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Coriolis Mass Flowmeter

Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation. Use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate. If you find something wrong or incorrect, please contact us.
- The content of this manual is strictly prohibited from being reprinted or copied.
- Please use this product in accordance with its explosion-proof characteristics and in compliance with national and regional laws and regulations.
- The final interpretation of this manual rests with our company.

Version

U-SUP-FCC800-EN 1

Safety Precautions

For the safe operation of this product, please strictly follow the outlined safety precautions.

About this manual

- Please ensure the instrument operators have a careful reading of this manual.
- Prior to operation, please study this manual in detail to ensure a thorough comprehension of the device's functionality.
- This manual only describes the product's functions. The responsibility for the device's suitability for any special or personalized purpose lies solely with the operator.

Precautions for product protection, safety, and modification

- For your safety and the normal operation of the product and its controlling systems, the guidelines and precautions specified in this manual are supposed to be fully observed. Operating the instrument in ways not specified in this manual may compromise its protective features. Our company shall not be liable for any malfunctions or accidents resulting from non-compliance with the precautions described.
- When equipping the product and its controlling systems with lightning protection or separate safety protection circuits, it needs to be implemented by other devices.
- If you need to replace components or fittings of the product, please use the model specified by the company.
- This product is not designed for use in systems directly related to personal safety, such as nuclear power facilities, radioactive equipment, railway systems, aviation equipment, marine equipment, and medical equipment. If applied, it is the user's responsibility to implement additional equipment or systems to ensure personal safety.
- Do not modify this product.
- The following safety symbols are used in this manual:

Hazard: Failure to take appropriate precautions may result in serious personal injury, product damage, or major property loss.

Warning: Pay special attention to critical information related to the product or specific sections of this user manual.

- Confirm whether the supply voltage is consistent with the rated voltage before operation.
- Do not use the instrument in a flammable and combustible or steam area.
- To prevent electric shock and operation errors, ensure proper grounding protection is in place.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at the correct electric level, shielded, with wires properly routed, and an SPD surge protector applied as needed.
- Some internal components may carry high voltage. To avoid the risk of electric shock, do not open the front square panel unless it is being handled by trained personnel or maintenance staff authorized by our company.
- To avoid electric shock, disconnect the power before performing any checks.
- Check the condition of the terminal screws regularly. If loose, please tighten them before use.
- Unauthorized disassembly, modification, or repair of the product is not allowed, as it may lead to malfunctions, electric shock, or fire hazards.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine, or other organic solvents, and avoid exposing the product to any liquids. If the product falls into the water, please cut off the power immediately to prevent leakage, electric shock, or fire hazards.
- Please check the grounding protection regularly. Do not operate the

product if you think that the protection, such as grounding protection and fuses, is inadequate.

- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life, and fire.
- Please strictly follow the instructions in this manual; failure to do so may damage the product’s protective devices.

⚠

- Do not use the instrument if it is found damaged or deformed upon opening the package.
- Prevent dust, wire ends, iron fines, or other objects from entering the instrument during installation, as this may cause abnormal operation or failure.
- During operation, to modify the configuration, signal output, startup, stop, and operation safety shall be fully considered. Improper operation may lead to failure and even destruction of the instrument and control equipment.
- Each part of the instrument has a certain service life, which must be maintained and repaired regularly for long-term use.
- If the product comes to the end of its service life, it should be disposed of as industrial waste as a way of environmental protection.
- Disconnect the instrument when it is not in use.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for terms beyond the scope of this product warranty.
- This company is not responsible for damage to the instrument, loss of parts, or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Items	Quantity	Note
1	Coriolis Mass Flowmeter	1	
2	User Manual	1	
3	Test Certificate	1	
4	Test Report	1	

After opening the box, please confirm the scope of delivery before starting the operation. If you find that the model and quantity are incorrect or there is physical damage to the product's appearance, please contact us.

Contents

1 Overview

1.1 Introduction

The Coriolis mass flowmeter is a new type of flow measurement instrument developed based on the Coriolis force principle. It can directly measure the mass flow rate, density, and temperature of fluids in closed pipes. It can be widely used in industries such as chemical, petroleum, food, pharmaceutical, and papermaking.

1.2 Measuring Principle

A Coriolis mass flowmeter operates on the Coriolis principle. When the medium flows through the measuring tube, the tube is driven into vibration. The sensor detects and analyzes changes in vibration frequency, phase shift, and amplitude, by which the sensor directly determines the mass flow of the medium. Based on the vibration frequency, the flowmeter calculates the flow density and simultaneously measures multiple process variables, such as volumetric flow rate and temperature.

1.2.1. Measurement System

The transmitter is composed of an intelligent measurement and control system based on DSP and ARM, which enables accurate measurement of mass flow rate, density, and temperature.

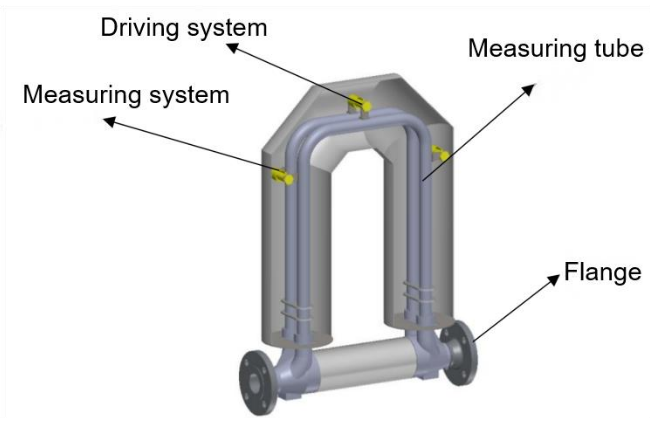

Fig.1 Measurement system

1.2.2. Measuring Principle

The driving coil located inside the sensor keeps the measuring tube continuously vibrating; when there is no medium flow, the tube maintains a stable and uniform vibration. When the medium flows through the measuring tube, its inertia causes a slight twisting of the vibration, resulting in different vibration directions at the tube's inlet and outlet. The detection coils located at the inlet and outlet accurately capture the temporal and spatial variation in the tube's variation. A proprietary algorithm then computes the phase difference, converts it into the instantaneous flow rate, and integrates the instantaneous flow to determine the mass of the medium passing through the measuring tube.

1.2.3. Density Measurement

During operation, the sensor measuring tube vibrates at its natural frequency. Changes in the density of the medium inside the measuring tube will cause a change in the resonant frequency of the measuring tube. By detecting the resonant frequency of the measuring tube and using a proprietary algorithm for correction calculation, the density of the medium inside the tube can be accurately measured.

1.2.4. Volumetric Flow Rate Measurement

The volumetric flow rate is calculated by measuring the obtained mass flow rate and density.

1.2.5. Temperature Measurement

The sensor has a built-in temperature sensor; temperature can be directly output as a measured variable.

1.3 Features

- Direct measurement of fluid mass flow.
- Wide measurement range with high accuracy.
- Low installation requirements; no need for upstream or downstream straight pipe runs.
- Integrated design with compact size for easy installation; an ultra-compact version is also available for confined installation spaces.
- Suitable not only for standard fluid measurement but also for industrial media that are difficult for conventional flowmeters to handle, such as high-viscosity

fluids, various slurries, and suspensions.

- Capable of online measurement of medium density, temperature, and other parameters.
- Reliable operation with low maintenance; no obstructions or moving parts inside the pipeline, resulting in fewer failure points and simplified installation and servicing.
- Adjustable damping time.
- Robust loop self-diagnostic functions for efficient troubleshooting.

