

# MEMS Mass Flow Meter MF5806 Series

## User Manual

(VB.3)



Please read this manual for ensuring correct use of this product. Make the manual available for easy access.

SIARGO LTD.



Siargo Ltd.

# MEMS MEMS Flow Meters

MF5806 Series

## User Manual

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## RESTRICTION ON USE

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1. This meter is designed and manufactured specially for hospital individual oxygen therapy applications that will delivery a better and controllable precious dosage. Do not alter any hardware and software of the product. Any modifications might cause damage and unexpected events.
2. All practices for electronic device safety should apply.
3. Do not use this product in any environments where safety may be a concern.
4. Only a qualified person from Siargo or a person who is accredited by Siargo can perform troubleshooting services to the product, Siargo is otherwise not liable for any consequences thereafter.

## SAFETY PRECAUSION

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1. The product can be utilized to measure and/or monitor in-line oxygen mass flow rate. For other special gases or variable concentration gases, the product may not function properly or even can be damaged. Please contact Siargo for further information.
2. The operational environments of the product are illustrated in the section of product specifications. If the product is used for other circumstances, the product may not function properly or even can be damaged.
3. Operation, installation, storage, and maintenance of the product must strictly follow the instructions described in this user manual. Otherwise, unpredicted damage and even injuries or other severe situations could be induced. All the installation, storage, and maintenance of the product must be performed by skilled workers. This user manual should be placed near the product for easy access.
4. Before using the product, the user should read this user manual completely and in details so that the user well understands all the important instructions.

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Siargo designs, develops and manufactures the world leading MEMS mass flow sensing products for various applications in gas flow monitor, measurement and control. This manual provides the instructions for proper use of the MF5806 series of products, including installation, maintenance and troubleshooting. For further customization or other product related questions, please contact the manufacture or visit [www.Siargo.com](http://www.Siargo.com)

## Overview

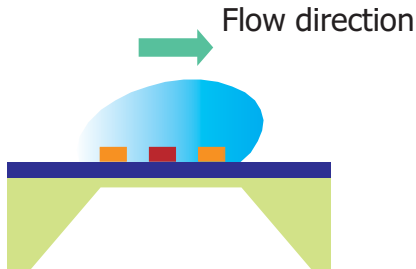
MF5806 mass flow meters are specially designed for hospital individual oxygen therapy applications. It provides precise measurement of instant oxygen intake rate and accumulated oxygen dosage for the individual oxygen delivery system. The design provides low power consumption that make it possible for operation on battery when power is an concern. The meter can be directly connected to the central station via RS485 that can provide remote monitoring and control which will reduce the risk of oxygen over dosing.

The meters are operated with the Siargo's proprietary MEMS thermal mass flow sensors together with the smart control electronics. The sensor probe surface is passivated with silicon nitride ceramic materials together with a water/oil proof nano-coating for performance and reliability. The current models provide plug-and-play connectors for hospital oxygen systems. The meter can be directly plug into the oxygen supply system outlet located at the hospital bedside.

