Liquid Turbine Flow Meter

— User Instruction Manual

CM Series

Preface:

Thank you for purchasing our product!

This manual provides instructions for the instrument's functions, settings, wiring, troubleshooting, and other aspects.

Please read this manual carefully before operating the instrument to ensure proper use. After reading, please keep it in a convenient location for easy reference during operation.

Notice:

The contents of this manual are subject to change without notice due to functional upgrades and other reasons.

This manual has been carefully proofread. If you find any discrepancies or errors, please contact the instrument's distributor.

In the event of any discrepancies between the actual product and this manual, the actual product shall prevail.

Version:

LWGY2401

Warn:

For your safety, please read the following safety warnings carefully before using the instrument.

Table of contents

Chapter 1 Safety Guide

Copyright and Data Protection:

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For each product purchased, the product documentation and the manufacturer's terms of sale apply.

The manufacturer reserves the right to modify the contents of this document, including this disclaimer, in any manner, at any time, for any reason, and without prior notice, and assumes no liability for the consequences of any such modifications.

1.1 Product Liability and Warranty

The purchaser is solely responsible for determining the suitability of the flowmeter for its intended purpose. The manufacturer assumes no liability for any consequences resulting from the purchaser's misuse of the flowmeter. Improper installation and operation of the flowmeter or system will void the warranty. Furthermore, the corresponding "Standard Terms of Sale" apply, forming the basis of the purchase contract.

Information about the documentation:

To avoid injury to the user or damage to the instrument, please carefully read the information in this document. Furthermore, you must comply with the relevant standards, safety regulations, and accident prevention rules of your country.

If you do not understand the contents of this document, please seek assistance from the manufacturer or the instrument salesperson. The manufacturer assumes no responsibility for any property or personal damage resulting from a misunderstanding of the information contained in this document. This document will help you establish correct operating conditions to ensure the safe and effective use of the instrument. In addition, areas requiring special attention and safety measures are marked with the following icons.

Graphic Symbol Conventions: The following graphic symbols help you to use this document more easily.

Danger!

This symbol indicates electrical safety instructions.

Warn!

Such warnings must be heeded. Any negligence may cause serious health hazards and may damage the instrument itself or Operation-related equipment and facilities.

Hint!

This symbol indicates important information related to the operation of the instrument.

1.2 Safety Instructions for Operators

warn!

For your safety, please read the following safety warnings carefully before using the instrument. This document will help you establish operating conditions, This will ensure you use the instrument safely and effectively.

Only personnel who have received relevant training and obtained relevant certificates are allowed to install, use, operate and maintain this instrument.

Warn!

When measuring flammable media, please use an explosion-proof flow meter and take precautions against fire or explosion.

When working in hazardous environments, correct operating procedures must be followed.

When removing the flowmeter, the medium may splash. Please follow the safety operating regulations of the fluid equipment manufacturer to prevent splashing.

Do not blow out the flow meter with compressed air.

Pay attention to the turbine blades inside the flow meter; even a small scratch or nick can affect accuracy.

In order to achieve the best results, the instrument calibration cycle should not exceed 1Year.

Chapter 2 Instrument Description

2.1 Scope of Delivery

Hint!

Please carefully check whether the packaging box is damaged or has been handled roughly. If there is any damage , please report it to the delivery person and the factory. Report damage to the manufacturer or instrument shipper

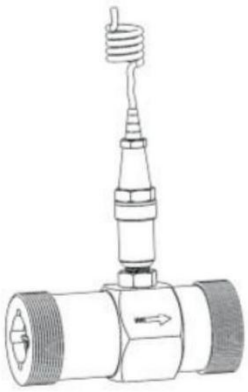
Hint!

Please check the packing list to confirm that you have received the complete shipment.

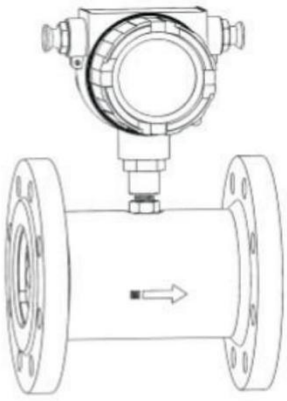
Hint!

Please check the nameplate of the instrument and confirm whether the content of the supply is the same as your order. Check whether the power supply information on the nameplate is correct. If it is incorrect, please contact the manufacturer or instrument dealer.

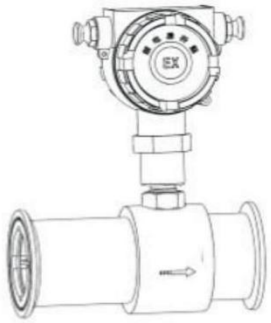
Liquid turbine flow sensor structure



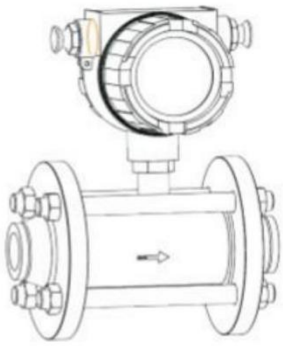
Threaded turbine flow sensor



Flanged turbine flow sensor



Sanitary turbine flow sensor



Clamp-on high-pressure turbine flow sensor

Instruction manual

Certificate of inspection

2.2 Measurement Principle

When the measured liquid flows through the sensor, the impeller is forced to rotate by the fluid, with its speed proportional to the average flow velocity in the pipe.

The impeller's rotation periodically changes the magnetic resistance of the magnetic circuit, causing the magnetic flux in the detection coil to change periodically. This generates an induced electromotive force with the same frequency as the blade's rotation. This electromotive force is amplified, converted, and processed.

The practical flow equation of the turbine flowmeter is:

$$Q_v = f/K$$

Where Q_v----is the volume flow rate,m^3 /s

f----Frequency of flowmeter output signal，Hz

K----Instrument factor of flow meter，$1/m^3$

Figure 1.1 shows the relationship between the flowmeter coefficient and flow rate (or Reynolds number). As can be seen from the figure, the meter coefficient is divided into two segments: a linear segment and a nonlinear segment. The linear segment, approximately two-thirds of the operating range, has characteristics related to the sensor's structural dimensions and fluid viscosity. The nonlinear segment's characteristics are significantly affected by bearing friction and fluid viscous resistance. When the flow rate falls below the sensor's lower flow limit, the meter coefficient changes rapidly with the flow rate. When the flow rate exceeds the upper flow limit, care must be taken to prevent cavitation.

