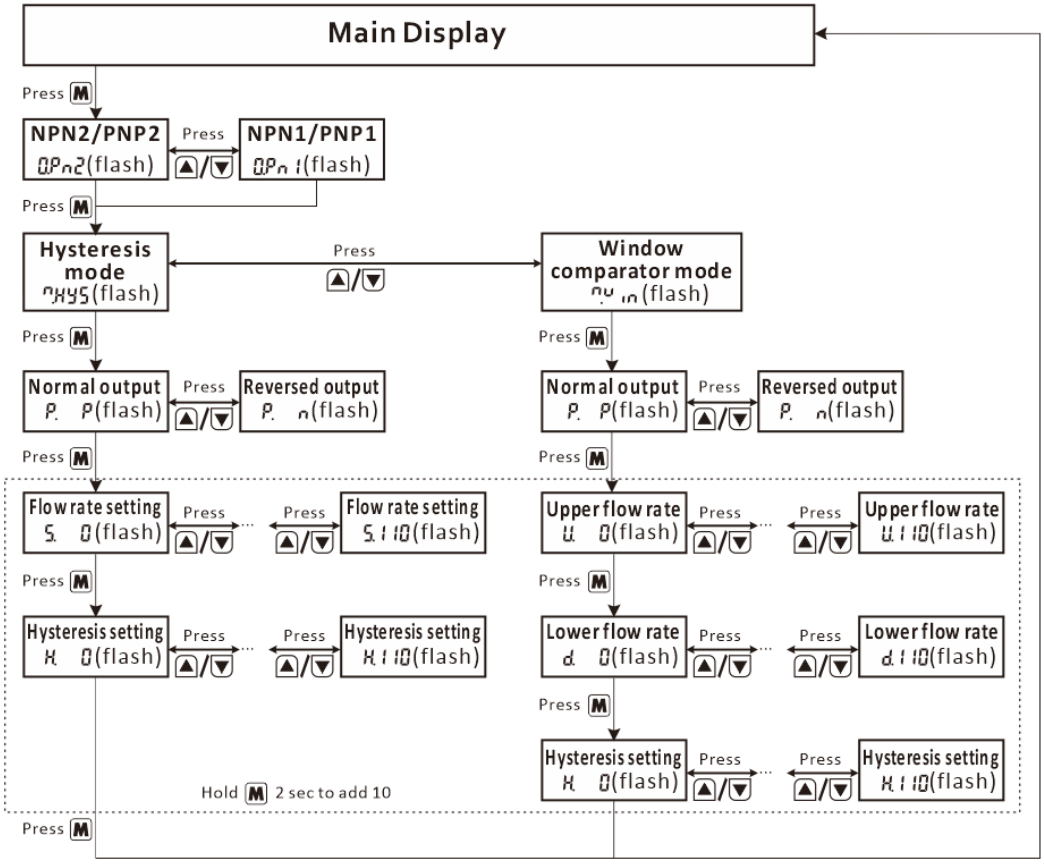


Figure 5.3: MF3000 NPN/PNP menu flow chart

1) Reset the accumulated flow rate

The maximum accumulated flow rate the meter can register is 99,999,999 SL. Once the value is reached, the accumulating function will stop processing the data. It is necessary to reset the register to continue this function.

Use this function with caution, as it will delete all accumulated flow rate data.

2) Reset or calibrate the offset

Sometimes, or after a long period of use (i.e., over 1 year), the sensor surface may develop a thin deposit of environmental contaminants if the gas is not exceptionally clean. Depending on the specific case, the deposits may change the sensor's thermal sensitivity, resulting in offset drift or a small flow at zero flow in the pipeline. Using this function to reset the offset will not impact the meter's performance if the offset is outside of the 100:1 calibrated range.

Use this function with caution and ensure there is no flow when executing; otherwise, it may incur some additional errors in the measurement.

3) Set the Modbus address of the meter

Use this function to set the RS485 Modbus address of the meter. This setting can also be done via the RS485 communication.

4) Set the response time

Use this function to adjust the meter's response time. The default one is 10 milliseconds. Increasing the response time will allow more data to be averaged and output a stable flow rate, even when the actual flow rate may result in undesired fluctuations.

Available response times are 10 msec (4.1), 20 msec (4.2), 50 msec (4.5), 100 msec (4.10), 200 msec (4.20), 500 msec (4.50), and 1000 msec (4.100).

5) Set the display refresh rate

Changing the display refresh rate will alter the display update time; it will have no impact on the meter's measurement. The default refresh rate is 250 msec.

Available refresh rates are 250 msec (5.25), 500 msec (5.50), 1000 msec (5.100), and 2000 msec (5.200).

6) Set the upper flow rate alarm

This function sets a maximum allowable flow rate above which an alarm will be triggered on a flashing screen.

7) Set the lower flow rate alarm

This function allows the user to set a minimum allowable flow rate below which an alarm will trigger a flashing screen.

8) Set the display decimal

The user can use this function to alter the default one-decimal display. Options are listed below for each flow range:

Table 5.2: decimal options

Flow range	Decimal options	Default Decimal
0 ~ 2, 5 SLPM	0, 1, 2, 3	2
0 ~ 10, 20, 50 SLPM	0, 1, 2	1
0 ~ 100, 200, 500 SLPM	0, 1	0
0 ~ 1000, 1500 SLPM	0	0

9) Set the communication baud rate

This function allows a MENU entry of the RS485 communication baud rate.

10) Set the GCF (the gas conversion factor)

The meter is usually calibrated with air at 20°C and 101.325 kPa. When the user wants to set the standard conditions other than the specified temperature, or applies the meter to other allowable gases (contact the manufacturer for the list of gases), this gas conversion factor function can be used to ensure the readings are correct and as desired.

The default value of the GCF is 1000 (1.000). For example, if one wants to alter the standard temperature to 0°C, the factor can be calculated using the gas equation: PV/T = constant:

GCF = 1000 x V(new) / V (20°C) = T (0°C) / T (20°C) = 1000 x 273 / 293 = 932

Then the gas conversion factor would be 932.

In some cases, the actual system may have a constant deviation from calibration; this GCF can also be used to adjust. For additional information, contact the manufacturer.

11) Set the accumulated flow rate unit.

The accumulated flow rate unit can be set to SL or Nm^3.

5.5 RS485 Modbus communication protocol

The digital communication protocol is based on the standard Modbus RTU Half-duplex mode. A master (PC or PLC) can communicate with multiple slaves (the current product) to exchange data and configure communication parameters. Refer to Table 3.1 for the cable connection.

5.5.1 Hardware connection

The RS485 hardware layer is TIA/EIA-485-A, as illustrated below. In this configuration, the product (MF3000) is a slave.

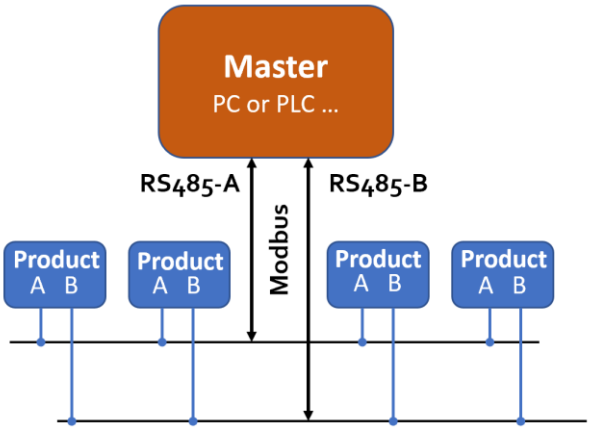


Figure 5.4: RS485 hardware

5.5.2 Communication parameters

The PC UART communication parameters are listed in Table 5.3.

Table 5.3: PC UART communication parameters

Parameters	Protocol
	RTU
Baud rate (Bits per second)	38400 bps (default)
Start bits	1
Data bits	8
Stop bits	1
Even/Odd parity	None
Bits period	104.2 µsec
Bytes period	1.1458 msec
Maximum data length	20
Maximum nodes	247

5.5.3 Frame

The frame function is based on the standard Modbus RTU framing:

Table 5.4: frame function

Start_bits	Address	Function codes	Data	CRC	Stop_bits
T1-T2-T3-T4	8 bit	8 bit	N 8 bit (20≥n≥0)	16 bit	T1-T2-T3-T4

Start_bits: 4 periods bit time, for a new frame.

Address: The address can be set from 1 to 247 except 157 (0x9d). 0 is the broadcast address.

