Coriolis Mass Flow Meter

User manual

About This Manual

The Manual includes instructions for using and managing the Product. Pictures, charts, images and all other information hereinafter are for description and explanation only. The information contained in the Manual is subject to change, without notice, due to firmware updates or other reasons. Please find the latest version of this Manual at the HIKMICRO website (*http://www.hikmicrotech.com*).

Please use this Manual with the guidance and assistance of professionals trained in supporting the Product.

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Symbols

The symbols that may be found in this document are defined as follows.

Symbol	Description
Danger	Indicates a hazardous situation which, if not avoided, will or could result in serious injury.
Caution	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
Note	Provides additional information to emphasize or supplement important points of the main text.

Safety Instruction

These instructions are intended to ensure that user can use the product correctly to avoid danger or property loss. The device can only be operated by trained personnel in accordance with these instructions and local safety regulations.

Laws and Regulations

- The device should be used in compliance with local laws, electrical safety regulations, and fire prevention regulations.

Transportation

- Keep the device in original or similar packaging while transporting it.
- Do not drop the product or subject it to physical shock. Keep the device away from magnetic interface.

Electrical Safety

- The device external wiring connected to the hazardous live terminals requires installation by an instructed person.
- Make sure that the power has been disconnected before you wire, install, or disassemble the device.
- The device must be connected to an earthed mains socket-outlet.
- Make sure the plug is properly connected to the power socket.
- If the device is powered by terminals connected to the power cord, ensure correct voltage and wiring of the terminals for connection to mains supply.
- DO NOT expose the device to high electromagnetic radiation.

Maintenance

- DO NOT maintain the camera when it is powered on, or it may cause electric shock!
- If the product does not work properly, please contact your dealer or the nearest service center. We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.
- Wipe the device gently with a clean cloth and a small quantity of ethanol, if necessary.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

Contents

1. Overview

1.1 Description

Coriolis Mass Flow Meter (hereinafter referred to as the device) operates based on the Coriolis force measurement principle. During flow detection, it is virtually unaffected by the physical properties of the measured fluid (e.g., temperature, pressure, viscosity, density), enabling direct and precise measurement of pipeline fluid mass flow.

Caution

Read this manual carefully before using the device. Incorrect installation may result in inaccurate measurement or even damage to the device.

1.2 Function

- Direct measurement of mass flow, density, and temperature.
- Indirect measurement of volume flow: The transmitter can be interchangeable.
- Transmitter interchangeability: transmitters can be replaced without requiring re-calibration with the sensor.
- Output Frequency, Current, and Output Parameter can be configured.
- On-site button operation for configuration and viewing functions.
- Prompts for measurement parameters and configuration operations.
- Features including small flow cut-off, zero calibration, and slug flow suppression
- Upper and lower limit settings for measured values with over-limit alarm function.
- Adjustable damping coefficient for smooth output.
- Error status indication: displays alarm information and status light indicators.
- Allows specific value output for flow, circulation flow, and frequency.

1.3 Transmitter Technical Specifications

1.3.1 Flow Error

1) Mass Flow Allowable Error

– Within 10:1 range ratio: ±0.1%

- 15:1 Within range ratio: ±0.15%
- 20:1 Within range ratio: ±0.20%
- 20:1 Range Ratio Out: ±(zero stability / instantaneous flow) × 100%

2) Measurement Repeatability

- Within 10:1 range ratio: ±0.050%
- Within 15:1 range ratio: ±0.075%
- Within 20:1 range ratio: ±0.1%
- Beyond 20:1 range ratio: ±1/2(zero stability/instantaneous flow) × 100%

3) Density Range: 200 kg/m³ ~ 3000 kg/m³
4) Density Error: ±1 kg/m³
5) Process Temperature Range:

   Remote: -40 ℃ to +200 ℃
   Integral: -40 ℃ to +125 ℃

6) Temperature Measurement Error: ±1 ℃ or ± 0.5% of measured value

1.3.2 Circulation Flow Output 1

1) Represented Parameter: Mass Flow / Volume Flow / Fluid Density / Fluid Temperature
2) Range: 4 mA ~ 20 mA
3) Error: ±8 μA
4) Zero: Better than ±0.001 mA
5) Temperature: ±0.002% full scale/°C
6) Power supply: 24 VDC (internal power supply)
7) Load: 250 Ω ~ 750 Ω

1.3.3 Circulation Flow Output 2

1) Represented Parameter: Mass Flow / Volume Flow / Fluid Density / Fluid Temperature
2) Range: 4 mA ~ 20 mA
3) Error: ±8 μA
4) Zero: Better than ±0.001 mA
5) Temperature: ±0.002% full scale/°C
6) Power supply: 24 VDC (internal power supply)
7) Load: 250 Ω ~ 750 Ω

1.3.4 Frequency/Pulse

1) Represented Parameter: Mass Flow / Volume Flow
2) Range: 1 Hz to set value, the maximum settable upper limit is 10 kHz
3) Resolution: 0.152 Hz
4) Power: 24V DC, internally powered
5) Load: standard load 5 kΩ

1.3.5 Ambient Temperature

1) Operating Temperature: -40 ℃~+60 ℃
2) Display Readability Temperature: -20 ℃~+60 ℃. (The readability of the display may be impaired at temperatures outside the temperature range.)
3) Storage Temperature: -40 ℃ to +70 ℃
4) Circulation Flow Influence: ±0.005% FS/℃
5) Frequency Influence: ±0.001% Actual Network Data/℃
6) Ambient Humidity: ≤90%RH (+25 ℃, no condensation)
7) Atmospheric Pressure: 80 KPa ~ 110 KPa

1.3.6 Power Supply

1) AC Power Supply: 85 VAC ~ 265 VAC (50/60 Hz), typical power 7 W, maximum power 13 W
2) DC Power Supply: 18 VDC ~ 36 VDC, typical power 7 W, maximum power 13 W
3) General Power Supply

- AC Power Supply: 85 VAC ~ 265 VAC (50/60 Hz), typical power 7 W, maximum power 13 W
- DC Power Supply: 18 VDC ~ 36 VDC, typical power 7 W, maximum power 13 W

1.4 Component

The device is made up of the sensor and transmitter, and depending on how the sensor and transmitter are connected, it supports two different types: integral and remote.

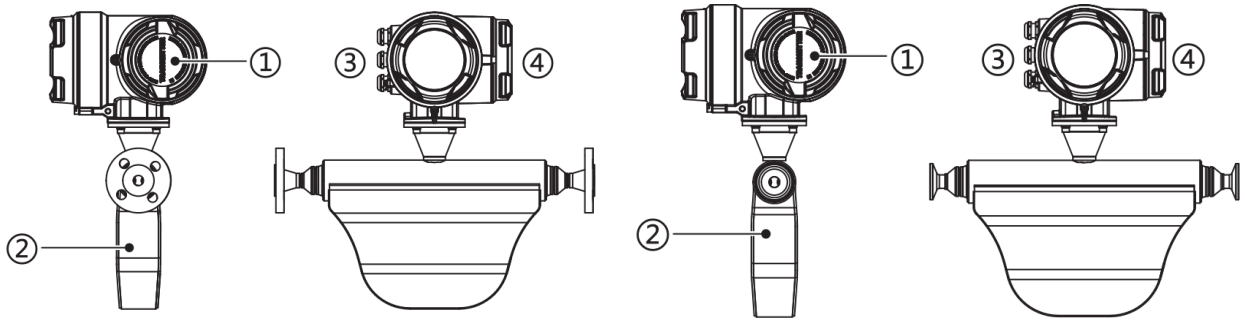
Note

For the exact size of the transmitter and sensor, please refer to the product datasheet.

1.4.1 Integral Flow Meter

The transmitter of the integral flow meter is assembled with the sensor as one unit, and the internal electrical connection has been completed before delivery. It can be connected to the pipe via flange or clamp, etc.

Flanged **Clamp**



1: Transmitter

2: Sensor

3: Terminal Connection for Power Supply and Signal Output

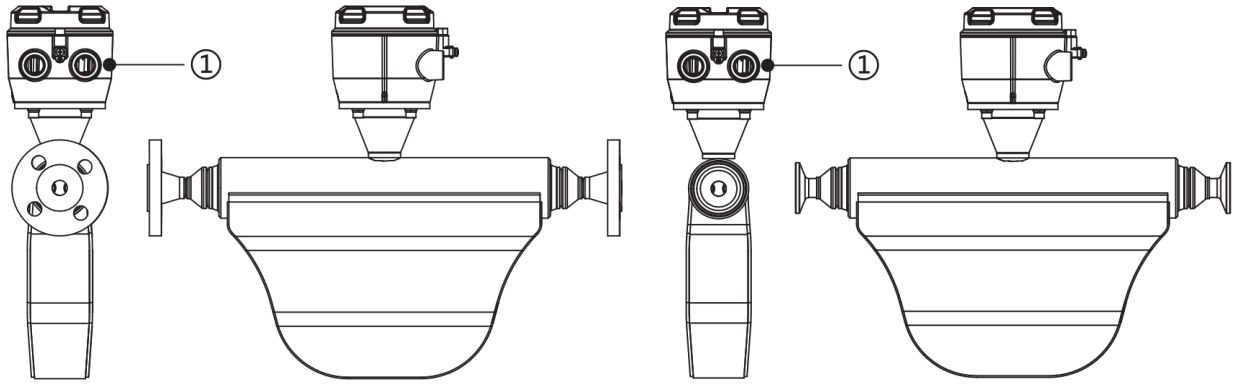
4: Connection Compartment Cover

1.4.2 Remote Flow Meter

The transmitter and sensor of the remote flow meter are installed independently, and connected via a standard signal cable. The sensor can be connected to the pipe in different ways, such as flange or clamp.

