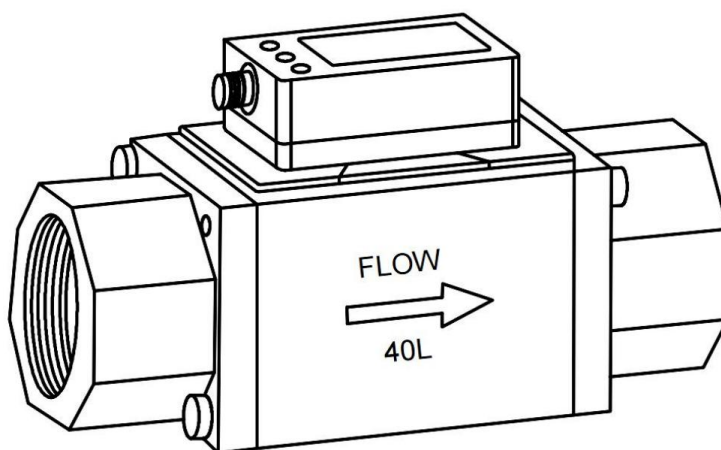


MVFM Vortex Flow Meter

User Manual





Preface

Thank you for choosing the precision micro-type vortex flow meter, independently developed and manufactured by our company.

This user manual provides instructions for using the product correctly and safely. To prevent damage to the instrument, ensure optimal performance, and guarantee stable operation, please read this manual carefully before installation and commissioning.

Step 1: Inspection upon Unpacking (Must Read)

1. **Check the packing list:** Verify that all accessories are included.
2. **Visual inspection:** Check whether the instrument is intact and confirm that there is no visible damage caused by transportation.
3. **Power-on test:** After connecting the instrument to an external **DC 24V** power supply, check whether the display screen shows the default interface completely and that the buttons operate normally.
4. **Confirm installation accessories:** Make sure all parts required for installation are available.

Step 2: Installation Instructions (Must Read)

1. **Select an appropriate installation environment:**
The ambient temperature should be **between -20°C and 65°C**, and **humidity should be between 5% and 90%**.
(Refer to Section 6.1 *Instrument Installation Environment Requirements* for details.)
2. **Purge the pipeline:** Ensure that there are no welding slags or solid residues inside the pipeline.
3. **Observe the flow direction mark** on the instrument during installation. Reverse installation is prohibited.
Ensure that the **upstream and downstream straight pipe sections** meet the specified requirements.
(Refer to Section 6.2 *Pipeline Installation Requirements* for details.)
4. **Open the upstream valve slowly** to prevent water hammer or air hammer that could damage the instrument.
5. **Pressure test and leak detection:** Ensure that the pipeline is leak-free.
6. **Perform an air-tightness test:** Verify that the installation meets sealing requirements.
7. **Slowly open the downstream valve** to ensure smooth and stable fluid flow through the instrument.



8. Put the instrument into normal operation.

Note: The installation environment should avoid strong vibration. Vibration can cause unstable readings or false flow indications under static conditions.

For mild vibration environments, add **pipe support clamps** at about **5D upstream and downstream**, and use **flexible connectors** when connecting to fans or other vibrating equipment.

Product Introduction

Product Overview

The **MVFM Series** is a vortex water flow sensor based on the principle of **Von Kármán vortices**. Under certain conditions, when a fluid of a given volumetric flow passes around a bluff body, two alternating rows of vortices with opposite rotational directions are generated downstream of the body—this is known as the **Kármán vortex street**.

The sensor's internal chip detects the frequency of these vortices and calculates the corresponding flow rate of the liquid through the pipe.

The MVFM vortex flow sensor features **long service life**, **high resistance to contamination**, **high accuracy**, **fast response**, and **zero drift**, making it an ideal choice for **demanding yet cost-sensitive OEM applications**.

Product Features

- ◇ **No moving parts**, ensuring high reliability, easy installation, and no need for on-site calibration or maintenance.
- ◇ **Flexible installation options**: can be mounted **horizontally, vertically, or at an inclined angle** according to the pipeline layout.
- ◇ **Low pressure loss** (approximately **1/4–1/2** that of an orifice plate), belonging to the energy-saving class of flow instruments.
- ◇ **Wide measuring range with high accuracy**, typically reaching **±1.5%** for standard liquid measurement.
- ◇ **Multiple circuit protection modes**, strong surge resistance, and excellent environmental adaptability.
- ◇ **Pulse frequency measurement**—the output frequency is linearly proportional to the actual flow rate of the fluid, ensuring **zero drift and stable performance**.
- ◇ **High-precision sensing probe with piezoelectric crystal design** for stable signal output.