Function codes: Define the product's functions/actions (slaves), either execution or response.

Data: The address of the register, the length of data, and the data themselves.

CRC: CRC verification code. The low byte is followed by the high byte. For example, a 16-bit CRC is divided into BYTE_H and BYTE_L. In the framing, the BYTE_L will come first, followed by the BYTE_H. The last one is the STOP signal.

Stop_bits: 4 periods of bit time, for ending the current frame.

5.5.4 Function codes

The Modbus function codes applied for the product are a subclass of the standard Modbus function codes. These codes are used to set or read the registers of the product:

Table 5.5: function codes

Code	Name	Functions
0x03	Read register	Read register(s)
0x06	Set a single register	Write one single 16-bit register
0x10	Set multiple registers	Write multiple registers

5.5.5 Registers

The product (MF3000) has multiple registers available for various functions. With these functions, the user can retrieve data from the products, such as product addresses and flow rates from the registers, or configure product functions by writing the corresponding parameters.

The currently available registers are listed in the following table. The registers may be customized upon contacting the manufacturer. Where R: read; W: write-only; W/R: read and write.

Note: At the time of shipping, the write-protection function is enabled, except for the address and baud rate. Once the user completes the register value change, write protection will be automatically enabled to prevent incidental data loss.

Table 5.6: Registers

Functions	Description	Register	Modbus
Address	Product address (R/W)	0x0081	40130 (0x0081)
Serial number	Serial number of the product (R)	0x0030 ~ 0x0035	40049 (0x0030)
Flow rate	Current flow rate (R)	0x003A ~ 0x003B	40059 (0x003A)
Accumulated flow	Accumulated or totalized flow rate (R)	0x003C ~ 0x003E	40061 (0x003C)
Temperature	Gas temperature	0x0040	40065 (0x0040)
Baud rate	Communication baud rate (R/W)	0x0082	40131 (0x0082)
GCF *	Gas conversion factor (R/W)	0x008B	40140 (0x008B)
Digital filter depth *	Response time or sampling time (R/W)	0x008C	40141 (0x008C)
High flow alarm *	Set high flow rate alarm (R/W)	0x0098 ~ 0x0099	40153 (0x0098)
Low flow alarm *	Set low flow rate alarm (R/W)	0x009A ~ 0x009B	40155 (0x009A)
Offset calibration	Offset reset or calibration (W)	0x00F0	40241 (0x00F0)
Write protection	Write protection of selected parameters (W)	0x00FF	40256 (0x00FF)
NPN/PNP Output mode	Hysteresis mode or Window comparator mode (R/W)	0x00CC (PN1) 0x00D2 (PN2)	40205(0x00CC) 40211(0x00D2)
NPN/PNP Switch operation	Normal output or Reversed output (R/W)	0x00CD (PN1) 0x00D3 (PN2)	40206(0x00CD) 40212(0x00D3)
NPN/PNP Hysteresis mode: flow rate setting	Hysteresis mode, set the flow rate (R/W)	0x00CE (PN1) 0x00D4 (PN2)	40207(0x00CE) 40213(0x00D4)
NPN/PNP Window comparator mode: upper flow	Window comparator mode, set the upper flow rate (R/W)	0x00CF (PN1) 0x00D5 (PN2)	40208(0x00CF) 40214(0x00D5)
NPN/PNP Window comparator mode: lower flow	Window comparator mode, set the lower flow rate (R/W)	0x00D0 (PN1) 0x00D6 (PN2)	40209(0x00D0) 40215(0x00D6)
NPN/PNP Hysteresis setting	Hysteresis mode or Window comparator mode, set the hysteresis (R/W)	0x00D1 (PN1) 0x00D7 (PN2)	40210(0x00D1) 40216(0x00D7)

Notes: 1, R – Read-only, W – Write only, R/W – Read and write.

2. For the * marked functions, please disable the write protection before executing the command.

The detailed information on each register is described below: Y: enabled; N: disabled.

Address	**0x0081**	**Write**	Y
		Read	Y
Description	Address of the product		
Value type	UINT 16		
Notes	Values range from 1 to 247, excluding 157 (0x9d). The broadcast address is not enabled, and the default address is 1.		

SN, Serial number	0x0030 ~ 0x0035	Write	N
		Read	Y
Description	Series Number of the product, SN		
Value type	ASCII (12 bits)		
Notes	SN= value(0x0030), value(0x0031),….,value (0x0035); **e.g.,** receiving 12 bits as: 2A 41 31 42 32 33 34 35 36 2A , the corresponding Serial Number is **A1B23456**.		

Flow rate	0x003A ~ 0x003B	Write	N
		Read	Y
Description	Current flow rate		
Value type	UINT 32		
Notes	Flow rate = [Value (0x003A) * 65536 + value (0x003B)] / 1000 **e.g.,** when the user reads "0" from register 0x003A and "20340" from register 0x003B, current flow rate = (0 * 65536 + 20340) / 1000 = 20.340 SLPM		

Accumulated flow	0x003C ~ 0x003E	Write	Y
		Read	Y
Description	Accumulated or totalized flow rate		
Value type	UINT 32 + UINT 16		
Notes	Accumulated flow = value (0x003C) * 65536 + value (0x003D) + value (0x003E) /1000 **e.g.,** for a totalizer or accumulated flow rate of 3452.245 m^3, the user will read "0 (0x0000)" from register 0x0004; "3452(0x0D7C)" from register 0x0005, and "245(0x00F5)" from register 0x0006. Then, the totalizer or accumulated flow rate = 0*65536 + 3452 + 245/ 1000 = 3452.245 m^3. **Notes: Please disable the write protection before executing this command.**		

Temperature	0x0040	Write	N
		Read	Y
Description	Gas temperature.		
Value type	UINT 16		
Notes	Ambient temperature = Value (0x0040) / 100 **e.g.,** for a gas temperature of 23.45 °C, the user will read "2345 (0x0929)" from register 0x0040, therefore Ambient temperature = 2345/100 = 23.45 °C		

Baud rate	0x0082	Write	Y
		Read	Y
Description	Communication baud rate		
Value type	UINT 16		
Notes	0: baud rate=4800; 1: baud rate=9600; 2: baud rate=19200; 3: baud rate=38400. 4: baud rate=57600. 5: baud rate=115200. The default value is 3. **e.g.,** when the user reads "3" from register 0x0082, the baud rate is 38400.		

GCF	0x008B	Write	Y
		Read	Y
Description	The gas conversion factor applies to gases other than the calibration gas.		
Value type	UINT 16		
Notes	The GCF of air is 1000 (default), usually read from register 0x008B. **Notes: The product will disable this function with write protection once the metering gas is confirmed with the proper GCF. For a specific GCF value, contact the manufacturer.**		

Digital filter depth	0x008C	Write	Y
		Read	Y
Description	Data sampling setting in the software filter		
Value type	UINT 16		
Notes	0 ~ 9 programmable, corresponding to 2^0 ~ 2^9 data sampling in the software filter. The default value is 3, corresponding to 2^3 = 8 data sampling rate. **Notes: Please disable the write protection before executing this command.**		

High flow alarm	0x0098 ~ 0x0099	Write	Y
		Read	Y
Description	Set the high-flow-rate alarm limit.		
Value type	UINT 32		
Notes	The set flow rate value = ((0x0098)*65536+(0x0099))/1000 **Notes: Please disable the write protection before executing this command.**		

Low flow alarm	0x009A ~ 0x009B	Write	Y
		Read	Y
Description	Set the low flow rate alarm limit.		
Value type	UINT 32		
Notes	The set flow rate value = ((0x009A)*65536+(0x009B))/1000 **Notes: Please disable the write protection before executing this command.**		

Offset calibration	0x00F0	Write	Y
		Read	N
Description	Reset or calibrate the offset.		
Value type	UINT 16, Fixed value 0xAA55		
Notes	To reset or calibrate the offset, write 0xAA55 to register 0x00F0. **Notes: When you execute this command, make sure there is NO flow in the flow channel.**		

Write protection	0x00FF	Write	Y
		Read	N
Description	Write protection disabler for a set value to a specific register.		
Value type	UINT 16, Fixed value 0xAA55		
Notes	This function is enabled at the time of product shipment. To enable the write function for a specific parameter, such as GCF or offset, send 0xAA55 to register 0x00FF; write protection is disabled. After the write execution is completed, the firmware will automatically re-enable the write protection.		