## Features

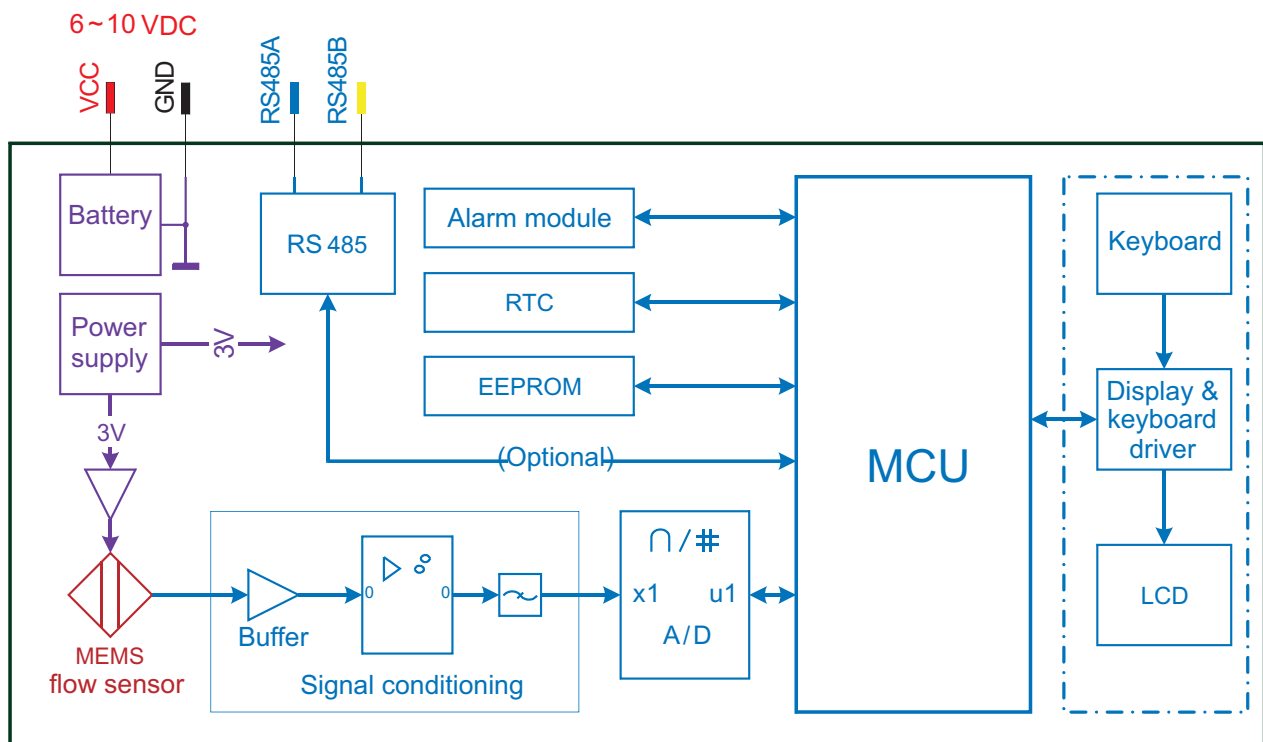
- ♦ Plug-and-paly hospital oxygen deliver design for easy usage
- ♦ Mass flow technology provide precise instant rate and accumulated dosage
- ♦ Historical data storage and retrieval
- ♦ Password protected access
- ♦ Instant rate and accumulated dosage alarm
- ♦ Excellent repeatability and accuracy
- ♦ Low power design with stand-alone operation by battery
- ♦ Interlock of in/out connector for prevention of wrong mechanical
- ♦ Manual adjustable valve for instant rate
- ♦ Standard RS485 Modbus interface for remote monitor and control
- ♦ Rotatable meter head for easy data reading
- ♦ Optional on/off valve provides additional control

**Working Principle**



MF5806 series flow meters measure flow using Siargo’s proprietary MEMS calorimetric mass flow sensor that is installed in the flow channel forming a plate that serves as an additional flow conditioner from the boundary layer configuration resulting in a laminar flow. The mass flow measurement is established as the fluid carries heat away from the heater causing the redistribution of the temperature field. Accurate flow rate is obtained by calibration with the standard fluid at the preset conditions.

