



# USER MANUAL

 ONE-STOP SOLUTION

 ONE-STOP SERVICE

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## MQF Series Coriolis Mass Flowmeter User Manual

The MQF Series Coriolis mass flowmeter is simple and reliable, compact in structure, easy to install and maintain, and powerful in function:

- Accurate data and high repeatability; suitable for a wide range of flow and process conditions.
- A single instrument can directly measure mass flow and density online; it can also measure volume flow and temperature, achieving multiple functions with one device.
- Unaffected by fluid characteristics, temperature, pressure, density, or viscosity, and no compensation conversion is required.
- Extremely rugged and durable; suitable for installation in any position without flow straightening or straight pipe runs, simplifying installation and saving costs.
- No moving parts, minimizing maintenance cost.

The MQF Series Coriolis flowmeter is designed for the most common flow and density measurement applications. The U-tube series, slightly curved V series, and triangular CLS series provided by us are compact in shape and can be installed almost anywhere. Their integrated electronic components make installation and setup very convenient.

The touch screen provides a friendly operating interface. Users can directly and conveniently perform instrument configuration operations, and it solves a series of problems that may occur with traditional LCD transmitters.

## 1. Safety Information

The safety information provided in this manual is used to protect personnel and equipment. Before proceeding to the next operation, please carefully read each safety message.

### Safety and Certification Information

If correctly installed according to the instructions in this manual, the product complies with the Chinese national standard and verification regulation JJG 1038-2008 Coriolis Mass Flowmeter.

### Return and Replacement Requirements

Before returning for repair, please ensure that the appearance of the mass flowmeter is not damaged, that the inside of the instrument has been cleaned and purged, and that no residual liquid remains. When returning for repair, please also return the product accessories and related documents supplied at shipment.

### Return Repair Policy

Returned equipment must comply with the MQF Series maintenance return requirements. Following these procedures ensures compliance with the regulatory requirements of government transport agencies and helps provide a safe working environment for our employees. If the return requirements are not followed, we will not accept the returned equipment.

- Accessories include: basic fittings supplied with the goods, flanges, brackets for remote installation, power supply, output modules, etc.
- Related documents include: instruction manual, certificate of conformity, test report, etc.

### Return Repair Requirements

- Any installed equipment, regardless of whether medium has flowed through it, will be judged as used.
- Used equipment must be cleaned before being returned to the factory. Our company refuses to repair equipment that has not been cleaned.
- Potentially hazardous materials must not be returned to the factory. For the safety of our employees, we refuse to repair or clean instruments containing materials.
- Instruments with pipeline blockage or confirmed corrosion leakage must not be returned to the factory and shall be treated as scrapped. If they must be returned, please contact our after-sales personnel first.
- Please provide proper packaging and transport protection when returning to the factory, and leave a detailed description of the fault phenomenon, return contact person, and other information in the packing box.
- During return repair, user cooperation enables faster, better, and safer results.

## 2 Before Getting Started

### 2.1 About This Manual

This manual is the operation manual for the Coriolis mass flowmeter MQF series. It explains the installation methods for our regular flowmeters (10 mm - 300 mm, 1/2" - 12" diameter), micro flowmeters (1 mm - 8 mm, 1/25" - 5/16" diameter), and remote flowmeter transmitters, as well as transmitter wiring, mass flowmeter commissioning, common fault maintenance, and user menu operations, for customer operation.

### 2.2 Risk Description

If a hazardous situation is not avoided, minor or moderate injury may or could result.

Incorrect voltage connection may damage the instrument. Please connect the power supply strictly according to the voltage markings on the wiring terminals.

Note: Unauthorized personnel may cause significant damage and/or incorrect configuration to end-user equipment. Protective measures should be taken to avoid any intentional or unintentional unauthorized use.

Physical security is an important part of any security procedure and is the basis for protecting your system. Physical access should be restricted to protect user assets. This applies to all systems used in the plant area.

### 2.3 Related Documents

All product documents can be found in the product operation manual supplied with the product.

The delivered product may include:

- Packing list
- Mass flowmeter operation manual
- Certificate of conformity
- Manufacturer test report

## 3 Installation Preparation

### 3.1 Installation Checklist

- Ensure that the hazardous area rating specified on the sensor certification label is suitable for the current installation environment of the instrument.

Warning: Failure to comply with these certification instructions may cause an explosion, resulting in personal injury or death.

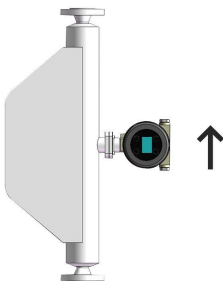
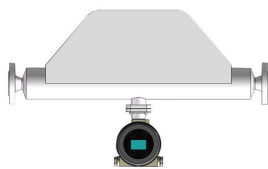
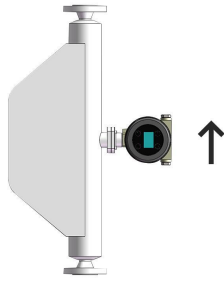
- Check the current ambient temperature and process temperature to ensure that they are within the instrument limits.

- If the sensor is equipped with an integrated transmitter, no wiring is required between the sensor and transmitter. Lay signal and power cables according to the wiring instructions in the transmitter installation manual.
- If the transmitter is equipped with remote transmitter electronics, connect the wiring between the sensor and transmitter according to the instructions in this manual, and then lay power and signal cables according to the transmitter installation manual.

Cable specification: 8-core three-layer shielded cable; armored cable (special note required when ordering).

Maximum cable length: 300 meters.

- For best performance, install the sensor in the preferred orientation. As long as the flow tubes are always full of process fluid, the sensor can operate normally regardless of orientation.

| Process           | Preferred Orientation                                                               | Second Preferred Orientation                                                         | Alternative Suitable Orientation                                                      |
|-------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Liquid and slurry |   |   |   |
| Gas               |  |  |  |

- When installing the instrument, make the flow direction arrow on the sensor housing consistent with the actual flow direction of the process fluid. The flow direction can also be selected by software, enabling forward and reverse flow.

### 3.2 Best Practices

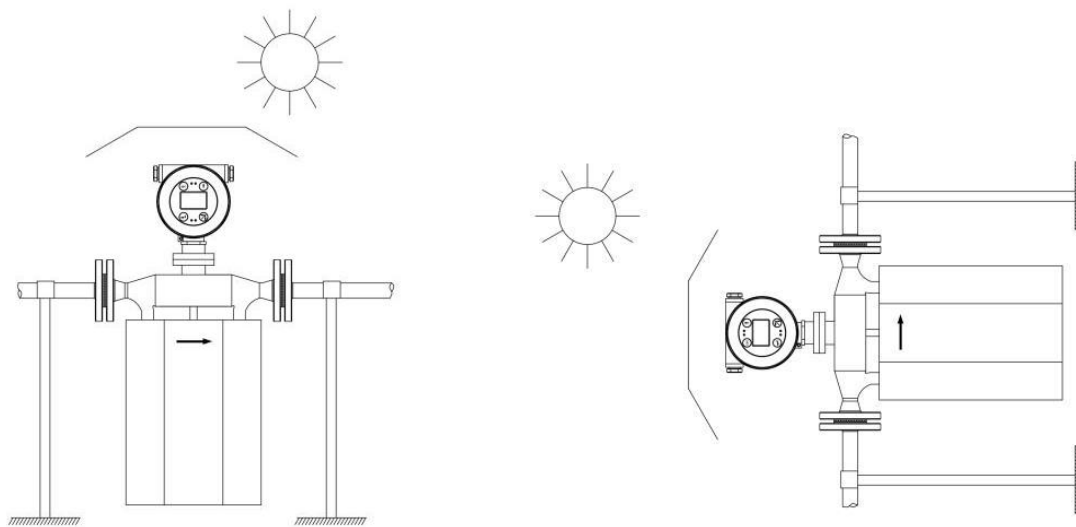
The following information can help users make the best use of the sensor.

- The MQF Series sensor requires no straight pipe run. No straight pipe run is required upstream or downstream of the sensor.
- Ensure that the sensor flow tubes are filled with process medium.
- The numbers of the sensor and transmitter must correspond one-to-one. The transmitter must not be replaced at will, otherwise measurement errors may occur. For the transmitter number, refer to the nameplate number; for the sensor number, refer to the stamped number on the top rod.

- If the gas content in the liquid is high, a gas-liquid separator must be installed at the front end of the flowmeter inlet.
- When thermal insulation is required for measuring high-temperature fluid, the insulation shell or heat tracing pipe must not directly contact the sensor housing. Our company can provide insulation shells specially designed for Coriolis sensors, used for steam or heat-transfer-oil insulation tracing, or electric heating tape tracing (to be ordered).
- The measured fluid shall be in a suitable flow state. If the natural environmental conditions make the flow state of the fluid unsuitable, external improvement shall be adopted. The fluid temperature can be adjusted (heating/cooling, insulation) so that the measured fluid is in a suitable flow state.
- Installation direction: confirm that the arrow direction on the sensor nameplate is consistent with the flow direction of the fluid, that is, the direction in which the fluid flows through the pipe.
- After the flowmeter wiring is completed, the front and rear end covers shall be tightened after wiring. The cable entries shall be tightened, and the rubber sealing rings inside the cable entries shall not be removed. Seal properly to prevent water ingress. If the flowmeter is used outdoors, rainproof and sunshade measures are preferred.