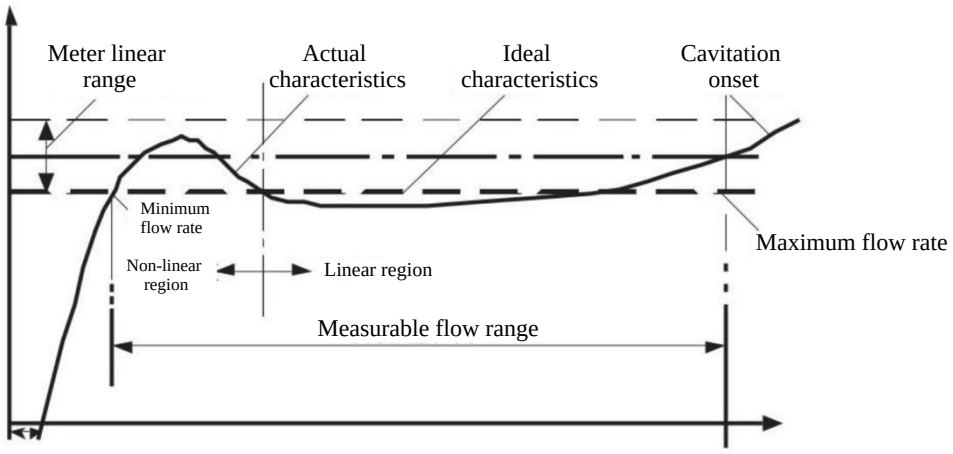


Figure 1.1 Turbine flowmeter characteristic curve

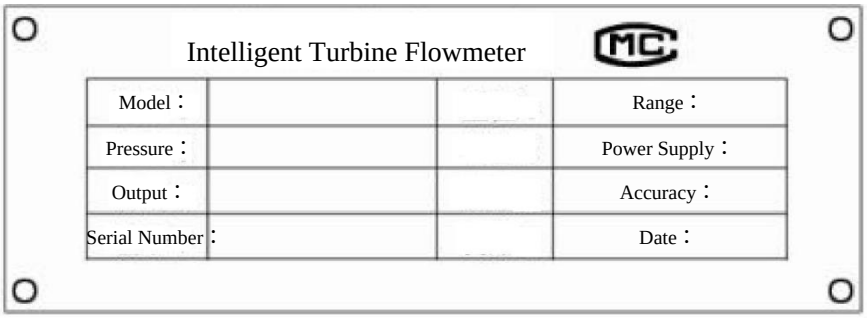
2.3 Application

The turbine flow sensor (hereinafter referred to as the sensor) is a velocity-type flow meter based on the torque balance principle. It features a simple, lightweight structure, high accuracy, good reproducibility, sensitive response, and easy installation, maintenance, and use. It is widely used in the petroleum, chemical, metallurgy, water supply, and papermaking industries. It is suitable for measuring liquids in closed pipes that are non-corrosive to stainless steel (1Cr18Ni9Ti, 2Cr13, corundum AI203, and carbide) and free of impurities such as fibers and particles. When used with a display instrument with special functions, it can also provide quantitative control and over-flow alarms. The explosion -proof version (ExdIICT6 Gb) of this product allows use in potentially explosive environments. The sensor is suitable for media with a viscosity of less than 5×10-6 m²/s at operating temperature. For liquids with a viscosity greater than 5×10-6 m²/s, the sensor must be calibrated with actual liquid before use.

2.4 Nameplate Description

Hint!

Please check the instrument nameplate to confirm that the contents are consistent with your order. Also, check that the power supply indicated on the nameplate is correct. The following image shows the nameplate contents:



Chapter 3 Install

3.1 Installation Check

Hint!

Please carefully inspect the packaging for damage or rough handling. If any damage is found, please report it to the delivery driver and the manufacturer or instrument shipper.

Please check the packing list to confirm that you have received the complete package.

Please check the instrument nameplate to confirm that the contents are consistent with your order. Check the power supply information on the nameplate to ensure it is correct. If not, please contact the manufacturer or instrument distributor.

3.2 Storage

Store!

Store the instrument in a dry, dust-free place.

Avoid prolonged exposure to direct sunlight.

Keep the instrument in its original packaging.

3.3 Installation Tips

Hint!

To ensure reliable installation, the following measures must be taken:

Leave sufficient space on the sides;

Do not subject the flowmeter to severe vibration.

3.4 Piping Design

The following items should be considered when designing the pipeline:

(1)Installation environment

■ The flow meter is best installed indoors. If it must be installed outdoors, measures should be taken to avoid direct sunlight and rain.

■ The flow meter should not be installed in places with high temperatures, heat radiation from equipment, or containing corrosive gases. If it must be installed, insulation and ventilation measures must be taken.

(2) Avoiding magnetic field interference

■ The turbine flow sensor cannot be installed near motors, transformers, or other power sources that are prone to electromagnetic interference.

■ The turbine flow sensor should not be installed near the inverter or obtain power from the inverter distribution cabinet to avoid interference.

(3) Maintenance space

■ For easy installation, maintenance, and servicing, there must be ample installation space around the turbine flow meter.

(4) Support of the flow meter

■ The turbine flow sensor should not be installed on pipes with mechanical vibration. If it must be installed, shock absorption measures must be taken. A hose transition can be installed, or a pipeline fixed support point can be installed 2DN upstream and downstream of the flow meter and a shock pad can be added.

■The flowmeter should be installed as far as possible on a long overhead pipe, as the sagging of the pipe can easily cause the seal between the flowmeter and the flange to leak. If installation is necessary, pipe support points must be set at 2D points upstream and downstream of the flowmeter.

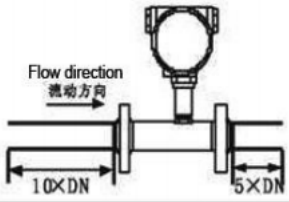
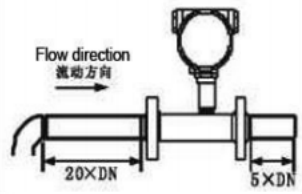
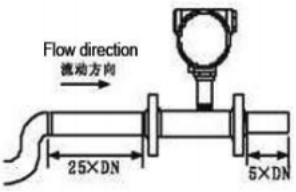
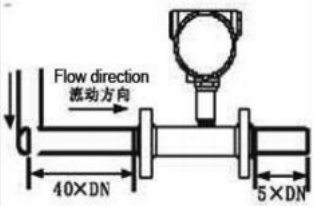
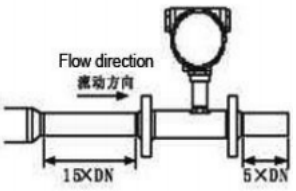
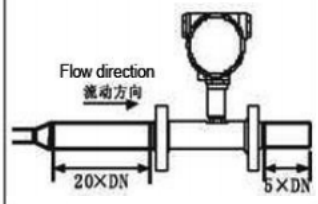
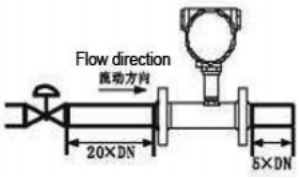
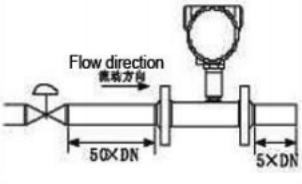
(5) Requirements for pipelines

■For horizontally installed sensors, the pipeline should not have a visually detectable tilt (generally within 5°). For vertically installed sensors, the vertical deviation of the pipeline should also be less than 5°.

■It must be ensured that the pipeline is full of liquid. If the measured liquid contains gas, a degasser should be installed on the upstream side of the sensor. The drain outlet and degasser outlet of the filter and degasser should be connected to a safe place.

(6) Length of straight pipe section

■The turbine flowmeter is sensitive to the flow velocity distribution distortion and rotational flow in the pipeline. The turbulence entering the sensor should be fully developed. Therefore, the necessary straight pipe section or rectifier should be equipped according to the type of flow blocker on the upstream side of the sensor. The required straight pipe section lengths for the inlet and outlet sections are shown in Table 1.2.