**Control Schematics**



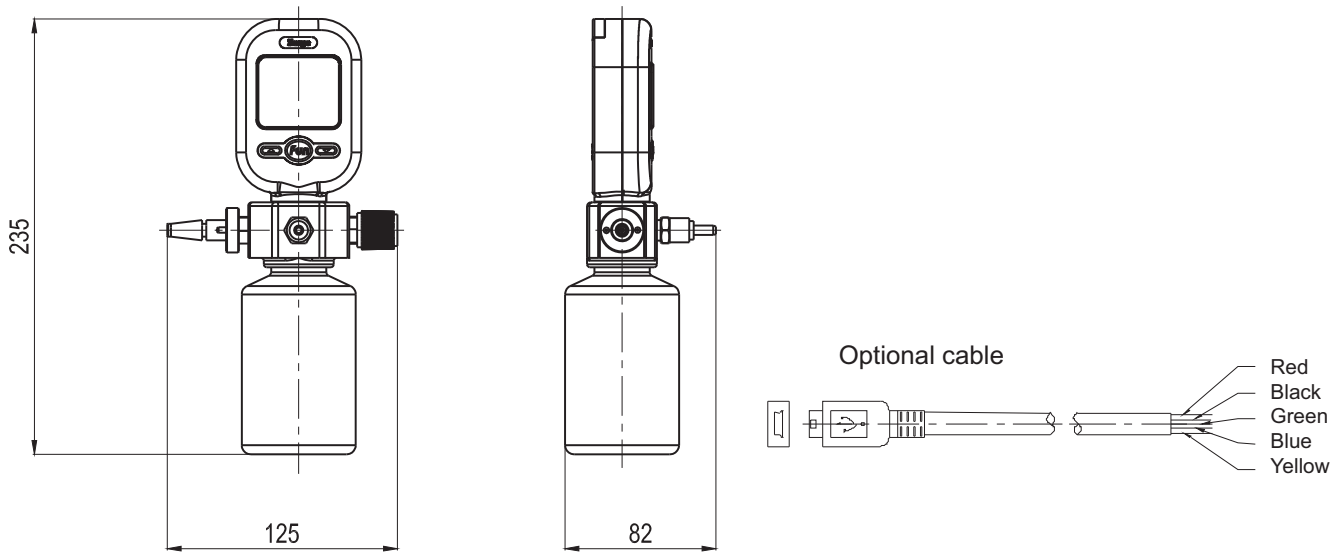
## Specifications

MF5806		
Flow range	0~10	SLPM
Accuracy	$\pm(1.5+0.5FS)$	%
Repeatability	0.5	%
Response time	$\leq 2$	Sec
Power supply	4 AA batteries (LR6) or AC adapter (6 ~ 10Vdc)	
Power consumption	$\leq 10$	mW
Digital output	RS485 (Modbus)	
Display	LCD	
Display information	Instant flow: SLPM; Accumulated flow: NCM; Time: Hour	
Flow resolution	Instant flow: 0.01SLPM; Accumulated flow: 0.001NCM; Time: 0:01Hour (1 min)	
Keyboard	3 keys	
User function	Password; alarm limit; accumulated flow; zero reset	
Max. pressure	0.6	MPa
Working temperature	-10 ~ 55	°C
Pressure loss	$\leq 500$	Pa
Battery life	>60	Day
Calibration gas	O <sub>2</sub>	
Pin out	miniUSB (optional)	
DN	6.0	mm
Mech. connection	Medical oxygen nozzle (customizable)	
Weight	~ 350	g

\*Meter head can be rotated 180 degree for convenience at installation and reading.

\*\* Internal data storage can be customizable.