### Outdoor Rainproof and Sunshade

The figure below shows rainproof and sunshade methods for outdoor use.



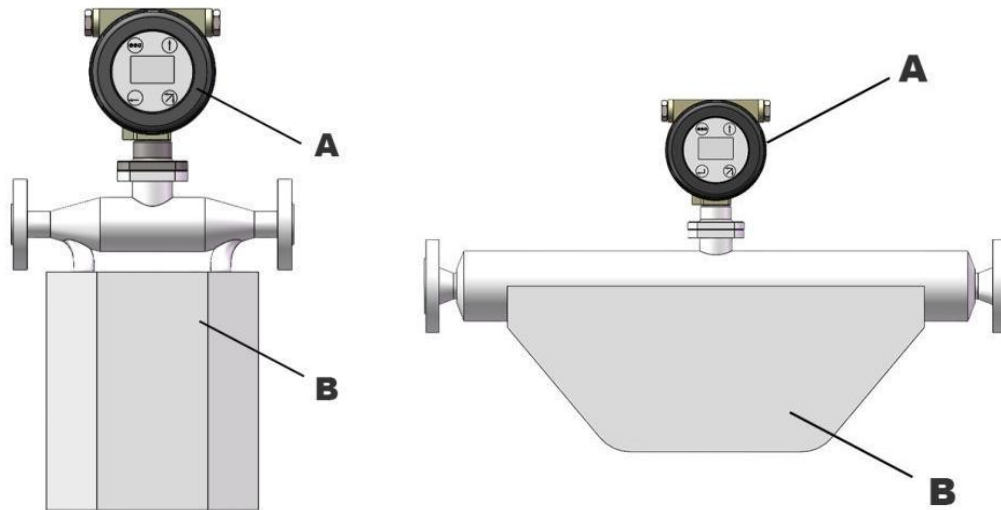
## 3.3 Installation Types

### Transmitter Connection Method

Installation type indication for MQF Series instruments:

This transmitter connection method represents integrated or remote type.

#### 3.3.1 Integrated Installation Type



The transmitter is directly mounted on the sensor. An integrated transmitter does not require independent transmitter installation.

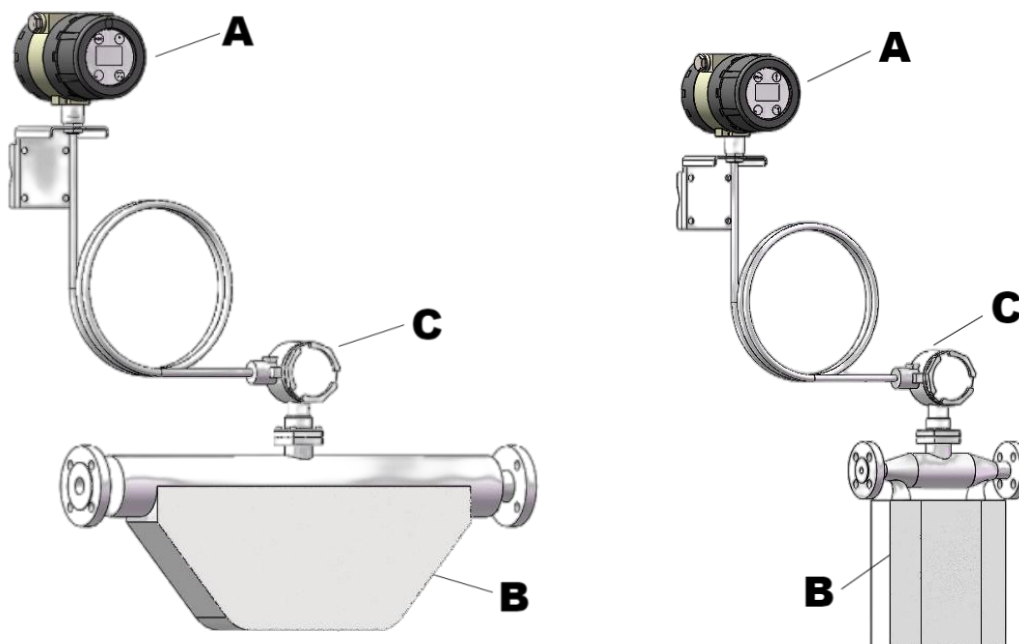
A: Transmitter B: Sensor

### 3.3.2 Remote Installation Type

The remote Coriolis mass flowmeter has two wiring methods: aviation-plug quick connection and explosion-proof junction-box connection. The aviation-plug quick connection is very simple and convenient and does not require additional wiring. The explosion-proof junction box is provided to facilitate on-site conduit installation by the customer.

- Aviation-plug wiring: after arriving on site, the customer connects it by themselves. Quick plug connection makes installation very simple and requires no wiring. Power supply and input/output must be connected to the transmitter on site.
- Explosion-proof junction box: the 8-wire connection between the transmitter and sensor must be wired on site. Power supply and input/output must be connected to the transmitter on site.

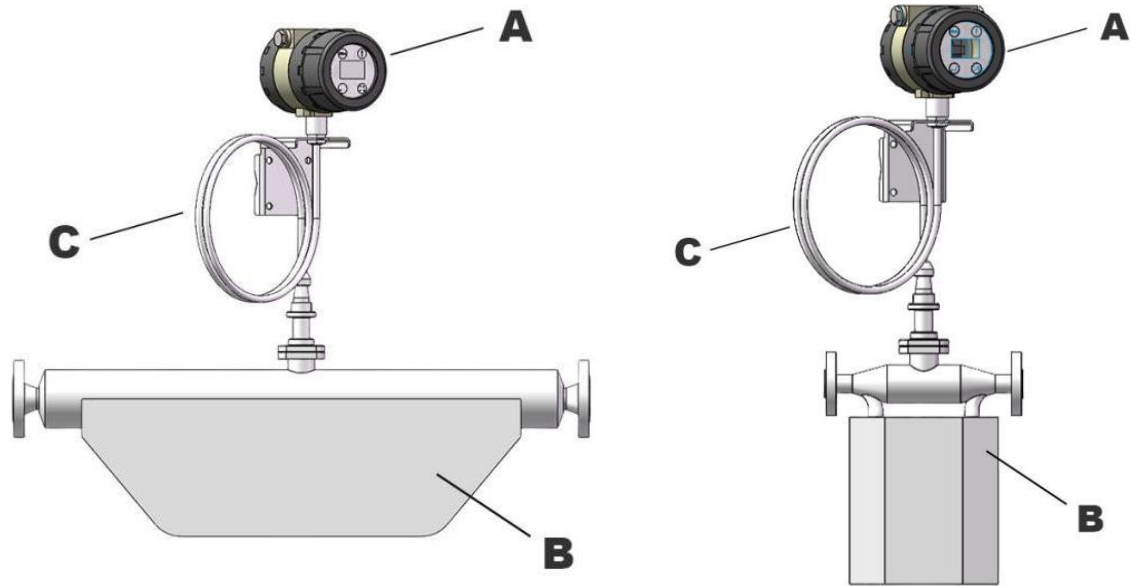
Remote explosion-proof junction box wiring is shown in the figure:



A: Transmitter

B: Sensor

C: Explosion-proof junction box



Remote aviation-plug wiring is shown in the figure:

A: Transmitter

B: Sensor

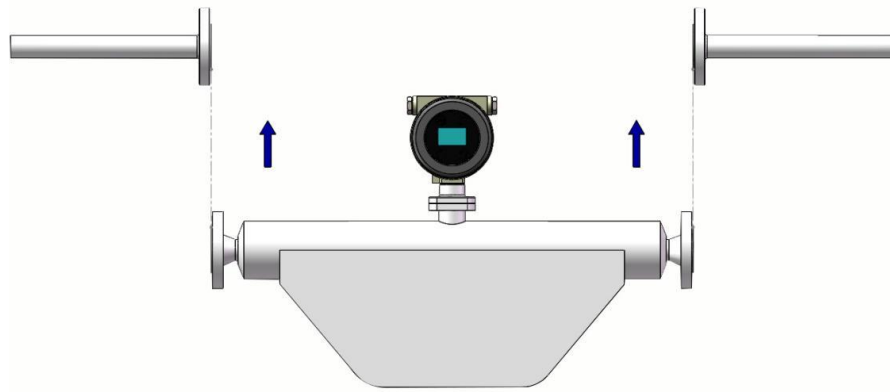
C: Special connecting cable for remote instrument

### 3.3.3 Conversion Between Remote and Integrated Types

Because the connecting parts for integrated and remote types are different, the standard remote or integrated product currently cannot be replaced on site at any time. If there are special requirements, for example, the integrated and remote types need to be freely replaceable and convertible on site, please contact the manufacturer before ordering. Special customization can be supported. If no advance statement is made, all shipped products are provided as standard products by default.

- If, after receiving the ordered product, the customer needs to change the product from integrated type to remote type, please contact us. The manufacturer needs to separately mail the connecting parts, cable, and mounting bracket to the customer. After receiving the accessories, the customer can replace them on site.
- If, after receiving the ordered product, the customer needs to change the product from remote type to integrated type, because the replacement method is relatively complex, the complete unit must be returned to the manufacturer for special processing and replacement.