NPN/PNP Output mode	0x00CC (PN1) / 0x00D2 (PN2)	Write	Y
		Read	Y
Description	Hysteresis mode or Window comparator mode		
Value type	UINT 16		
Notes	0: Window comparator mode; 1: Hysteresis mode. **e.g.,** when the user reads "1" from register 0x00CC, the PNP1/NPN1 output mode is Hysteresis mode.		

NPN/PNP Switch operation	0x00CD (PN1) / 0x00D3 (PN2)	Write	Y
		Read	Y
Description	Expected output or Reversed output		
Value type	UINT 16		
Notes	0: Reversed output; 1: Normal output. **e.g.,** when the user reads "1" from register 0x00CD, the PNP1/NPN1 switch operation is Normal output.		

NPN/PNP Hysteresis mode: flow rate setting	0x00CE (PN1) / 0x00D4 (PN2)	Write	Y
		Read	Y
Description	Hysteresis mode. Set the flow rate: 0 stands for zero flow (0%), and 11000 corresponds to a full scale of 110%.		
Value type	UINT 16		
Notes	Available value: 0 ~ 11000. 0 ~ 11000 corresponding to 0% ~ 110% of the full scale. 0 - 0% of full-scale; 5000 - 50% of full-scale; 10000 - 100% of full-scale; 11000 - 110% of full-scale. **e.g.,** a meter with a full-scale of 50 SLPM. If one reads "5000" from register 0x00CE, in the PNP1/NPN1 Hysteresis mode, the flow rate is 25 SLPM (= 50 SLPM * 50%).		

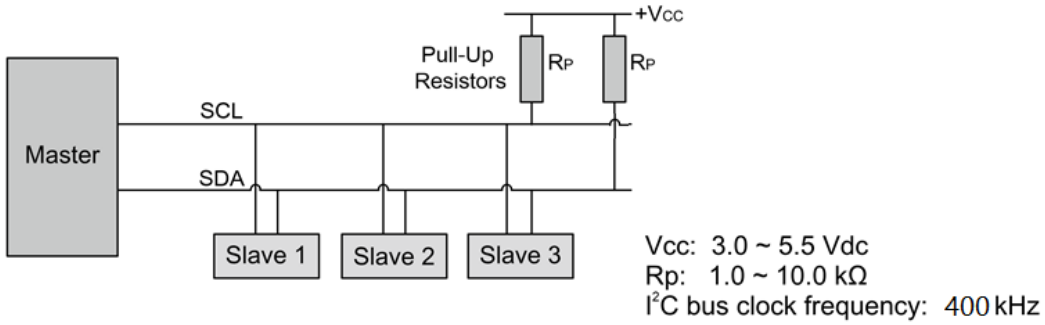
NPN/PNP Window comparator mode: upper flow	0x00CF (PN1) / 0x00D5 (PN2)	Write	Y
		Read	Y
Description	Window comparator mode. Set the upper flow rate, where 0 stands for zero flow or 0%, and 11000 corresponds to a full-scale of 110%.		
Value type	UINT 16		
Notes	Available value: 0 ~ 11000. 0 ~ 11000 corresponding to 0% ~ 110% of the full scale. 0 - 0% of full scale; 5000 - 50% of full-scale; 10000 - 100% of full-scale; 11000 - 110% of full-scale. **e.g.,** a meter with a full-scale of 50 SLPM. When the user reads "6000" from register 0x00CF, in the PNP1/NPN1 Window comparator mode, the upper flow rate is 30 SLPM (= 50 SLPM * 60%).		

NPN/PNP Window comparator mode: lower flow	0x00D0 (PN1) / 0x00D6 (PN2)	Write	Y
		Read	Y
Description	Window comparator mode. Set the lower flow rate to 0 (zero flow, 0%), and set 11000 to the full scale of 110%.		
Value type	UINT 16		
Notes	Available value: 0 ~ 11000. 0 ~ 11000 corresponding to 0% ~ 110% of the full scale. 0 - 0% of full-scale; 5000 - 50% of full-scale; 10000 - 100% of full-scale; 11000 - 110% of full-scale. **e.g.,** a meter with a full scale of 50 SLPM. When the user reads "4000" from register 0x00D0, in the PNP1/NPN1 Window comparator mode, the lower flow rate is 20 SLPM (= 50 SLPM * 40%).		

NPN/PNP Hysteresis setting	0x00D1 (PN1) / 0x00D7 (PN2)	Write	Y
		Read	Y
Description	Hysteresis mode or Window comparator mode. Set the hysteresis: 0 stands for zero flow (0%), and 11000 corresponds to a full scale of 110%.		
Value type	UINT 16		
Notes	Available value: 0 ~ 11000. 0 ~ 11000 corresponding to 0% ~ 110% of full-scale. 0 - 0% of full-scale; 5000 - 50% of full-scale; 10000 - 100% of full-scale; 11000 - 110% of full-scale. **e.g.,** a meter with a full-scale of 50 SLPM. When the user reads "1000" from register 0x00D, in the PNP1/NPN1, the hysteresis is 5 SLPM (= 50 SLPM * 10%).		

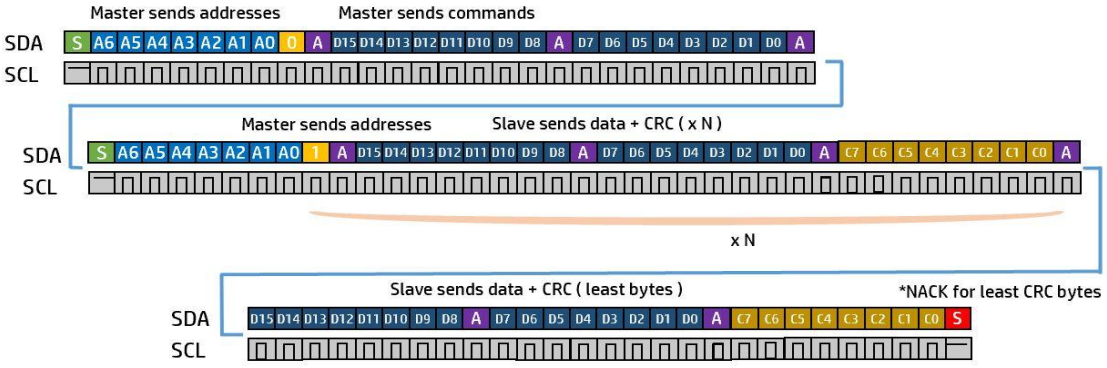
5.6 I²C communication protocol

5.6.1 I²C interface connection diagram

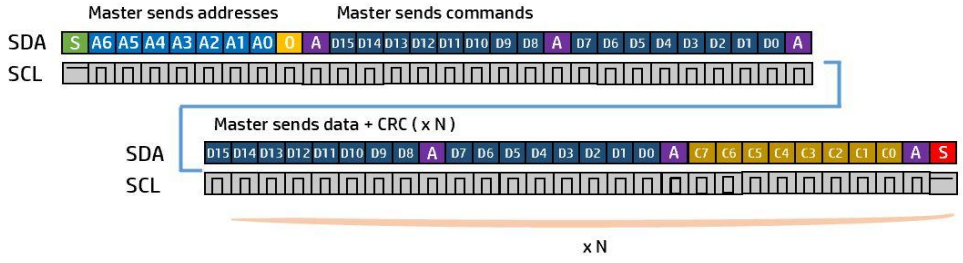


5.6.2 I²C interface read/write sequences

I²C reads:



I²C writes:



Note:

bit		
S	Start bit	Master pulls SDA from HIGH to LOW while SCL remains HIGH.
S	Stop bit	Master allows SDA to float from LOW to HIGH while SCL remains HIGH.
A	ACK	Acknowledgement
1	Read	(1 bit)
0	Write	(1 bit)
A6	Address	7 bits, the 7 most significant bits of the first transmitted byte. Default address: 1 (0000 001x)
D15	Data bit	16 bits
C7	CRC bit	8 bits