2 Technical Parameters

Table 1 Technical specifications

Performance parameters	
Measured variables	Mass flow rate, density, temperature
Nominal diameter	U-shaped type: DN3~DN150 Micro-bend type: DN8~DN100 Straight pipe type: DN8~DN50 Inverted triangle type: DN1~DN2
Range ratio	U-shaped type: 10:1 Micro-bend type: 10:1 Straight pipe type: 5:1 Inverted triangle type: 10:1
Flow range	See Table 2
Density measurement range	(0.5~2.0) g/ cm^3
Temperature measurement range	(-240~350)℃
Accuracy	Flow volume: Level 0.15, Level 0.2, Level 0.5 Density: ±0.001g /cm^3 (± 1kg / m^3) Temperature: ± 1 ℃ or ± 0.5% × test value, whichever is greater.
Repeatability	1/2 of the accuracy
Output	
Transmitter output	(4～20) mA, load resistance ≤ 750Ω
Communication	RS485 , MODBUS-RTU;Hart
Pulse output	Duty cycle: 10%~90% Pulse frequency: Maximum 10000Hz Active: Output current 10mA, open circuit voltage 30V
Power supply	
Power supply	24VDC/220VAC
Power consumption	≤ 10W

Electrical interface	M20*1.5
Process conditions	
Measuring medium	Gases, liquids, slurries, suspensions, etc.
Medium temperature	Standard temperature type: Integrated type: (-50~80)℃ remote type: (-50~150) Cryogenic type: (-200~150)℃ (only available for U-type and remote type models) Ultra-low temperature type: (-255~150)℃ (optional for remote type only) High-temperature type: (-50~230)℃ (optional for remote type only) Ultra-high temperature type: (-50~350)℃ (optional for remote type models only)
Nominal pressure	Clamp connection type: Pressure resistant PN16 Flange connection type: pressure resistant PN16, PN40, or PN63
Environmental conditions	
Ambient temperature	(-40~55) ℃ (with display: -25 ℃～ 55 ℃)
Storage temperature	(-40~70)℃
humidity	≤95%
Protection level	IP67

Table 2 Flow range

Diameter	Maximum flow		Diameter	Maximum flow	
	kg/min	Lb/min		kg/min	Lb/min
DN1	0.2	0.44	DN25	200	440
DN2	1.6	3.53	DN40	450	992
DN3	3	6.61	DN50	650	1433
DN4	5	11	DN80	2000	4409
DN8	20	44	DN100	3000	6613
DN15	60	132	DN150	12000	26455
DN20	100	220			

3 Structure and Dimensions

3.1 U-shaped Coriolis Mass Flowmeter

- DN3~DN25 U-type flowmeter

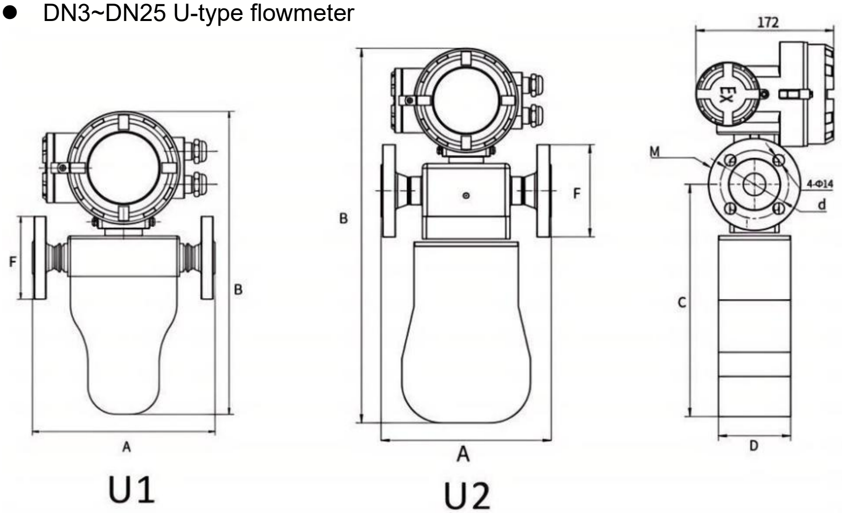

Fig.2 Diagram of U-type flowmeter with dimensions DN3~DN25

Table 3 DN3~DN25 wide U-shaped flowmeter dimensions (unit: mm)

Type	Diameter	A	B	F	C	D	d
U1	DN3	210	325	95	156.50	54	φ65
	DN4	210	325	95	156.50	54	Φ65
	DN8	210	325	95	156.50	54	Φ65
	DN15	210	348	95	180	54	Φ65
U2	DN20	212	458	115	289	90	Φ85
	DN25	212	458	115	289	90	Φ85

- DN40~DN150 U-type flowmeter external dimensions

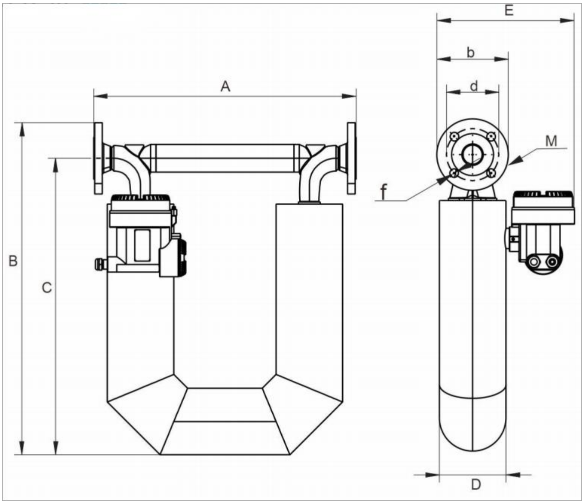

Fig.3 Diagram of U-type flowmeter with diameters from DN40 to DN150

Table 4 DN40~DN150 U-type flowmeter dimensions (unit: mm)

Diameter	A	B	C	D	E	M	d	b
DN40	552	699	624	140	288	4- Φ 18	Φ 110	Φ 150
DN50	600	747	665	159	305	4- Φ 16	Φ 125	Φ 165
DN80	763	950	850	219	353	8- Φ 18	Φ 160	Φ 200
DN100	963	1079	962	273	416	8- Φ 22	Φ 190	Φ 235
DN150	1164	1144	994	324	467	8- Φ 26	Φ 250	Φ 300

3.2 Micro-Bend Coriolis Mass Flowmeter

Table 5 U-shaped Coriolis mass flowmeter specifications

Sensor type	**Nominal diameter**	**Maximum work pressure of measuring tube**	**Maximum flow**	
			kg/min	**Lb/min**
Micro-bend type	DN8	≤10MPa	20	44
	DN15		60	132
	DN25		200	440

Sensor type	**Nominal diameter**	**Maximum work pressure of measuring tube**	**Maximum flow**	
			kg/min	**Lb/min**
	DN40		450	992
	DN50		650	1433
	DN80	≤6.3MPa	2000	4409
	DN100	≤4MPa	3000	6613

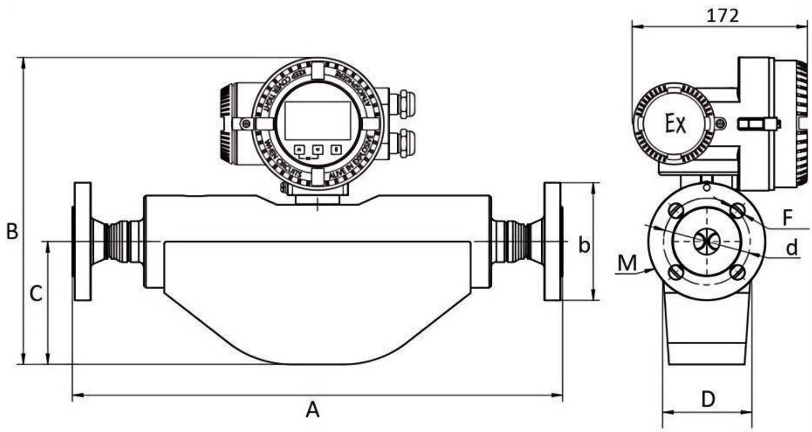

Fig.4 Diagram of the micro-bend flowmeter

Table 6 Dimensions of the micro-bend flowmeter (unit: mm)

Diameter	A	B	C	D	F	d	b
DN8	390	270	100	70	4-Φ14	Φ65	Φ95
DN15	390	270	100	70	4-Φ14	Φ65	Φ95
DN25	480	300	120	90	4-Φ14	Φ85	Φ115
DN40	816	401	200	125	4-Φ18	Φ110	Φ150
DN50	816	401	200	125	4-Φ16	Φ125	Φ165
DN80	954	567	300	170	8-Φ18	Φ160	Φ200
DN100	1111	552	292	292	8-Φ22	Φ190	Φ235

3.3 Straight Tube Coriolis Mass Flowmeter

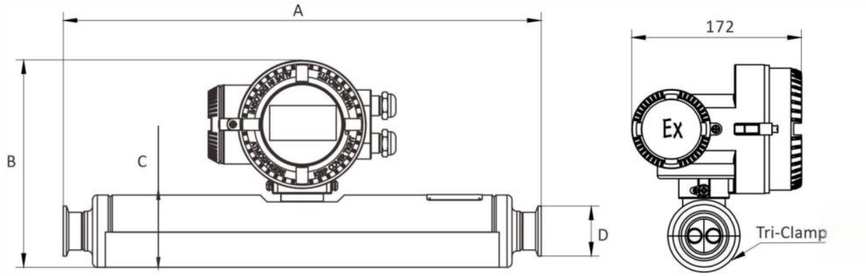

Fig.5 Diagram of straight tube Coriolis mass flowmeter

Table 7 Straight pipe flowmeter dimensions (unit: mm)

Diameter	A	B	φC	φD
DN8	382	207	73	50.5
DN15	382	207	73	50.5
DN25	483	209	73	50.5
DN40	750	260	125	91
DN50	750	260	125	91

4 Installation

4.1 Installation Tips

Note!