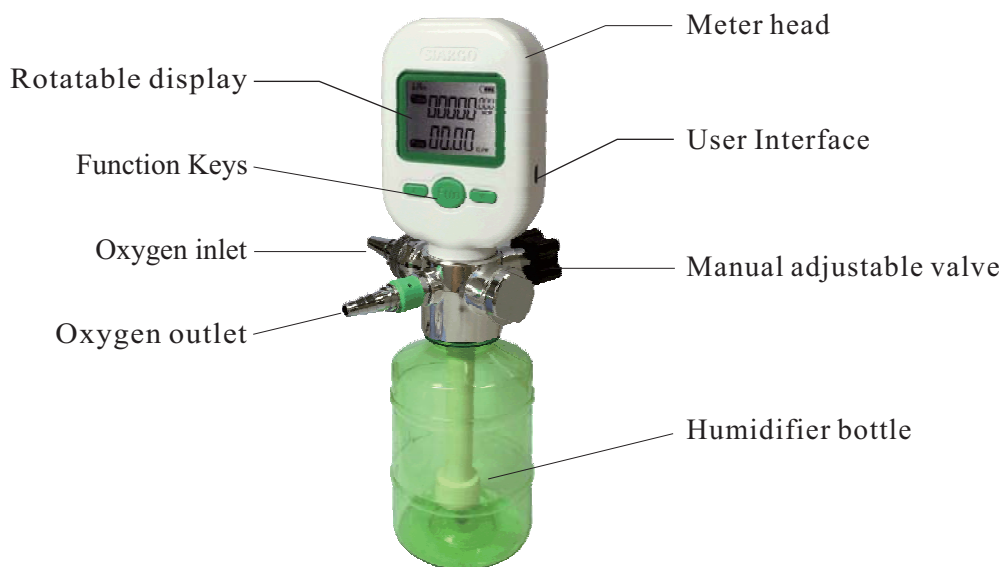
**Dimensions**



**Note:**

- 1) Please note the inlet would be from the medical connector. If the inlet is connected to the other one, the reading will be null.
- 2) The optional miniUSB cable will provide connections to external power supply as well as the RS485 communication. For connection definitions, see the corresponding descriptions.

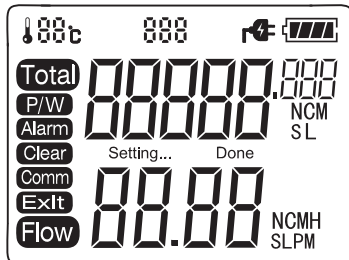
**Description**





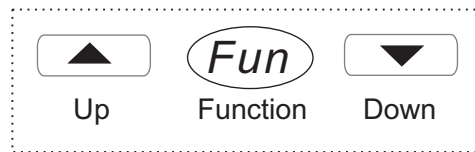
**Menu Operation**

**7.1 Interface illustration**



Interface includes *instant flow, accumulated flow; temperature and battery status; menu and other process data during setup.* See the graph at the left for details.

Three function keys on the front of the meter head:

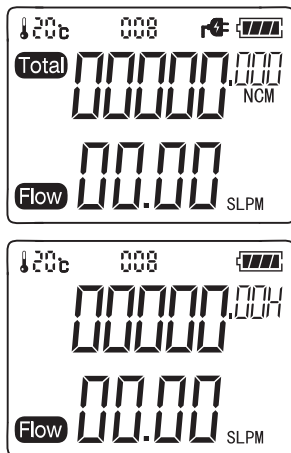



**7.2 Operation**

The following contents describe the details for each steps. Please read carefully before process.

**7.2.1 Display at normal operation**

Upon power on, after self-check, the meter will come to the following display:

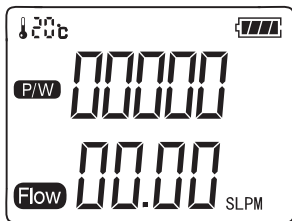


- a. Temperature: current temperature;
- b. Meter address: current protocol and address. The displayed address indicates remote communication is on. Otherwise, only local display is functional;
- c. Battery status: when this display turns into , the battery should be changed immediately or switch to external power;
- d. Total or accumulated flow: NCM or SL
- e. Instant flow: SLPM
- f. Time: Pressure the function key **Fun** (keep for less than 0.5 sec), total will change to time. There will be a unit of "H" as left.

If the display is normal, press the *function key* **Fun** and keep for more than 1 sec, it will enter into the password interface. Refer to 7.2.2 for password verification function. Once the password is correctly input, other interfaces will display.

**7.2.2 Password verification**

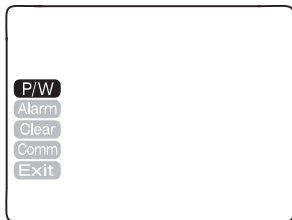
At the normal operation display, press **Fun** key, one can enter into password verification interface. Input the correct password, the *Setup Menu* will display. If the password is incorrect, the display will not change. For the first time use, the factory password is 11111.