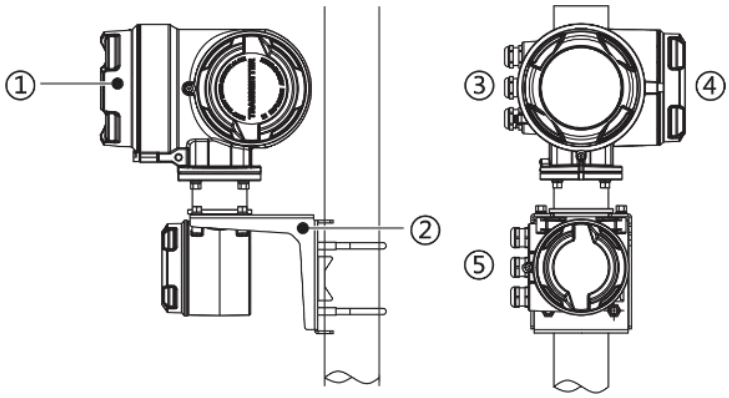
Sensor

Flanged **Clamp**



1: Sensor Cable Connection

Transmitter



1: Transmitter

2: Standard Bracket

3: Terminal Connection for Power Supply and Signal Output

4: Connection Compartment Cover

5: Sensor Cable Connection

2. Installation

2.1 Installation Location

- The sensor should be installed in a pipe section filled with medium. In non-full pipe conditions, the flow meter will exhibit significant value fluctuations and produce serious measurement errors.
- Make sure that the measurement tube position does not generate or accumulate bubbles. If bubbles enter the sensor's measurement tube, it will cause significant value fluctuations and lead to serious measurement errors.
  - Avoid installation at the highest point of the pipeline (prone to bubble accumulation)
  - Avoid direct installation above downward draining pipelines (to prevent empty measurement tubes)

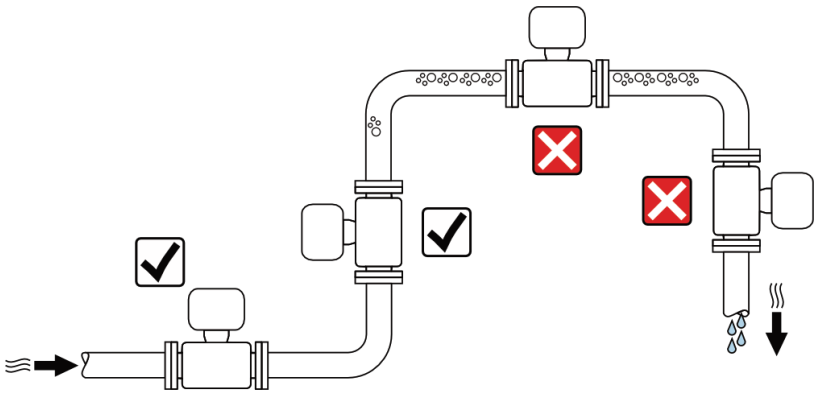


Figure 2-1 Avoid sections of tubes where bubbles tend to accumulate.

- When installing sensors on vertical pipelines, it is recommended to choose pipelines where the fluid flows upward from bottom to top. In this way, when the pipeline fluid is stationary, solid particles will sink and gases will rise, both staying away from the sensor, preventing solid adhesion.

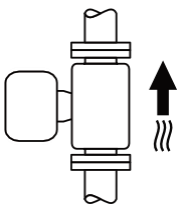


Figure 2-2 Vertical Installation

- When installing sensors horizontally, the installation method is as shown in the figure below. For low-temperature conditions, choose the upward-facing installation direction; for high-temperature conditions, choose the downward-facing installation direction. Make sure that the ambient temperature meets specification requirements.

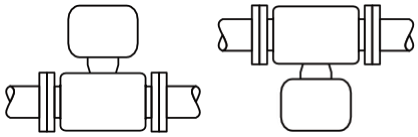


Figure 2-3 Horizontal Installation

- Do not install the flow meters in negative pressure pipelines. Install it in downstream pipelines of pumps.

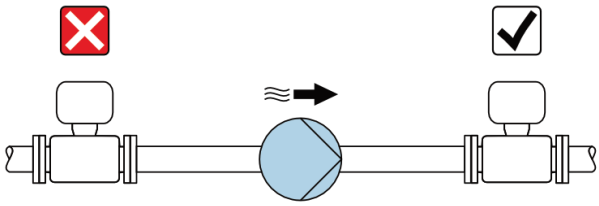


Figure 2-4 Avoid Negative Pressure Pipe

2.2 Sensor Installation

The integral and remote sensors have the same installation methods, including flange and clamp types.

Caution

- Pipeline welding should be completed before device positioning. Electric welding operations are prohibited after equipment positioning.
- The arrow direction of the device flow direction mark should be consistent with the flow direction.
- When insulating and heat tracing the sensor, ensure electronic components are not sealed within insulation materials.

2.2.1 Flanged Connection

Install the flange-type flow meter as shown in the diagram. During field installation, use bolts to connect the flange on the sensor with the flange on the pipeline. The threads of bolts and nuts used for tightening the equipment should be complete and undamaged with good lubrication.

- Use a torque wrench to tighten bolts according to flange size and torque requirements. Regularly tighten bolts to prevent loosening.
- During installation, both side flanges should slowly and alternately approach the sensor. Do not tighten one side first and then the other.
- Suitable gaskets must be installed at the connection between the sensor and pipeline.

  Gasket material must be compatible with the process fluid and operating conditions; Flange gasket shall not obstruct the pipe cross-section.

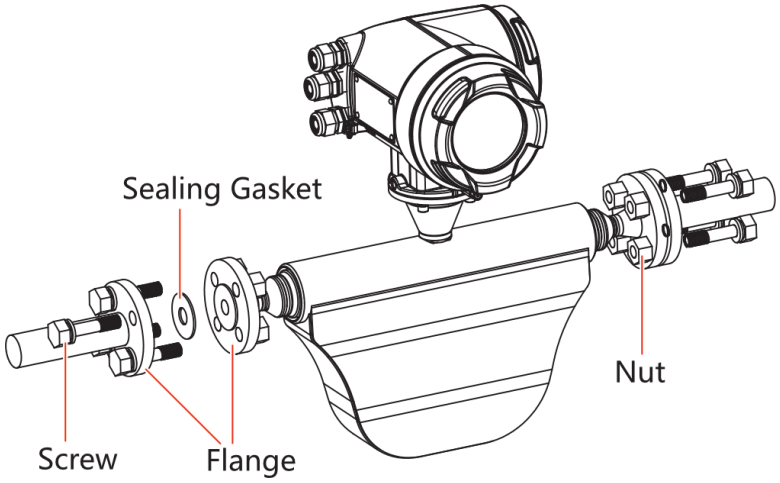


Figure 2-5 Flanged Connection (taking the integrated type as an example)

2.2.2 Clamp Connection

Install the flow meter as shown in the figure below. Install a lined installation clamp between the clamp and measuring equipment.

1. Place the clamps at the connection between the sensor and the pipe, and make sure that the center of the clamp is aligned with the axis of the pipe.
2. Loosen the clamp screws and fix the clamp to the sensor and pipeline.
3. Install suitable sealing gaskets at the connection between the sensor and pipeline.
4. Close the clamp and tighten the clamp screws, recommended torque is 1.47 Nm to 2.03 Nm

   Note

   Make sure that the clamp is tight but do not overtighten to avoid damaging the sensor.
5. Install supports on the connecting pipelines on both sides of the sensor to prevent vibration of the flow meter and related pipelines.

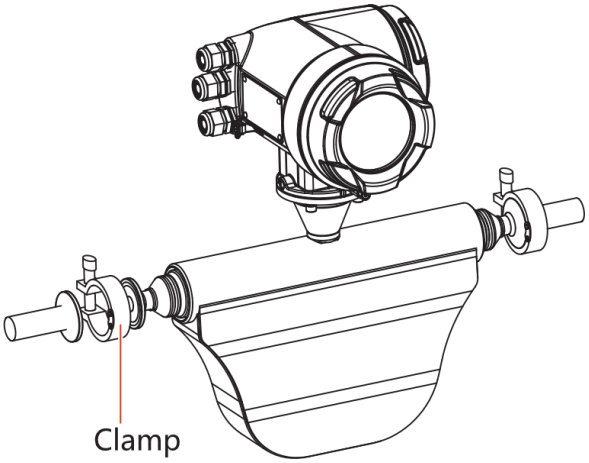


Figure 2-6 Clamp Connection (Taking the integrated type as an example)

Note

After installation completes, on-site zero calibration is required. Please refer to Zero Calibration.