Please inspect the packaging box for any damage or signs of rough handling. If there is any damage, report it to the delivery personnel, the manufacturer, or the instrument supplier.

Note!

Please check the packing list to make sure the items you received are complete.

Note!

Please inspect the nameplate on the instrument to confirm that the supplied items match your order. Verify that the power supply information on the nameplate is correct. If it is incorrect, contact the manufacturer or the instrument supplier.

Note!

The installation diagram is for reference only; please refer to the actual product.

4.2 Installation Inspection

- Check to ensure there is no damage during transportation.
- Ensure that the current installation environment matches the information on the nameplate.
- Check the current ambient temperature and process medium temperature to ensure they are within the range specified in "Operating Conditions".
- If the sensor is configured with an integrated transmitter, no wiring is required between the sensor and the transmitter.
- If the sensor is configured with a remote transmitter, the wiring of the sensor and transmitter has been completed in the factory, and the transmitter needs to be installed on-site.

4.3 Installation Precautions

- The installation sites should avoid electromagnetic interference and mechanical vibration.
- The control valve connected in series with the Coriolis flowmeter should be installed downstream.
- When installing the sensor, the measuring tube should be filled with the medium being measured, which helps prevent a decrease in its measurement performance.
- Although the performance of the flowmeter is not usually affected by uneven velocity profiles or vortices caused by upstream or downstream pipes, and special straight pipe sections are generally not required, it is advisable to maintain good pipe conditions and use rigid straight connections to avoid installation stress acting on the sensor and causing it to malfunction.

4.4 Installation Requirements

4.4.1. Straight Pipe Mass Flowmeter Installation

(1) Under most circumstances, such as liquid measurement, media containing small amounts of particles, or gas flow measurement, a vertical installation is recommended. The flowmeter should be mounted at the lowest point of a vertical pipeline, with the medium flowing upward. This prevents gas pockets or liquid accumulation in the vibrating tubes, which could affect measurement accuracy. The installation diagram is shown in the figure below:

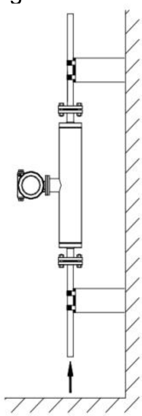

Fig.6 Vertical installation diagram

(2) If the measured medium is purely liquid, horizontal installation is also possible. It is recommended to install it at the lowest point of the entire system to ensure the instrument is fully filled and to prevent gas accumulation that could cause measurement errors. An installation diagram is shown below :

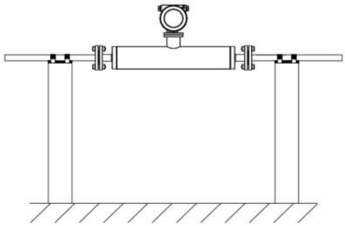

Fig.7 Horizontal installation diagram

(3) When measuring the flow rate of liquid media, media with a small amount of particulate matter, and gaseous media, the device can be installed at an angle with the media flowing upwards to avoid gas or liquid volume remaining in the vibrating tube and affecting normal measurement. The installation diagram is shown below:

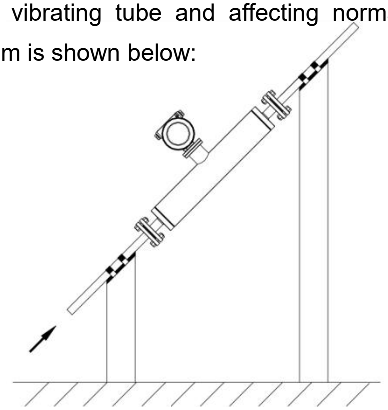

Fig.8 Angled installation diagram

(4) When using/installing instruments with hygienic process connections, ensure that the instruments are properly supported/clamped due to their weight. 3A certification requires the instrument to be "self-draining," so it must be installed vertically with the flow from bottom to top. Support/clamp the main body of the instrument.

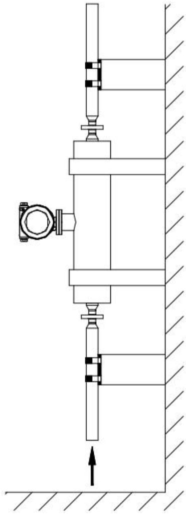

Fig.9 Installation diagram of a sanitary straight pipe mass flowmeter

(5) Insulation and heating installation: If insulation is required onsite, a range of materials can be used for insulation treatment. Note that the insulation layer should not exceed the position shown in the diagram. Electric heating can be used, but note that the heating layer should not exceed the position shown in the diagram. Liquid/steam jacketed heating should be installed according to the heating interface provided by the instrument. It is recommended to use reinforced flexible hoses to connect the heating jacket to the heat source.

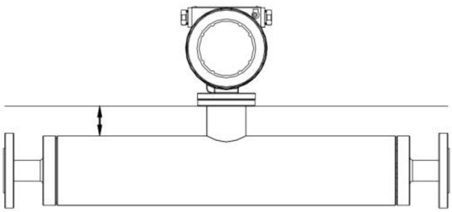

Fig.10 Diagram of the insulated and heated straight tube mass flowmeter

(6) Incorrect Installation Instructions

- Horizontal installation, with the water flowing vertically down a long distance after passing through the instrument, is not recommended.
- Installing the flowmeter at the highest point of the pipe can cause air to accumulate.
- Installing the flowmeter directly at the downward-facing vent outlet is not recommended.

- Flow regulating valves must not be installed upstream of the flowmeter. If installation is necessary, please install them downstream of the flowmeter.
- When installed horizontally, the vibratory tube is subjected not only to the Coriolis force but also to its own weight, making it impossible to perform measurements normally.

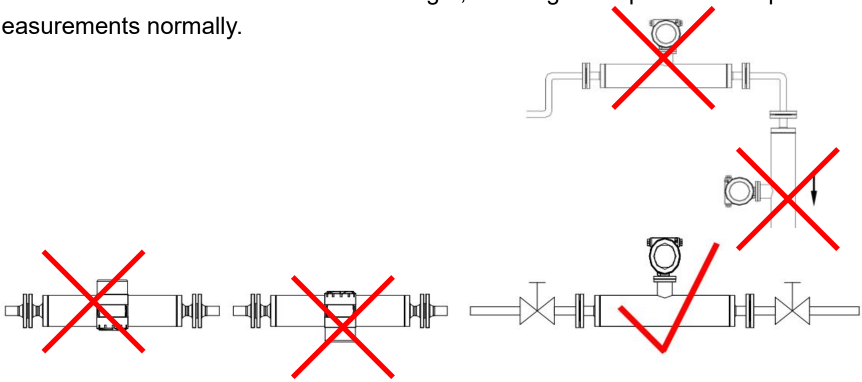

Fig.11 Installation Instructions

(7) Fixed

Coriolis mass flowmeters are vibratory instruments, meaning their two vibrating tubes are constantly vibrating during operation. Therefore, external vibrations or pipeline vibrations can affect their operation, potentially causing malfunctions. Consequently, the sensor should be fixed to both ends with brackets during installation, and the main body of the instrument can also be fixed. The brackets should be installed on a stable, vibration-free surface.

If a fixed support cannot be guaranteed, or if the pipeline connection cannot guarantee that vibration will be avoided, the sensor can be installed on a stable interface and connected to the pipeline with a flexible hose.

(8) Flowmeter hoisting

The following points should be noted during transportation:

① Do not remove the original packaging during transportation.

② Do not remove the protective cover on the process connector to avoid mechanical damage to the sealing surface of the connector during transportation and storage, and to prevent foreign matter from entering the measuring tube.

③ When hoisting, use a soft mesh rope to wrap around the connection points at both ends. Do not wrap the hoisting rope around the converter housing or the wiring cavity housing. To protect the flowmeter’s housing, the chain is not advised to be used during hoisting.

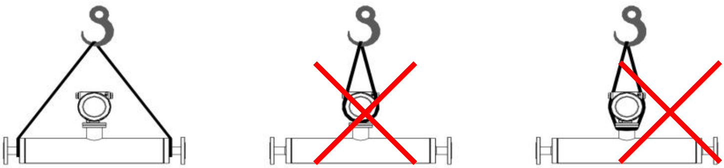

Fig.12 Flowmeter hoisting

4.4.2. Non-Straight Pipe Flowmeter Installation

Non-straight pipe mass flowmeters can be installed vertically downwards, vertically upwards, or in a flag-style (vertical) or oblique flag-style (vertical) configuration. However, horizontal installation must be avoided (in which case the vibrating tube is subjected not only to the Coriolis force but also to the weight of the vibrating tube, making the measurement impossible).