To enter the password, press or key to change the digit when it flashes, and press **Fun** to confirm the enter. Repeat this process for all 5 digits and the meter will enter into the menu interface.

**Note:** at the time of password input, the flow measurement will not be interrupted.

### 7.2.3 Meter menu

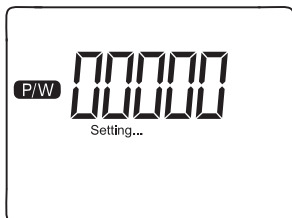


When the meter passed “password verification”, the following menu can be accessed:

Press or to select the corresponding menu of desire. The selected menu will be flashing, press **Fun** to confirm the selection.

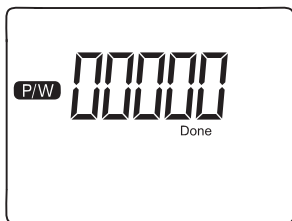
### 7.2.4 Change the default password

For data safety, it is advised that the default or factory set password should be changed at the first use of the product. (The factory preset password is 11111).



Press or to change the digit when it is flashing, and press **Fun** to confirm your enter.

**It is advised that your password should be kept at a safe location and shall be recovered when it is needed. In case of password lost, please contact manufacture to obtain the special password for access of the meter.**

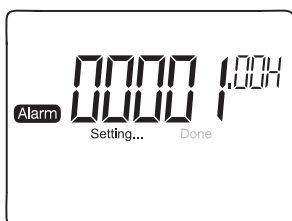


After the 5 digits are entered completely, the interface will display “Setting...”. Please do not interrupt until “Done” appears on the screen. The process usually takes 3 seconds, and then it will automatically return to the menu selection screen.

### 7.2.5 Alarm setting

The alarm function allows the user to set the maximum accumulated flow or totalization of the flow. When the set value is reached and the flow is still accumulating, the alarm function will be triggered. The alarm is a sharp sound pulse at every 2 seconds with the entire screen flashing.

If the flow is ceased, the alarm will be switched off automatically. If any flow starts, the alarm will come back on. User can also disable the alarm by resetting the value or switching off the flow.



To set the 8 digit alarm value (maximum accumulated flow), please press or to enter the desired value and press **Fun** to confirm the enter.

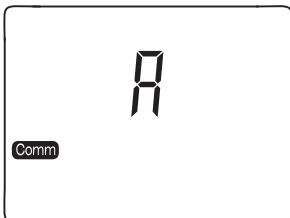
When the value is confirmed, the meter will start to save the value, and the process takes about 3 seconds, and the screen will show “Setting...”. Please do not interrupt until “Done” is displayed. The screen will then automatically return to the menu selection screen.

### 7.2.6 Reset the accumulation value



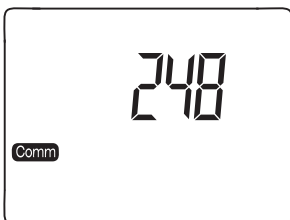
The function allows user to nullify the accumulated flow value. By selecting this menu (Clear), the accumulated flow will become zero. After press **(Fun)**, the screen will show "Setting...". Please do not interrupt until "Done" is displayed. The screen will then automatically return to the menu selection screen.

### 7.2.7 Communication menu



This function allows user to select single meter communication or communication network via RS485 (Modbus). After selecting this menu, the communication status is shown by the flashing letter at the center of the screen. **A** indicates single meter operation while **b** represents the Modbus networking status. Press **▲** or **▼** can alter the current status. Then press **(Fun)** to confirm.

If your selection is **b**, after press **(Fun)** you will enter into the address selection menu as indicated below:



The meter address contains 3 digits, and can be any one from 001 to 255. Press **▲** or **▼** to change the digit when it flashes, and press **(Fun)** to confirm the change. After the last digit, the meter will start to save the changes that you have made. The process will take about 3 seconds and please do not interrupt the process until it shows "Done". The screen will automatically return to menu selection screen.

### 7.2.8 Exit

When all parameters are set as desired, select the "Exit" menu to exit and return to normal operation interface.