## 3.4 Installation Method



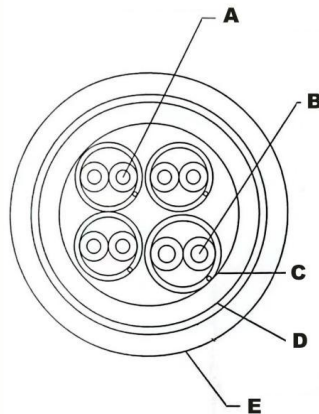
- Do not use the sensor to support the pipeline.
- The sensor shall be suspended above the ground and must not be placed on the ground.
- Provide supports for the pipelines before and after the flowmeter.

### 3.5 Maximum Cable Length Between Sensor and Transmitter

The MQF Series provides two types of cables: shielded cable and armored cable.

Default shielded cable

| Cable Type     | Maximum Length                       |
|----------------|--------------------------------------|
| Shielded cable | Default 2 meters; maximum 300 meters |



3\*(2\*22AWG)+1\*2\*18AWG

A: 3\*(2\*22AWG), conductor:  $\phi$  0.25\*7 (tinned wire), pitch: 15 mm, insulation thickness: 0.4 mm, colors: (gray, blue), (white, green), (orange, black).

B: 1\*2\*18AWG, conductor:  $\phi$  0.25\*19 (tinned wire), insulation thickness: 0.3 mm, colors: brown, red.

C: Cable outer diameter: 7.4 +/- 0.2 mm.

D: Sheath thickness: 0.5 mm, blue PE sheath.

E: Sheath thickness: 1.0 mm, blue SU1509 sheath, cable outer diameter: 12 mm.

### 3.6 Output Options

The transmitter is directly mounted on the sensor. An integrated transmitter does not require independent transmitter installation. Power supply and input/output must be connected to the transmitter on site.

| Output Method                               | Description                                         |
|---------------------------------------------|-----------------------------------------------------|
| One 4-20 mA, one 0-10 kHz, ModBus 485       | Standard                                            |
| Two 4-20 mA, ModBus 485, HART               | Equipped with 0-10 kHz to 4-20 mA conversion module |
| One 4-20 mA, one 0-10 kHz, ModBus 485, HART |                                                     |
| One 4-20 mA, one 0-10 kHz, FF, HART         | FF requires customization                           |

#### Output Signals

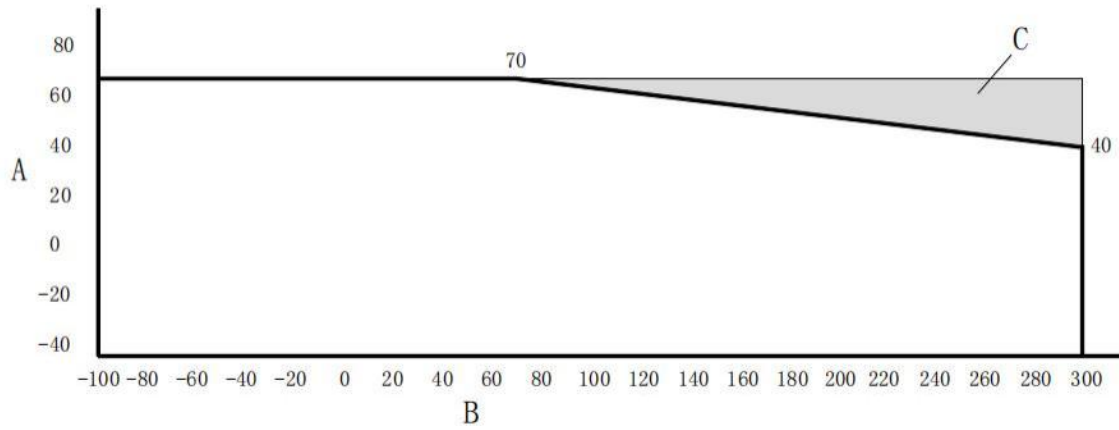
| Channel                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Channel A                                    | One active 4-20 mA output; <ul style="list-style-type: none"> <li>• non-intrinsically safe;</li> <li>• isolated by +50 VDC from all other outputs and ground wires;</li> <li>• maximum load limit: 700 ohms;</li> <li>• can output mass flow, volume flow, density, temperature, and component A content;</li> <li>• within the 4 to 20 mA range, the output is linear with the process variable.</li> </ul> |
| Channel B<br>(active frequency/pulse output) | Non-intrinsically safe; <ul style="list-style-type: none"> <li>• can be used to indicate mass flow or volume flow;</li> <li>• full scale 1-10 kHz adjustable;</li> <li>• within 10000 Hz, the output is linear with the selected flow.</li> </ul>                                                                                                                                                            |
| Channel C                                    | One RS-485 (Modbus RTU) can be used to connect a Modbus host system. Supported baud rates: 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 128000.                                                                                                                                                                                                                                                     |

#### Output Correspondence

| Output Method            | Description                                                       |
|--------------------------|-------------------------------------------------------------------|
| 4-20 mA                  | Mass flow, volume flow, density, temperature, component A content |
| 0-10 kHz                 | Mass flow, volume flow                                            |
| ModBus 485 communication | All                                                               |

### 3.7 Temperature Limits

Installation is allowed at temperatures within the bold line.



A: Ambient temperature (deg C)

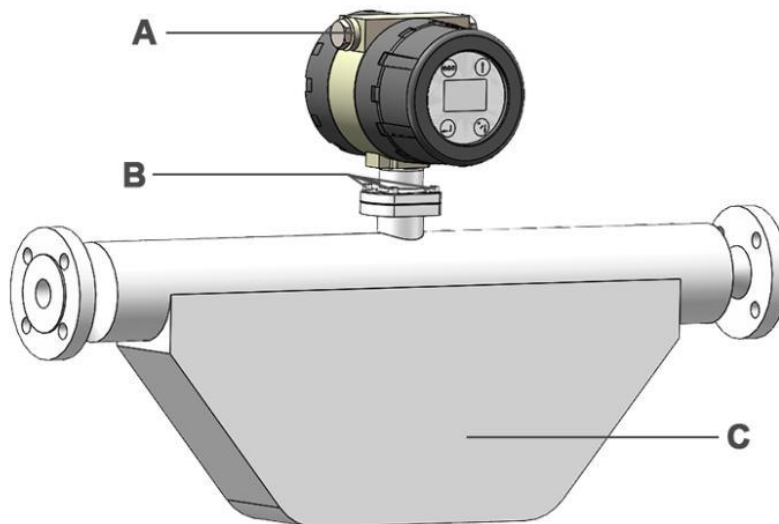
B: Process temperature (deg C)

C: Shaded area applies only to remote-mounted electronics

The temperature of the electronic components must be kept between -40 deg C and +70 deg C. It is recommended not to store the electronic components for a long time at temperatures below -40 deg C.

## Rotating the Transmitter on the Sensor

### 3.8 Integrated Transmitter Assembly



A: Transmitter

B: Base screw

C: Sensor

#### Procedure

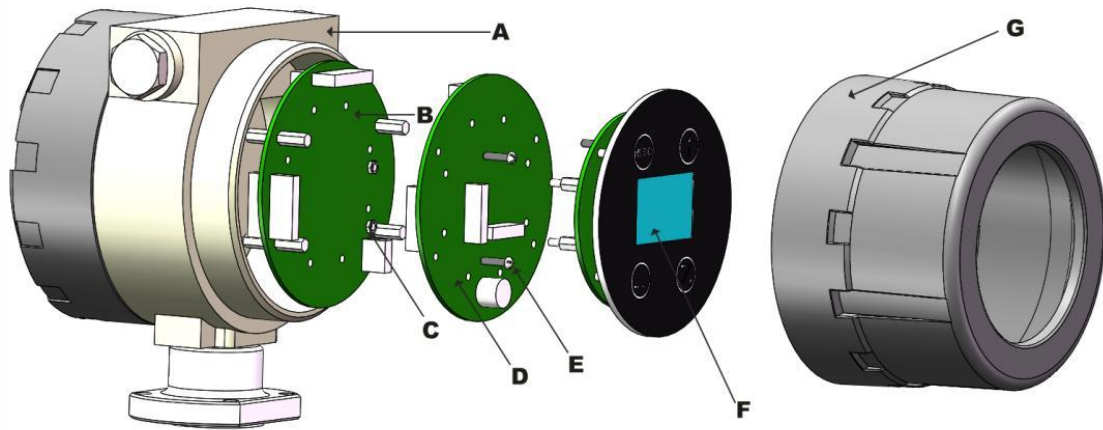
1. Unscrew the four base screws (M5) respectively.
2. Rotate the transmitter 180 degrees.

3. Tighten the base bolts.

Important: Do not rotate the transmitter more than 360 degrees in any direction.

### 3.9 Rotating the Main Board on the Transmitter

Display component:



- A: Transmitter housing
- B: Fixing plate
- C: M3 nut
- D: CPU board
- E: M3 screw
- F: Display module
- G: Display cover

Note:

- The transmitter display is a touch screen with full touch keys.
- After the housing cover is removed, it can still work normally.