Inlet section choke type	Installation conditions			Installation conditions	
	Entrance section	Exit segment		Entrance section	Exit segment
General situation			Two 90° elbows in the same plane		
Two 90° elbows in the same plane			Two 90° elbows in different planes		
Shrink tube			Expansion		
Full open valve			Half open valve		

The dimensions shown in Table 1.2 represent the minimum straight pipe length required to ensure accuracy. Doubling the straight pipe length improves accuracy.

Upstream: The minimum allowable straight pipe length is at least 10 pipe diameters.

Downstream: The minimum allowable straight pipe length is at least 5 pipe diameters.

3.5 Mechanical Installation

Instrument operation instructions

(1) Be careful not to damage the instrument when unpacking

It is best not to unpack the instrument before transporting it to the installation site to avoid damaging the instrument. Use the mounting ring when lifting the instrument. Do not use a rod or rope to pass through the sensor measuring tube to lift the instrument.

(2) Prevent the instrument from vibrating

Prevent the instrument from being dropped or pressed hard, especially the flange surface cannot be subjected to force, which may damage the sealing surface.

(3) Protection of the sensor flange surface

After unpacking the instrument, pay attention to the protection of the flange. Do not place the flange on the ground without padding or other uneven surfaces.

(4) Long-term non-use of the instrument

After the instrument is installed, avoid long-term non-use. If it is not used for a long period of time, the following measures must be taken for the instrument:

A: Check the sealing of the end cover and the wiring port to ensure that moisture and water do not enter the instrument. Regularly check the above-mentioned measures and the condition of the junction box, at least once a year.

B: When there is a possibility of water intrusion into the instrument (such as after heavy rain or lightning), the instrument should be checked immediately.

3.5.1 Pipeline Installation

■ Before installing the flowmeter, calibrate the pipeline to ensure good concentricity between the meter's diameter and the user's pipeline. Therefore, flowmeters often require grounding. This creates an internal space shielded from external interference by grounding the flowmeter casing, thereby improving measurement accuracy.

■ Newly installed pipelines often contain foreign matter (such as welding slag). Before installing the flowmeter, flush away any debris. This not only prevents damage to the lining but also prevents measurement errors caused by foreign matter passing through the measuring tube during measurement.

■ Create a cut in the pipeline according to the required opening size, ensuring that the opening's position meets the requirements for the straight pipe section. Place the entire flowmeter, with the flange attached, into the cut pipeline.

■ Spot weld the flange to the pipeline. After spot welding, remove the flowmeter; do not weld with the flowmeter in place. Remove the flowmeter, weld the flange as required, and clean any protruding parts in the pipeline.

■Install a sealing gasket with the same diameter as the pipe into the inner groove of the flange. Install the flowmeter into the flange, ensuring that the flow direction indicator of the flowmeter is aligned with the direction of the fluid. Then tighten with the bolts.

3.5.2 Installation of Pipeline Flowmeter

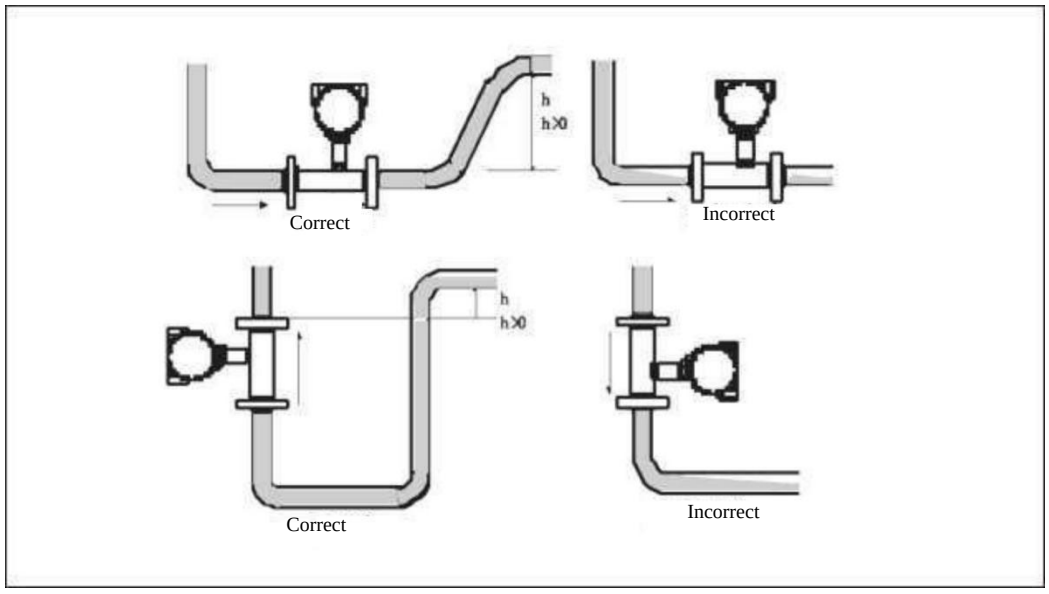
■ Regarding installation direction, the flow direction of the measured fluid should align with the flow direction marking on the flowmeter.

■ Flange gaskets installed between flanges should be corrosion-resistant and should not protrude into the pipe.

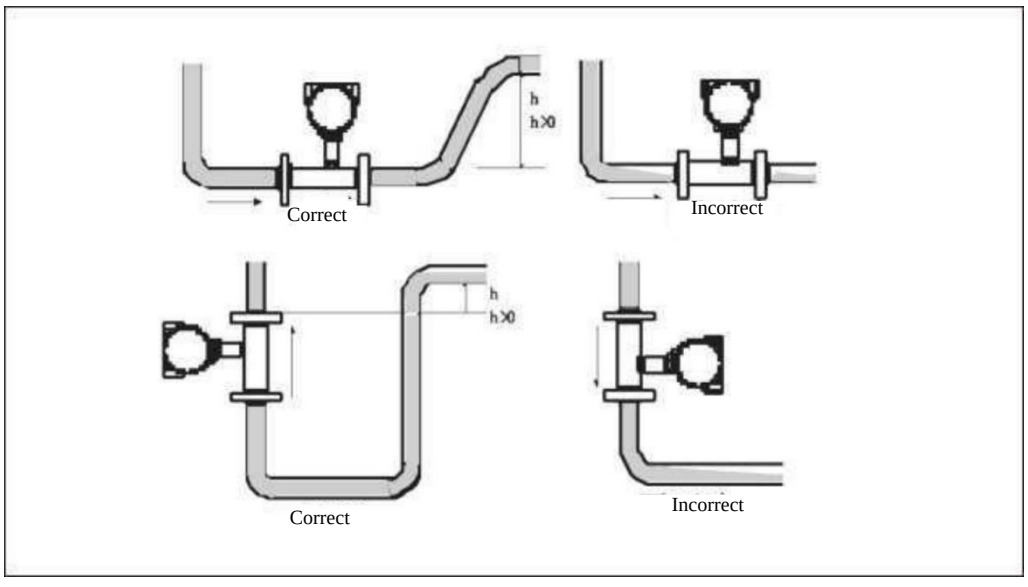
■ During on-site installation, bolt the sensor flange to the pipe flange. The bolts and nuts securing the instrument should be intact, intact, and well lubricated. Flat washers and spring washers should also be used. If possible, tighten the bolts using a torque wrench according to the flange size and torque. During daily use, tighten the bolts regularly to prevent them from loosening.