2.3 Transmitter (Remote Type) Installation

Caution

- Keep the transmitter away from direct sunlight and install it in a cool, dry place.
- The transmitter installation location should have sufficient operating space for convenient wiring and conduit connection.
- It is strictly prohibited to install the transmitter on vibrating bases or branches.
- The installation location should avoid electromagnetic interference and stay away from equipment that generates strong electromagnetic fields, such as high-power motors, transformer facilities, frequency conversion equipment, etc.
- The leads between sensor and transmitter of remote-type flow meter should be routed separately and not covered on motors or other power equipment to avoid electromagnetic field interference with measurement. Lead length should not exceed 100 m.

Fix the installation bracket as shown in the diagram, then fix the transmitter to the supplied bracket with screws.

1. Fix the installation bracket to a round tube or on the wall.

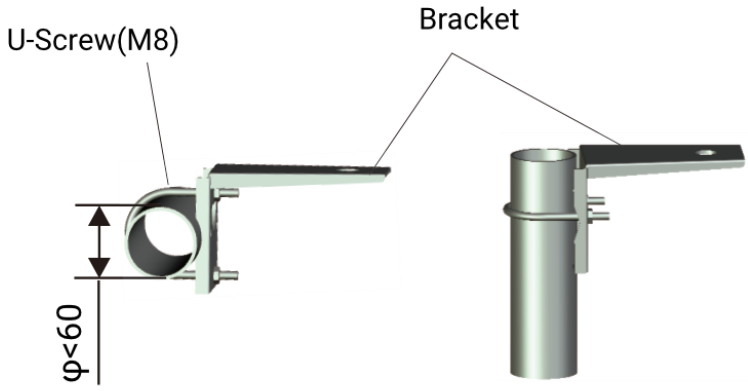


Figure 2-7 Installation on Bracket with Round Tube or Wall Mount

2. Mount the transmitter on the bracket with screws.

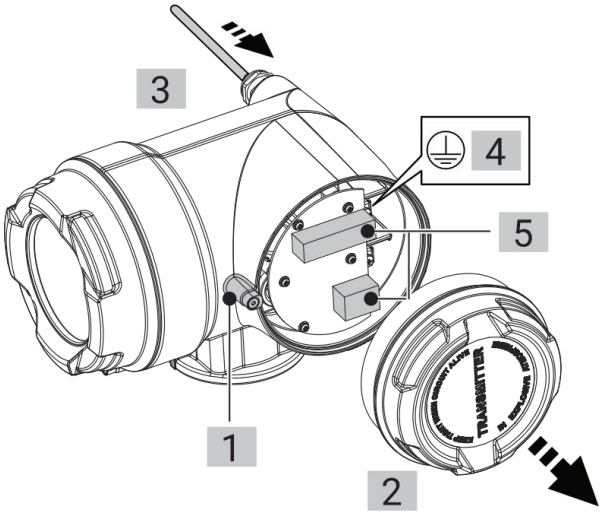
Figure 2-8 Mount Transmitter to Bracket

2.4 Electrical Connection

Caution

- Cable installation and wiring should comply with industry regulations and practices.
- Use the dedicated sensor cable provided by our company, with maximum length not exceeding 20 m.
- Consider factors such as corrosion resistance, high temperature resistance, and transmission distance when wiring cables.
- The wiring should be corrosion-resistant and heat-resistant, and the transmission distance should be considered.
- To ensure maximum isolation of electrical noise for the flow meter, avoid running power lines and signal lines in parallel, and ensure that power lines and signal lines do not share the same conduit entry on the flow meter transmitter.
- The sensor should be reliably grounded with a grounding resistance less than 1 Ω.

2.4.1 Terminal Assignment



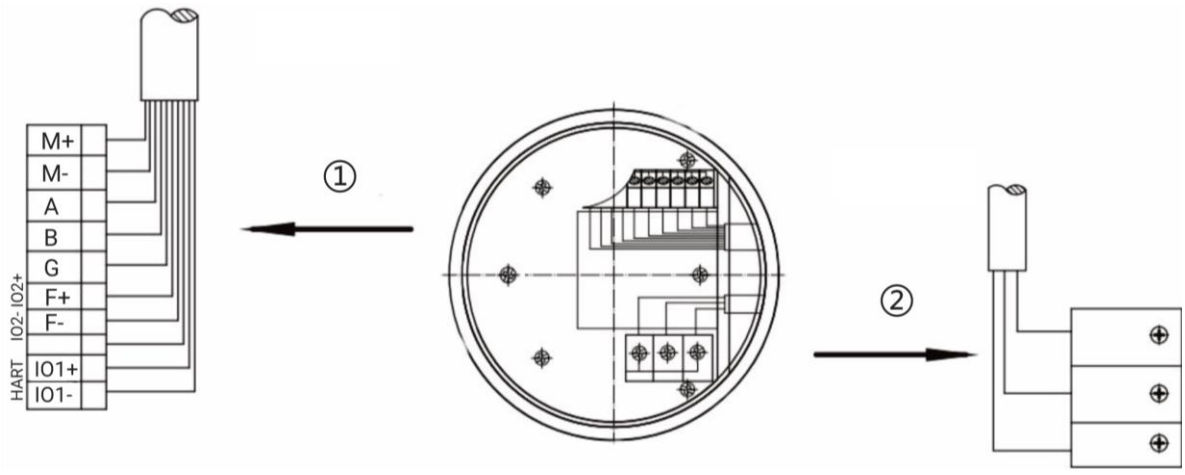
1. Loosen the hex socket screw of the connection compartment cover.

2. Use external tool (e.g., Place a wrench with a rubber sleeve in the groove and rotate the handle to open the cover by leverage.) to unscrew the connection compartment cover.

3. Insert the cable through the connection entry.

4. Connect the ground screw.

5. Connect the cable according to the terminal assignment.



1: Signal Output

2: Power Supply

Table 2-1 Terminal Assignment

Terminal	Description
IO1+, IO1-/HART	Active output. For optional 4 to 20 mA current output (channel 1) with optional HART protocol superposition. *The terminal varies according to different device models.
F+, F-/IO2+, IO2-	Active output. For frequency or pulse output, or 4 to 20 mA current output (channel 2). Switchable via device configuration.
A, B, G	For Modbus communication. RS-485 serial, A: 485+, B: 485-, G: ground.
M+, M-	Reserved.
Power Supply	For 24 VDC or 220 VAC power supply input. AC power supply: connect live wire to “L”, neutral wire to “N”, and ground terminal to ground screw. DC power supply: connect positive terminal wire to “+” and negative terminal wire to “-”.

Note

Please refer to Table 4-1 I/O Port Resource for detailed output types and setting path instructions.

2.4.2 Power Connection

Caution

Operating with live power can endanger personal safety. Voltage input beyond the specified range may cause damage to the transmitter.

- Open the rear cover. The left terminal is for output signal and the right terminal is for power.
- Select the appropriate power supply according to the power identification on the nameplate and terminal block.
- Connect the power cable to the power terminal block.
- Connect the transmitter housing grounding terminal to earth.

Caution

Select the allowed power cord length according to the power type under the conditions of 24 V DC power supply and limited current of 1 A, as shown in the table below.

Table 2-2 Power Cable Requirements

Power	Cable Diameter (mm²)	Max. Cable Length (m)
AC/DC-DC Power Supply	1.5	500 m
	2.5	750 m
	4	1000 m

2.4.3 Signal Output Connection

- Frequency/Pulse Output: Internally powered by 24 VDC isolated power supply, standard load 5 kΩ. Use RVVP shielded twisted pair cable (≥0.35 mm²). Remove the shielding layer at the transmitter terminal end, and ground the shielding layer at the counter end.
- Current Output 4 mA~20 mA: Internally powered by 24 VDC isolated power supply, maximum external load 750 Ω. Use RVVP shielded twisted pair cable (≥0.35 mm²).
- HART Signal Output:

  HART output requires separate customization. Using HART terminals, communication with the transmitter can be performed at any point in the control room, field, or signal loop.

  - Ensure cable specifications, and the cable shielding layer must be grounded at both ends to meet electromagnetic compatibility requirements.
  - Current output load must be ≥250 Ω to avoid communication errors.
  - Polarity does not need to be distinguished during connection.

3. Operation

3.1 Power-On and Display Interface

Select the correct power supply according to the transmitter nameplate and terminal block power identification. After confirming all input and output connections are correct, power on and perform self-test.

Table 3-1 Indicator Light Description

Indicator Light	Status	Meaning
Green	1 second on, 1 second off	System operating normally
	Solid	Button operation in progress
Red	Flicker Every 2 Seconds	System malfunction exists
	Solid	Critical system failure.