◇ **Multiple output options** available: **pulse, 4–20mA**, and **RS485**, with **no need for customization**.

Product Applications

- ◇ Monitoring of **cooling water**, **circulating water**, and **critical water flow**
- ◇ Flow monitoring for **organic and inorganic solutions**
- ◇ Flow monitoring in **anti-freeze systems**, **spray systems**, and **wastewater protection**
- ◇ Monitoring of **highly contaminated fluids**, featuring strong anti-fouling capability

Technical Specifications

- ◇ **Standard Compliance:** JB/T9249-2015 *Vortex Flow Meter*
- ◇ **Nominal Pressure:** 0–1000 KPa
- ◇ **Ambient Temperature:** -20°C to +65°C
- ◇ **Medium Temperature:** 0–140°C
- ◇ **Material:**
 - Sensor body: PPS
 - Threaded straight pipe section: Stainless steel 304
- ◇ **Flow Range:** 0.5–40 L/min (depending on pipe size).
Refer to the *Flow Range Table* for specific standard flow data.
- ◇ **Accuracy:** $\leq \pm 1.5\%$ F.S (flow), $\leq \pm 2.0^\circ\text{C}$ (temperature)
- ◇ **Repeatability:** $< 0.5\%$
- ◇ **Turndown Ratio:** 1:10
- ◇ **Connection Type:** G1/2 (threaded)
- ◇ **Power Supply:** 24 VDC
- ◇ **Output Signals:**
 - Three-wire pulse output
 - Three-wire 4–20 mA output
 - RS485 output
- ◇ **Protection Grade:** IP65
- ◇ **Measured Medium:** Liquid
- ◇ **Transmission Distance:**
 - Pulse output ≤ 300 m
 - 4–20 mA output ≤ 1200 m (load resistance $\leq 500\ \Omega$ @ 24V)
 - RS485 output ≤ 1000 m

Flow Measurement Range

The flow measurement range varies with the meter's nominal diameter. When selecting a meter, it is **essential to choose based on the expected flow range** rather than simply the pipe size. Selecting a meter solely based on pipe diameter can easily lead to insufficient flow and measurement errors.

For vortex flow meters, the **flow range is determined based on the actual operating flow**. During selection, convert the expected flow into the operating flow and compare it with the *Flow Range Table*. Ideally, the commonly used flow should fall near the **middle of the meter's measurement range**.

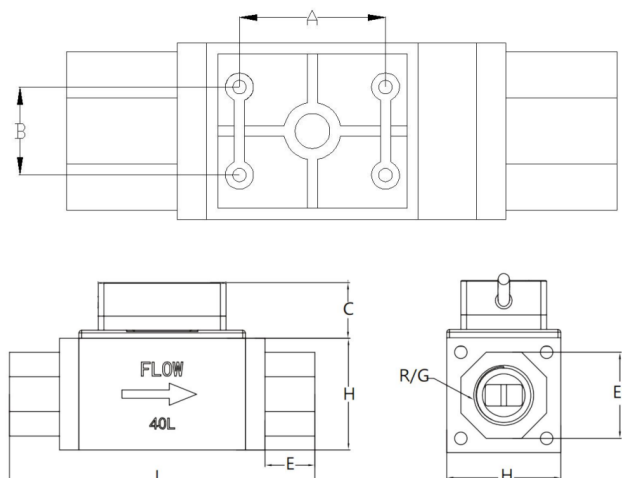
Reference Conditions

- **Medium:** Liquid (normal temperature water)
- **Temperature:** 20°C
- **Density:** 998.2 kg/m³

Reference Flow Range Table under Standard Conditions

Model Code	Measuring Range (L/min)	Frequency Range (Hz)	Meter Coefficient Range (P/m ³)
MVFM-4L	0.5–4	69–553	8,300,000
MVFM-16L	2–16	66–528	1,980,000
MVFM-40L	5–40	65–520	780,000
MVFM-100L	10–100	/	Reserved
MVFM-250L	50–250	/	Reserved