3.5.3 Flow Meter Location

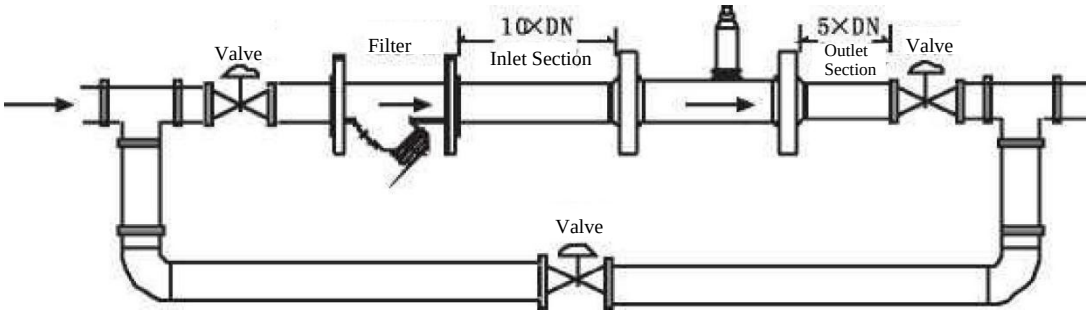
The pipe must be completely filled with liquid. It is important to keep the pipe completely filled with liquid at all times, otherwise the flow display will be affected and may cause measurement errors.



Avoid air bubbles. If air bubbles enter the measuring tube, the flow rate display may be affected, potentially causing measurement errors.



3.5.4 Typical Installation Pipeline Forms for Turbine Flow Sensors



The sensor should be installed in a location that is easily accessible for maintenance and free from pipeline vibration, strong electromagnetic interference, and thermal radiation. Where flow cannot be stopped, a bypass pipe and a reliable shutoff valve should be installed (see the figure above). During measurement, ensure that the bypass pipe is leak-free.

In newly laid pipelines, a short length of pipe should be connected to the sensor location. After the "line sweep" is complete and the pipeline is clean, the sensor can be installed. If the sensor is installed outdoors, it should be protected from direct sunlight and rain.

3.6 Installation Dimensions

Flange connection turbine flow sensor

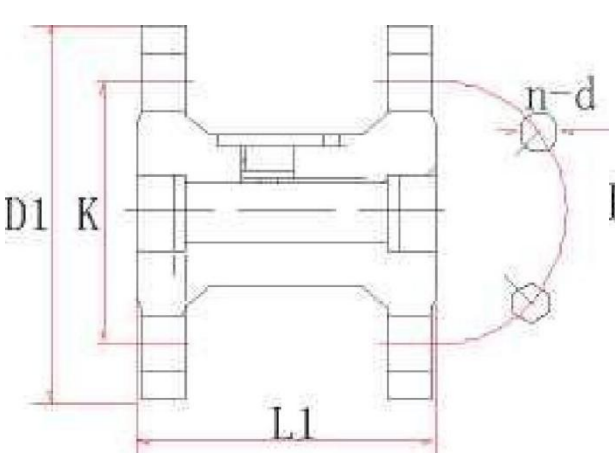


Figure 4.1 Dimensions of DN15~DN200 Flange-Connected Turbine Flow Sensors

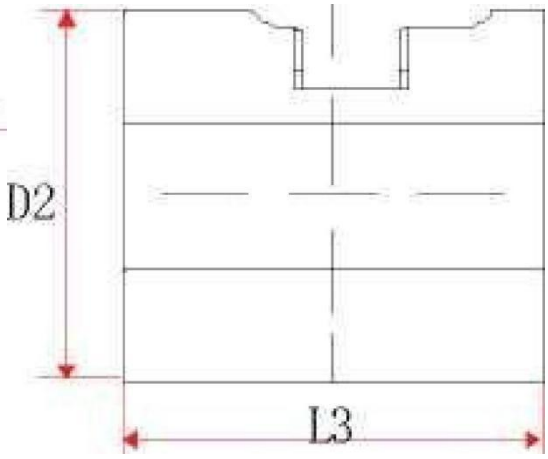


Figure 4.2 DN4~DN200 Flange-Mounted Type Turbine Flow Sensor Dimensions

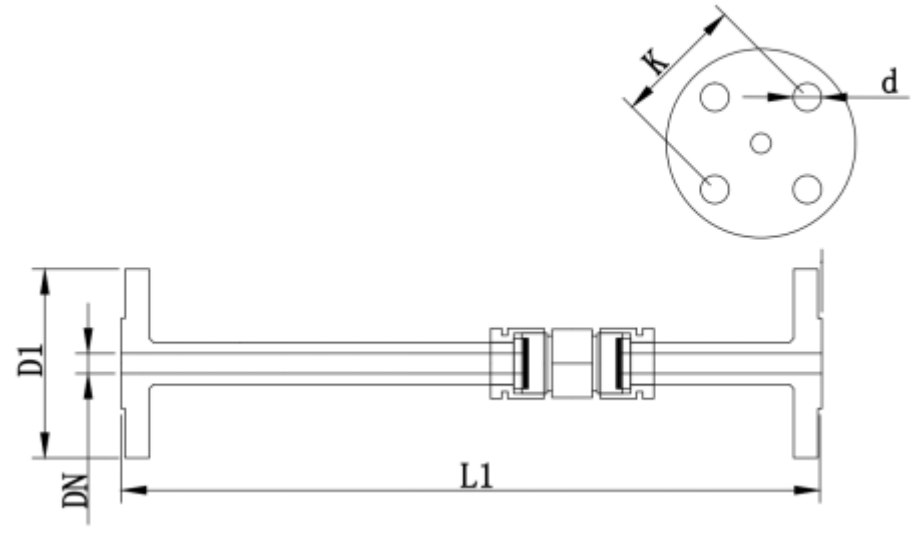


Figure 4.3 Dimensional drawing of flange connection type turbine flow sensor DN4~DN10

Threaded connection turbine flow sensor

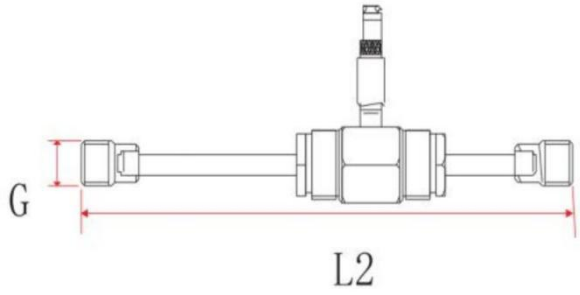


Figure 4.4 DN4~DN10 Threaded Turbine (Including Straight Pipe Section) Dimensions

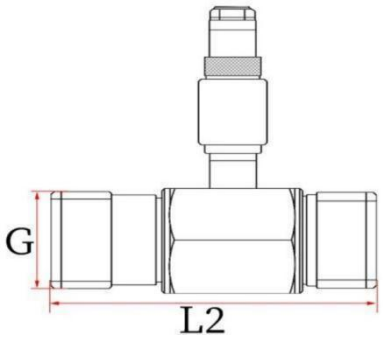


Figure 4.5 Dimensions of DN15~DN50 threaded flow sensor turbine flow sensor (excluding straight pipe section)