Note

If startup abnormalities occur after power-on, such as no display interface or red indicator light, please refer to Diagnosis and Maintenance for fault diagnosis and troubleshooting.

3.2 Button Operation

The device contains three photosensitive keys, as shown in the table below.

Button Type	Function		Operation
Left Button	Menu Interface	Page turning	Short press
		Item selecting	Short pess
	Configuration Interface	Digit editing	Short pess
		Switching between first digit and "-" (when editing signed data)	Press and hold
Middle Button	Menu Interface	Return to upper menu	Short press
		Exit editing state	Short

			press
	Configuration Interface	Shift key during number input	Short press
		Switching between character "0" and "-"	Press and hold
Right Button	Menu Interface	Enter lower level	Short press
	Configuration Interface	Confirm key after editting	Short press
	Simulation Interface	Return to upper menu	Short press
Left + Right Button	Display Interface	Enter menu interface	Short press

Note

Pressing a button for no less than 3 seconds is regarded as long press.

3.3 Menu Settings

Introduces device menu settings, including transmitter settings, sensor settings, diagnosis and simulation, information viewing.

Note

Press the left photoresistance button to change the view. Hold the left and right buttons together for 3 seconds and release to enter the menu.

4. Transmitter Settings

4.1 Flow Settings

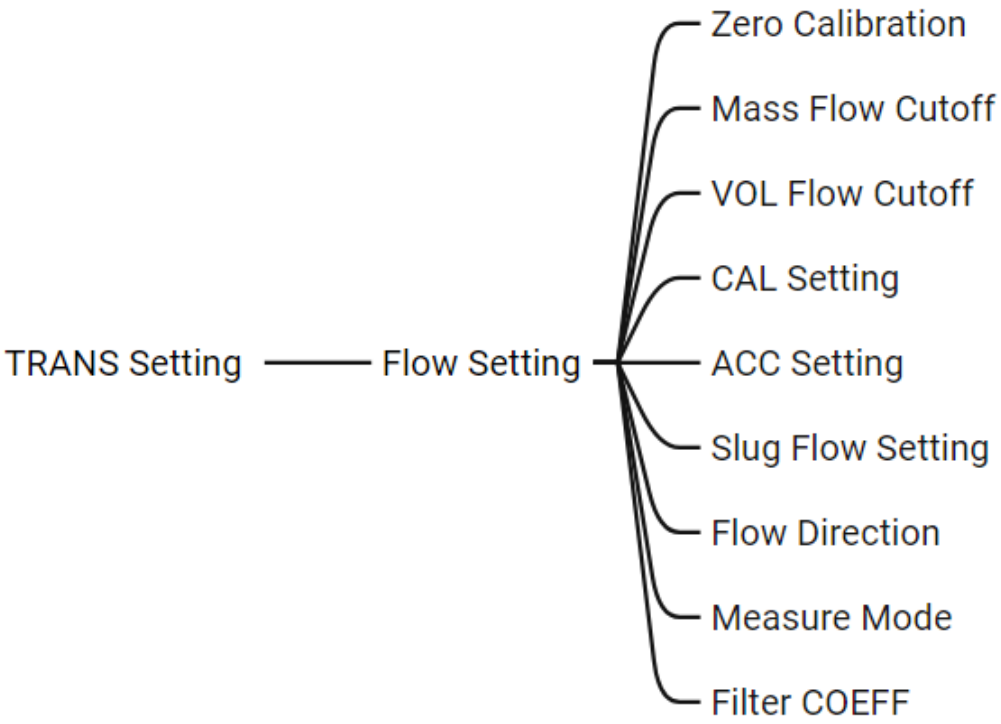


Figure 4-1 Flow Setting Menu

4.1.1 Zero Calibration

Zero calibration is required when:

- The flow meter is installed for the first time
- The sensor has been moved
- After maintenance and reinstallation
- After sensor analog board repair
- After a shutdown subsequent to high-temperature operation and upon restart

Note

Install globe valves near the flow sensor inlet and outlet for zero calibration. Avoid any medium flow during zero calibration.

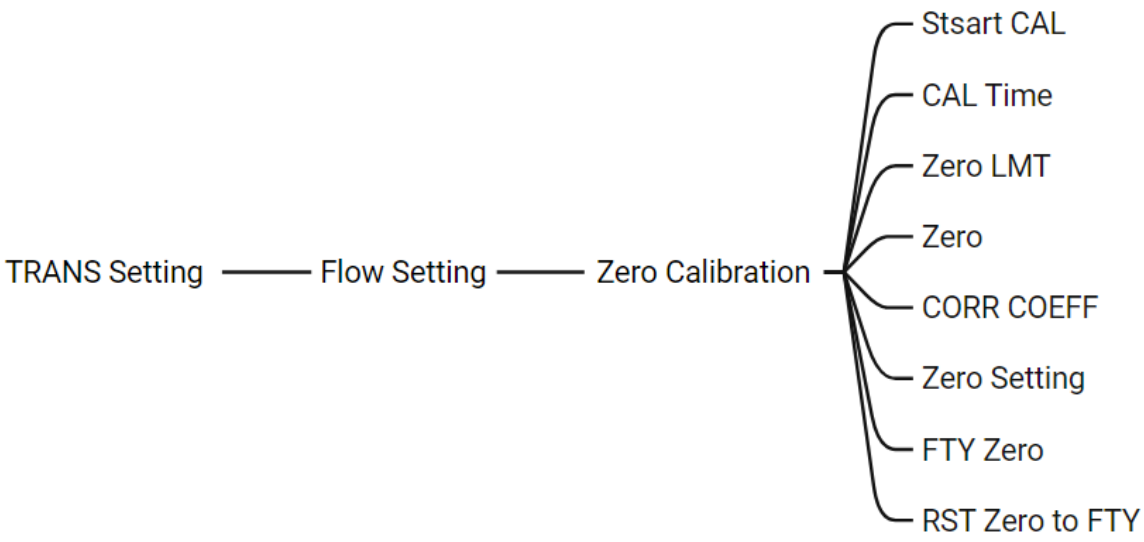


Figure 4-2 Zero Calibration Menu

1. Let the flow meter work with liquid for 30 minutes or longer until the indicated temperature value is within ±10°C of the actual medium temperature
2. Set variables related to zero calibration:
   - Zero LMT: The upper limit of phase difference measured by the measuring tube when the medium is stationary during zero calibration. Factory setting: 2 μs. If the collected phase difference exceeds this limit during calibration, the zero value is considered too large and zero calibration fails. This setting prevents zero calibration with flow present, which could cause measurement errors.
   - CAL Time: The time for collecting raw data during zero calibration. Factory default: 30 seconds. Extend calibration time if zero instability occurs due to vibration or other factors.
   - Zero: Displays the zero value currently used by the system (last calibrated value stored in internal memory).
   - Zero Setting VAL: Manually set the zero value. The set value cannot exceed the Zero LMT.
   - CORR COEFF: Corrects flow when there is a fixed deviation in flow measurement

4.1.2 Mass Low Flow Cutoff

Low flow cutoff refers to the minimum effective flow value during flow measurement, used to eliminate small flow fluctuations caused by noise, pipeline vibration, etc., improving measurement authenticity.

When the absolute value of mass flow is not greater than this set value, the mass flow display value and output value are set to 0.

4.1.3 Volume Low Flow Cutoff

Low flow cutoff refers to the minimum effective flow value during flow measurement, used to eliminate small flow fluctuations caused by noise, pipeline vibration, etc., improving measurement authenticity.

When the absolute value of volume flow is not greater than this set value, the volume flow display value and output value are set to 0.

4.1.4 Calibration Settings

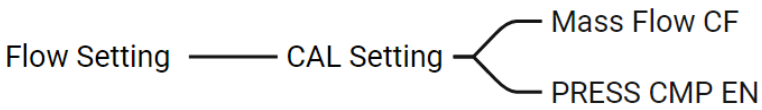


Figure 4-3 Calibration Menu

- Mass Flow CF: Linearly corrects mass flow value
- PRESS CMP EN: Enable/disable the compensation function for the effect of pressure on mass flow.

4.1.5 Accumulator Settings

The accumulator is used to measure the total volume flow or total mass flow of fluid passing through the pipeline.

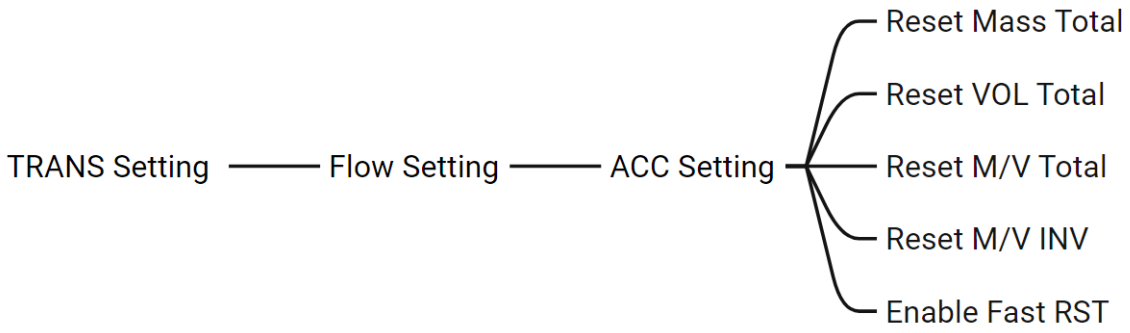


Figure 4-4 Accumulator Settings

Caution

Use the operations in the accumulator settings menu with caution, as these operations will clear flow data.