#### Procedure

1. Turn off the power supply of the equipment.
2. Rotate the display cover counterclockwise and remove it from the housing.
3. Remove the four screws on the CPU board counterclockwise.
4. Hold the transmitter housing and carefully pull the CPU board and display module out of the fixing plate until the pin terminals of the bottom frame are separated from the fixing plate.
5. Remove the four inner nuts on the CPU board counterclockwise.
6. Hold the CPU board and carefully pull the display module out of the CPU board until the pin terminals of the bottom frame are separated from the CPU board.
7. Rotate the display module to the required position.
8. Tighten the four inner nuts on the CPU board clockwise.
9. Align the CPU board and display module with the pins and plug them in firmly.
10. Tighten the four screws on the CPU board clockwise.

### 3.10 Transmitter Wiring Instructions

Note:

- The integrated instrument has been connected and installed before leaving the factory.
- The remote sensor and transmitter are connected through a special cable and connector.
- If the sensor and transmitter need to be installed separately, please specify the transmission distance before ordering. The maximum distance shall not exceed 300 meters.
- During installation, ensure that the transmitter number and sensor number are consistent and cannot be replaced with each other.
- The power supply shall be subject to the physical stamp.
- Please check carefully before wiring to avoid damage to the flowmeter.

Very important:

- The frequency and current outputs of the transmitter are active signals by default.
- External power supply is strictly prohibited. Incorrect external power supply may damage the instrument.

#### 3.10.1 Requirements for Power Cables

For long-distance laying of power cables, use thicker power cables as far as possible. In principle, the wire size must not be less than 1.0 mm<sup>2</sup>. Too thin a power cable may cause a large power voltage drop.

#### 3.10.2 Requirements for Frequency and Current Acquisition Lines

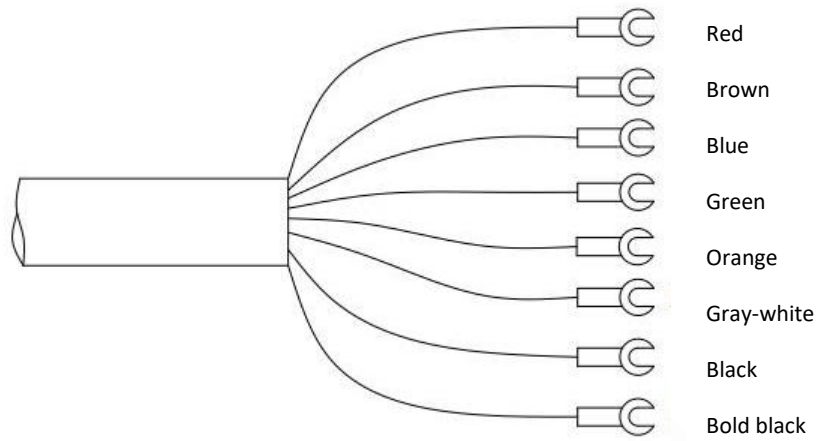
Shielded twisted-pair cables must be used, especially in applications with electromagnetic interference. Proper shield grounding can minimize the influence of electromagnetic interference on instrument signal transmission.

#### 3.10.3 Requirements for 485 Communication Wires

It is recommended to use a dedicated 485 twisted shielded cable. It is characterized by oxygen-free copper material and a very short twisting pitch, which can maximize the stability of 485 communication and reduce the possibility of packet loss.

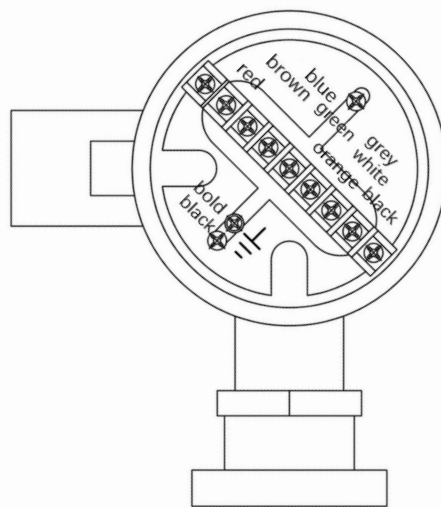
#### 3.10.4 Junction Box and Wire Definition

Wire definition

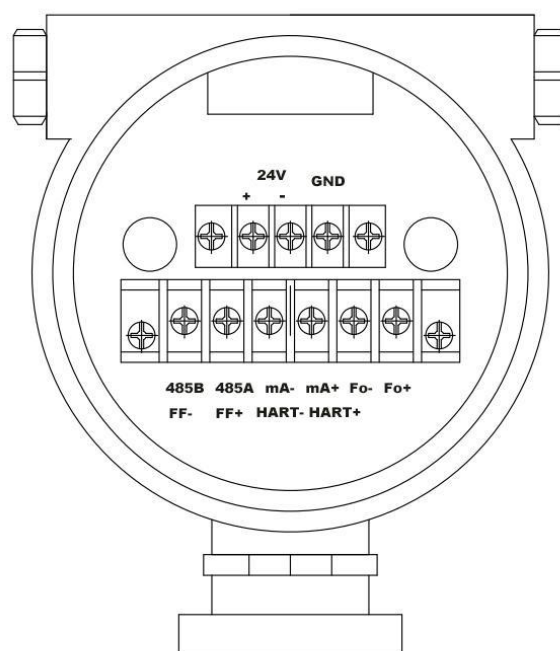


#### Explosion-proof junction box definition

Please carefully check the corresponding colors in the explosion-proof junction box.



#### 3.10.5 Transmitter Wiring Instructions



| Terminal                                                                          | Description                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| A / B                                                                             | The power supply shall be subject to the physical stamp.<br>24VDC: current not less than 500 mA, A(+) / B(-); 220VAC: A(L) / B(N). |
| Fo+ / Fo-                                                                         | Frequency output and pulse equivalent are optional (instantaneous mass flow or volume flow), modified under password "020".        |
| mA+ / mA-                                                                         | Current output (instantaneous flow or density optional).                                                                           |
| 485A / 485B                                                                       | RS-485 communication, factory setting: 9600, N 8 1, no parity. Local address: 1.                                                   |
| FF+ / FF-                                                                         | Only one FF bus communication mode can be selected.                                                                                |
| GND                                                                               | Signal shield ground.                                                                                                              |
|  | Instrument housing ground.                                                                                                         |

### 3.11 Installation Precautions - Large-Diameter Mass Flowmeter

#### (10 mm - 300 mm, 1/2" - 12" diameter)

- The installation position of the flowmeter should be away from interference sources that can cause mechanical vibration of the pipeline, such as pumps on process pipelines. If sensors are used in series on the same pipeline, special care should be taken to prevent mutual influence caused by resonance. The distance between sensors shall be at least greater than three times the width of the sensor outline.
- For the installation position of the flowmeter, attention should be paid to the expansion, contraction, and deformation of the process pipeline caused by temperature changes. In particular, it must not be installed near the expansion joint of the process pipeline. If installed near an expansion joint, the expansion and contraction of the pipeline will cause lateral stress, causing the sensor zero point to change and affecting measurement accuracy.
- The installation position of the flowmeter should be away from industrial electromagnetic interference sources, such as high-power motors and transformers. Otherwise, the self-resonant vibration of the measuring tube in the sensor will be disturbed, and the weak signal detected by the velocity sensor may be submerged in electromagnetic interference noise. The sensor should be at least 5 meters away from transformers and motors. Do not use walkie-talkies within one meter of the flowmeter.
- Because the measured medium is liquid, the installation position of the flowmeter should ensure that the fluid in the pipeline always fills the sensor measuring tube. Maintaining a certain back pressure is beneficial to accurate measurement. The instrument should be installed at the lowest point of the pipeline. The flowmeter outlet pipeline is preferably level with or higher than the flowmeter outlet; at least it must not be lower than 1/2 of the total height of the flowmeter.
- The flowmeter installation flange must be coaxially connected with the pipeline flange to reduce installation stress and ensure measurement accuracy. During installation, ensure that the pipe supports support only the process pipeline; direct support of the sensor bottom is prohibited. Ensure that the sensor housing is suspended and does not contact any object.
- When the flowmeter is installed on a process pipeline, ensure that the pipeline system is firmly connected to stable supports at two positions on both the upstream and downstream sides of

the sensor. All threaded connections must be tightened. Clamping the process pipeline helps reduce potential vibration interference.

- Shutoff valves shall be installed upstream and downstream of the sensor.
- Eliminating installation stress: when installing the sensor, the most effective method is to first arrange the piping, pre-install the process pipeline, valves, and sensor as a whole, then hoist them, and then weld them to the main process pipeline. For the best stress elimination effect, keep the sensor, shutoff valves, and main process pipeline on the same axis.
- When installing the sensor, choose a suitable installation location. In addition to being away from vibration sources, in order to eliminate the influence of vibration on measurement, support rods should be used during installation to firmly support the pipeline and valves. The lower end of the support rod must be fixed on a stable foundation, and the upper end shall cooperate with pipe clamps to support the process pipeline. Do not use the sensor housing to support the sensor, pipeline, valves, pumps, etc.
- For convenient maintenance of the flowmeter, it is preferable to provide a bypass for the flowmeter.
- After initial installation, the flowmeter must be filled with medium and zero calibration shall be performed under static conditions. If the sensor needs to be disassembled and reinstalled, zero calibration must be performed again. When the medium temperature or pressure changes greatly, perform zero calibration under pressure or at the operating temperature as far as possible.
- Installation of shutoff valves and control valves: to ensure that no fluid flows during zero adjustment, shutoff valves shall be installed upstream and downstream of the flowmeter and no leakage shall be ensured. The control valve shall be installed downstream of the flowmeter. The flow rate of the flowmeter shall be adjusted by regulating the downstream control valve, so that the flowmeter maintains as high a static pressure as possible to prevent cavitation and flashing.
- Because it is a mass flowmeter, it is preferable to use mass flow units, such as "kg/h, t/h", and avoid volume flow units, such as "m<sup>3</sup>/h", as far as possible. In this way, the influence of density variation can be ignored. Mass flow is directly measured, while volume flow is converted, namely mass flow / density = volume flow.