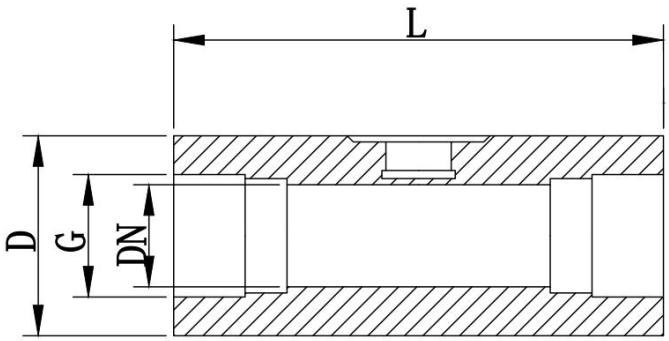


Figure 4.6 Dimensional drawing of DN4~DN50 female thread connection type turbine flow sensor

Female Thread Turbine Flow Sensor Installation Dimension Table

Caliber	Female Connection		
	L	G	D
4	75	1/2	42
6	75	1/2	42
10	75	1/2	42
15	100	1/2	44
20	120	3/4	43
25	120	1	49
32	120	1 1/4	56
40	120	1 1/2	60
50	120	2	72

Caliber	Threaded Connection		Flange Connection (mm)					Clamp Connection (mm)		Range(m^3 / h)	
	L2	G	L1	D1	K	d	n	L	D	conventional	Extensions
4	225	G1/2	228	95	65	14	4	50	50.5	0.04~0.25	0.04~0.4
6	225	G1/2	228	95	65	14	4	50	50.5	0.1~0.6	0.06~0.6
10	345	G1/2	347	95	65	14	4	50	50.5	0.2~1.2	0.15~1.5
15	75	G1	75	95	65	14	4	100	50.5	0.6~6	0.4~8
20	85	G1	85	105	75	14	4	100	50.5	0.8~8	0.45~9
25	100	G5/4	100	115	85	14	4	100	50.5	1~10	0.5~10
32	140	G3/2	140	140	100	18	4	120	50.5	1.5~15	0.8~15
40	140	G2	140	150	110	18	4	140	64	2~20	1~20
50	150	G5/2	150	165	125	18	4	150	78	4~40	2~40
65			170	185	145	18	4	170	91	7~70	4~70
80			200	200	160	18	8	200	106	10~100	5~100
100			220	220	180	18	8	220	119	20~200	10~200
125			250	250	210	18	8			25~250	13~250
150			300	285	240	22	8			30~300	15~300
200			360	340	295	22	12			80~800	40~800

Turbine flow sensor installation dimension table

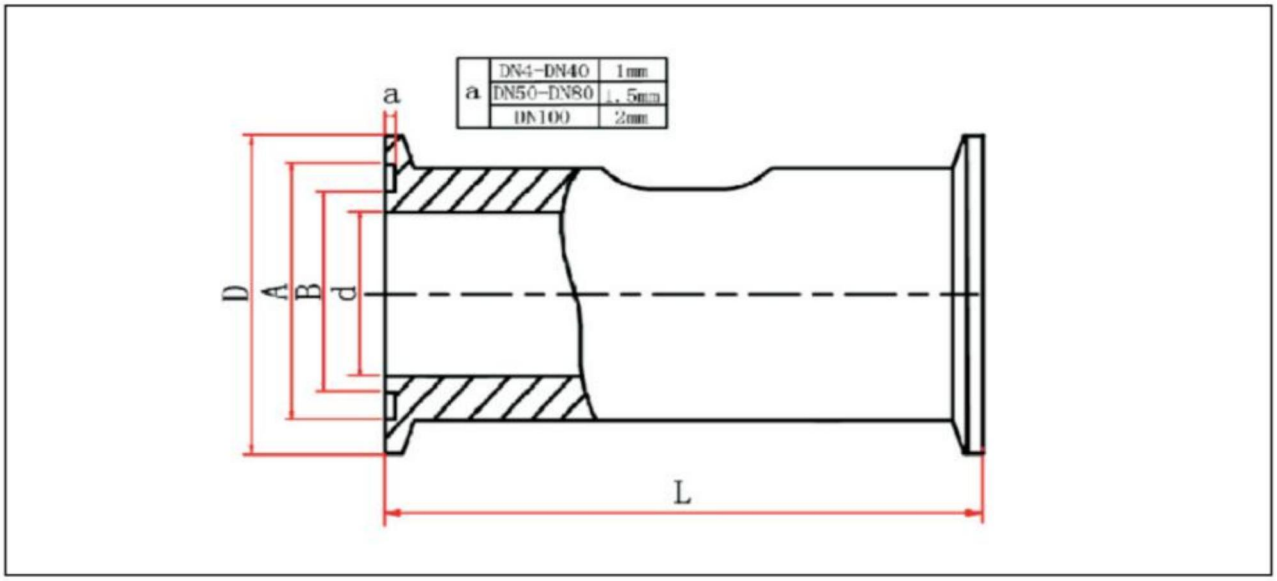
Note: The above flange clamp-type turbine flow sensor has a pressure rating of 1.6 MPa.

The above dimensions are for design reference only. Actual dimensions are subject to factory confirmation or ordering.

The dimensions of high-temperature and high-pressure models are subject to factory confirmation or order confirmation.

The flowmeter mounting flange conforms to the company standard. Other national or industry standards, as well as other national standards (such as American, German, and Japanese) can also be used as required. Please specify special standards when ordering.

Dimensional drawing of sanitary turbine sensor



The size of the sanitary turbine sensor

caliber	D(mm)	A(mm)	B(mm)	d(mm)	L(mm)
DN4	50.0	46	40.5	4	50
DN6				6	
DN10				10	
DN15				15	100
DN20				20	
DN25				25	
DN32				32	120
DN40	64	59	53.5	40	140
DN50	78	73.5	63	50	150
DN65	91	86	80.5	65	170
DN80	106	100.5	94	80	200
DN100	119	113	106	100	220

Dimension D represents the outer diameter of the matching clamp.

The standard pressure rating for sanitary turbine sensors is 1.0 MPa.

Chapter 4 Electrical Connections

4.1 Safety Tips

Danger!

All work on the electrical connections must be carried out with the power supply disconnected . Note the power supply data on the nameplate.

Danger!

Please comply with the relevant national installation regulations and specifications.

Warn!

Please strictly comply with local occupational health and safety regulations. Only properly trained personnel are allowed to Working on electrical equipment.

Hint!

Please check the nameplate of the instrument and confirm that the nameplate content is the same as your order. Check whether the power information on the nameplate is correct. If it is incorrect, please contact the manufacturer or instrument seller

4.2 Tips for Electrical Cables and Signal Cables for Instruments

Hint!

Using a double-shielded signal cable and effectively grounding the shield can greatly reduce interference in the measurement value transmission process.

Please note the following tips:

Please securely lay the signal cable.

Signal cables may be laid in water or soil.

Insulation materials must be flame retardant and comply with relevant standards such as EN5062 and IEC60322 -1.

Signal conductors must not contain chlorinated plasticizers or plasticizers and remain flexible even at low temperatures.

Connect the internal shield via a multi-strand drain wire.

For electrical connections, it is recommended to use "RVVP" shielded cable. The 24V power cable enters through one wiring hole, and the 4-20mA signal cable exits through the other.

The shielded cable connecting the flowmeter should be routed away from areas with strong electromagnetic interference and must not be laid together with high-voltage cables. The shielded cable should be kept as short as possible and not coiled to reduce distributed inductance. The maximum length should not exceed 500 meters.