Structural Dimensions



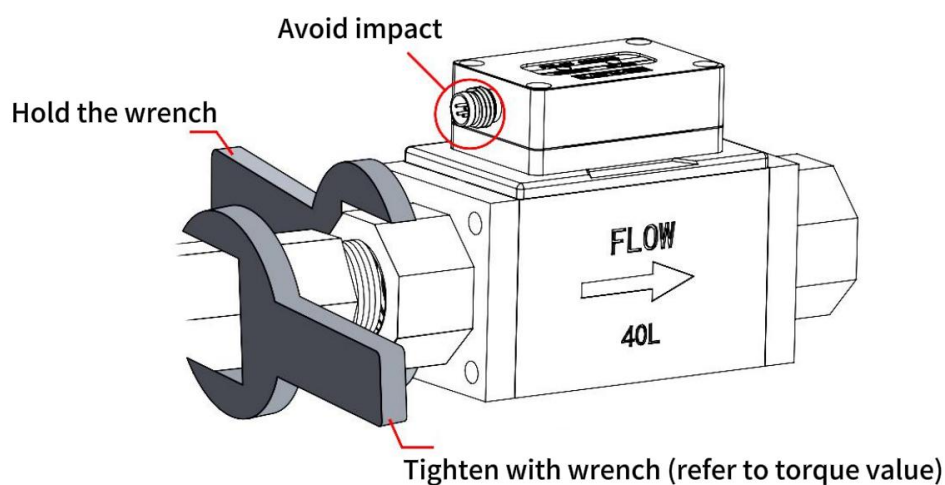
Model Code	Mounting Hole (A, mm)	Mounting Hole (B, mm)	Housing Height (C, mm)	Body Height (H, mm)	Body Length (L, mm)	Locking Position (E, mm)	Connector Octagon (ES, mm)	Thread Size (R/G)
MVFM-4L	25	15	22	30	88	16	27	G½
MVFM-16L	25	15	22	30	95	19	27	G½
MVFM-40L	40	15	22	40	108	18	28	G½
MVFM-100L	/	/	/	/	/	/	/	/
MVFM-250L	/	/	/	/	/	/	/	/

Product Installation

Piping Method

When connecting the product to piping, use a wrench on the **metal parts integrated with the piping section** (pipe fittings) only. Force applied to any other part may **damage the flow meter**.

Important: Do not apply force to the connector, as this may **damage the connector section**.





Strictly Observe Safe Torque Values During Piping

Thread Size	Applicable Torque Range	Safe Torque Limit
G 3/8	22–24 N·m	< 200 N·m
G 1/2	28–30 N·m	
G 3/4	28–30 N·m	
G 1	36–38 N·m	
G 1-1/4	40–42 N·m	< 250 N·m
G 1-1/2	48–50 N·m	

Installation Instructions:

- Do **not allow sealing tape** to enter the inside of the pipe during installation.
- Ensure that **piping connections** are properly tightened to prevent liquid leakage.
- Over-tightening beyond the specified torque range may **damage the switch**.
- Under-tightening below the specified torque may cause the **threaded connection to loosen**.

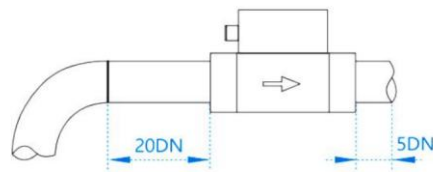
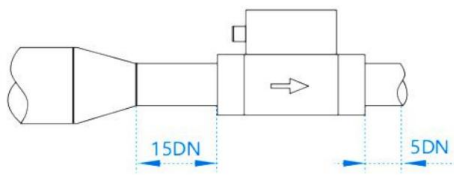
Instrument Installation Environment Requirements

1. The flow meter should preferably be installed **indoors**. If installed outdoors, it must have a **protective cover** to prevent rain and direct sunlight, which could shorten the meter's service life.
 - When wiring, the shielded cable should form a **U-shape**, entering the meter housing from **bottom to top** to prevent rainwater from entering the housing along the wires.
2. Avoid installing the meter near **strong external magnetic fields, high-power electrical equipment, or high-frequency devices**, and do not share the same power supply with these devices.
3. Do not share a power supply with devices that pollute electricity, such as **variable frequency drives or welding machines**. If necessary, install a **power purifier**.
4. Avoid installation in **high-temperature, extremely cold, corrosive, or excessively humid environments**. If unavoidable, take appropriate protective measures for the flow meter.
5. The meter should **not be installed on strongly vibrating pipelines**. If necessary, install **pipe clamps 2D upstream and downstream** and add **vibration-damping pads** to improve vibration resistance.