### 3.12 Installation Precautions - Micro Mass Flowmeter

#### (1 mm - 8 mm, 1/25" - 5/16" diameter)

- Because it is a micro flowmeter, it must be fixed on a stable metal bracket or concrete wall to minimize external vibration interference to the flowmeter. The pipelines at the inlet and outlet ends of the flowmeter shall also be fixed properly to reduce the influence of pipeline installation stress on the flowmeter.
- The flowmeter installation position should be as far from the pump as possible to reduce the influence of the pump on the flowmeter, at least more than 1 meter. If a distance of more than 1 meter cannot be achieved, add a flexible connection between the pump outlet and the flowmeter inlet.
- Shutoff valves must be installed before and after the flowmeter. The medium flow direction shall be consistent with the arrow direction. When the flowmeter is used for the first time, zero calibration shall be performed according to the manual.

- Because it is a mass flowmeter, it is preferable to use mass flow units, such as "kg/h, g/h", and avoid volume flow units, such as "l/h", as far as possible. In this way, the influence of density variation can be ignored. Mass flow is directly measured, while volume flow is converted, namely  $\text{mass flow} / \text{density} = \text{volume flow}$ .
- The fluid should be kept at a uniform and steady flow as far as possible. If it is pulsating flow, it is preferable to install a damper or surge tank between the pump outlet and the flowmeter.

### 3.13 Temperature Limits

The sensor can be used within the process and ambient temperature ranges shown in the temperature limit diagram.

Note: In all cases, the electronic components must not be used at ambient temperatures below -40.0 deg C or above 70.0 deg C. If the sensor is to be used in an application where the ambient temperature exceeds the allowable range of the electronic components, the electronic components must be remotely mounted in a location where the ambient temperature is within the allowable range. Temperature limits may be more strictly restricted by hazardous-area certification.

For ambient temperature, we provide two transmitter options: -20 to 50 deg C (-4 to 122 deg F) and ultra-low-temperature LCD screen of -41 to 80 deg C (-41.8 to 176 deg F), for use in cold weather. If extreme severe weather such as blizzards may be encountered, the mass flowmeter is still recommended to be installed indoors. If it must be installed outdoors and the ambient temperature is below -41 deg C, separate insulation for the transmitter is required to ensure normal operation of the transmitter.

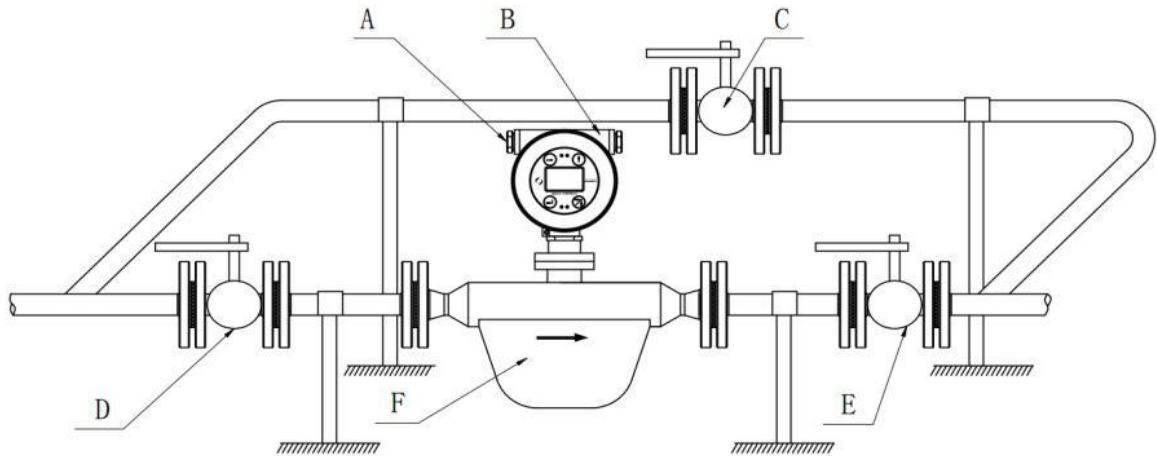
## 4 Installation Methods

### 4.1 Installation Method for Large-Diameter Mass Flowmeter (10 mm - 300 mm, 1/2" - 12" Diameter)

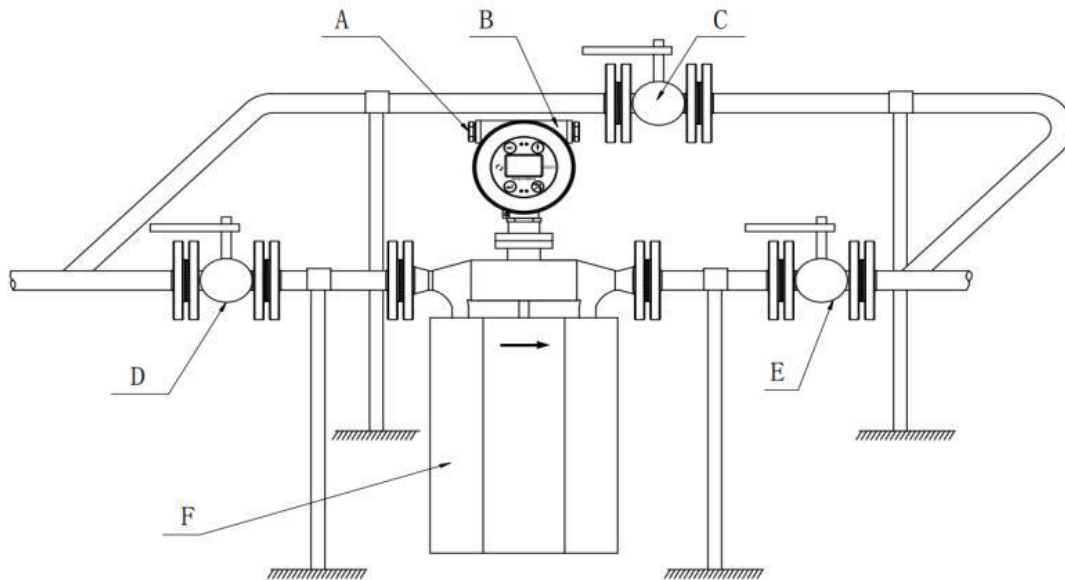
#### 4.1.1 Horizontal Installation

When measuring liquid with a mass flowmeter, horizontal installation is recommended. It can effectively discharge gas that may exist in the instrument measuring tube.

The figure below is a schematic diagram of horizontal installation of a slightly curved mass flowmeter:



The figure below is a schematic diagram of horizontal installation of a U-tube mass flowmeter:



A: Electrical interface: 1/2" NPT, M20\*1.5 can be specially customized

B: Transmitter

C: Bypass valve

D: Inlet valve

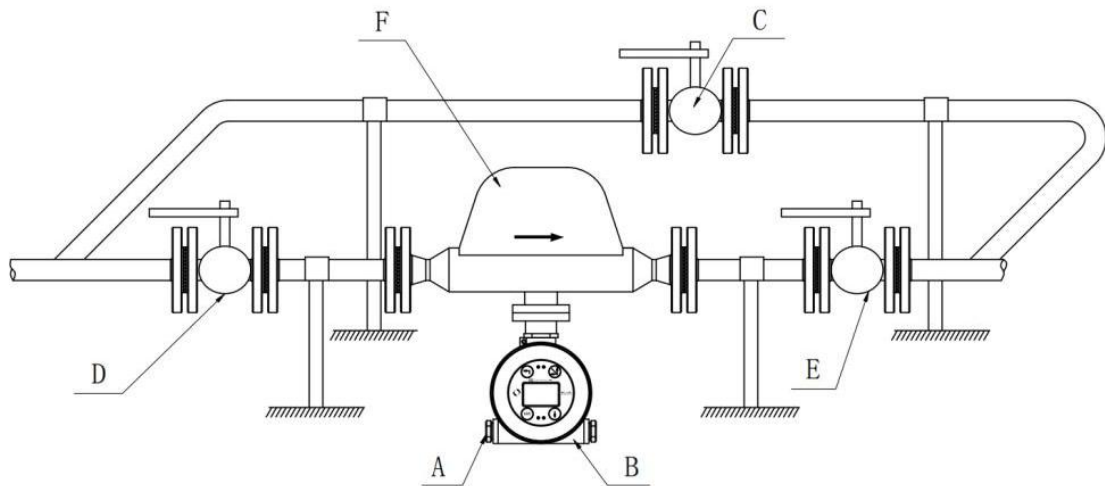
E: Outlet valve

F: Sensor

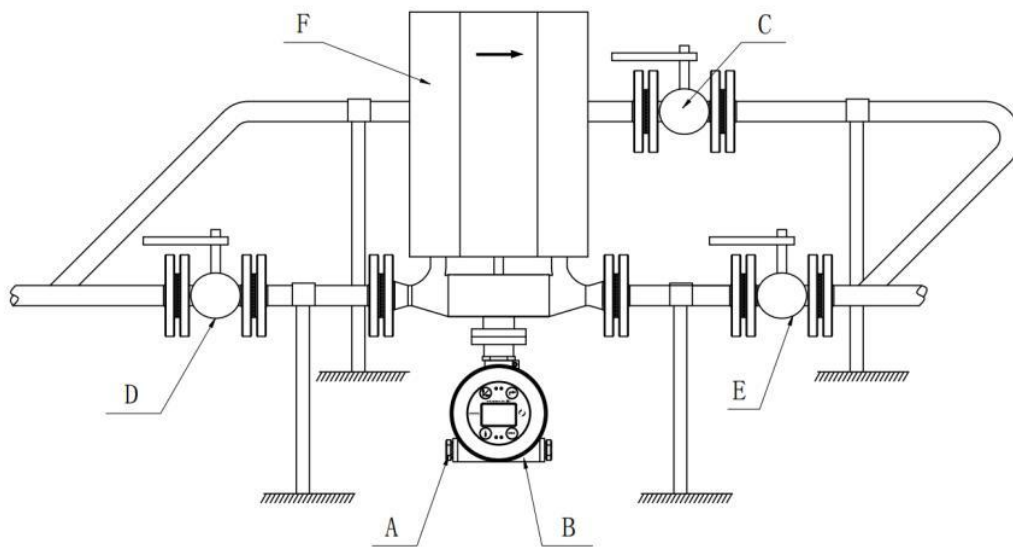
#### 4.1.2 Inverted Installation

This is the recommended installation method when the mass flowmeter measures gas. It can effectively discharge liquid that may exist in the instrument measuring tube.

The figure below is a schematic diagram of inverted installation of a slightly curved mass flowmeter:



The figure below is a schematic diagram of inverted installation of a U-tube mass flowmeter:



A: Electrical interface: 1/2" NPT, M20\*1.5 can be specially customized

B: Transmitter

C: Bypass valve

D: Inlet valve

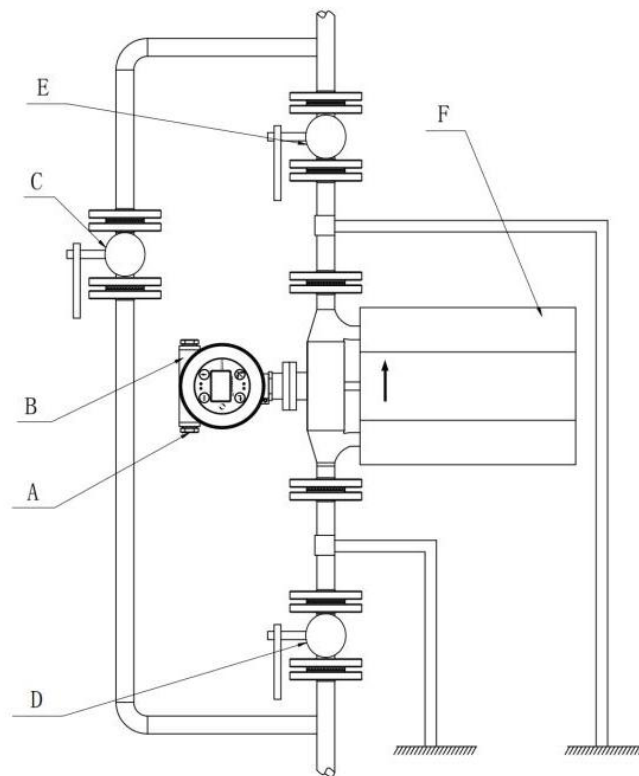
E: Outlet valve

F: Sensor

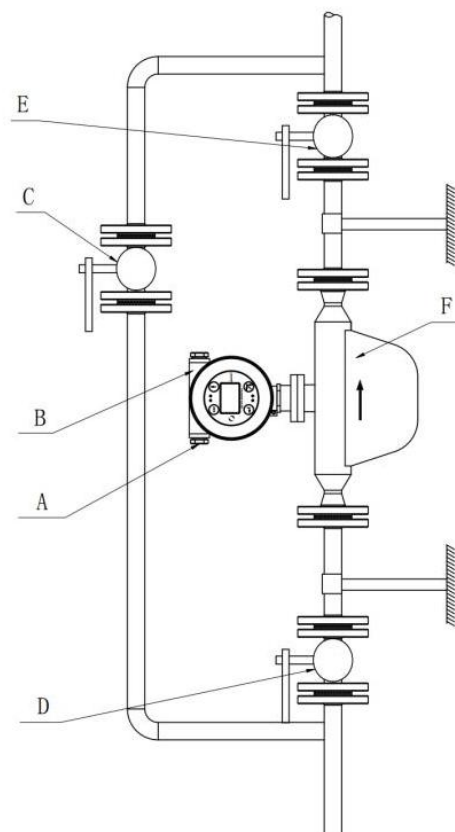
#### 4.1.3 Flag-Type Installation

Recommended installation method for high-viscosity liquids, suspensions, liquid-solid two-phase flow, or certain special process occasions, such as high-temperature easily solidified fluids that require pipeline fluid to be drained at the end of production.

The figure below is a schematic diagram of flag-type installation of a U-tube mass flowmeter:



The figure below is a schematic diagram of flag-type installation of a slightly curved mass flowmeter:



A: Electrical interface: 1/2" NPT, M20\*1.5 can be specially customized

B: Transmitter

C: Bypass valve

D: Inlet valve

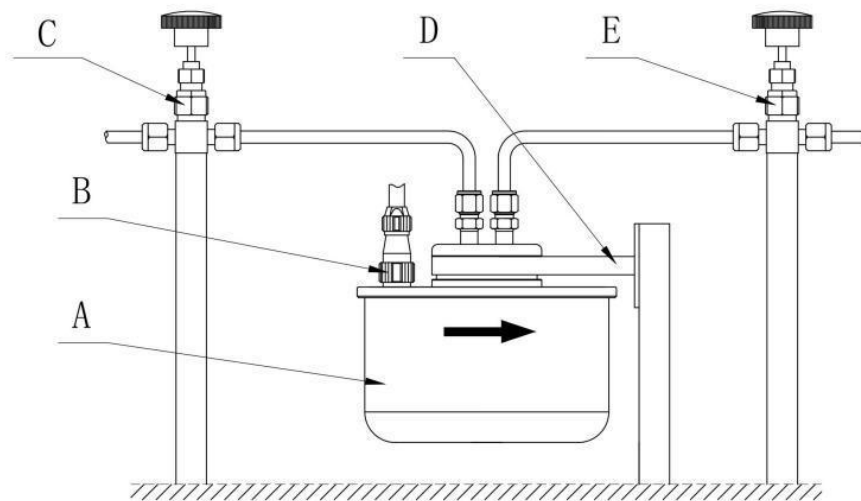
E: Outlet valve

F: Sensor

## 4.2 Installation Method for Small-Diameter Mass Flowmeter (1 mm - 8 mm, 1/25" - 5/16" Diameter)

### 4.2.1 Horizontal Installation

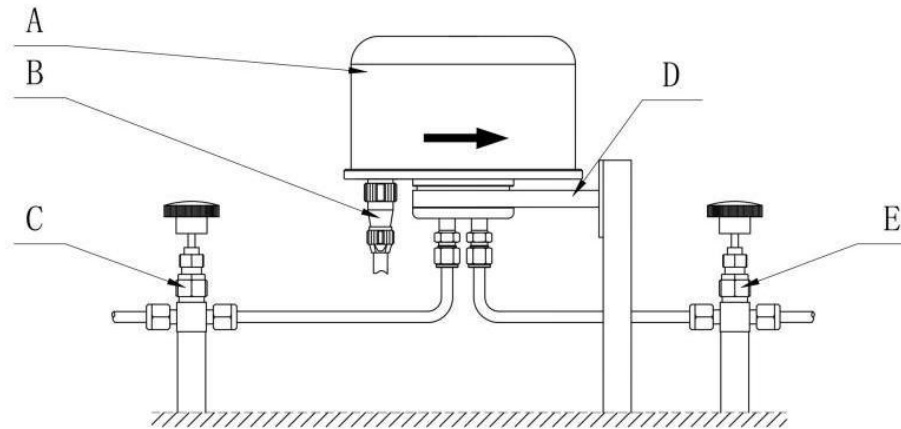
The figure below is a schematic diagram of horizontal installation for liquid measurement with a small-diameter flowmeter:



- A: Sensor
- B: Quick plug connected to transmitter
- C: Inlet valve
- D: Mounting bracket
- E: Outlet valve