4.3 Connecting Electrical Cables

Danger!

Signal and power cables may only be connected when the power is disconnected.

Danger!

WARNING

The instrument must be connected to the protective grounding terminal as required to protect operators from electric shock.

Danger!

WARNING

For instruments used in areas with explosion hazards, please also pay attention to the safety and technical instructions provided in the dedicated explosion-proof instructions.

Warn!

CAUTION

Please strictly comply with local occupational health and safety regulations. Only properly trained personnel are allowed to work on electrical equipment.

Danger!

No voltage difference is allowed between the measuring sensor and the protective ground of the housing or converter.

The measuring sensor must be fully and properly grounded. Refer to the grounding requirements of the relevant standard (HVT20513-2014 Instrument System Grounding System Design Specification).

The grounding conductor should not transmit any interference voltage.

No other electrical equipment should be connected to the grounding conductor simultaneously.

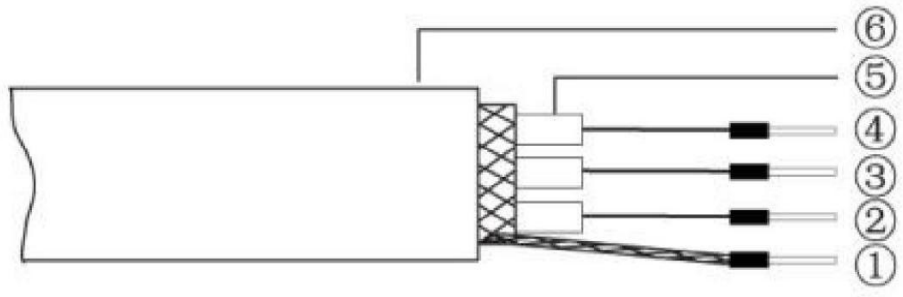
4.4 Electrical Wiring

Installation materials and tools are not included in the scope of supply. Please use installation materials and tools that comply with occupational health and safety standards.

N-type (basic pulse) terminal diagram and wiring instructions: Signal cable structure.

The signal cable is a shielded cable used to transmit the turbine flowmeter signal.

Bending radius > 50mm/2"



① Signal shield wire (cable shield)

② Sensor power supply wire (positive) (red)

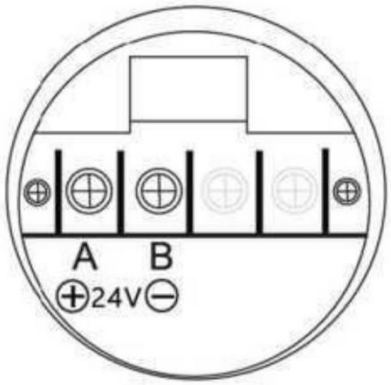
③ Sensor power supply and signal (negative) common ground (ground) (blue)

④ Sensor signal wire (positive) (yellow)

⑤ Copper core wire outer sheath

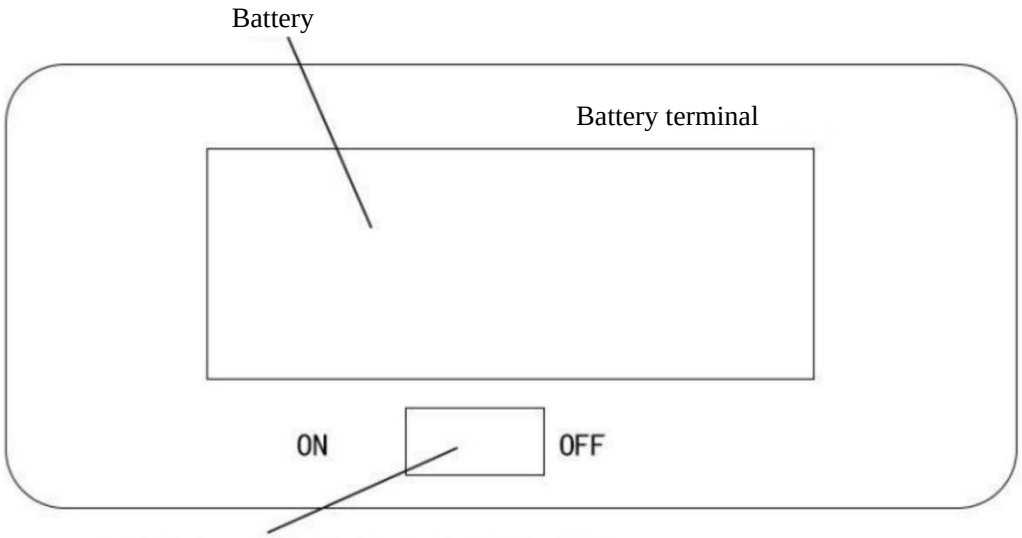
⑥ Cable sheath

Type A (two-wire current output) wiring



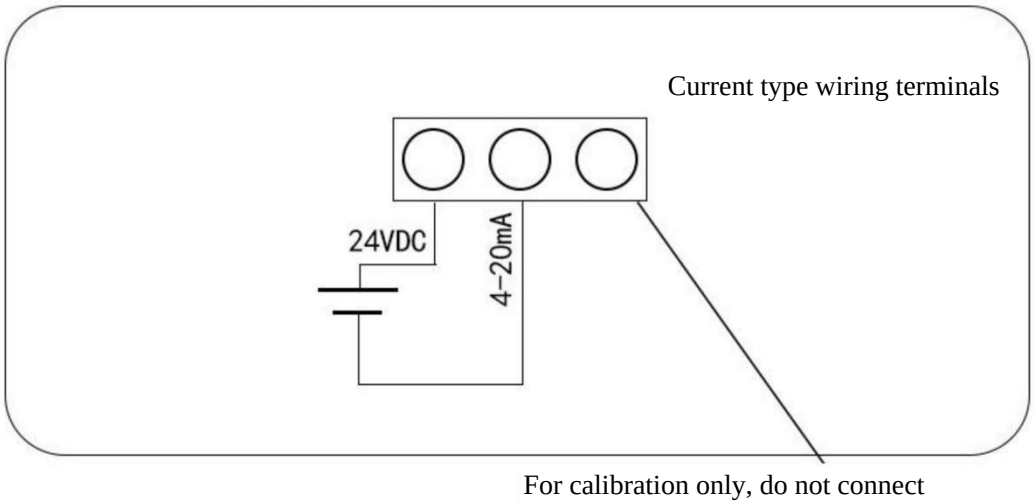
"A" is the "+" terminal of a 15-24V power supply.
"B" is the 4-20mA current output terminal.
Connect "A" to a +24V external power supply. The current output flows from "B" to the sampling resistor of a computer or display meter, passes through the sampling resistor and other loads, and then flows back to the "-" terminal of the power supply.