- Reset Mass Total: Resets accumulated total mass flow
- Reset VOL Total: Resets accumulated total volume flow
- Reset M/U Total: Resets accumulated total mass and volume flow
- Reset M/U INU: Resets all inventory of mass and volume flow
- Enable Fast RST: When enabled, long-pressing the down key in the flow total and flow display interface can quickly clear volume and mass flow totals

4.1.6 Slug Flow Settings

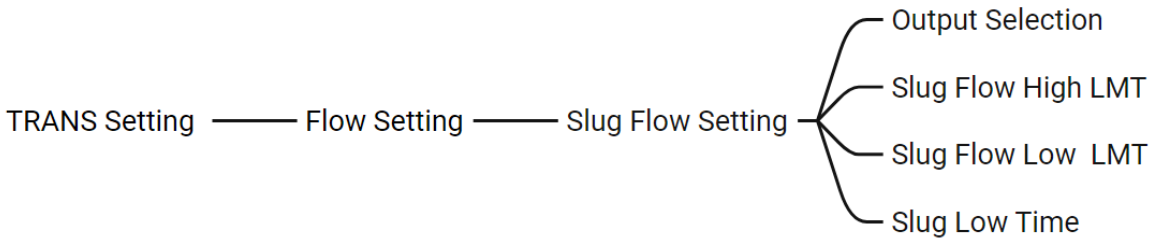


Figure 4-5 Slug Flow Menu

Slug flow refers to when gas is mixed into the measured fluid medium during flow measurement, causing density changes. Although the inlet conditions are stable, the flow velocity is unstable, leading to measurement errors.

Set slug flow high and low limit. Select output mode when slug flow occurs (Realtime Flow/Set Flow to Zero /Set Flow to Avg) for alarm.

4.1.7 Flow Direction

The flow direction can be one of the following: forward, reverse, bidirectional, absolute value, neg. forward, or neg. bidirectional.

The choice of flow direction affects the transmitter's mass flow and mass flow total value.

Setting Value	Forward Flow	Forward Flow	Reverse Flow	Reverse Flow
	Mass Total	Flow Display	Mass Total	Flow Display
Forward	Accumulate	Positive Value	No Change	Negative Value
Reverse	No Change	Positive Value	Accumulate	Negative Value
Bidirectional	Accumulate	Positive Value	Decrement	Negative Value
Absolute Value	Accumulate	Positive Value	Accumulate	Positive Value
Neg. Bidirectional	Decrement	Negative Value	Accumulate	Positive Value
Neg. Forward	No Change	Negative Value	Accumulate	Positive Value

Figure 4-6 Influence of Flow Direction on Flow Value

The effect of flow direction on current output depends on the setting corresponding to the 4 mA output.

- When the 4 mA signal value is set to 0 (with the 20 mA signal value x > 0), refer to the figure below.

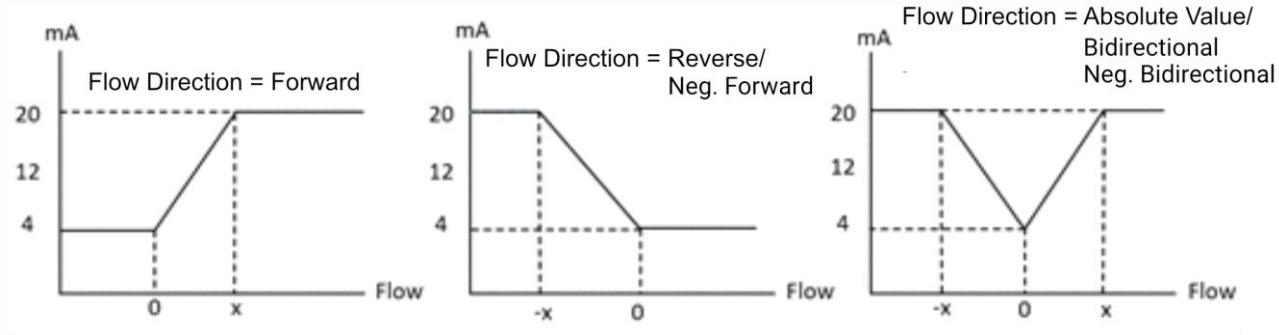


Figure 4-7 Influence of Flow Direction on Current Output (4 mA signal value = 0)

- When the 4 mA signal value is set to a value less than 0 (where the 4 mA signal value corresponds to -x, with x > 0, and the 20 mA signal value corresponds to +x, with x > 0), refer to the figure below.

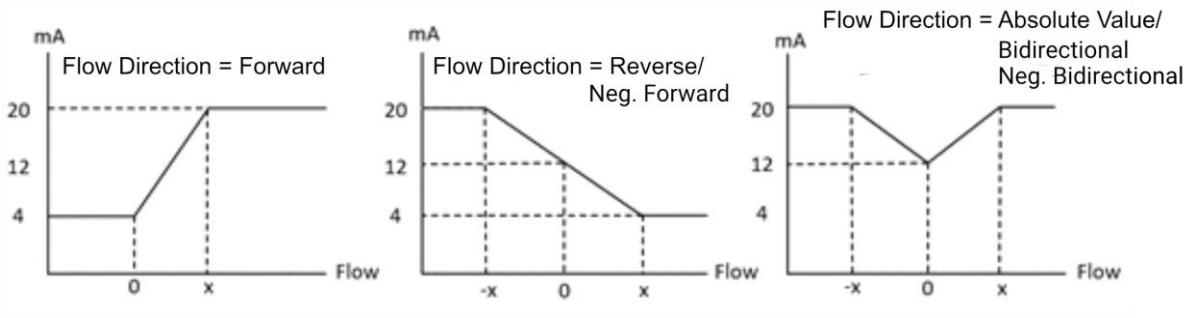


Figure 4-8 Influence of Flow Direction on Current Output (4 mA signal value < 0)

4.1.8 Measurement Mode

Liquid: For measurement of incompressible fluids (e.g., liquids) under operating condition.

Gas: For compressible media (e.g., gases), measure volume flow under standard conditions by setting standard density.

Note

After switching modes, it is recommended to first clear the volume total and inventory, then start flow measurement to ensure measurement accuracy.

4.1.9 Filter Coefficient

Filter coefficient is used for filtering collected data to reduce the impact of interference signals. Value range: (0.1~0.9)

4.2 Output Settings

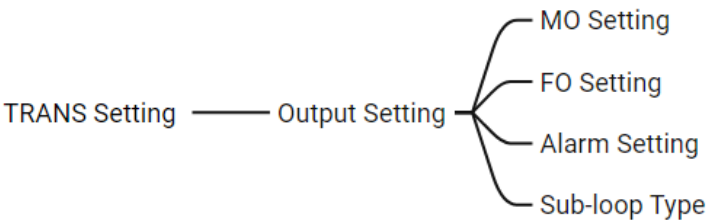


Figure 4-9 Output Menu

The output setting path and corresponding signal types are as follows:

Table 4-1 I/O Port Resource

Interfaces	Setting Path	Optional Signal Types
I/O1 (4-20mA)	TRANS Setting – Output Setting – MO Setting – MO1 Setting	**1st 4-20mA Current:** Mass Flow, Volume Flow, Density, Temperature
HART (with Generic DD file)	Not required	Various types via **HART** protocol
Either I/O2 Or F (Sub-loop Type)	1. TRANS Setting->Output Type->Current 2. TRANS Setting–>Output Setting–>MO Setting–>MO2 Setting	**2nd 4-20mA Current:** Mass Flow, Volume Flow, Density, Temperature
	1. TRANS Setting->Output Type->Frequency 2. TRANS Setting–>Output Setting–>FO Setting–>FO1 Setting	Frequency: Mass Flow, Volume Flow
G A B (RS-485)	Not required	Various types via **MODBUS** protocol

Note

For port wiring instructions, please refer to Electrical Connection.

4.2.1 Current Settings

Current settings allow selecting any variable to output as a current signal. Variables include mass flow, volume flow, density, and temperature.

After selecting the corresponding variable, set the variable minimum value corresponding to 4 mA current and the maximum value corresponding to 20 mA current.