### 4.2.2 Inverted Installation

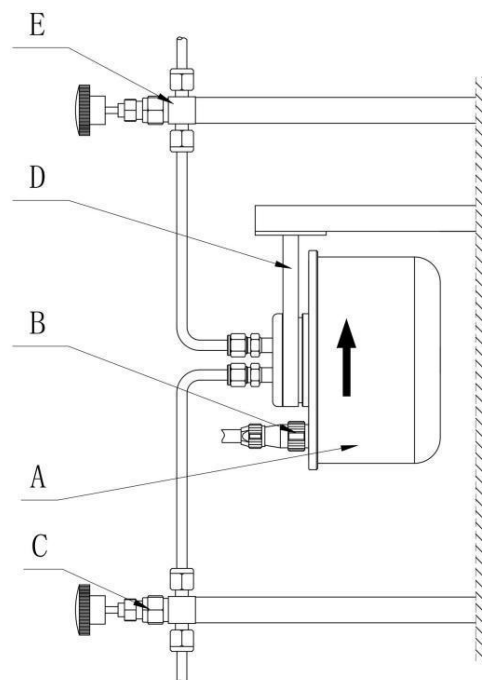
The figure below is a schematic diagram of inverted installation for gas measurement with a small-diameter flowmeter:



- A: Sensor
- B: Quick plug connected to transmitter
- C: Inlet valve
- D: Mounting bracket
- E: Outlet valve

#### 4.2.3 Flag-Type Installation

The figure below is a schematic diagram of flag-type installation for liquid measurement with a small-diameter flowmeter:



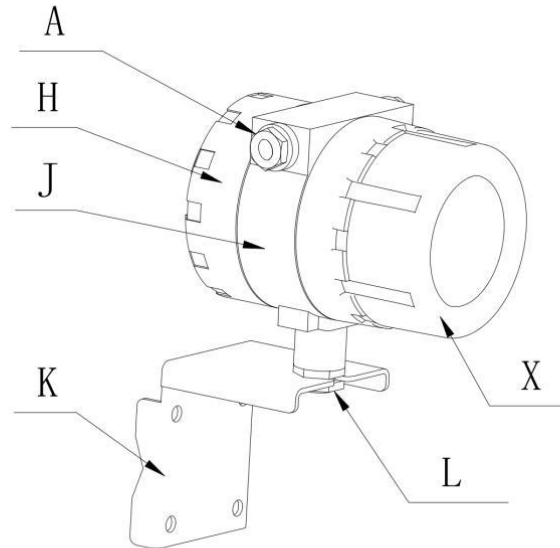
- A: Sensor
- B: Quick plug connected to transmitter
- C: Inlet valve

D: Mounting bracket

E: Outlet valve

## 4.3 Remote Flowmeter Transmitter Installation

### 4.3.1 Remote Flowmeter Transmitter Components



A: Electrical interface 2-1/2" NPT

H: Wiring end cover

J: Core housing

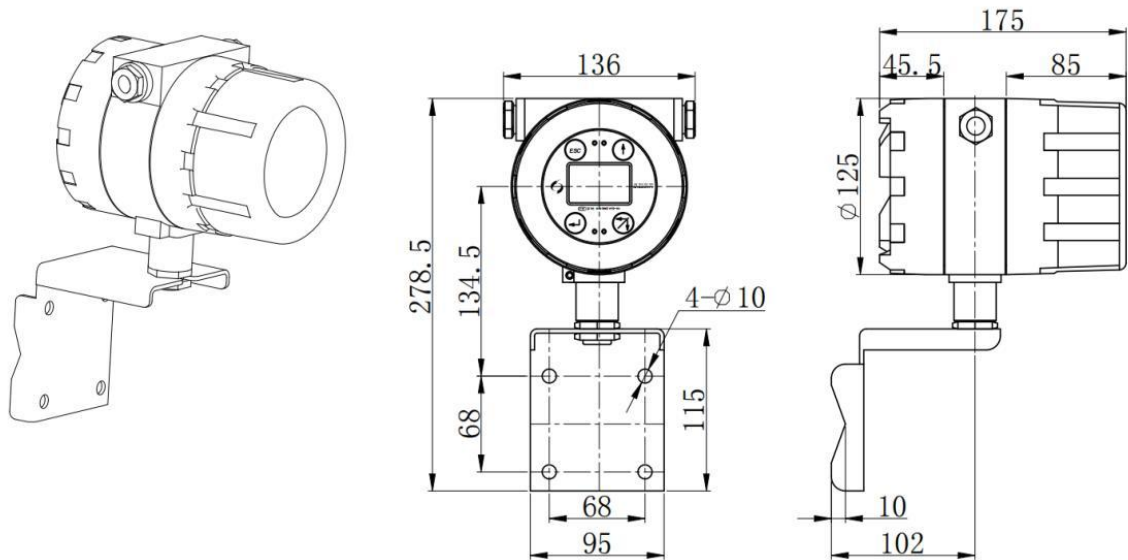
K: Mounting bracket

X: Display end cover

L: Sensor connection port

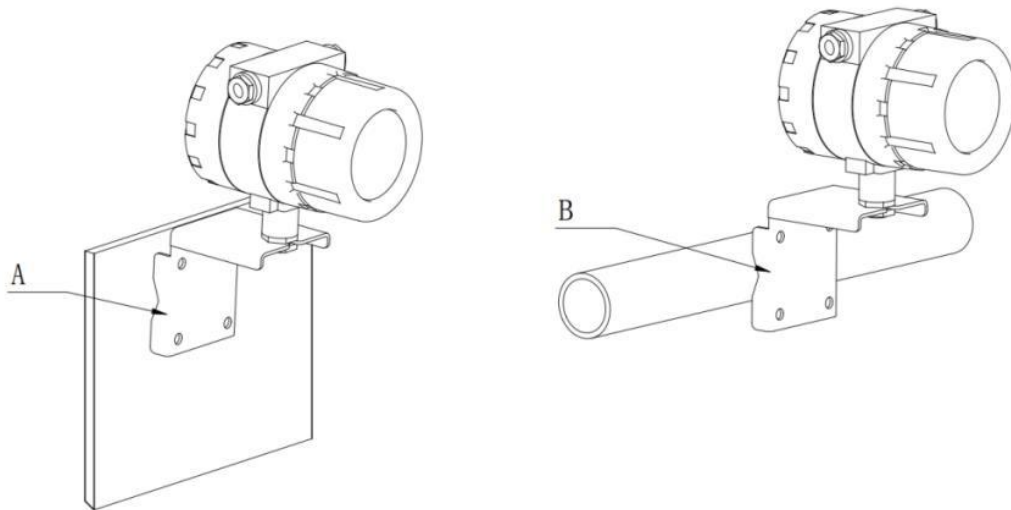
### 4.3.2 Remote Flowmeter Transmitter Dimensions

The figure below shows the dimensions of the remote flowmeter transmitter (unit: mm):



#### 4.3.3 Remote Flowmeter Transmitter Installation

The figure below is a schematic diagram of wall/pipe installation of the remote flowmeter transmitter:



A: Mounting bracket (wall mounting)

B: Mounting bracket (pipe mounting)

#### 4.3.4 Precautions for Remote Flowmeter Transmitter Installation

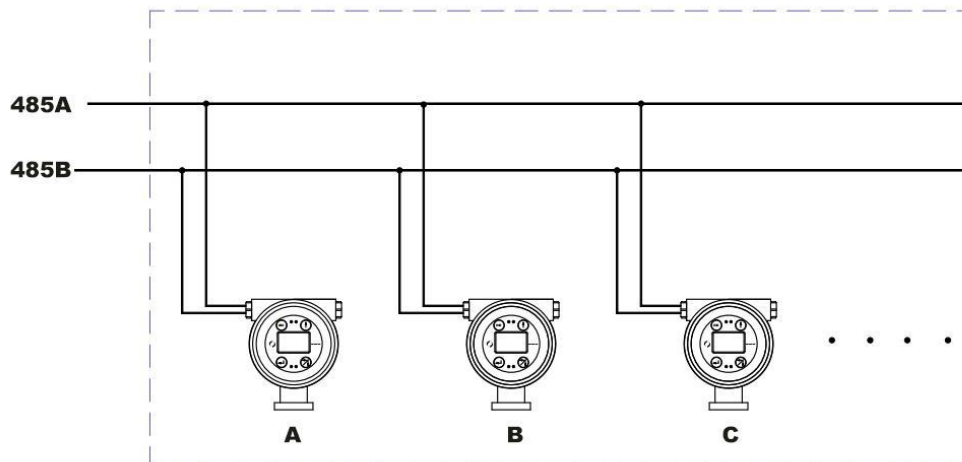
The instrument can provide remote installation. The extension cable shall not exceed 300 meters. Please be sure to specify this when ordering.

Remote instrument connection method:

- The wire at the transmitter end is fixed and cannot be removed.
- The wire at the sensor end is connected by an aviation plug or junction box.
- If it is connected by a junction box, please wire strictly according to the marked colors.

### 4.3.5 Multi-Point Installation Selection

Multi-point instrument installation can form a network through communication for centralized data acquisition. It is recommended to form the communication network as follows:



A: Station address 1

B: Station address 2

C: Station address 3

## 5 General After-Sales Guidance for Flowmeter

### 5.1 Zero Calibration

1. Run the medium through the flow for 4-5 minutes. The instantaneous flow should preferably be at least half of the range.
2. First close the outlet valve, then close the inlet valve. Let the liquid in the flowmeter stand still for 1 minute to ensure that the medium is static.
3. Perform zero calibration.