CM0 (display + lithium battery power supply) wiring instructions



Battery switch: ON position is open, OFF position is closed

CM2 (current type 4-20mA) wiring diagram

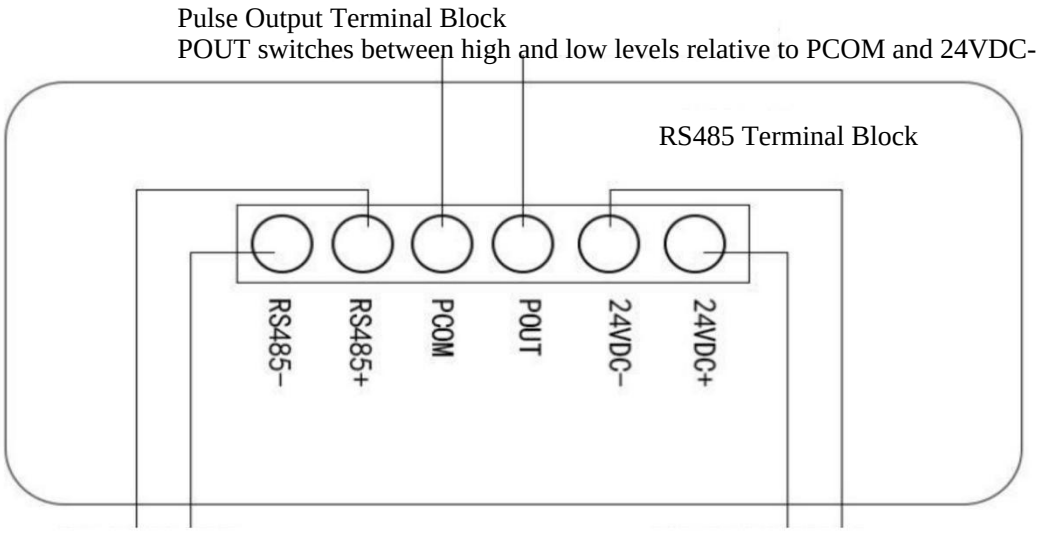


The "-" terminal is the 4-20mA current output terminal.

The "+" terminal is the 24V power supply terminal.

Connect to a +24V external power supply. The current output flows from this terminal to the sampling resistor of a computer or display meter, passes through the sampling resistor and other loads, and then flows back to the power supply terminal.

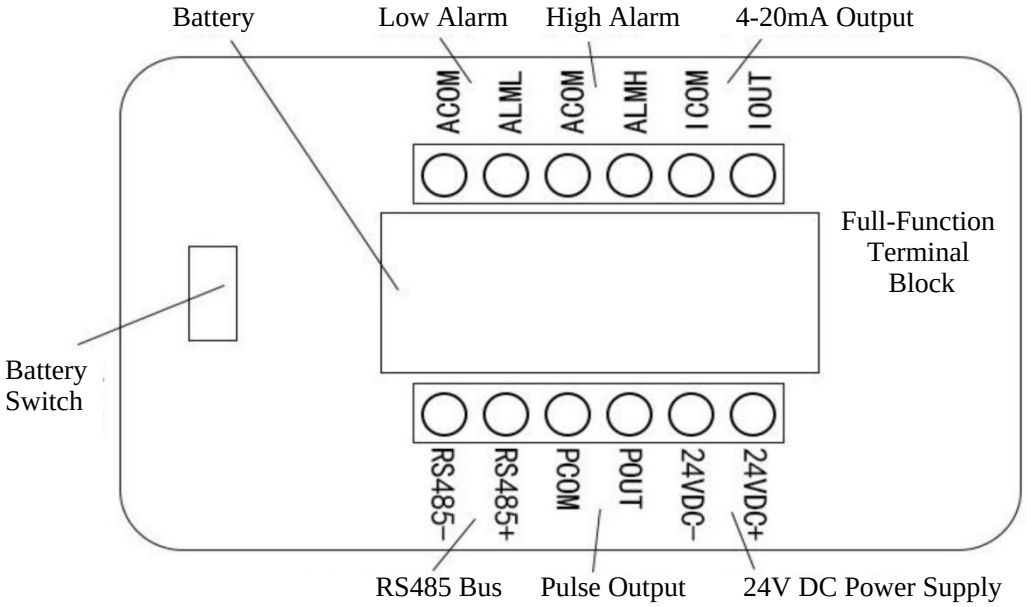
CM3 (RS485 Communication/Pulse) Terminal Diagram and Wiring Instructions



Connecting to the RS485 bus:
Polarity +(A) and -(B)

Connecting to a 24V DC power supply:
Rated current <50mA

CM4 (4-20mA/RS485 Communication/Pulse) Terminal Diagram and Wiring Instructions



3.6V lithium battery auxiliary power supply:

The battery power supply can be turned on or off using the "Battery Switch." When operating solely on battery power, all outputs (such as RS485 and 4-20mA) are inoperative, and only the flow rate and total are displayed. When connected to a 24V DC power supply, the instrument automatically switches to 24V power.

Two-wire current operation mode:

Connect the positive lead of the 24V DC power supply to 24VDC+ and the negative lead to IOUT. The instrument controls the current level of the two-wire 4-20mA circuit. In this mode, other outputs (such as RS485 and pulse) are disabled.

Full-function mode:

Connect the positive lead of the 24V DC power supply to 24VDC+ and the negative lead to 24VDC-. All outputs are enabled and independent. Pulse Output: POUT varies between high and low levels relative to PCOM and 24VDC.

4-20mA Output: When IOUT forms a loop with ICOM and 24VDC, the current on the IOUT line varies between 4-20mA.

RS485 Communication: Connects to the RS485 bus and supports ModBus over RS485.

High Alarm: In alarm mode, ALMH disconnects from ACOM; otherwise, it connects (forward voltage, maximum current 30mA).

Low Alarm: Same as high alarm mode. It is recommended to use an intermediate relay to drive high-power devices.

4.5 Connect to Power

Danger!

The instrument must be connected to the protective grounding terminal as required to protect operators from electric shock.

Hint!

Included in the permitted range: 12VDC/24VDC or lithium battery power supply

Please select the corresponding wiring method below based on the flow meter model and power supply type purchased.

Chapter 5 Startup Operation

5.1 Turn on the Power

Notice!

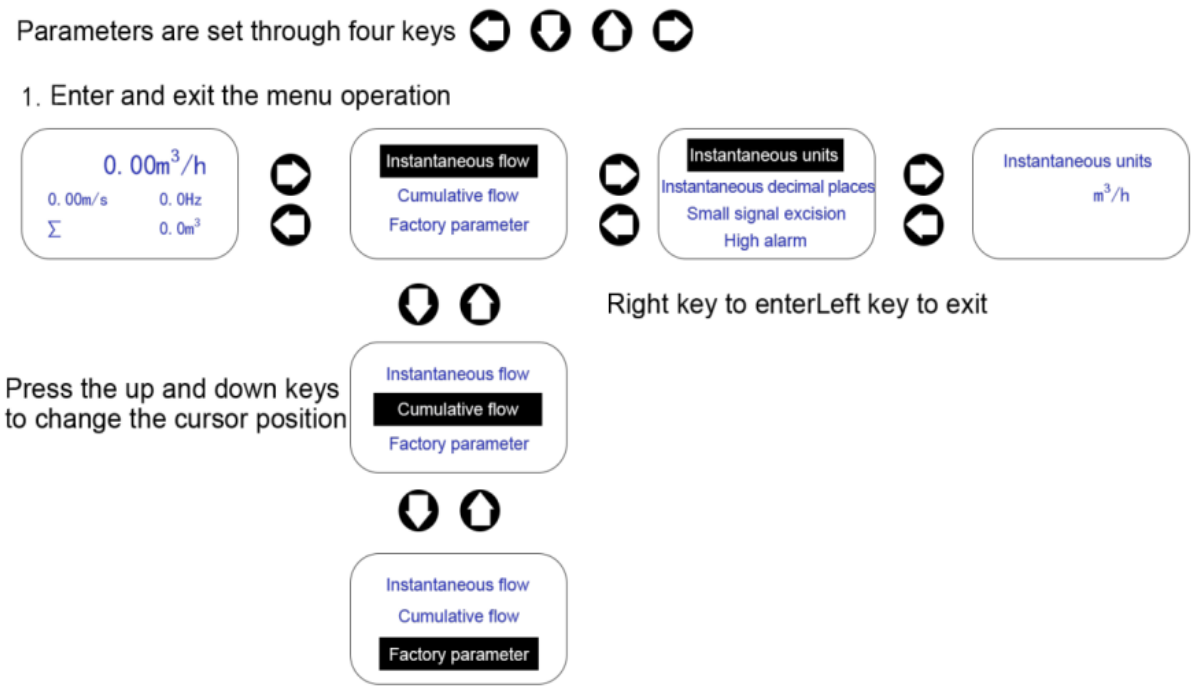
Before turning on the power, please check whether the instrument installation is correct, including: the flowmeter must be installed safely and in compliance with regulations.