5.6.3 I²C interface command description

Command Byte	Length (int 16)	Command Name	Read/Write	Notes
0x00A4	1	I²C address	Read/Write	Int 16. Bit 0 is the R/W flag bit. bits 1 ~ bit 7 are available; bit 8 ~ bit 15 = 0. The default I²C address is 1. Hex: 0x0002 (write) /0x0003 (read), Bin: 0000 0000 0000 0010 (write) 0000 0000 0000 0011 (read).
0x0030	6	Sensor serial number	Read	ASCII
0x003A	2	Flow rate	Read	Int 32/1000 SLPM
0x003C	3	Accumulated flow	Read/Write	(Int 32 + Int 16/1000) SL or Nm^3
0x0040	1	Temperature	Read	Int 16/100 °C
0x008B	1	GCF	Read/Write	Gas conversion factor
0x008C	1	Filter depth	Read/Write	Int 16, 0 ~ 9, corresponding to 2^0 ~ 2^9 data in the software filter. The default value is 3, corresponding to 2^3 = 8 data in the software filter.
0x0098	2	High flow alarm	Read/Write	Set a high flow rate alarm
0x009A	2	Low flow alarm	Read/Write	Set a low flow rate alarm
0x00F0	1	Reset the offset of the flow rate	Write	Fixed value, 0xAA55
0x00CC (PN1) 0x00D2 (PN2)	1	Output mode	Read/Write	Hysteresis mode or Window comparator mode
0x00CD (PN1) 0x00D3 (PN2)	1	Switch operation	Read/Write	Normal output or Reversed output
0x00CE (PN1) 0x00D4 (PN2)	1	Hysteresis mode: flow rate setting	Read/Write	Hysteresis mode: Set the flow rate
0x00CF (PN1) 0x00D5 (PN2)	1	Window comparator mode: upper flow	Read/Write	Window comparator mode, set the upper flow rate
0x00D0 (PN1) 0x00D6 (PN2)	1	Window comparator mode: lower flow	Read/Write	In the window comparator mode, set the lower flow rate
0x00D1 (PN1) 0x00D7 (PN2)	1	Hysteresis setting	Read/Write	Hysteresis mode or Window comparator mode sets the hysteresis

Note: The I²C address is set to bits 7 to 1. E.g., if the I²C address is 1 (0000 001x), the write address will be 0x02 (0000 0010) and the read address will be 0x03 (0000 0011).

5.6.4 CRC checksum calculation

The 8-bit CRC checksum transmitted after every two data bytes (int 16) is generated by a CRC algorithm. Its properties are listed in the table below. To calculate the checksum, only these two previously transmitted data bytes are used.

Property	Value
Name	CRC-8
Protected data	I^2C read and write
Width	8 bits
Polynomial	0x07 (x8 + x2 + x + 1)
Initialization	0x00
Reflect input	False
Reflect output	False
Final XOR	0x00
Example	CRC(0x4E20) = 0x6D

5.7 Analog output (1 ~ 5 Vdc)

The product offers an analog voltage output of the instantaneous flow rate. Refer to Table 3.1 for the wire connection for this output. The meter is calibrated to 110% of the specified full-scale flow rate. The typical analog output is indicated below. This over-range applies to both analog and digital outputs.

Table 5.7: MF3000 analog output 1 ~ 5 Vdc

Flow rate	Analog output (Vdc)
0.00	1.00
10 % F.S.	1.40
20 % F.S.	1.80
30 % F.S.	2.20
40 % F.S.	2.60
50 % F.S.	3.00
60 % F.S.	3.40
70 % F.S.	3.80
80 % F.S.	4.20
90 % F.S.	4.60
100 % F.S.	5.00
110 % F.S.	5.40
120 % F.S.	5.40

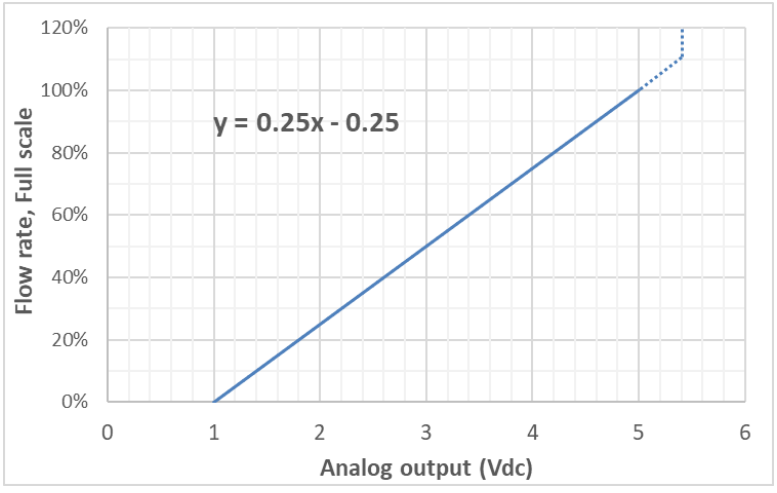


Figure 5.5: MF3000 analog output 1 ~ 5 Vdc

5.8 Analog output (4 ~ 20 mA)

The loop resistor connection is illustrated in the graph. The current output load depends on the power supply (Yellow area in the graph). The maximum load resistor, R_L, will be 450 Ω with a 24 Vdc supply,

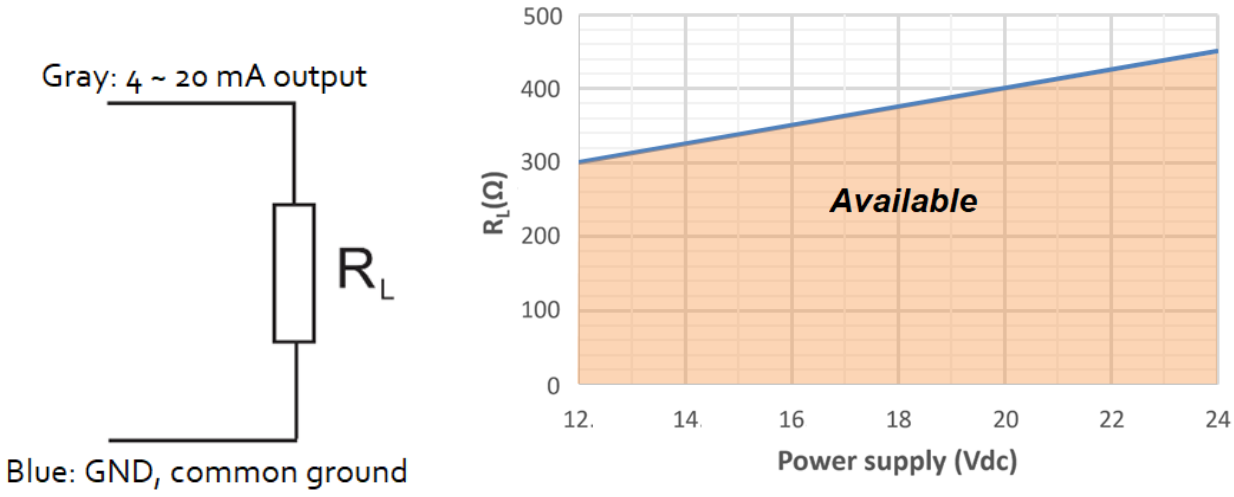


Figure 5.6: Analog output.

The typical analog outputs (4~20 mA) are shown below.

Table 5.8: MF3000 analog output 4 ~ 20 mA

Flow rate	Analog output (mA)
0.00	4.00
10 % F.S.	5.60
20 % F.S.	7.20
30 % F.S.	8.80
40 % F.S.	10.40
50 % F.S.	12.00
60 % F.S.	13.60
70 % F.S.	15.20
80 % F.S.	16.80
90 % F.S.	18.40
100 % F.S.	20.00
110 % F.S.	20.00
120 % F.S.	20.00

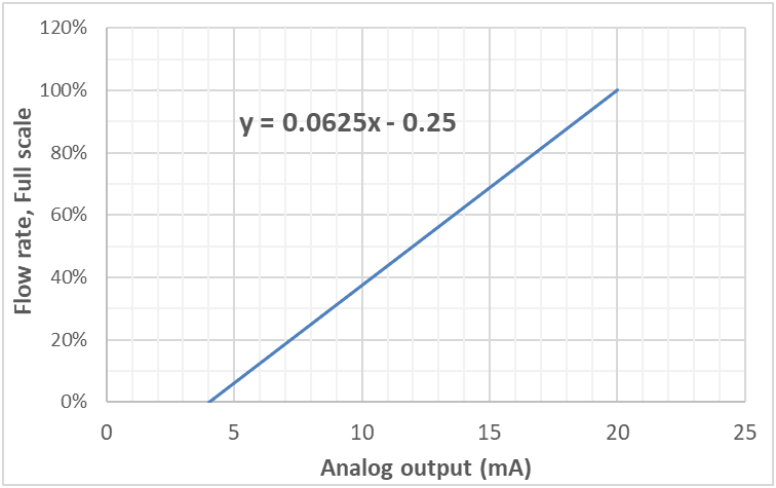
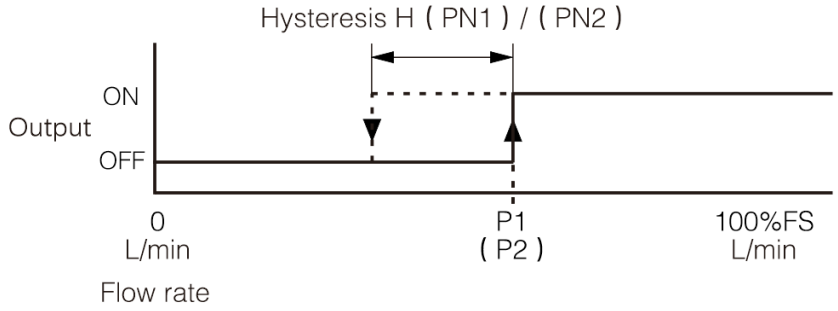