（1）When measuring the flow rate of liquid media, the vibratory tube should be installed vertically with the tube facing downwards to avoid gas accumulation inside the tube, which could affect normal measurement. An installation diagram is shown below:

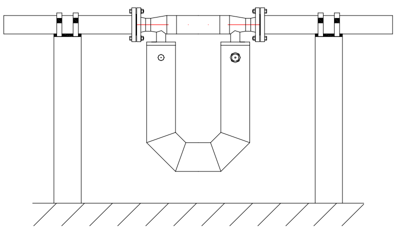

Fig.13 Vertically downward installation in a horizontal pipe run

（2）Under normal conditions, when measuring the flow rate of gaseous media, the vibrating tube should be installed vertically upwards to avoid liquid volume inside the vibrating tube affecting normal measurement. The installation diagram is shown below:

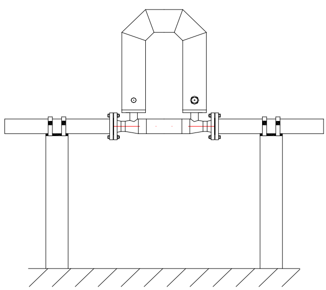

Fig.14 Vertically upward installation in a horizontal pipe run

（3）If the measured medium possibly contains particulate matter in the vibrating tube, the flag-type (vertical) installation method should be adopted to avoid particulate accumulation affecting normal measurement. The installation diagram is shown below:

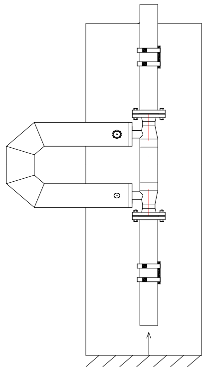

Fig.15 Vertical (flag-style) installation diagram

（4）Fixing of flow sensor

Coriolis mass flowmeters are vibratory instruments, meaning their two vibrating tubes are constantly vibrating during operation. Therefore, external vibrations or pipeline vibrations can affect their operation, potentially causing malfunctions. Consequently, the sensor should be fixed at both ends with brackets (the connection should be fixed, while the vibrating tubes remain free), as shown in Figures 16-18 above. The brackets should be installed on a stable, vibration-free interface.

If a fixed support cannot be guaranteed, or if the pipeline connection cannot guarantee that vibration will be avoided, the sensor can be installed on a stable interface and connected to the pipeline with a flexible hose.

Small-diameter (triangular) flowmeters have thinner connecting pipes, ensuring the sensor is protected from vibration during connection, and fixation is challenging. Therefore, small-diameter sensors are manufactured with two mounting holes on the sensor housing. Users can use these holes to fix the sensor to a bracket. The mounting bracket should be installed on a stable surface. A sensor installation diagram is shown below.

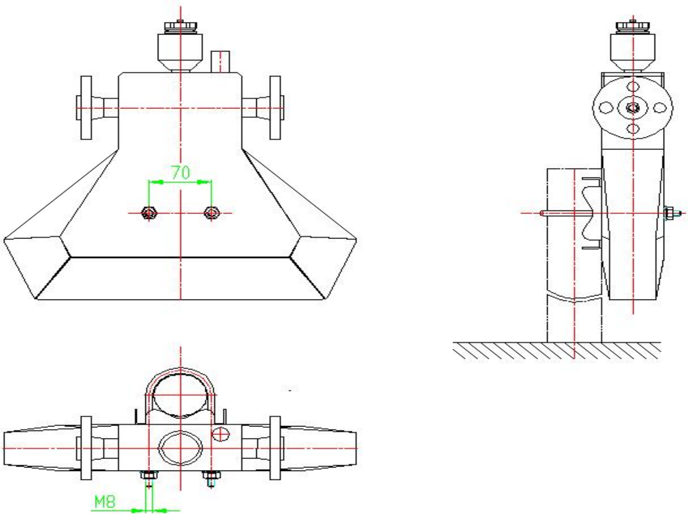

Fig.16 Bracket fixing diagram

（5）Fixed remote type converter

remote type mass flowmeters are generally equipped with a 3-meter-long converter signal cable. The installation diagram is shown below:

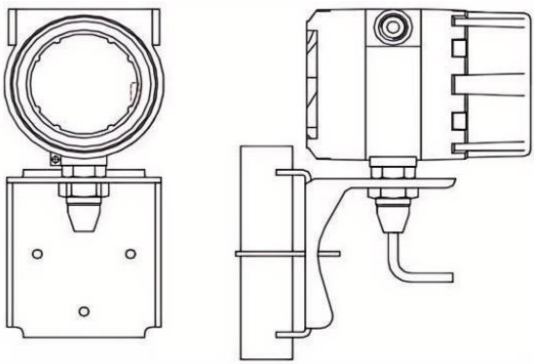

Fig.17 Diagram of a converter fixed with bracket

4.5 Inverted Triangle Coriolis Mass Flowmeter

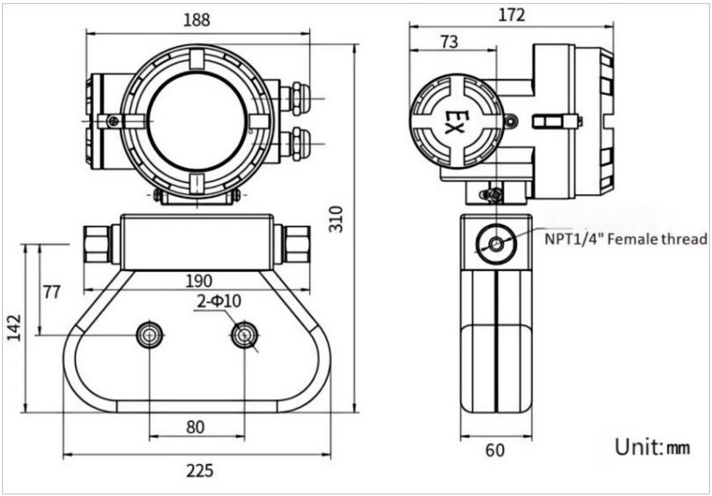

Fig.18 Inverted triangle Coriolis mass flowmeter dimension diagram

4.6 Cryogenic Coriolis Mass Flowmeter

(1) DN8 cryogenic Coriolis mass flowmeter

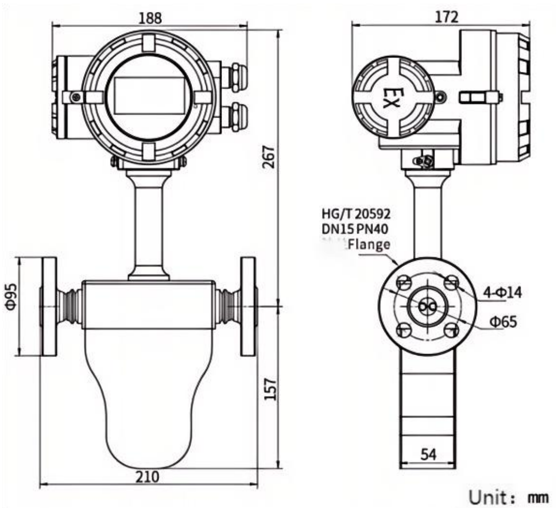

Fig.19 DN8 cryogenic coriolis mass flowmeter dimensions

(2) DN40~DN80 cryogenic Coriolis mass flowmeter

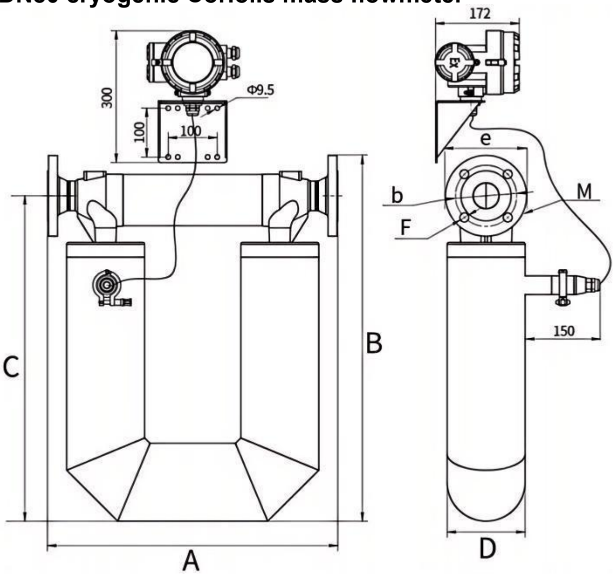

Fig.20 DN40~DN80 cryogenic coriolis mass flowmeter external dimensions

Table 8 DN40~DN80 cryogenic flowmeter dimensions (unit: mm)

Diameter	A	B	C	D	e	b	F
DN40	560	699	624	Φ140	φ150	φ110	4-φ18
DN50	592	747	665	Φ159	φ165	φ125	4-φ18
DN80	763	950	850	φ219	φ200	Φ160	8-φ18

4.7 Process Connection

Thread: NPT internal thread.