### 7.2.9 Offset setting

Press **▲** and **▼** for more than 2 sec, the meter will measure the offset.

**Note:** Before offset setting, please close the valve and ensure there is no flow in the pipeline.

## Communication

This product support RS485 Modbus protocol.

### 8.1 Cable definition

Cable	Name	Definition
Red	VCC	Power supply (+)
Green	RS485A	RS485A
Brown	RS485B	RS485B
Blue	NC	Not connected
Black	GND	Power supply (-)

### 8.2 Communication port settings

Baud rate: 57600 bps (Protocol A) / 9600 bps (Protocol B)  
 Data bits: 8 bits  
 Stop bits: 1 bit  
 Parity: None  
 Flow control: None

### 8.3 Communication protocol

The meter supports two protocols. Protocol A can be used for single meter communication only while Protocol B is the standard Modbus.

#### 8.3.1 Protocol A

Protocol A can only used for single meter communication and it can be used to access the meter via the communication port.

Digital communication mode: user can then access the digital data via the port:

- send 0x9d via RS485 and receive the same returned 9x9d;
- send 0x54 via RS485 and receive the same returned 9x54.

The meter will be at Digital communication mode at which the data from the meter will be sent via RS485 in an interval of 4 seconds. The data are in the following format:

***S=sssss F=ffffff A=aaaaa.aaa T=tttt;\r\n***

*S=sssss* Voltage code, variable length;

*F=ffffff* Mass flow rate, variable length (Equal to ffff.ff SLPM);

*A=aaaaa.aaa* Accumulated flow (Equal to aaaaa.aaa NCM), 3 decimal digits, variable integer digits.

*T=tttt* Gas temperature, variable length (Equal to ttt.t°C)

**Attention: there is a space before *F*, *A* and *T*.**

Local display mode: use this mode when only LCD display is needed.

- send 0x9d via RS485 and receive the same returned 9x9d;
- send 0x00 via RS485 and receive the same returned 0x00.

#### 8.3.2 Protocol B

Protocol B is based on the standard Modbus communication protocol. It supports either single meter communication or multi-meter networking. For detailed information, please contact the manufacturer.

### Parts in Package

MF5806 mass flow meter	1	User manual	1
QC certificate	1	Connection cable (optional)	1
AC adapter	1		

## Safety and Maintenance

### 10.1 Safety Precautions

The product is designed for use with general purpose gases such as air and nitrogen. It is advised that the products are best used for non-explosive clean gases. The meters cannot be used for gas metrology of fluoride or fluoride containing gases. For updates of the product certification information, please contact manufacturer or visit [www.Siargo.com](http://www.Siargo.com). Use for other gases such as extreme corrosive and toxic agents may cause the product malfunctioning or even severe damages. The product sealing is ensured to work under working pressure of 0.8MPa and is leakage proof before the shipment. But cautions and further leakage test are important at installation as well since any leakage could cause severe safety issue. The power supply for this product is 4-AA batteries or external adapter, all precautions and measures for electrical voltage handling must apply.

**Attention: any alternation and/or improper use of the product without the permission of the manufacturer can cause unpredicted damages and even injuries or other severe situations. Siargo or any of its employees, subsidiaries shall not be hold and indemnified against such consequences due to such circumstances via improper use of the product.**

### 10.2 Cautions for change of batteries

When the battery life indicator on LCD shows low, batteries should be changed immediately or switch to AC power. Do not allow battery leakage inside the meter.

### 10.3 Maintenance

**Attention: without prior permission of the manufacturer, please do not attempt to alter any parts of the product as it may cause unrecoverable damages. If there are questions or doubts, please contact manufacturer immediately before further actions.**

All maintenance of the sensor should be performed by trained and certified personnel by Siargo.

## Customer Service

Siargo Ltd. is making every effort to ensure the quality of the products. In case of questions, and or product supports, please contact customer service at the address listed below. We will respond your request in a timely fashion and will work with you toward your complete satisfaction.

Customer service and all orders should be addressed to

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