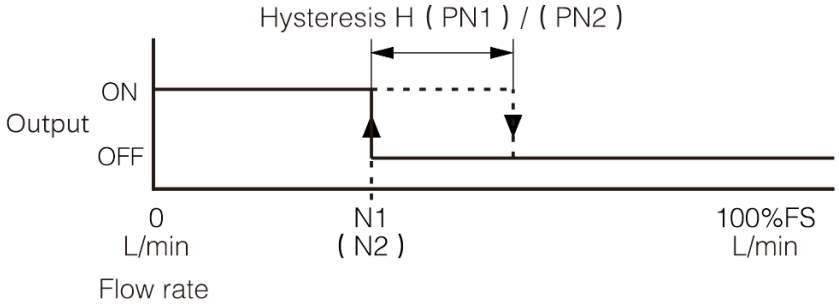
Figure 5.7: MF3000 analog output 4 ~ 20 mA

5.9 NPN/PNP output mode and switch operation

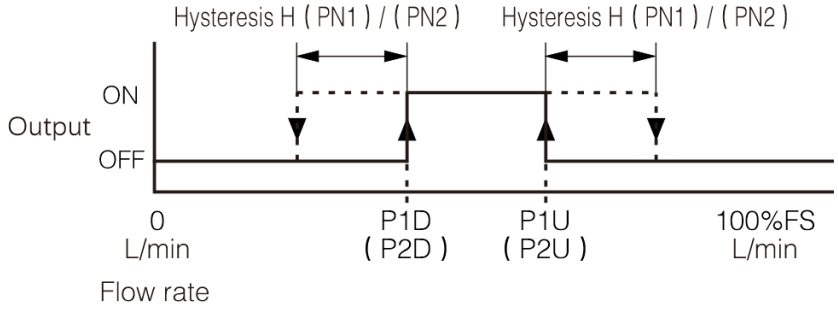
Hysteresis mode, Normal output



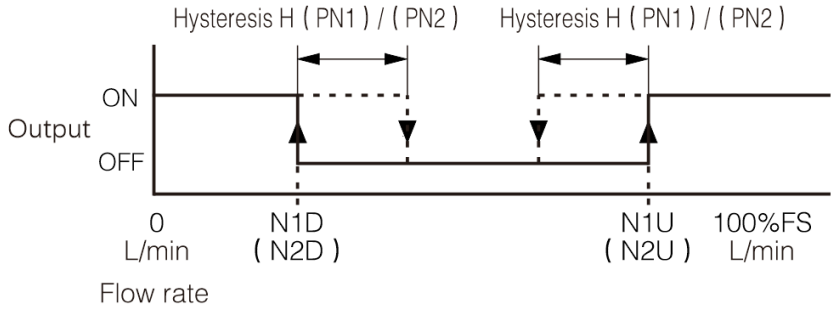
Hysteresis mode, Reversed output.



Window comparator mode, Normal output



Window comparator mode, Reversed output.



5.10 Pressure loss

The product is designed to minimize pressure loss. The following graphs are the pressure loss data of the selected models.

Table 5.9: Pressure loss (full-scale of 2 and 5 SLPM)

Flow rate (SLPM)	Pressure loss (Pa)			
	BSPT 1/4	8mm	6mm	4mm
0.0	0	0	0	0
1.0	10	15	20	30
2.0	25	30	40	80
3.0	40	50	60	150
4.0	60	70	90	240
5.0	80	100	130	370

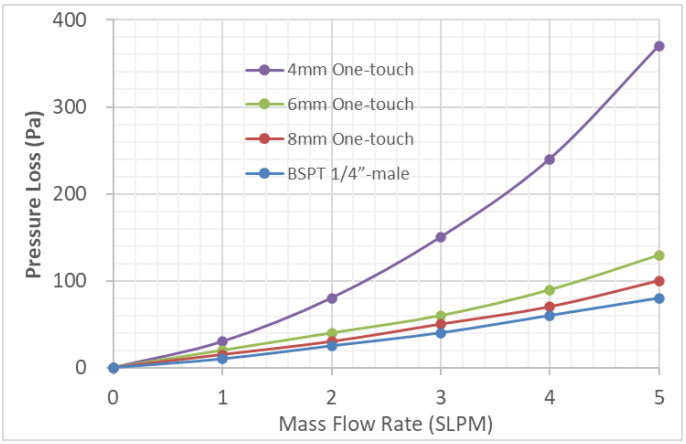


Figure 5.8: Pressure loss (full scale 2 and 5 SLPM)

Table 5.10: Pressure loss (full-scale of 10 and 20 SLPM)

Flow rate (SLPM)	Pressure loss (Pa)			
	BSPT 1/4	8mm	6mm	4mm
0	0	0	0	0
5	50	60	80	130
10	150	170	250	450
15	300	350	500	850
20	500	600	800	1400

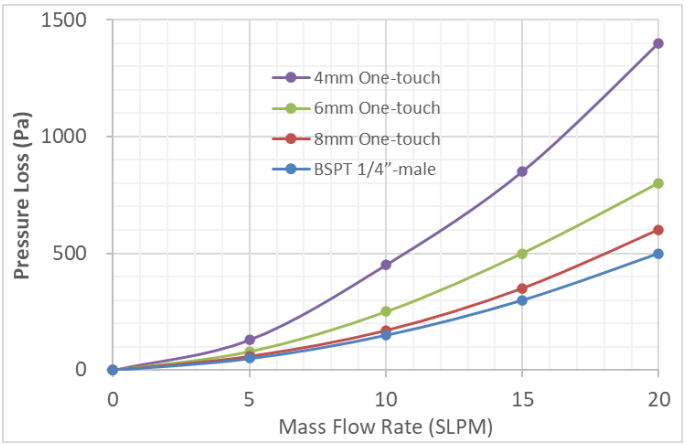


Figure 5.9: Pressure loss (full scale 10 and 20 SLPM)

Table 5.11: Pressure loss (full-scale of 50 SLPM)

Flow rate (SLPM)	Pressure loss (Pa)			
	BSPT 1/4	8mm	6mm	4mm
0	0	0	0	0
10	150	180	250	450
20	400	450	750	1500
30	900	1000	1600	3000
40	1500	1700	2600	4800
50	2200	2500	4000	7000

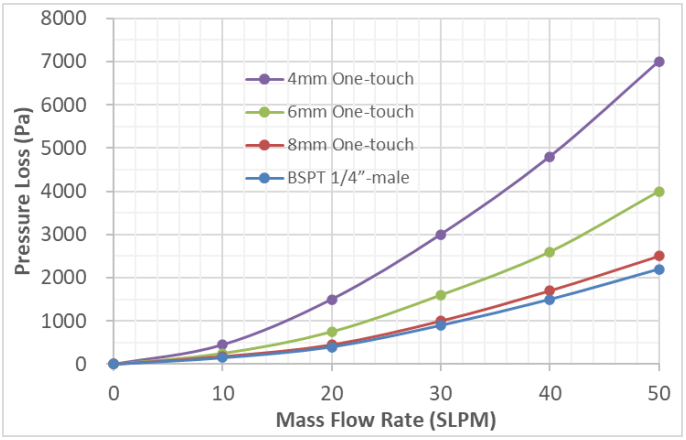


Figure 5.10: Pressure loss (full scale 50 SLPM)

Table 5.12: Pressure loss (full-scale of 100 and 200 SLPM)

Flow rate (SLPM)	Pressure loss (kPa)	
	BSPT 1/4	8mm
0	0.0	0.0
50	3.0	4.0
100	7.5	9.5
150	14.2	17.0
200	23.2	27.0