6. Ensure there is **sufficient space around the installation point** for wiring and regular maintenance.

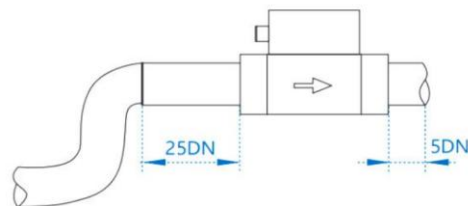
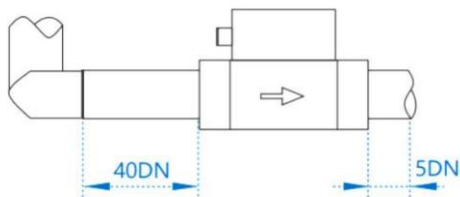
Pipeline Installation Requirements

The flow meter requires **specific lengths of straight pipe upstream and downstream** of the installation point. Improper straight pipe lengths can disturb the flow profile and affect measurement accuracy. The required straight pipe lengths depend on the **nominal diameter (DN) of the meter** (unit: mm) and must follow the diagram below.



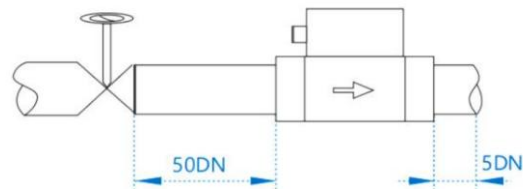
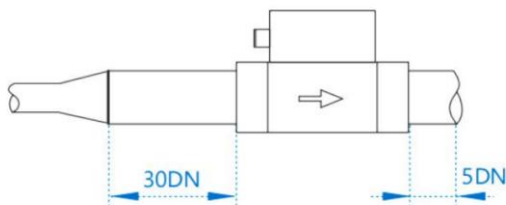
Concentric Reducing Full-Bore Valve

A 90-Degree Elbow



Two 90-Degree Elbows in Different Planes

Two 90-Degree Elbows in the Same Plane



Concentric Pipe Expansion

Control Valve Half-Open (Not Recommended)

Installation Precautions

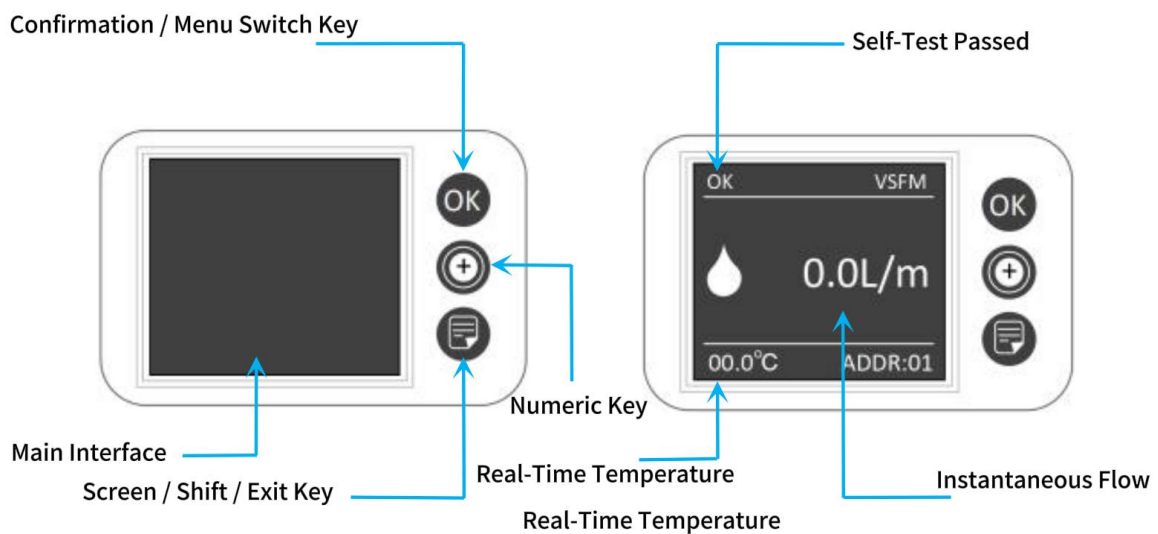
1. **Control valves** should preferably **not be installed upstream** of the flow meter. If used, install them at least **10D downstream** of the meter.
2. The **inner diameters of upstream and downstream piping** should be the same. If there is a difference, the pipe inner diameter (D_p) and the flow meter body inner diameter (D_b) must satisfy:

$$0.98 D_b \leq D_p \leq 1.05 D_b$$

3. The **upstream and downstream pipes** should be **concentric with the flow meter body**, and the **eccentricity** must be less than **0.05Db**.
4. The flow meter can be installed **horizontally, vertically, or at an inclined angle**.
5. When measuring **high or low temperature media**, appropriate **thermal insulation** must be applied.
 - For **high-temperature media**, the internal temperature of the converter (inside the display housing) should generally **not exceed 70°C**.
 - For **low-temperature media**, condensation may occur inside the converter, reducing the insulation resistance of the circuit board and affecting normal operation.

Panel Diagram

LCD Display Type



Key Function Description

- **Confirmation Key:**
 - In the password setting interface, it functions as a **shift key**.
 - In the sub-menu interface, it acts as the **confirmation key**.
- **Numeric Key:**
 - In the password and menu setting interfaces, it is used to **modify values**.
- **Shift Key:**

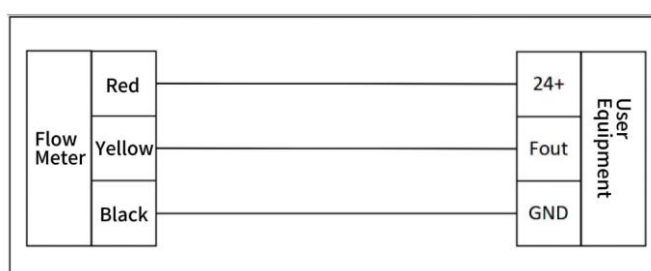
- On the main interface, pressing it allows **switching between screen menus**.
- In the menu setting interface, it functions as a **shift key**.

Aviation Connector Cable Wiring Definition

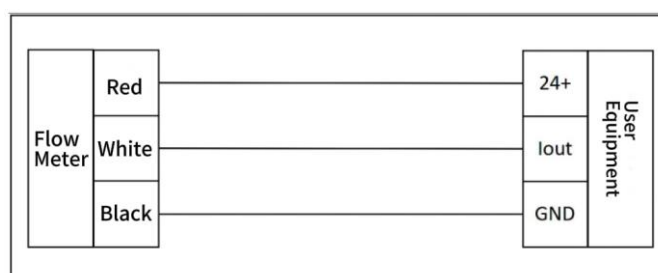
No.	Cable Color	Function Description
1	Red	External power supply; DC 24V positive input
2	Black	External power supply; DC 24V negative input
3	Yellow	Pulse output positive; use red, black, and yellow wires for three-wire pulse output.
4	White	Current output is positive; use red, black, and white wires for three-wire current output.
5	Brown	RS485 output signal A
6	Blue	RS485 output signal B

Electrical Wiring Diagram

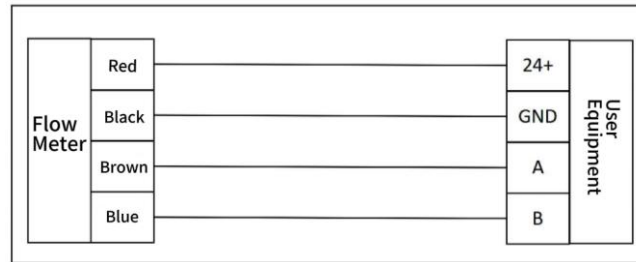
- **Three-Wire Pulse Signal Output Wiring**



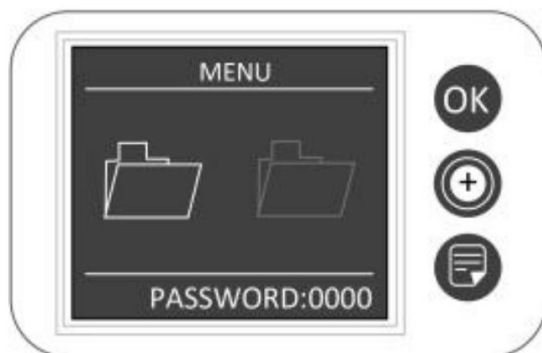
- **Three-Wire 4–20 mA Signal Output Wiring**