Note: Zero calibration is required in the following cases:

- After the flowmeter is installed for the first time.
- If the flowmeter operates continuously, zero calibration does not need to be repeated. However, if it operates intermittently, for example if it stops for several days, zero calibration shall be performed before the flowmeter resumes operation.
- After the flowmeter installation position is moved.
- After the flowmeter is impacted.

### 5.2 Output Test

Our instrument has an analog output test function. It can simulate standard outputs at five full-scale points: 0%, 25%, 50%, 75%, and 100%. The corresponding current output values are 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA, and the corresponding output frequencies are 0 kHz, 2.5 kHz, 5 kHz, 7.5 kHz,

and 10 kHz. This function is very helpful for checking whether instrument wiring and data acquisition are correct.

### 5.3 Flow Coefficient Adjustment Method

Before adjusting the flow coefficient of the flowmeter, please be sure to confirm the following points:

- Ensure that zero calibration of the flowmeter has been completed after installation.
- If volume unit flow display is used, please confirm whether the measured density is consistent with the actual density. If mass unit display is used, this step can be ignored.
- Use the mass flowmeter to measure at least three times, and record all measurement accuracy and data. Wait until the repeatability of measurement accuracy is stable. If the measurement accuracy is less than 2% for three measurements, the repeatability is considered stable. Then the following flow coefficient modification steps can be started.

If the measurement accuracy error is greater than or equal to 2%, the repeatability is not considered stable. Please repeatedly confirm whether zero calibration has been completed and confirm whether it is an installation problem. For details, please contact our engineers.

The following are the steps for modifying the flow coefficient of the flowmeter:

1. Press and hold ESC and the Up key at the same time. The screen prompts: "Enter password".
2. Hold the Down key to shift, press the Up key to enter password 980, and hold the Enter key to enter the menu.
3. Press the Up key to find "Flow Coefficient".
4. Hold the Enter key to select "Flow Coefficient". Hold the Down key to shift and press the Up key to enter the new "Flow Coefficient", then press Enter to confirm.
5. Press ESC to exit.

Formula for updating the flow coefficient:

New "Flow Coefficient" = original "Flow Coefficient" x (weighing / current accumulated value of the flowmeter).

Note: Please use the accumulated data of the last single measurement for calculation.

### 5.4 Sensor Problem Judgment Method

#### Resistance method

For remote type, simply disconnect the aviation plug connecting the transmitter and sensor for measurement.

For integrated type, remove the four hexagon socket screws connecting the transmitter and sensor, then remove the transmitter for measurement.

Use the resistance range of a multimeter to measure on the sensor aviation socket:

Resistance between 1-2 (drive): about 200 ohms.

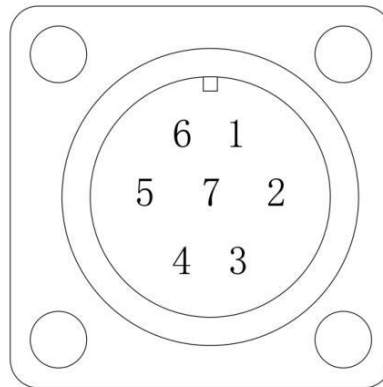
Resistance between 3-6 (left detection): about 100 ohms.

Resistance between 4-6 (right detection): about 100 ohms.

Resistance between 5-7 (temperature): about 100 ohms.

If the resistance value is incorrect, it indicates a sensor problem and the sensor must be returned to the factory for repair. If the resistance value is correct, it indicates that the sensor has no problem. Please connect the transmitter and sensor properly and tighten the screws.

The figure below shows the pin arrangement of the aviation socket on the sensor:

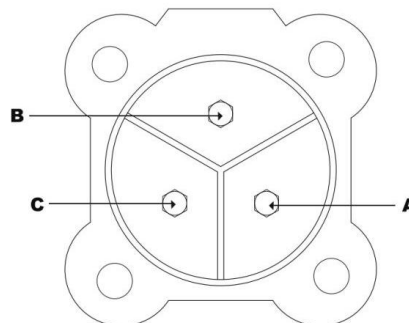


## 5.5 Electric Heat Tracing Thermostat Wiring Method

For insulation jackets, we can provide steam insulation jackets, electric heat tracing insulation jackets, heat-transfer-oil insulation jackets, etc.

This step is the wiring method for the electric heat tracing insulation jacket:

1. Open the junction box cover of the electric heating tape thermostat, unscrew the connector sleeve, and pass the neutral and live wires of 220VAC through the connector sleeve, pressure ring, and rubber sealing ring into the wiring cavity.
2. Connect the neutral wire to the common terminal, connect the live wire to terminal A, then tighten the connector sleeve and install the junction box screws.
3. Open the temperature adjustment box cover and align the blank position on the knob with the small white reference point on the core strip.



A: Live wire input L

B: Neutral wire N

C: Heating tape live wire L

## 6 Flowmeter Menu

Display menu (can be selectively hidden)

Mass flow

Accumulated mass

Volume flow

Accumulated volume

Medium density

Medium temperature

Percentage content

User menu: touch the Enter key at the lower left corner

Password "020"

View records

Instantaneous mass range

Software version number

Instrument model

Instrument number

Q1 XXXX

Q2 XXXX

Q3 XXXX

XXXX XXXX

Modify settings

Accumulated quantity reset: Yes/No

Zero calibration: Yes/No

Instantaneous flow unit:

Kg/h, L/h, l/d, l/h, l/min, l/s, m3/d, m3/h, m3/min, m3/s, us gal/h, uk gal/min, us gal/s, us gal/d, uk gal/h, uk gal/d, fm3/min, fm3/s, fm3/h, fm3/d

Accumulated flow unit:

t, m3, L, bbl, us gal, uk gal, fm3

Density unit selection:

g/cm3, kg/m3, g/ml, kg/l, g/l, lb/gal, lb/fm3

Input density value (gas standard-condition density, to calculate standard-condition volume):

XXX.XXX g/l

Instantaneous mass range: XXXX.XXX

Instantaneous volume range

Density upper limit

Density upper limit

Current output selection: mass flow, volume flow, medium density, medium temperature

Frequency output selection: mass flow, volume flow

Frequency output form

Pulse

Pulse equivalent

Frequency output upper limit: 10 kHz

Display parameter settings: mass flow, volume flow, medium density, medium temperature, component A content

Local address

Baud rate: 9600 (default)

Parity: none

Small signal cutoff ratio %

Number of decimal places

Language: Chinese, English, Russian, German

Medium flow direction: forward, reverse, bidirectional

Medium density 1 (mixed liquid percentage content calculation): 0.800 g/cm<sup>3</sup>

Medium density 2 (mixed liquid percentage content calculation): 1.000 g/cm<sup>3</sup>

Backlight brightness: Yes/No

Flowmeter reset: Yes/No

Temperature correction coefficient

Pressure correction coefficient

Density coefficient

Stability coefficient correction

Restore factory settings: Yes/No

Temperature unit selection: deg C / deg F

HART enable: Yes/No

Output test

Fixed output test: 0%, 25%, 50%, 75%, 100%

Clear fault code

Clear fault code: Yes/No

## 7 Coriolis Mass Flowmeter Modbus RTU Address Table

| Register | Address<br>(Hexadecimal/ Decimal) | Chinese Menu Name         | Remarks |
|----------|-----------------------------------|---------------------------|---------|
| 41001    | 0x03E8 / 1000                     | Instantaneous mass flow   |         |
| 41003    | 0x03EA / 1002                     | Accumulated mass flow     |         |
| 41005    | 0x03EC / 1004                     | Instantaneous volume flow |         |
| 41007    | 0x03EE / 1006                     | Accumulated volume flow   |         |
| 41009    | 0x03F0 / 1008                     | Density                   |         |

|       |               |                            |                                                 |
|-------|---------------|----------------------------|-------------------------------------------------|
| 41011 | 0x03F2 / 1010 | Temperature                |                                                 |
| 41013 | 0x03F4 / 1012 | Component A content        |                                                 |
| 41077 | 0x0434 / 1076 | Accumulated quantity reset | Write 1.0                                       |
| 41105 | 0x0450 / 1104 | Zero calibration           | Ensure the medium is full and static, write 1.0 |

Notes:

- Addresses not listed are internal calibration parameters of the instrument or parameters rarely used on site. If required, please contact our company.
- Factory default parameters: baud rate 9600; parity none; data bits 8; stop bit 1.
- Data type: all data are floating-point numbers, including data such as 0.0 and 1.0.

### Serial Port Debugging Assistant Command Format

| Communication Command Format      | Binary Command                         |
|-----------------------------------|----------------------------------------|
| Read instantaneous flow           | 01 03 03 E8 00 02 44 7B                |
| Read accumulated mass flow        | 01 03 03 EA 00 02 E5 BB                |
| Read instantaneous volume flow    | 01 03 03 EC 00 02 05 BA                |
| Read accumulated volume           | 01 03 03 EE 00 02 A4 7A                |
| Read density                      | 01 03 03 F0 00 02 C4 7C                |
| Read temperature                  | 01 03 03 F2 00 02 65 BC                |
| Remote accumulated quantity reset | 01 10 04 34 00 02 04 3F 80 00 00 CE 74 |