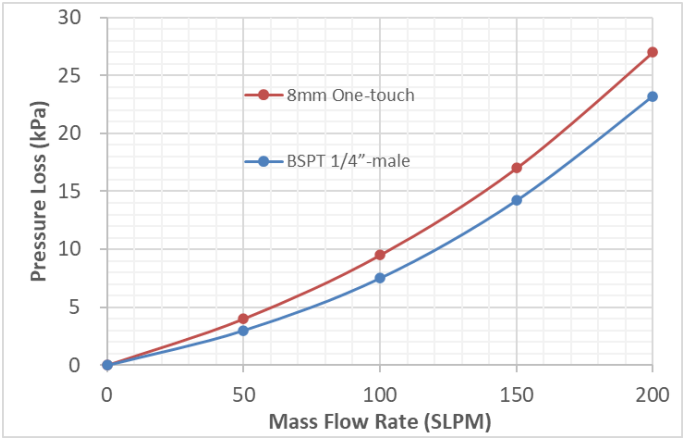


Figure 5.11: Pressure loss (full scale 100 and 200 SLPM)

Table 5.13: Pressure loss (full-scale of 500, 1000, and 1500 SLPM)

Flow rate (SLPM)	Pressure loss (kPa)
	BSPT 1/2-female
0	0
500	7.5
1000	18.0
1500	33.0

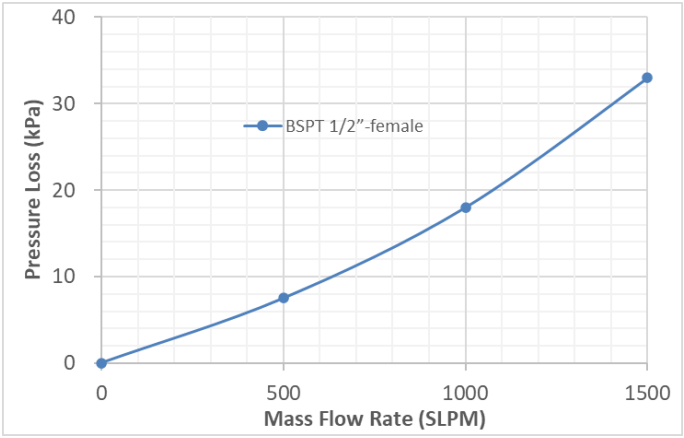
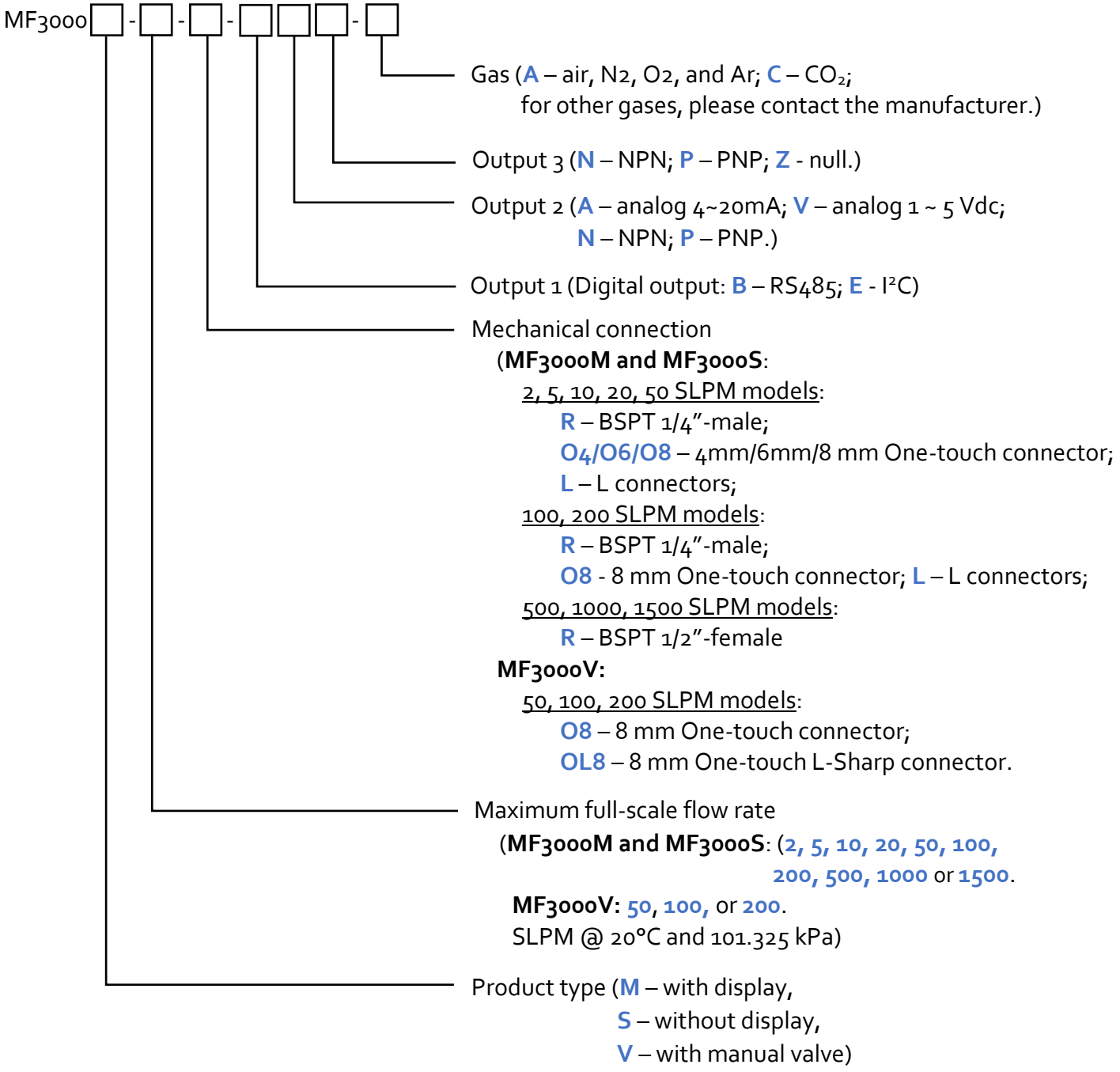


Figure 5.12: Pressure loss (full scale 500, 1000, and 1500 SLPM)

6. Product selection

The product part number is composed of the product model number and suffixes indicating the full-scale flow rate, as well as the other parameters. Refer to the following for details.



Selection of the mechanical connections:

Product type	Full scale	Mechanical connection code	Mechanical connection
MF3000M MF3000S	➢ Air, N2, O2, and Ar: 2, 5, 10, 20, 50 SLPM ➢ CO2: 2, 5, 10, 20, 50 SLPM **with real gas calibration**	R	BSPT 1/4"-male
		O4	4mm One-touch connector
		O6	6mm One-touch connector
		O8	8 mm One-touch connector
		L	L connectors
	➢ Air, N2, O2, and Ar: 100, 200 SLPM ➢ CO2: 100 SLPM **with real gas calibration**	R	BSPT 1/4"-male
		O8	8 mm One-touch connector
		L	L connectors
	➢ Air, N2, O2, and Ar: 500, 1000, 1500 SLPM ➢ CO2: 200, 500, 800 SLPM	R	BSPT 1/2"-female
MF3000V	➢ Air, N2, O2, and Ar: 50, 100, 200 SLPM ➢ CO2: 50, 100 SLPM	O8	8 mm One-touch connector
		OL8	8 mm One-touch L-sharp connector

Output signals selection:

NPN/PNP signals	Output signals code	Descriptions Output 1, Output 2, Output 3
No NPN/PNP	BAZ	RS485, 4 ~ 20 mA
	BVZ	RS485, 1 ~ 5 Vdc
	EAZ	I²C, 4 ~ 20 mA
	EVZ	I²C, 1 ~ 5 Vdc
Single NPN/PNP	BAN	RS485, 4 ~ 20 mA, NPN
	BAP	RS485, 4~20mA, PNP
	BVN	RS485, 1 ~ 5 Vdc, NPN
	BVP	RS485, 1~5Vdc, PNP
	EAN	I²C, 4 ~ 20 mA, NPN
	EAP	I²C, 4 ~ 20 mA, PNP
	EVN	I²C, 1 ~ 5 Vdc, NPN
	EVP	I²C, 1 ~ 5 Vdc, PNP
Dual NPN/PNP	BNN	RS485, NPN, NPN
	BNP	RS485, NPN, PNP

	BPN	RS485, PNP, NPN
	BPP	RS485, PNP, PNP
	ENN	I²C, NPN, NPN
	ENP	I²C, NPN, PNP
	EPN	I²C, PNP, NPN
	EPP	I²C, PNP, PNP

For example, "MF3000M-200-O8-BVN-A" stands for the product has a display, 0~200 SLPM, 8 mm One-touch connectors, RS485 Modbus digital output, analog 1~5 Vdc, and an NPN. It is applicable for air, nitrogen, oxygen, and argon.