Flanges: HG/T 20592 flange is in default. HG/T 20615 flange, GB/T 9115 flange, ASME B16.5 flange, or JIS B2220 flange are optional.

Clamps: ISO 2852 clamps.

4.8 Material

Converter housing material: 304

Sensor housing material: 304 or 316L

Measuring tube material: 316L or HC

5 Electrical Connection

5.1 Wiring Precautions

- For integrated transmitters, no wiring is required between the sensor and the transmitter.
- Always disconnect the power supply before connecting the power cord, and ensure that the power supply voltage matches the transmitter's operating voltage.
- When wiring the power input, the red wire represents "+" and the black wire represents "-".

5.2 Terminal Blocks

The transmitter's secondary terminal block is marked with various interfaces. The wiring diagram for the signal output is shown below:

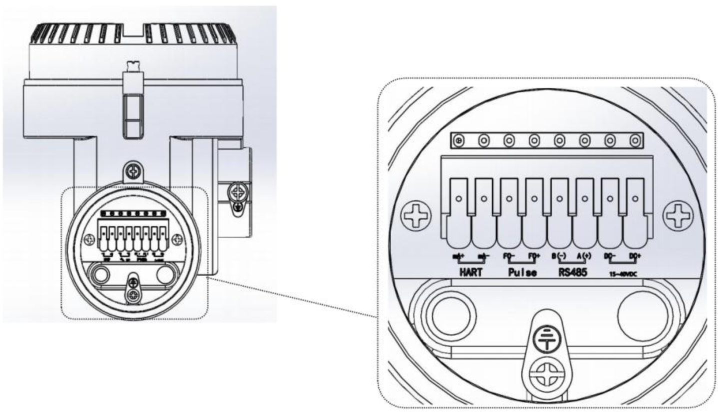

Fig.21 Terminal diagram

HART: HART protocol output signal. When wiring, "mA+" is positive and "mA-" is negative.

Pulse: Pulse output signal. When wiring, "FO+" is positive and "FO-" is negative.

RS485: Modbus/RS485 output signal. When wiring, "A" is the positive signal and "B" is the negative signal.

15~40VDC: Power cord terminals. When wiring, "DC+" is positive and " DC-" is negative.

5.3 Output Wiring Instructions

5.3.1. RS-485 Output Wiring

The RS-485 interface is used to connect to a computer's serial port, enabling communication and debugging between the flowmeter and the host computer software. Its default baud rate is 38400 bit/s. The wiring diagram is as follows:

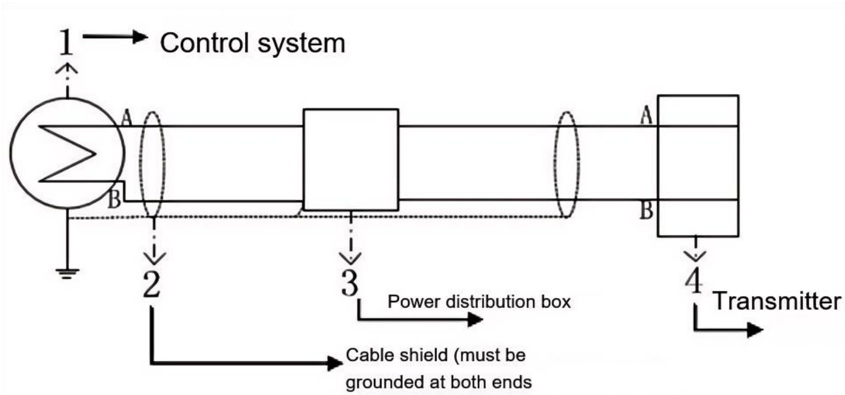

Fig.22 RS485 wiring diagram

5.3.2. Pulse Signal Output Wiring

The Pulse interface is used for wiring pulse output signals. The default pulse signal is active, 5VDC; it can be adjusted to passive: open collector, maximum 30VDC, 100mA. See the output wiring diagram.

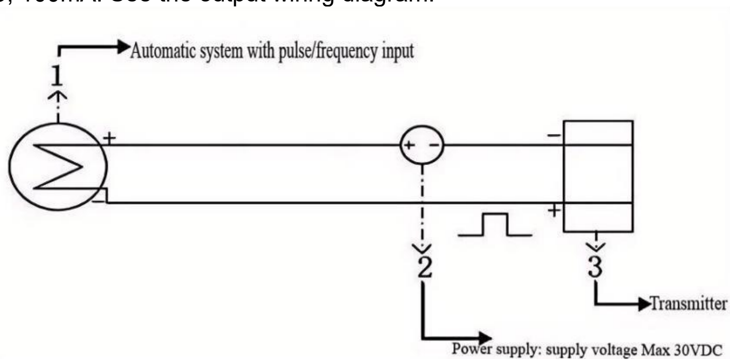

Fig.23 Pulse signal output wiring diagram

5.3.3. (4~20) mA/HART Output Wiring

The Cloop interface is used for wiring ports of (4 ~ 20) mA current loop or HART output signals, with a supply voltage of (12 ~ 28) VDC and a current range of 4 ~ 20mA. The output wiring diagram is as follows:

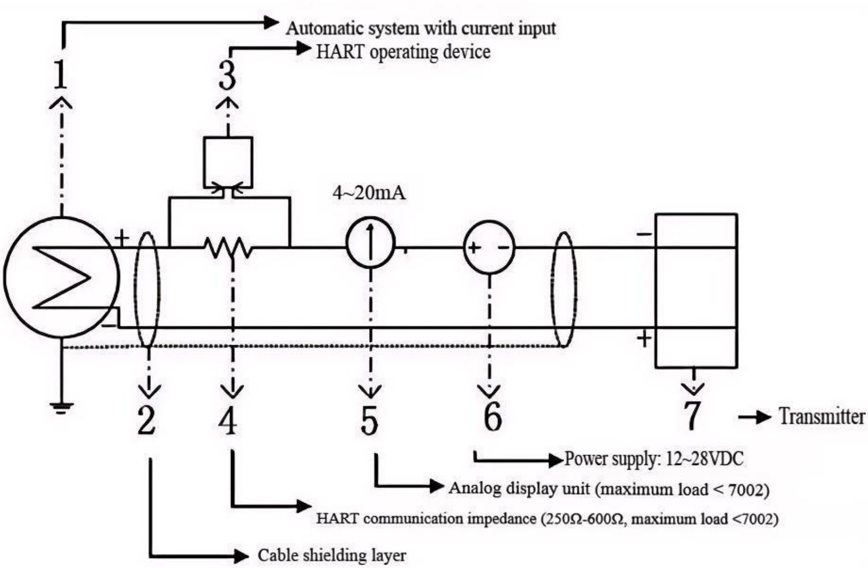

Fig.24 Current loop/HART output wiring

6 Operation

6.1 Display and Operation Unit

6.1.1. Main Interface

The main interface can display eight measurement parameters, including: mass flow rate, volumetric flow rate, standard volume flow rate, totalized mass, totalized volume, cumulative standard volume, density, and temperature.

The main interface display parameters can be set in "Config" → "Disp cnfg".

Fig.25 Main interface diagram

6.1.2. Button Functions

Table 9 Key Definition

Symbol	Button Name	Button Functions
▲	Up Key	Move the cursor up
▼	Down key	Move the cursor down.
E	Menu button/Confirm button	On the main interface, go to the settings menu. Confirm on the settings interface.
▲+▼	Back button	Press the keys simultaneously to return to the previous screen.

6.2 Menu Description

Press the "E" key on the main interface to enter the menu interface.

Note: If no action is taken within one minute of entering the menu interface, you will be automatically returned to the main interface.