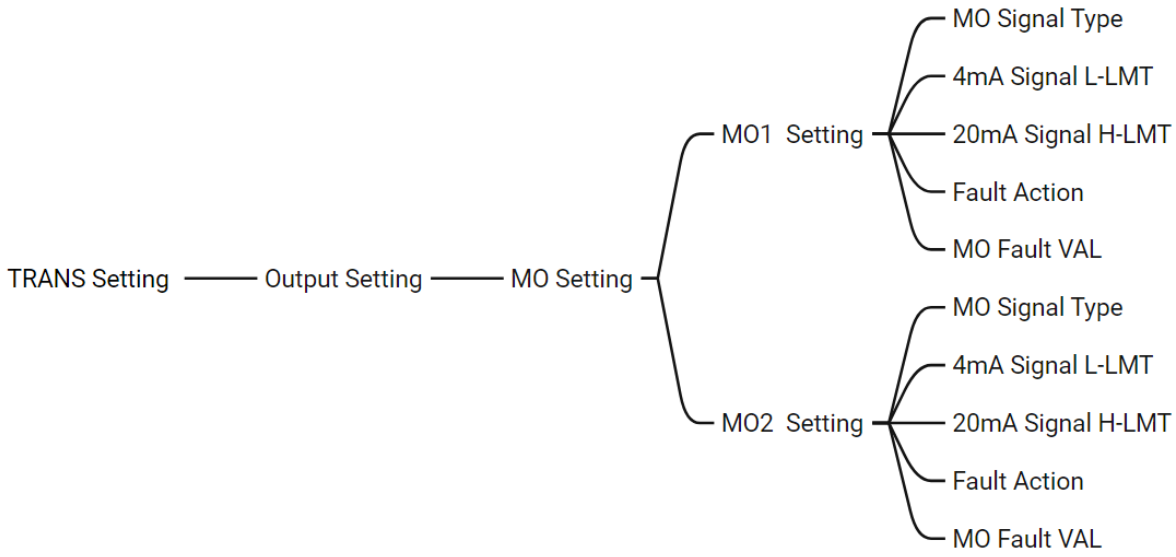


Figure 4-10 Current Setting Menu

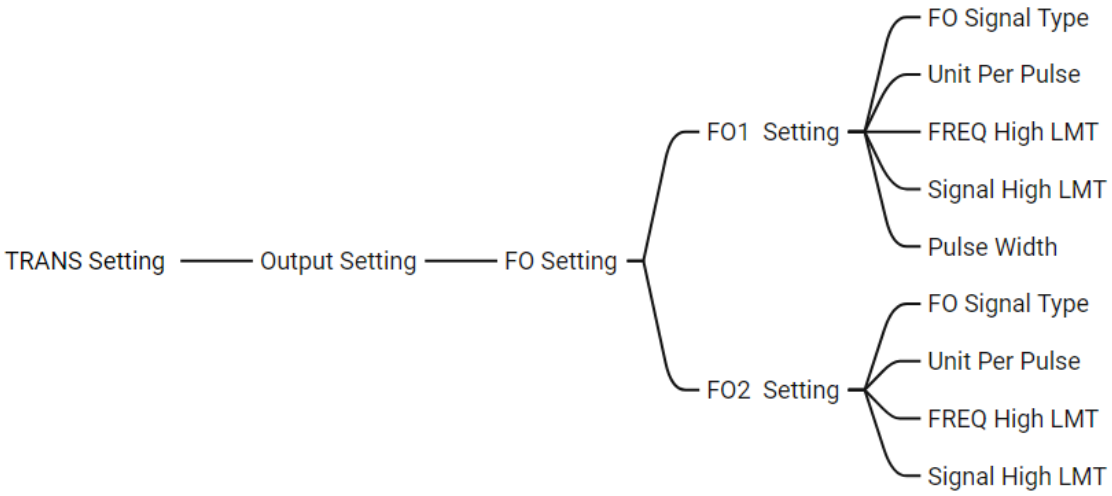
- MO Signal Type: Used to select the process variable type for current output. The variable can be any of mass flow, volume flow, density, or temperature.
- 4 mA Signal L-LMT: Output minimum value, cannot be less than the lower limit value of the corresponding variable in alarm output.
- 20 mA Signal L-LMT: Output variable maximum value, cannot be greater than the upper limit value of the corresponding variable in alarm output.
- Fault Action: Select whether to output fault signals through current when serious faults occur. Selecting "None" means no fault alarm output through current when serious faults occur; selecting "Upscale" or "Downscale" means current will output corresponding current for fault alarm.
- MO Fault VAL: Sets the current value for fault alarm output when faults occur. For "Upscale": 21.5 mA~24.0 mA (configurable within range); for "Downscale": 3.2 mA~3.55 mA (configurable within range).
- Frequency/MO2 Setting is a sub-loop that can only have one output at a time. Refer to Sub-Loop Type to select current output or frequency output.

If you set **Sub-loop Type** to **Current,** please configure MO2 parameters; if you set **Sub-loop Type** to **Frequency**, when entering the MO2 configuration menu, it will prompt “Disabled Function”.

4.2.2 Frequency Settings

Used to output values collected by the device as pulse frequency signals. This frequency value can represent mass flow or volume flow.

After selecting the corresponding output type, set the pulse equivalent.



- FO Signal Type: Used to select output of mass flow or volume flow.
- Unit Per Pulse: Represents different meanings depending on the output signal type. When selecting mass flow: represents pulses/Kg; volume flow: pulses/L; gas mode: pulses/NL.
- FREQ High LMT: Sets the maximum frequency value to be output. This value can be set in the range of 100~10000 Hz. Recommended minimum setting value: not less than 1000 Hz.
- Signal High LMT: Used to set the maximum value of the signal corresponding to the maximum frequency.
- Pulse Width: Sets the duty cycle of the output frequency pulse signal (ratio of high-level duration to entire cycle time). This value can be set in the range of 10%~90%.

If an additional frequency (FO2) output is needed, please contact us. The configuration for FO2 is the same as for FO1, but FO2 has a 50% fixed duty cycle.

4.2.3 Alarm Settings

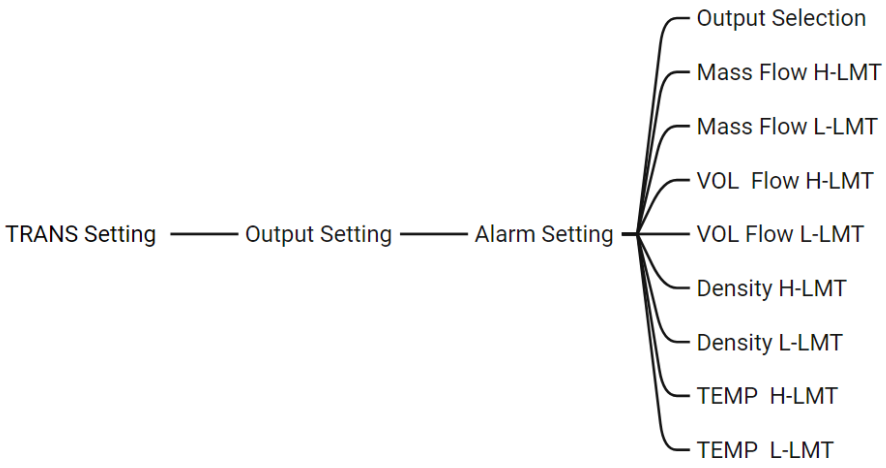


Figure 4-11 Alarm Setting Menu

- Output Selection: Zero Value or Real-time Value is selectable; Zero Value: when related signal values exceed upper/lower limits, the signal will be forced to 0; Real-time Value: outputs according to actual values.
- Max Flow H/L-LMT: Sets the maximum and minimum values for mass flow.
- VOL Flow H/L-LMT: Sets the maximum and minimum values for volume flow.
- Density H/L LMT: Sets the maximum and minimum values for density.
- TEMP H/L LMT: Sets the maximum and minimum temperature.

4.2.4 Sub-Loop Type

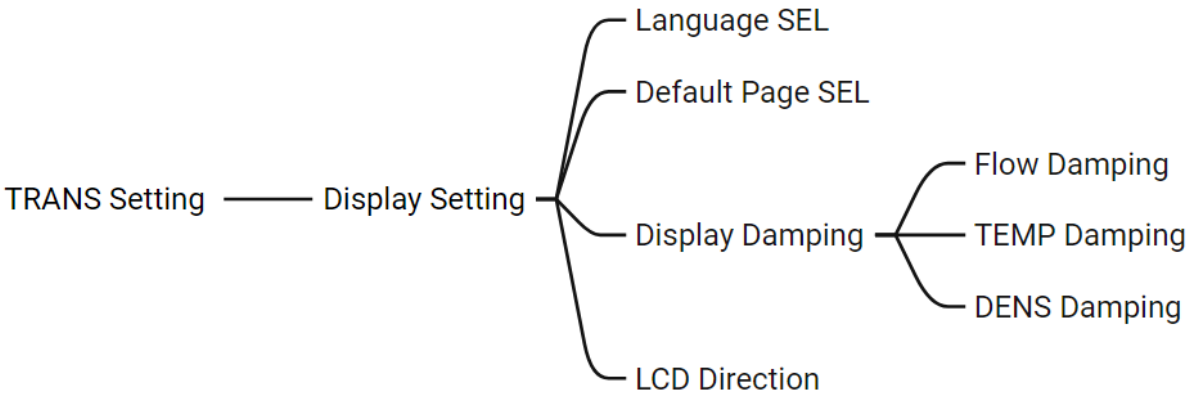
Used to configure the output type of the frequency/MO2 sub-loop. You can set sub-loop type to **Frequency** or **Current**.