"MF3000S-500-R-EPP-C" is a model without a display, 0~500 SLPM, with BSPT 1/2"- female connectors, I²C digital output, and dual PNP. It applies to CO2.

"MF3000V-100-OL8-ENN-A" is a model with a display and manual valve, 0~100 SLPM, with 8 mm One-touch L-Sharp connectors, I²C digital output, and dual NPN. It applies to air, nitrogen, oxygen, and argon.

7. Technical specifications

7.1 Specifications

All specifications listed in the following table, unless otherwise noted, apply for calibration conditions at 20°C and 101.325 kPa absolute pressure with air. The product is horizontally mounted during calibration.

	Value	Unit
Full-scale flow range		
MF3000M, MF3000S		
(air, N_2, O_2 and Ar)	2, 5, 10, 20, 50, 100, 200, 500, 1000, 1500	SLPM
(CO_2)	2, 5, 10, 20, 50, 100, 200, 500, 800 ***Real CO_2 gas calibration for models <= 100 SLPM.***	SLPM
MF3000V		
(air, N_2, O_2 and Ar)	50, 100, 200	SLPM
(CO_2)	50, 100	SLPM
Accuracy	±(2.5 + 0.5FS)	%
Repeatability	(0.8+0.15FS)	%
Turn-down ratio	50:1	
Working temperature	-10 ~ +55	°C
Temperature coefficient	±0.12	%/°C
Working pressure	0.8	MPa.g
Response time	10	msec
Filter depth	3 (default, 0 … 9 programmable)	
Humidity	<95, no condensation	%RH
Power supply	8~24 (50 mA)	Vdc
Output 1 (Digital output)	RS485 Modbus or I^2C	
Output 2	Analog 4~20 mA, 1~5 Vdc, NPN, PNP	
Output 3	NPN, PNP	
Null shift (1 ~ 5 Vdc output)	±30	mVdc

Model:	***2, 5 SLPM***	***10, 20 SLPM***	***50 SLPM***	***100, 200 SLPM***	***500, 1000, 1500 SLPM***	
Max. overflow	30	100	200	500	2000	SLPM
Max. flow change	4	15	30	100	400	SLPM/sec
Electrical connector	HRS:DF51K-6P-2DS					

Mechanical connection	**MF3000M, MF3000S** 2, 5, 10, 20, 50 SLPM: BSPT 1/4"-male, 4mm / 6mm / 8mm One-touch connectors, or L connectors 100, 200 SLPM: BSPT 1/4"-male, 8 mm One-touch connectors or L connectors 500, 1000, 1500SLPM: BSPT 1/2"-female **MF3000V** 50, 100, 200SLPM: 8 mm One-touch connector, or 8 mm One-touch L-sharp connector	
Protection	IP40	
Storage temperature	-20 ~ 70	°C
Fluid compatibility	Non-corrosive	
CE	EN61000-2; -3; -4	
RoHS/REACH	Certified	

7.2 Wetted materials

The wetted materials include silicon nitride, FR4, and epoxy (Loctite Ablestik 84-3J). The product body (flow channel) is made with polycarbonate plus Acrylonitrile butadiene styrene (ABS). Other materials are stainless steel 304 and Polybutylene terephthalate (PBT).

8. Technical notes for the product performance

8.1 Measurement principle

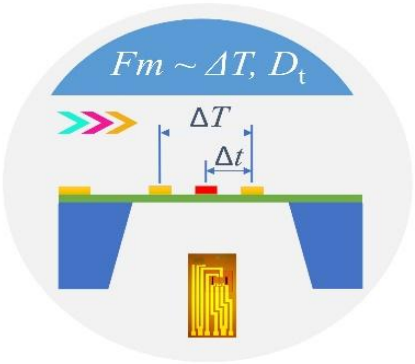


Figure 8.1: Measurement approach illustration.

The products utilize the Company's proprietary micro-machined (MEMS) thermal calorimetric sensing in time-domain data, with a data-processing algorithm (Thermal-D sensing). A thermal signal generator (microheater) with a pair of sensing elements is precisely manufactured upstream and downstream, separated by predefined micrometer distances on the chip surface, under excellent thermal isolation. When a fluid flows through the sensing chip, the fluid carries the thermal signal downstream. The sensing elements register the amplitude, time, and temperature differences. It calculates the thermal diffusivity and correlates it with the fluid mass flow rate during calibration.

This unique thermal sensing approach offers an extensive dynamic range and better performance under environmental parameter variations. It is the first of its kind in the industry, enabling property-independent mass flow measurements for gases with similar thermal diffusivities. It significantly simplifies process control with high precision and easy maintenance. Please refer to the company's USA patents and other publications made available for additional information.

8.2 Precautions for the best performance of the product

8.2.1 Comparison with a third-party reference meter

It is common practice to compare product data with a third-party reference meter, and in many cases, discrepancies can occur.

When performing such a comparison, please note that the reference meter should have a more precisely specified accuracy (approximately one-third of that specified by the product), and pay special attention to differences in reading and full-scale accuracy.

A full-scale accuracy = reading accuracy x (full-scale flow rate/ set point (current) flow rate)

Another key point to comparing the different flow meters is that as long as the fluidic flow is a continuous flow without pulsation, then the fluid dynamics will have the system following the Bernoulli equation:

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

Where ρ is the fluid density, g is the acceleration due to gravity, P_1 is the pressure of the reference meter, P_2 is the pressure at the test meter, v_1 is the velocity of the reference meter, and v_2 is the velocity of the test meter. h_1 and h_2 are the corresponding heights for the meters, which are often the same in the system. Therefore, it will be essential to ensure the system has no pressure variation. (This explains our recommendations for the installations in Section 4). In addition, the meter measurement principle is often the key to understanding any discrepancies.

Please note that, when comparing with a rotameter, the reading may show large deviations due to differences in measurement principles. Particularly, a rotameter is sensitive to pressure and temperature variations.

8.2.2 Particle contamination and fluidic cleanness

Any contamination, including particles and liquid vapors, would be detrimental to the accuracy of the flow measurement and the meter's functionality. It is critical to ensure that the applied flow medium is clean and dry. If contamination is suspected, please allow experienced technical personnel to check and recondition it. Do not use foreign cleansers or other fluids to clean the flow path, as they could cause irreparable damage.

8.2.3 Apply to a different gas medium

The product is calibrated using a high-precision NIST-traceable metrological standard and clean and dry air. With this unique thermal sensing technology, the product can be applied to meters and control other clean, dry gases with similar thermal diffusivities without sacrificing accuracy. It has effectively resolved the nonlinearity issues when applying to a gas conversion factor in calorimetric sensing, making the measurement highly accurate with an extensive dynamic range. Applicable gases include air, N_2, O_2, Ar, CH_4, and CO.

This innovative product also follows the basic sensing principle described in the international standard for thermal mass flow meters (ISO 14511:2001 - Measurement of fluid flow in closed conduits — Thermal mass flowmeters). For gases with different diffusivities, a gas conversion factor could be applied. For more information, contact your sales representative or manufacturer.

Under normal operation conditions, the wetted materials are fully compatible with common gases, such as air, oxygen, nitrogen, argon, and carbon dioxide. If a special gas is applied, please check the gas compatibility data with the manufacturer. In some cases, packing materials may need to be changed for gas compatibility, or additional hazardous-zone certification may be required before the products can be used.

8.2.4 Recalibration and maintenance

The controller's recalibration depends on usage and application requirements. Therefore, it is a decision by the applications.

If preferred, Siargo can offer free calibration software or a user application kit to facilitate the customer's calibration requirements. Alternatively, contact your sales representative or contact the manufacturer for assistance. Siargo calibrates all products with NIST (National Institute of Standards and Technology, USA) traceable calibrators.

For maintenance, the services must be performed by trained or certified technicians by Siargo. Any changes to the products will void the product warranty. It could cause irreparable damage to the products and lead to unexpected injuries.