Table 10 Menu List

Level 1	Level 2	Level 3	Parameter Description
Totalizer	Mass total	Rst mass total	Reset the accumulated mass to zero
		Mass total	Current cumulative quality value
	Vol. total	Rst vol. total	Totalized volume reset to zero
		Vol. total	Current totalized volume value
	SCF total	Rst SCF total	The totalized SCF(standard cubic foot) is cleared to zero.
		SCF total	Current totalized SCF(standard cubic foot) value
	Mass inv.		Current mass inventory value
	Vol. inv.		Current volume inventory value
	SCF. inv.		Current SCF(standard cubic foot) inventory value
Cal.	Zero cal.		Perform instant zero-point calibration.
Config.	F cnfg	Parm/Units	Flow direction: forward/reverse/bidirectional/absolute value
			Flow damping: 0s~60s
			Low flow rate cutoff: 0~0.1 flow rate limit
			Standard density: 0.000~4.000, unit: kg/L
			SCF density: g/s, g/min, g/h, kg/s, kg/min, kg/h, kg/d, t/min, t/h, t/d, lb/s, lb/min, lb/h, lb/d, st/min, st/h, st/d, lt/h, lt/d
			Mass flow rate units: m^3/s, m^3/min, m^3/h, m^3/d, L/s, L/min, L/h, L/d, ML/d, CUFT/S, CUFT/MN, CUFT/H, CUFT/D, USGPS, USGPM, USGPH, USGPD, MILG/D, UKGPS, UKGPM, UKGPH, UKGPD, bbl/s, bbl/min, bbl/h, bbl/d,

Level 1	Level 2	Level 3	Parameter Description
			bbbl/s, bbbl/mn, bbbl/h, bbbl/d
			Volumetric flow unit: Nm^3/s, Nm^3/min, Nm^3/h, Nm^3/d, scf/s, scf/min, scf/h, scf/d,slp/s, slp/min, slp/h, slp/d
			Totalized mass units: g, kg, t, st, lt, lb, oz, dr, gr
			Totalized volume units: m^3, L, ft^3, USgal, UKgal, bbl, bbbl
			Totalized SCF units: Nm^3, scf, slp
		F parm	Zero flow rate: -10~10us
			Calibration factor: 0.1~50000
			Correction factor: 0~100
			Flow coefficient: 0.8~1.2
	Den cnfg	Den CF	Density upper limit of 0~0.5
		Den unit	g/cm^3, g/mL, g/dm^3, g/L, g/m, kg/cm^3, kg/dm^3, kg/L, kg/m^3, lb/in^3, lb/ft^3, lb/USgal, lb/UKgal, lb/bbl
		Den cof	0.8~1.2
		Den damping	0s~60s
		Den cal. cof	
		Den cal. cnst	
		Std den 1 (note: air)	
		Std den2 (note: water)	
	Temp. cnfg	Temp.cof	0.8~1.2
		Temp. damping	0s~60s
		Temp.unit	℃, ℉, R, K
		Temp. cal. cof	
		Temp.cal. cnst	
	Comm	Modbus	The baud rate, parity, stop bits, data bits, device address, byte order,

Level 1	Level 2	Level 3	Parameter Description
	cnfg		Modbus transmission delay, and other parameters for RS-485 communication can be configured.
		Waveform	Waveform mode: Pulse output
			Pulse output: Pulse duty cycle, pulse polarity, pulse fault action, pulse output variables, pulse equivalent, and pulse frequency can be set.
		CL/HART	Current loop: Allows setting parameters for (4~20) mA output, as well as setting the upper/lower limits of (4~20) mA output, etc.
			HART communication parameters
	Disp cnfg	MID parm	Configure the parameters displayed on the main interface, including mass flow rate, volumetric flow rate, SCF flow, totalized mass, volumetric totalization, totalized SCF, density, and temperature.
		B.light adj	Display backlight settings
		Lang sel	Choose from Chinese, English, or Russian.
	Reg. cnfg		
Sys mode	User Mode		
	Plnt mode		
Alarm enq	Sensor failure		
	Flow overrun		
	Sys Normal		
Eqpt. info	Query device information		

6.3 Operating Instructions

Example 1: The main interface displays parameter modifications.

(1) Step 1: Press the "E" key on the main interface to enter the function menu, press the ▼/▲ key to jump to the "Config" menu, press the "E" key to confirm, and enter the configuration settings.

(2) Step 2: In "Config", press the ▼/▲ key to jump to "Disp cnfg", press the "E" key to confirm, and use the same method to jump to “MID parm” (Main Interface Display Parameters) and press the "E" key to confirm.

(3) Step 3: Use the ▼/▲ keys to jump to the parameter that needs to be adjusted, and press the keys to check or uncheck the parameter.

(4) Step 4: After modifying the parameters, press the ▼ and ▲ keys simultaneously to go back through the layers until you return to the main interface, and check if the settings were successful.

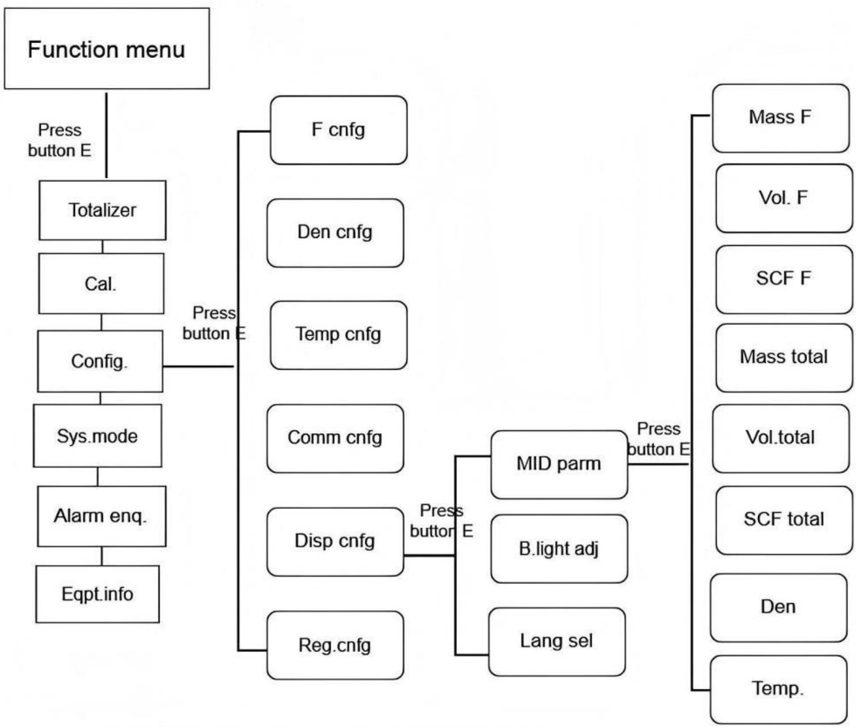

Fig.26 Steps for modifying parameters on the main interface

Example 2: Clear mass totalization

(1) Step 1: Press the "E" key on the main interface to enter the function menu, press the ▼/▲ key to jump to "totalizer", press the "E" key to confirm, and enter the accumulator.

(2) Step 2: In the accumulator, press the ▼/▲ key to jump to "Mass total", press the "E" key to confirm, and enter the mass accumulation.

(3) Step 3: Press ▼/▲ to jump to "Rst mass total", press "E" to confirm, and the mass totalization will be cleared to zero.

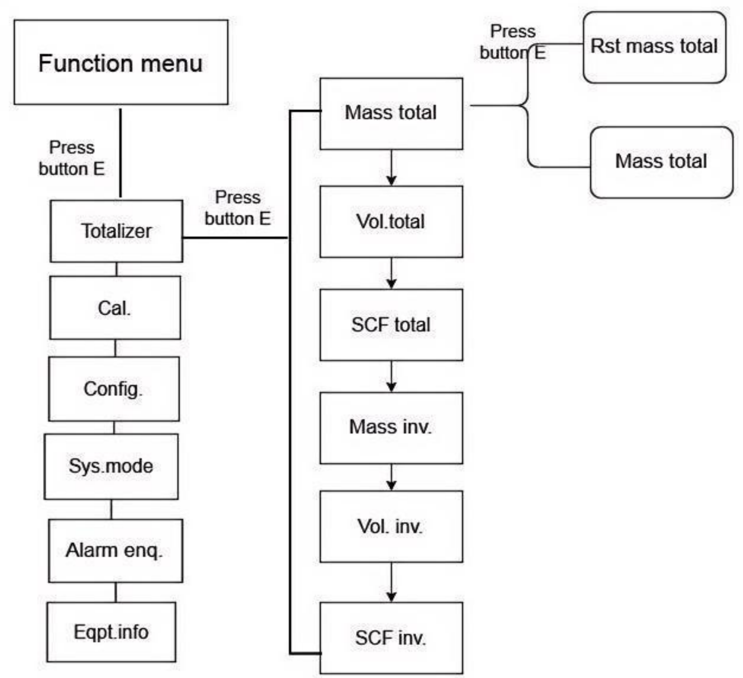

Fig.27 Clear mass totalization

Example 3: Zero point calibration

(1) Step 1: Press the "E" key on the main interface to enter the function menu, press the ▼/▲ key to jump to "Cal" (calibration), press the "E" key to confirm, and enter the calibration.

(2) Step 2: Under calibration, press the ▼/▲ key to jump to "zero cal."(Zero Point Calibration), press the "E" key to confirm, and enter the zero point

calibration.

(3) Step 3: Press ▼/▲ to jump to "Start", press "E" to confirm, and begin zero-point calibration.