• Four-Wire RS485 Output Wiring



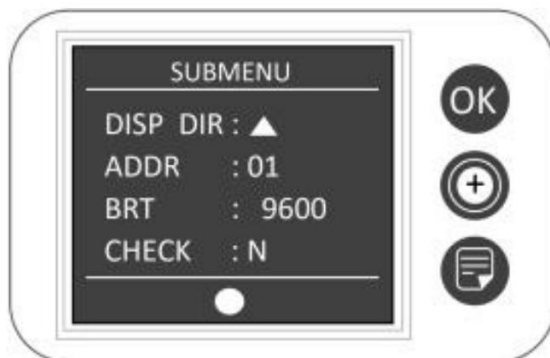
Display Menu Description



Press the **Shift Key** once, then press the **Confirmation Key** once.

Use the **Numeric Keys** to modify values and the **Shift Key** to move between digits.

After entering the password **2010**, press the **OK Key** to enter the **RS485 Settings Menu**.

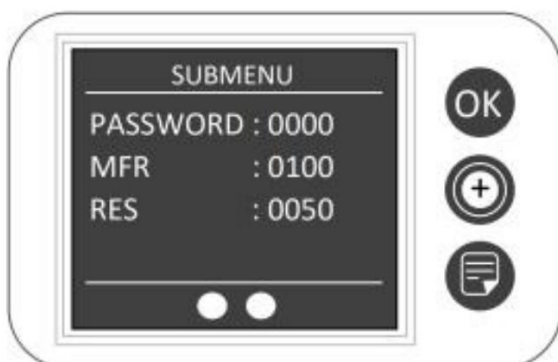


DISP DIR: Adjust the **LCD orientation**.

ADDR: Set the **RS485 address**, default is **01**.

BRT: Set the **RS485 baud rate**, default is **9600**. Supported rates: **4800, 9600, 19200, 38400**.

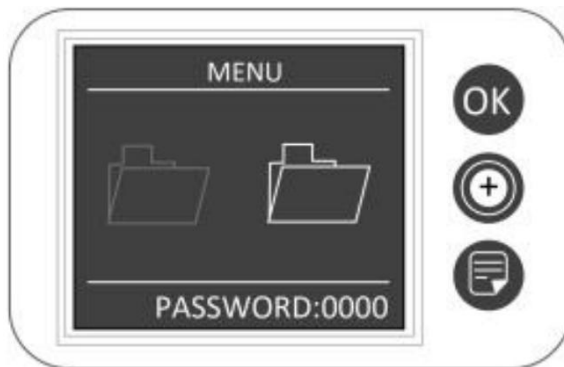
CHECK: Set the **RS485 parity bit**: **N** = No parity; **O** = Even parity; **E** = Odd parity



PASSWORD: Modify the **user password**.

MFR: Set the **full-scale range** corresponding to the 4–20 mA output.

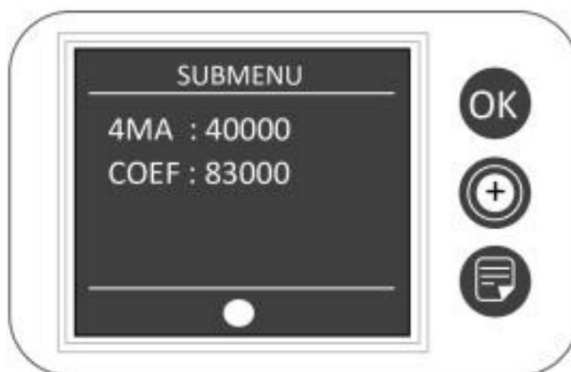
RES: Set the **lower cut-off frequency**.



Press the **Shift Key** twice, then press the **Confirmation Key** once.

Use the **Numeric Keys** to modify values and the **Confirmation Key** to shift between digits.

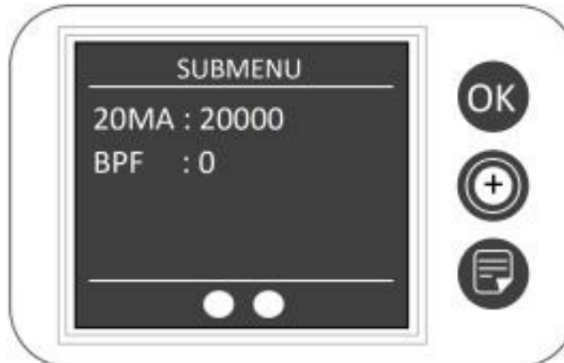
After entering the password **4321**, press the **OK Key** to enter the **Current Calibration Menu**.