The products do not require regular maintenance if the specified application conditions are exactly observed. Maintenance is required if indications of contamination or malfunctions are verified. In this case, contact your sales representative or customer support directly (information available on the Company's webpage) to obtain an RMA (Return Material Authorization) before shipping the products back to the Company's support center. Siargo commits to responding as fast as possible. Regular service will be performed within five business days if no major parts change is required.

9. Troubleshooting

Phenomena	Possible causes	Actions
No signal/display	The power is not connected	Connect the power, check the cable.
	Cable connection incorrect	Check the cable.
	No flow or clogging	Check flow and contamination.
	Power regulator failure	Return to the factory.
	Sensor failure	Return to the factory.
Significant errors or unexpected flow rate	Particles, fluid type	Check the system.
Erroneous or large noise	Vibration, unstable flow	Check the system.
Offset unstable	Circuitry instability	Check the system, power off.
No digital interface	Wrong address, software	Check commands and connection.

10.Warranty and Liability

(Effective January 2018)

Siargo warrants that the products sold hereunder, when properly used and installed under normal circumstances and with normal service, will be free from defects. As described in this user manual, OEM products shall be free from faulty materials or workmanship for 180 days, and non-OEM products for 365 days, from the date of shipment. This warranty period is inclusive of any statutory warranty. Any repairs or replacement product shall bear the exact terms of this warranty.

Siargo makes no warranty, representation, or guarantee and shall not assume any liability regarding the suitability of the products described in this manual for any purposes that are not specified in this manual. Users shall be held fully responsible for validating the performance and suitability of the products for their particular design and applications. For any misuse of the products beyond the scope described herein, the user shall indemnify and hold Siargo, its officers, employees, subsidiaries, affiliates, and sales channels harmless against all claims, costs, damages, expenses, and reasonable attorneys' fees arising from any direct or indirect sources.

Siargo makes no other warranty, express or implied, and assumes no liability for any special or incidental damage or charges, including but not limited to any damages or charges due to installation, dismantling, reinstallation, etc., or other consequential or indirect damages of any kind. To the extent permitted by law, the exclusive remedy of the user or purchaser, and the limit of Siargo's liability for any and all losses, injuries, or damages concerning the products, including claims based on contract, negligence, tort, strict liability, or otherwise shall be the return of products to Siargo, and upon verification of Siargo to prove to be defective, at its sole option, to refund, repair or replacement of the products. Regardless of form, no action may be brought against Siargo more than 365 days after the cause of action accrues. Products returned under warranty to Siargo shall be at the user's or purchaser's risk of loss and, if returned at all, at Siargo's risk of loss. Purchasers or users are deemed to have accepted this limitation of warranty and liability, which contains the complete and exclusive limited warranty of Siargo. It shall not be amended, modified, or its terms waived except by Siargo's sole action.

The product information in this manual is believed to be accurate and reliable at the time of release. They are made available to users. However, Siargo shall assume no responsibility for any inaccuracies and/or errors and reserves the right to make changes without further notice for the relevant information herein.

This warranty is subject to the following exclusions:

(1) Products that have been altered, modified, or have been subject to unusual physical or electrical circumstances, but not limited to those stated in this document or any other actions that cannot be deemed as proper use of the products;

(2) Products that have been subject to chemical attacks, including exposure to corrosive substances or contaminants. In the case of battery usage, long-term discharge, or leakage-induced damage;
(3) Products that have been opened or dismantled for whatever reason;
(4) Products that have been subject to working conditions beyond the technical specification as described by this manual or related datasheet published by the manufacturer;
(5) Any damages incurred by the incorrect usage of the products;
(6) Siargo does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.
(7) Products resold by unauthorized dealers or any third parties.

11. Service/order contact and other information

Siargo Ltd. is making every effort to ensure the quality of its products. For any questions or product support, contact your direct sales representative. If you require additional assistance, contact the customer service at the address listed below. We will respond quickly to your requests and work with you to your complete satisfaction.

For sales or product orders, contact the local sales representatives or distributors listed on the company's webpage www.Siargo.com.

For any returns, contact your direct sales representative to obtain an RMA. For any further assistance, contact info@siargo.com to obtain additional information or a Return Materials Authorization (RMA) before shipping the product back to the factory for factory services such as calibration. In your email messages, please specify the status of the product you intend to return to the factory, and include your shipping address. Be sure to write the RMA on the returned package or include a letter with the RMA information.

Direct customer service request(s) should be addressed to

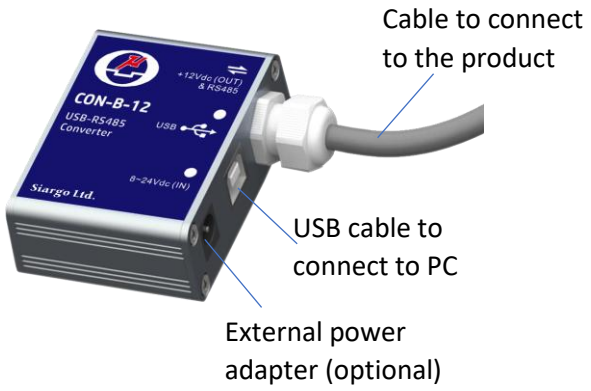
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Email: Info@Siargo.com

For further information and updates, please visit www.Siargo.com.

Appendix I: Product evaluation kit

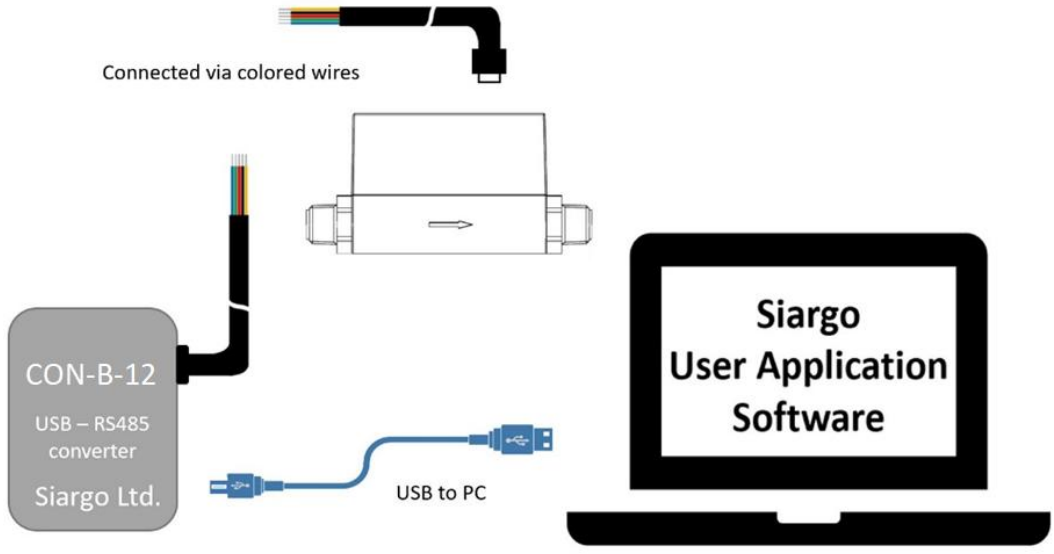
Siargo offers a product evaluation kit. It includes a digital data converter, USB data cable, and User Application software. The kit provides the opportunity to quickly evaluate the product's performance on a Microsoft Windows-based computer. This kit can also be used for simple applications with digital data transfer. The user can read and visualize the flow rate, obtain the totalizer or accumulated flow rate, and save the data for further analysis. It can be connected to up to 128 meters using the RS485 serial interface.

For further information and to purchase the evaluation kit, contact the manufacturer or the sales representative.



Each converter has a fixed cable that can be directly connected to the product. The USB cable to the PC is also included.

For most products, the power from the PC via the USB cable will be sufficient. No external power will be required. However, for multiple products connected in series, the power supplied by the USB cable may not be enough. An external power adapter with an 8-24V DC voltage will be required.



Appendix II: Document history

Revision VB.0 (March 2026)

- Added the manual control option (MF3000V).

Revision VA.1.02 (August 2025)

- Corrections.

Revision VA.1.01 (October 2024)

- Add the analog (4~20 mA) output description.

Revision VA.1 (April 2024)

- Update the turn-down ratio to 50:1.
- Update the mechanical dimensions.
- Minor corrections.

Revision VA.0 (December 2023)

- First release.