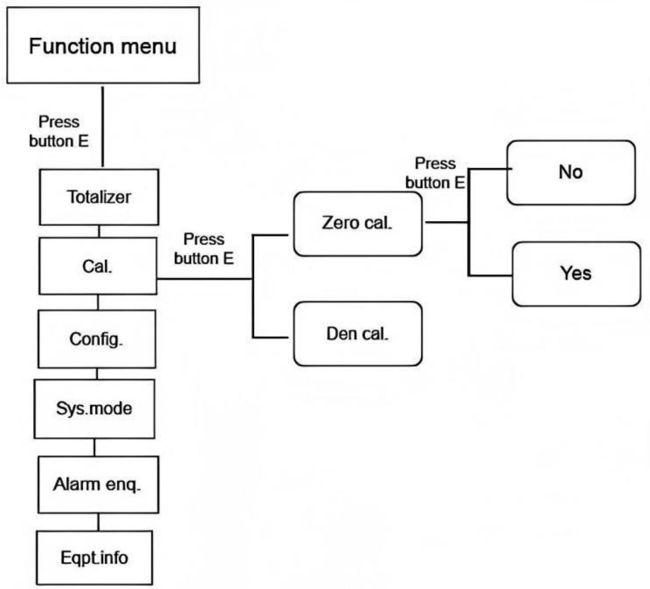

Fig.28 Zero point calibration steps

Example 4: Modify the output variable (4~20) mA

(1) Step 1: Press the "E" key on the main interface to enter the function menu, press the ▼/▲ key to jump to "Config"(Configuration), press the "E" key to confirm, and enter the configuration.

(2) Step 2: In the configuration interface, press the ▼/▲ key to jump to "Comm cnfg" (communication Configuration), press the "E" key to confirm and enter the communication configuration. In the same way, jump to "Current Loop /HART " and press the "E" key to confirm.

(3) Step 3: Press ▼/▲ to jump to "CLOV"(Current Loop Output Variable), press "E" to confirm, and start zero-point calibration.

(4) Step 4: Use ▼/▲ to jump to the variable that needs to be output, and press "E" to select or unselect the variable.

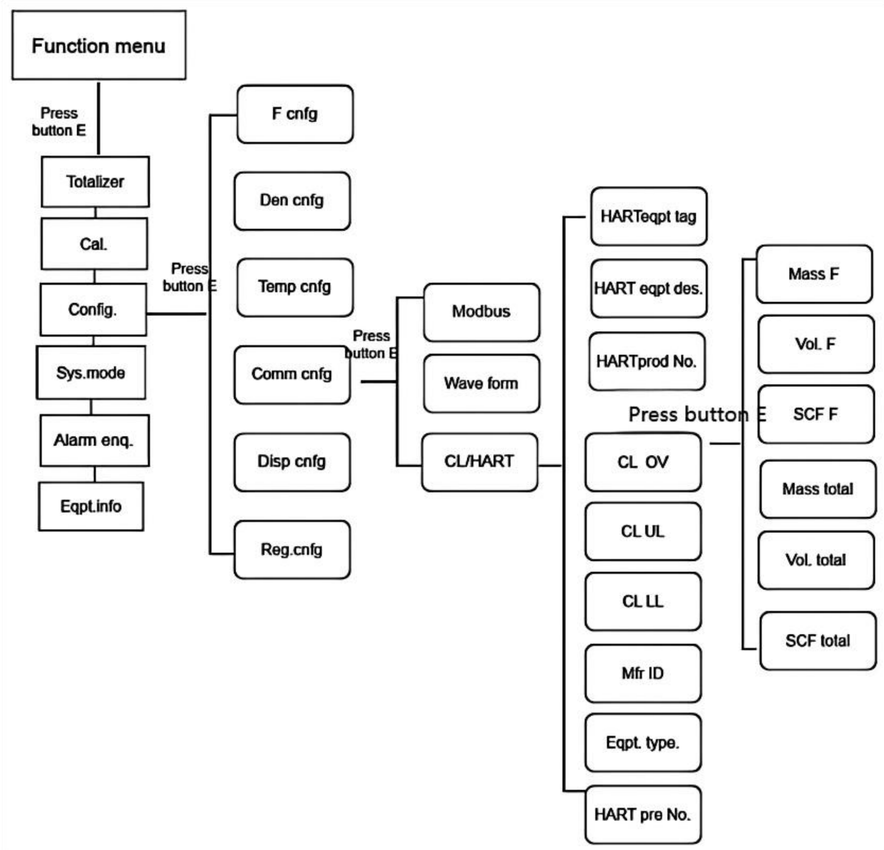

Fig.29 Steps to modify (4~20) mA output variables

Example 5: Modify the upper limit of (4~20) mA output

(1) Step 1: Press the "E" key on the main interface to enter the function menu, press the ▼/▲ key to jump to "config."(Configuration), press the "E" key to confirm, and enter the configuration.

(2) Step 2: In the configuration interface, press the ▼/▲ key to jump to "Comm cnfg"(communication Configuration), press the "E" key to confirm and enter the communication configuration. In the same way, jump to "CL/Hart"(Current Loop /HART) and press the "E" key to confirm.

(3) Step 3: Press ▼/▲ to jump to "CL UL"(Current Loop Upper Limit), and press "E" to confirm.

(4) Step 4: Display the current loop upper limit, then press the "E" key to confirm and start the modification. At this time, an arrow symbol will appear to indicate that it can be modified. Press the ▼/▲ key to adjust to the desired value, then press the "E" key to confirm and complete the modification of the first digit. At this time, an arrow symbol will appear to indicate that it can be modified. Modify the second digit in the same way, and then press the key to confirm the modification.

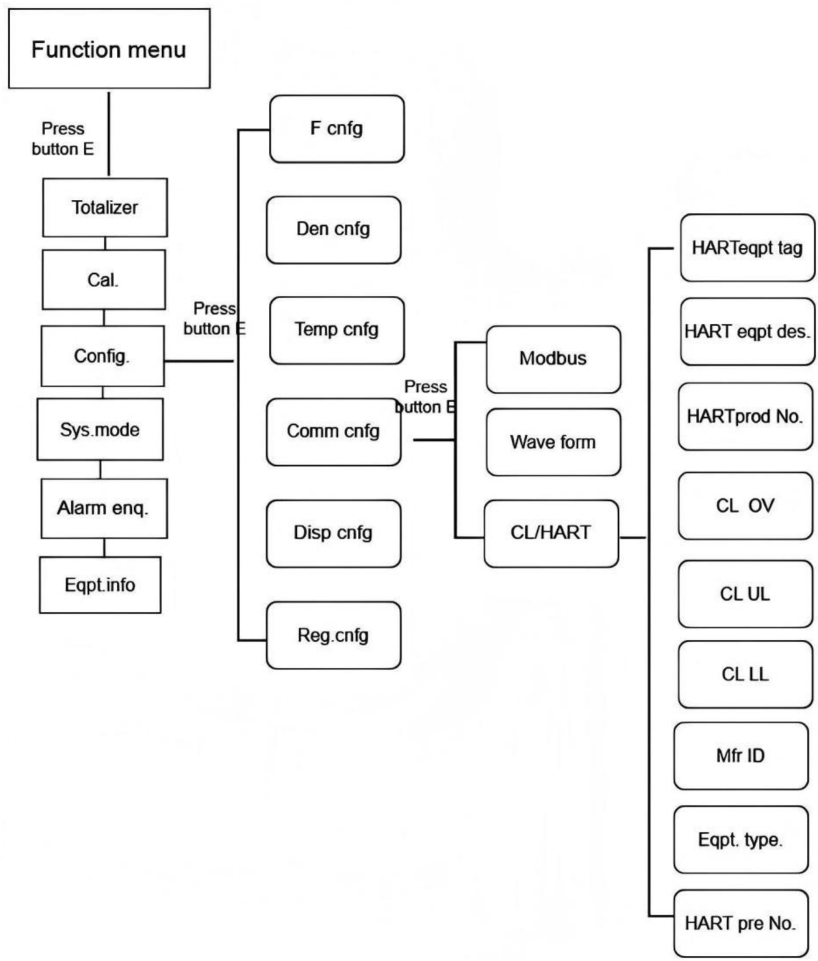

Fig.30 Steps to modify the upper limit of mA output (4~20)

Fig.31 Diagram of modifying the (4~20) mA output upper limit

Example 5: Change the display language

(1) Step 1: Press the "E" key on the main interface to enter the function menu, press the ▼/▲ key to jump to "Config”(configuration), press the "E" key to confirm, and enter the configuration.

(2) Step 2: In the configuration, press the ▼/▲ key to jump to "Disp cnfg”(display configuration), press the "E" key to confirm and enter the display configuration. In the same way, jump to "Lang sel” (Language Selection) and press the "E" key to confirm.

(3) Step 3: Use the ▼/▲ keys to jump to the desired language, and press the "E" key to check it. After changing the language, press the ▼ and ▲ keys simultaneously to return, and the modified language will be displayed.