Sub-Loop Type	F- F+ / (IO2-)(IO2+)	Signal Type
Frequency (default)	FO1 Setting (Pulse)	Mass Flow
		Volume Flow
Current	MO2 Setting (4-20 mA)	Mass Flow
		Volume Flow
		Density
		Temperature

Note

If Sub-loop Type is **Frequency**, signal type of Current for 2nd channel cannot be selected.

4.3 Display Settings



- Language SEL

  The transmitter can display in Chinese or English.

- Default Page SEL

  The parameter interface displayed after the transmitter is powered on and initialized, and the parameter interface displayed after returning from the menu interface to the default interface. Available combinations are: mass total and mass flow, volume total and volume flow, density and temperature, mass flow and density.

- Display Damping

  - Flow Damping: For real-time flow filtering calculation. Damping is used to smooth measured values and suppress sharp fluctuations. The smaller the coefficient, the greater the damping. Factory default: 0.8.

- TEMP Damping: For real-time temperature filtering calculation. Same as flow damping. Factory default: 0.8.
- DENS Damping: For real-time density filtering calculation. Same as flow damping. Factory default: 0.8.

4.4 Unit Settings

Unit settings menu includes: mass unit, mass flow unit, volume unit, volume flow unit, density unit, temperature unit, etc.

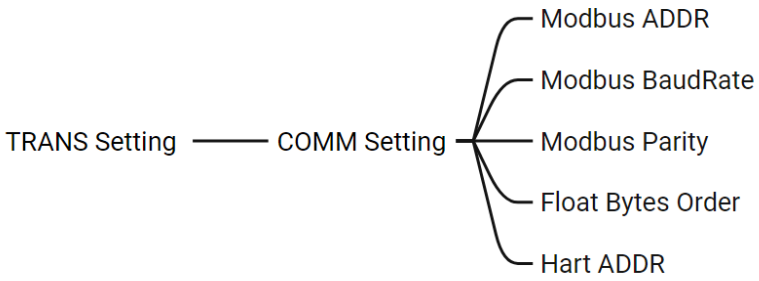
The unit settings are for display values only and are unrelated to measurement calculations. Select appropriate units as needed.

- Mass Unit: g, kg, t
- Mass Flow Unit: g/s, kg/min, kg/h, t/h.
- Volume Unit: divided into liquid volume unit and gas volume unit.
  - Liquid Volume Unit: L, m^3, US Gal, ImpGal.
  - Gas Volume Unit: NL, Nm^3, Scf.
- Volume Flow Unit: divided into liquid volume flow unit and gas volume flow unit.
  - Liquid Volume Flow Units: L/s, L/min, L/h, m^3/s, m^3/min, m^3/h, USGal/s, USGal/min, USGal/h, USGal/d, ImpGal/s, ImpGal/min, ImpGal/h, ImpGal/d.
  - Gas Volume Flow Units: NL/s, NL/min, NL/h, Nm^3/s, Nm^3/min, Nm^3/h, Scf/s, Scf/min, Scf/h, Scf/d.
- Density Unit: g/cm^3, kg/m^3.
- Temperature Unit: ℃ or ℉.

4.5 Communication Settings

The transmitter has RS-485 port, enabling data communication such as Modbus RTU. In the communication settings menu, you can set baud rate, parity, ID, and float byte order.

For RS-485 and HART wiring instructions, refer to Electrical Connection.



- Modbus ADD

  Set the serial communication address between the transmitter and the host. You can set the address between 1~255.

- Modbus BaudRate

  Sets the baud rate for communication between the transmitter and host computer. Five baud rates available: 2400 bps/4800 bps/9600 bps/19200 bps/38400 bps.

- Modbus Parity

  Sets the parity method for serial communication between the transmitter and host computer. Options: odd parity, even parity, or no parity.

- Float Bytes Order

  Set the parameter to ensure data compatibility with host computer software of different floating-point sequences.

- HART Address

  The transmitter can support optional HART communication. The default HART polling address when connecting is 0. The host can connect through the polling address and read relevant parameters of process variables. The valid range for transmitter address setting is 0~15.

5. Sensor Settings

Used for setting characteristic parameters and related parameters of sensors matched with the transmitter.

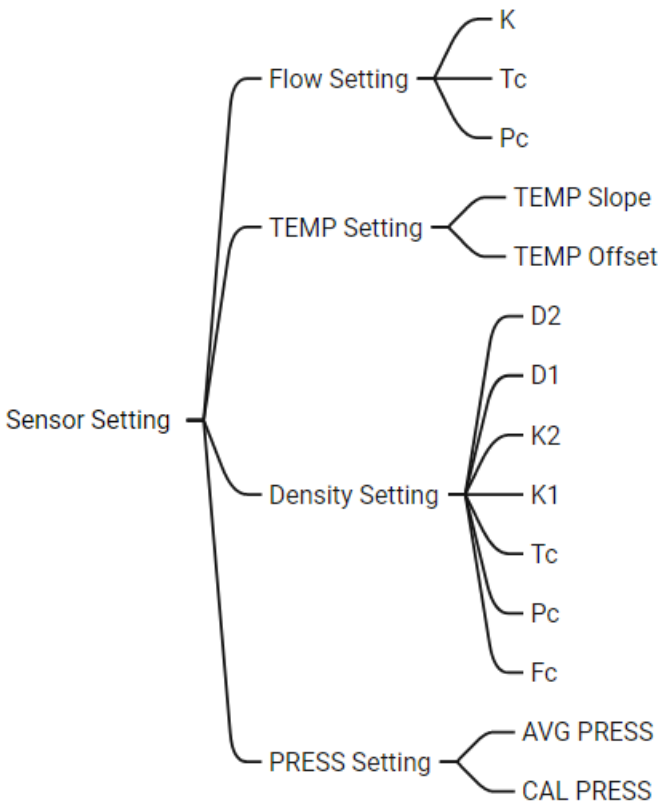


Figure 5-1 Sensor Setting Menu

5.1 Flow Setting

- Flow Slope (K)

  Key Parameters for Batch Measurement of Flow Meters: The flow rate gradient should be consistent with the K value on the sensor nameplate. Calibration method can refer to JJG 1038-2008 Verification Regulations.

- Flow Temperature Compensation (TC)

  The flow temperature compensation coefficient TC is a correction parameter when temperature changes affect flow. Refer to the corresponding values on the sensor nameplate for details.

- Flow Pressure compensation (PC)

  Flow measurement of some sensors is affected by pressure. PC is a correction parameter when pressure changes affect flow. Refer to the sensor selection guide or consult our company for specific values.

5.2 Temperature Settings

- Temperature Slope: The slope value for temperature measurement, representing the temperature correction factor.
- Temperature Offset: The offset value when temperature is zero.

5.3 Density Settings

Please refer to the corresponding values on sensor nameplate for sensor density parameters.

- High Density (D2)

  The standard density value of high-density medium during density verification.
- Low Density (D1)

  The standard density value of low-density medium during density verification.
- High Cycle (K2)

  The vibration period of the measurement tube when using high-density medium.
- Low cycle (K1)

  The vibration period of the measurement tube when using low-density medium.
- Density Temperature Compensation (Tc)

  Correction parameter when temperature changes affect density.
- Density pressure compensation (Pc)

  Correction parameter when pressure changes affect density.

5.4 Pressure Settings

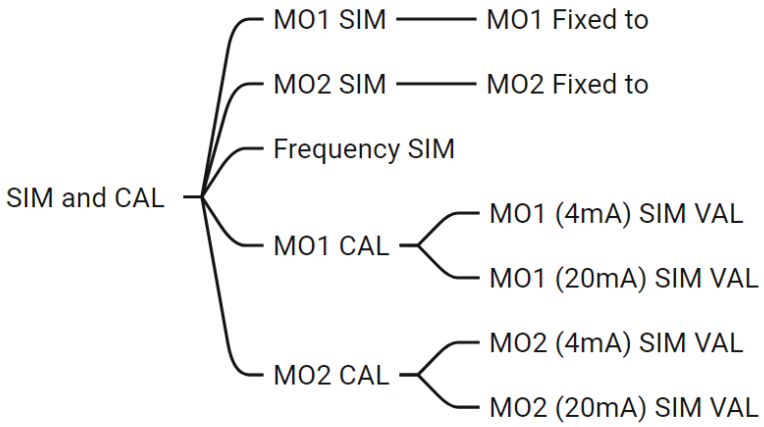
- Average Pressure

  In scenarios with relatively constant pressure, when pressure correction is needed for mass flow and density, setting the average pressure can achieve the corresponding function. Calculate the average pressure according to the field situation and input the corresponding pressure value during compensation.
- Calibration Pressure

The pressure when the sensor leaves the factory, also known as standard pressure.