4mA: Calibrate the **zero-point value** of the 4–20 mA current output.

COEF: Instrument coefficient, unit **P/m³**. The value entered must be **divided by 100**.

Example: If the calibration coefficient is **8,300,000 P/m³**, enter **83,000**.



20mA: Calibrate the **full-scale value** of the 4–20 mA current output.

BPF: Set the **gain**:

0 = High gain

1 = Low gain

Routine Maintenance

Wiring Method

The vortex flow meter is a **high-precision measurement instrument**, and improper use can reduce its service life. Many users know how to operate the device but may overlook the importance of **regular maintenance**, which is as critical as proper usage.



Our company has extensive experience and unique insights into the **daily maintenance of vortex flow meters**. We provide expert guidance to ensure that after purchase, customers receive reliable **after-sales support** with peace of mind.

The following are our recommended **routine maintenance practices** for vortex flow meters:

1. **Regular Cleaning, Inspection, and Recalibration:**
 - It is recommended to **calibrate the vortex flow meter every two years**.
2. **Display Check:**
 - Monitor the instrument display and evaluate readings. Any abnormality should be investigated promptly.
3. **Keep Filters Clear:**
 - Ensure that filters are unobstructed.
 - If blocked by impurities, the **pressure difference between the filter's inlet and outlet** will increase.
 - Clear blockages promptly, as they can significantly reduce flow measurement accuracy.
4. **Careful Maintenance:**
 - Pay special attention to protecting the **vortex shedding body** and **sensor probe** during inspection or repair.
 - Do not disassemble the instrument components without understanding the fault, as this may **damage the probe or compromise the seal**, causing sensor leakage.
 - For unresolved issues, contact the manufacturer for assistance.

Quality Assurance

Warnings and Personal Safety

- **Do not use this product** in safety protection devices, emergency stop equipment, or any application where product failure could cause personal injury, unless for a specific purpose or with authorized use.
- **Before installation, handling, use, or maintenance**, refer to the product datasheet and user manual. Failure to follow these instructions may result in **death or serious personal injury**.
- Our company **will not be liable** for any personal injury or death arising from misuse, and is **exempt from any claims** against company management, employees, affiliated agents, or distributors, including costs, claims, and legal fees.



- Due to the **intrinsic design of components**, the product is **sensitive to static electricity**. To prevent damage or performance degradation caused by electrostatic discharge, please adopt necessary **anti-static measures** during application.
- Our company is **only responsible for defects** occurring when the product is used in conditions that meet its technical specifications.
- No guarantee is made for **use in non-recommended or special scenarios**.
- We do not assume any responsibility for the **reliability of the product when used with other non-company products or circuits**.



Appendix 1 – RS485 Communication Protocol

The vortex flow meter uses the **MODBUS-RTU protocol**, supporting **only the Read command 03**. **Write operations are not supported**. The **baud rate is fixed at 9600**, other rates are not supported.

Modbus Poll Software RTU Connection:

- **Display Option:** Floating Pt (data display format – floating point)
- **Command 03:** HOLDING REGISTER (read holding registers)
- **Device ID:** Internal address of the flow meter
- **Address:** Starting address of the meter parameters, from **1 to 14**
- **Length:** Data length, must satisfy **Length + Address ≤ 14**

Parameter Addresses:

- **40001–40002:** Reserved
- **40003–40004:** Instantaneous flow
- **40005–40006:** Medium temperature
- **40007–40008:** Frequency

Appendix 2 – Selection Table

Model Explanation:

MVFM-	L	GK	M	IFR	Description
MVFM					Product Name
	04L				Flow Range
	16L				Flow Range
	40L				Flow Range
	100L				Flow Range
	250L				Flow Range
		GK			Process Connection: Internal Thread G
		/			Process Connection: Internal Thread R
		/			Process Connection: Internal Thread NPT
			M		Electrical Connection: M8-6Pin Aviation Connector (standard 20 cm)
				IFR	Current Output / Pulse Output / RS485 Full Function