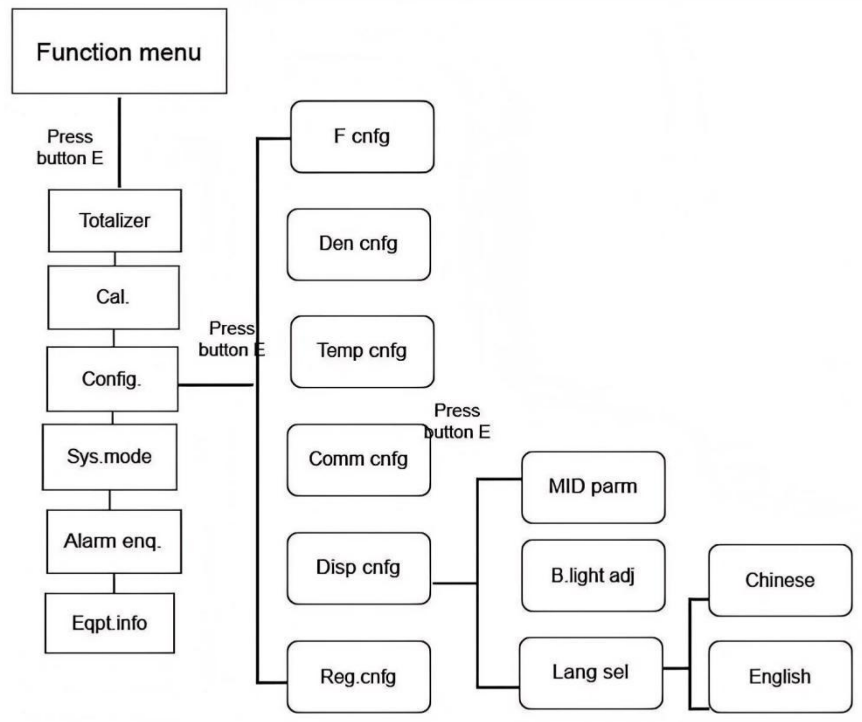

Fig.32 Language settings

7 Maintenance

7.1 Flowmeter Maintenance

Because of its design, the flowmeter typically requires reduced routine maintenance. However, under certain operating conditions, appropriate measures should be taken to ensure accurate and reliable performance. For example:

- If particles in the process fluid may accumulate inside the vibrating tubes, the meter should be inspected and cleaned periodically to prevent measurement issues.
- If the medium tends to adhere to the inner walls of the vibrating tubes, schedule regular flushing to maintain proper operation.
- If abrasive particles in the medium could wear the vibrating tubes, inspect the sensor in a timely manner and take corrective actions as needed.

7.2 Flowmeter Cleaning

The instrument is filled with dry protective gas before leaving the factory. Any moisture entering the sealed sections can cause damage. Do not disassemble the instrument’s sealing structure on site; doing so may result in permanent failure. Contact the manufacturer if guidance is needed.

For cleaning, you may follow standard pipeline cleaning procedures. In-place cleaning (CIP) is recommended, provided that the process temperature and pressure stay within the ratings listed on the nameplate. Select cleaning agents compatible with the flowmeter’s materials. Avoid using hard tools or objects to clear internal passages, as they may damage the vibrating tubes and compromise accuracy.

If disassembly is unavoidable due to special circumstances, ensure that the converter housing and all fastening screws are fully tightened afterward, and that both explosion-proof plugs are completely sealed. The sensor section may be immersed in water; however, the flowmeter’ s electrical connections and converter must not be submerged. Only low-pressure rinsing is permitted for those areas.

8 Fault Analysis and Troubleshooting

The table below lists potential problems with flowmeters and their solutions. If your problem is not listed or the solution does not address your issue, please contact our company.

Table 11 Troubleshooting

Fault phenomenon	Troubleshooting	Solutions
Zero drift	The flowmeter tubes are not completely filled, or the medium is still flowing.	Ensure the meter is fully filled (e.g., during charging/feeding) and close the valves on both sides of the meter.
	The piping is not firmly fixed, or strong vibration sources/frequency converters are nearby.	Add proper supports or use flexible connections.
	Sensor installation under stress	The connecting pipes and sensor interfaces must be on the same axis.
Instantaneous flow rate display is abnormal.	Actual flow exceeds the meter’s configured maximum range.	Reduce the pipeline flow or reconfigure the meter’s maximum flow setting.
	Strong vibration on the sensor cable or pipeline	Add support or use a flexible hose connection
	Zero point may be incorrect.	Recalibrate the zero point under proper calibration conditions.
	The operating frequency or zero value appears abnormal, indicating faulty operation.	If the instrument is not working properly, contact the manufacturer’s service team.
	Sensor pin parameters	If parameters are out of

Fault phenomenon	Troubleshooting	Solutions
	are abnormal.	range, contact the manufacturer's service team.
The instrument panel is not displaying anything.	Power supply fault	Check supply voltage and terminal wiring to ensure proper power delivery.
	Power to the measurement board is abnormal	Verify voltage and wiring on the board.
No communication signal	Communication cables are reversed or broken.	Check the wiring or swap the connections between A and B.

Appendix A Communication Protocol

A.1 Physical Interface

Table 12 physical interface

Interface	RS485
Baud rate	1200, 2400, 3600, 4800, 9600, 19200, 38400 (default), 56700, 11520 0
Protocol	Modbus RTU
Address range	1 ~ 24, default 1
Transmission method	Half-duplex, asynchronous
Parity check	No parity (default), odd parity, even parity
Stop bit	1 digit (default), 2 digits

A.2 Modbus Protocol

Modbus RTU, based on serial data transmission, transmits data through consecutive bits:

Slave address	Supporting function codes	data	CRC check
1 byte	0x03 , 0x04, 0x06, 0x16	0 ~ 252 bytes	2 bytes data=Lo-Hi

A.3 Data Types

The Modbus fieldbus data model refers to the mapping of input and output data within a storage area. This data can be accessed and retrieved via bus commands.

Storage area	Data types	RW	Data length	Number of registers	Data format	Default Format
1000 ~ 1999	floating-point	RW	32-bit	2	1-0-3-2	1-0-3-2
3000 ~ 3999	16-bit integer	RW	16-bit	1	1-0	1-0

A.4 Register Address

Table 13 Process Measurement Register

Address	Data name	Data types	RW	Function
1029	Flow rate (kg/min)	float	R	
1031	Temperature (°C)	float	R	
1033	Cumulative mass (kg)	float	R	Can be cleared
1035	Density (g/cm^3)	float	R	
1039	Volumetric flow rate (m^3/s)	float	R	
1041	Totalized volume (m^3)	float	R	Can be cleared
1043	Standard volumetric flow rate (Nm^3/s)	float	R	
1047	Totalized volume under standard conditions (Nm^3)	float	R	Can be cleared

Table 14 Communication Configuration Register

Commtype	Address	Data Name	Data types	RW	Function
Pulse	1545	Output pulse equivalent	float	RW	
	1551	Maximum pulse output frequency	float	RW	1000 (default)
(4~20) mA output	1857	Current output limit	Current output upper limit	RW	Maximum flow rate within the range
	1571	Current output lower limit	Current output lower limit	RW	0 (default)
Modbus	3035	Transmitter address number	16-bit integer	RW	1 (default)
	3031	Serial port baud	16-bit	RW	0:1200

Commtype	Address	Data Name	Data types	RW	Function
		rate	integer		1:2400 2:4800 3:9600 4:19200 5:38400 6:57600 7:115200
	3036	Floating-point byte order	16-bit integer	RW	0:0- 1-2-3 1:2-3-0-1 2:1-0-3-2 (default) 3:3-2-1-0
	3037	16-bit integer byte order	16-bit integer	RW	0:0-1 1:1-0 (default)
	3032	Parity bit	16-digit integer	RW	0: No validation (default) 1: Odd parity 2: Even parity
	3033	Stop bit		RW	0: 1 stop bit (default) 1:2 stop bits

Table 15 Process Control Register

Address	Data Name	Data types	RW	Function
1207	Small flow cutoff	float	RW	

Address	Data Name	Data types	RW	Function
1037	Drive gain	float	R	
3026	Flow direction	16-bit integer	RW	0: Forward 1: Reverse 240: Absolute value 241: bio-direction 242: Not positive 243: Non-bidirectional
3007	Totalization reset	16-bit integer	RW	0: No operation 1: Clear all 2: Reset totalized mass to zero 3: Reset the totalized volume to zero 4: SCF cleared

Table 16 Sensor parameter register

Address	Data Name	Data types	RW	Function
1201	System zero point	float	RW	Nameplate parameters
1203	K coefficient	float	RW	
1205	Temperature correction factor	float	RW	
1359	Temperature at the air density point	float	RW	
1351	Frequency of air density points	float	RW	
1361	The temperature at the density point of water	float	RW	
1353	Frequency of water density point	float	RW	