6. Simulation and Calibration

Input simulation values to test the device's actual signal output and perform calibration.



6.1 Loop Test

Set the simulation current value in the current simulation interface, and the corresponding value will be output at the current output port for current output testing and troubleshooting.

The range of the simulation current for MO1 is 3.2 to 24 mA, and that for MO2 is 0 to 24 mA. If the loop output function is not enabled or is disabled, it will prompt "Disabled Function" or "Unsupported function".

6.2 Frequency Simulation

Set the output frequency value in the frequency simulation interface, and the corresponding frequency pulse signal will be output at the frequency output port for frequency (pulse) output testing and troubleshooting.

Pulse signal output frequency range is 0~12.5 KHz. With frequency output enabled, frequency simulation can be performed normally. If the frequency (pulse) output function is disabled or hardware does not support it, it will prompt "Disabled function" or "Unsupported function".

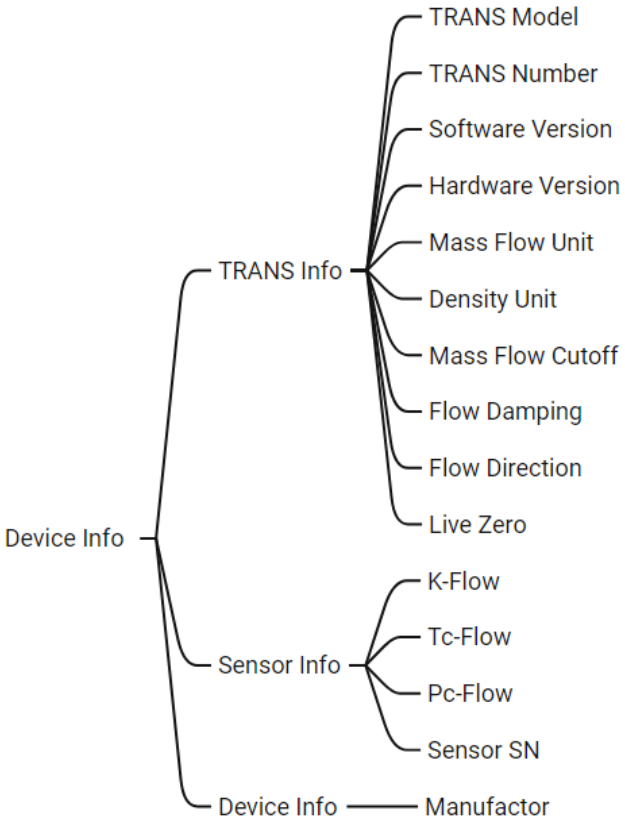
6.3 Loop Current Calibration

When there is a deviation between the output current and the actual current, current calibration can be performed to improve measurement accuracy.

1. Set the simulation current to 4 mA or 20 mA to obtain the actual current value at the transmitter's output port respectively.
2. In the calibration menu, input these current values into the 4 mA and 20 mA output current values respectively.
3. Confirm completion of output calibration.
4. (Optional) If the calibration result does not meet expectations after one attempt, repeat the above steps for secondary or multiple calibrations.

7. More Settings

7.1 View Information



- TRANS Info

  Shows flow unit, density unit, low flow value, flow damping, flow direction and other information.

- Sensor Info

  Shows specific information about flow slope, flow temperature compensation, flow pressure compensation, and mass total accumulation.

- Device Info

  Shows specific information about supplier, device model, device ID, hardware version, and software version.

7.2 Restore Configuration

Restore parameters to factory settings. Factory parameters are a set of basic parameters for normal operation of the sensor and transmitter, configured according to user requirements and tested for normal operation before leaving the factory. If the request is not made or the transmitter is not purchased separately, this function may not be activated. If this function is not activated and the user performs the restore factory parameters operation, the interface will prompt "Disabled Function".

Caution

- This function is an auxiliary function for professionals to repair faults when the transmitter experiences abnormal conditions. Under normal circumstances, it is not recommended to perform this operation during use.
- After executing this function, all parameters during product use will be restored to factory configuration. This may cause loss of user's effective configuration parameters (such as effectively corrected sensor characteristic parameters). Problems caused by this operation need to be borne by the user.

7.3 Change Password

The factory default password is 1000. The password is to prevent from accidentally entering the menu and changing settings without intention.

Caution

It is recommended to keep the default password. If it is changed, make sure you remember the new password, because the settings cannot be made by the local buttons without the correct password. If you forget the new password, the device should be returned to the manufacturer for processing. This may cause loss of original settings and extra cost.

8. Diagnosis and Maintenance

If abnormal operation is found during transmitter use, first determine the cause of the fault. Usually, fault causes can be divided into two kinds: application problems and flow meter system problems. Application problems are more complex, such as measurement fluctuations and errors caused by process or medium state changes, which should be analyzed according to the actual situation. This chapter mainly describes flow meter system fault causes and solutions.

8.1 Fault Diagnosis

You can perform fault diagnosis with the help of status indicators on the panel and the LCD display.

Different colors of status indicators represent the transmitter's working status. Green indicator blinking indicates normal operation; red indicator blinking indicates an alarm. The LCD display can display the transmitter's self-diagnosis alarm information, facilitating user judgment.

When "F" flashes in the upper right corner of the LCD display's home display interface or the red status indicator blinks, it indicates that the transmitter has detected one or more of the above faults. View specific faults by paging through the data display interface's fault information.

8.2 Trouble Shooting

8.2.1 Power Fault

No display when powered on: Check if the power supply cable connection is correct (whether the cable is damaged or the terminal connections are loose).

Display present but abnormal startup when powered on: Low voltage at the transmitter end during startup. Normally, DC power supply voltage at the transmitter end cannot be lower than 18 VDC, and AC power supply voltage cannot be lower than 85 VAC.

8.2.2 Common Faults

Table 8-1 Common Fault

No.	Fault Information	Cause of Failure	Solution	Display Method

01	Memory Read/Write Error	EEPROM Exception	Replace display board, or return to factory for processing	Fault
02	DSP Communication Failure	Communication abnormal between display board and DSP board	A: Check if display board is firmly connected B: Other reasons require return to factory processing	Fault
03	Flow Exceeds Upper/Lower Limit	Flow limit setting unreasonable	Modify flow limit value	Information
04	Temperature Exceeds Upper/Lower Limit	A Temperature limit setting unreasonable B: Temperature measurement abnormal	A: Modify temperature limit value B: Check if temperature measurement line is reliable C: Other reasons require return to factory processing	Information
05	Density Exceeds Upper/Lower Limit	Density limit setting unreasonable.	Modify density limit value	Information
06	Slug Flow Occurs	Medium contains excessive gas	Improve medium condition, reduce gas content	Information
07	Serial Communication Exception	A: A/B line connected incorrectly B: Communication parameter configuration error C: Confirm if twisted pair cable is used D: Other reasons require return to factory processing	Connect the A→A and B→B lines. B: Match communication parameters between both parties C: Confirm if twisted pair cable is used D: Other reasons require return to factory processing	Information

08	Zero Too Large, Cannot Calibrate	A: Valve not closed tightly, flow present B: Medium not filling measurement tube	A: Check if the valve is closed. b: Reopen the valve and fill with medium. C: Other Reasons for Factory Return	Information
09	Current 1 Hardware Abnormal	Current Abnormal	A: Check if current wiring is good. B: Other reasons require return to factory processing	Information

Note

When faults 01 or 02 occur, the current output will output corresponding alarm signals according to the configured fault alarm level (high limit alarm, low limit alarm).

8.3 Maintenance

If sensor or transmitter abnormalities cannot be solved, please contact us or mail the abnormal product to our company, and we will provide technical services as soon as possible.

9. Regulatory Information

Note

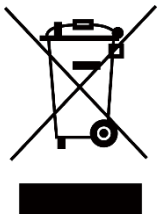
These clauses apply only to the products bearing the corresponding mark or information.

EU Conformity Statement

This product and - if applicable - the supplied accessories too are marked with "CE" and comply therefore with the applicable harmonized European standards listed under the Directive 2014/30/EU (EMCD) and Directive 2011/65/EU (RoHS).

Note: The products with the input voltage of within 50 to 1000 VAC or 75 to 1500 VDC comply with Directive 2014/35/EU (LVD), and the rest products comply with Directive 2001/95/EC (GPSD). Please check the specific power supply information for reference.

Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.



Directive 2012/19/EU (WEEE Directive): Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points. For more information see: www.recyclethis.info

Regulation (EU) 2023/1542(Battery Regulation): This product contains a battery and it is in conformity with the Regulation (EU) 2023/1542. The battery cannot be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. The battery is marked with this symbol, which may include lettering to indicate cadmium (Cd), or lead (Pb). For proper recycling, return the battery to your supplier or to a designated collection point. For more information see: www.recyclethis.info.

10. Modbus Communication Address

Scan the QR code to get the Modbus communication address of device service and function command.

Note

The function varies according to different device models. Please take the actual device for reference.

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