The power connection should be carried out in accordance with the regulations.

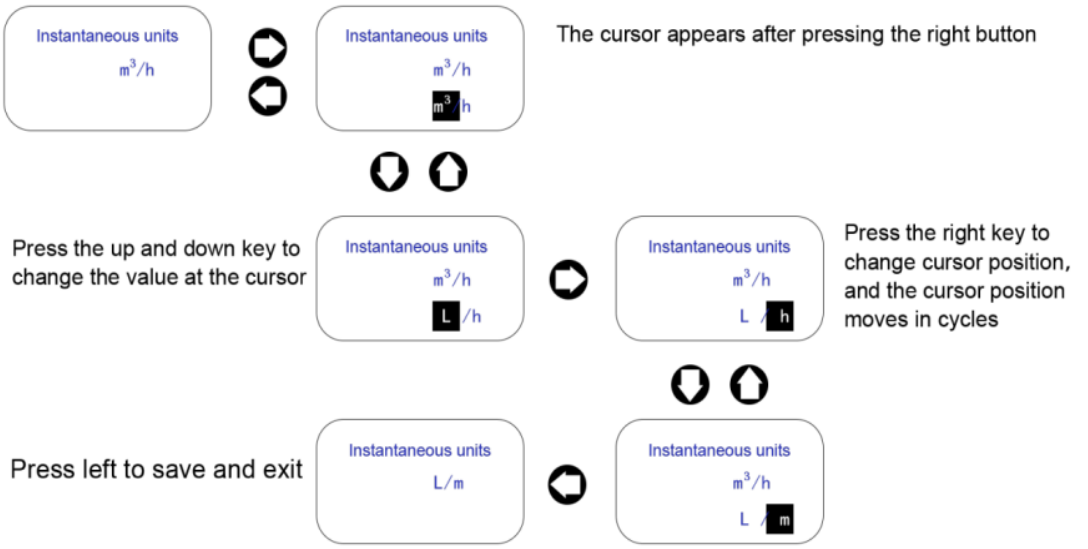
Cover the electrical connection room with the protective cover and tighten the cover plate.

Please check whether the electrical connection of the power supply is correct.

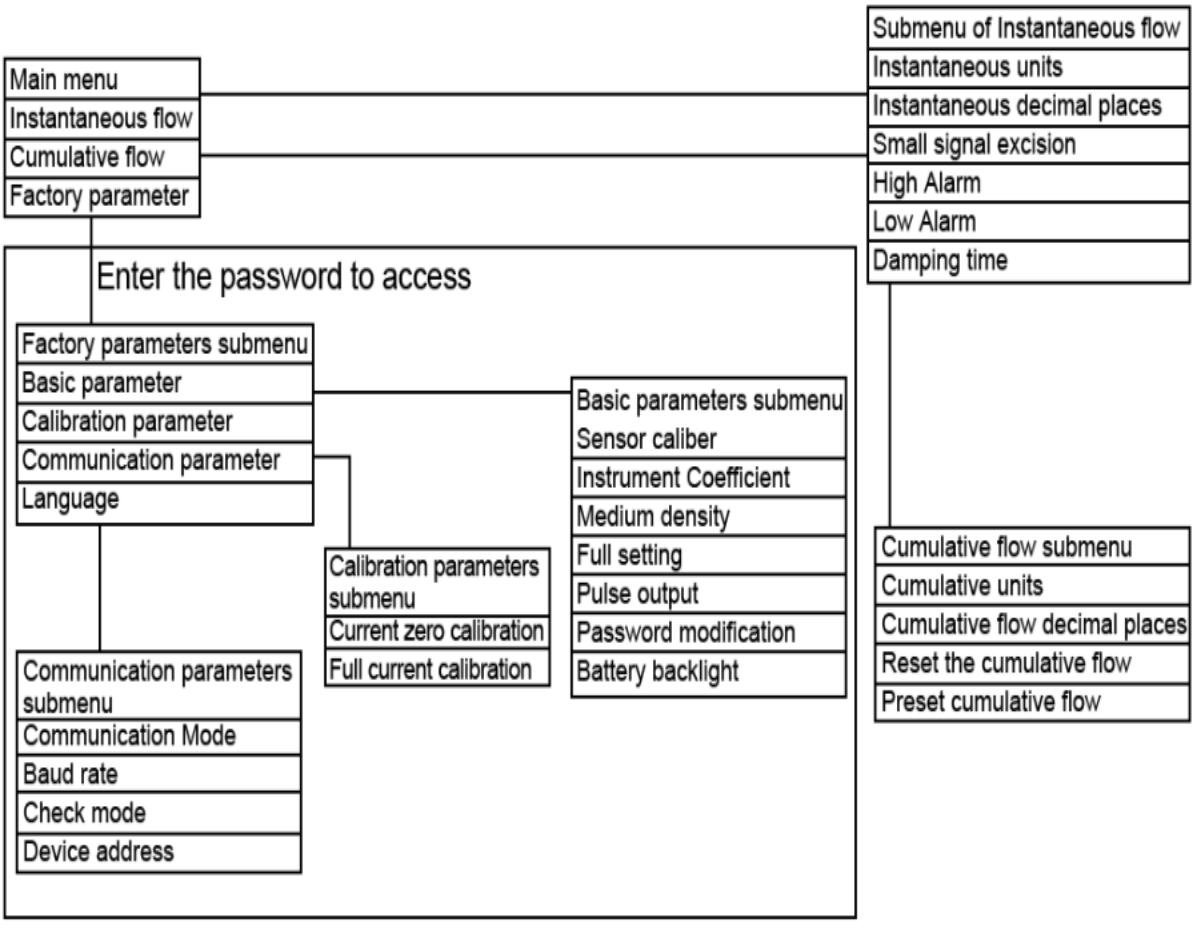
5.2 Menu Operation



2. Operations to modify parameters



5.3 Menu Structure



5.4 Parameter Description

5.4.1 Instantaneous Flow

Instantaneous Unit	Options: m³/h, m³/m, m³/s, L/h, L/m, L/s, USG /h, USG /m, USG /s, gal /h, gal /m, gal /s, kg /h, kg /m, kg /s, t/h, t/m, t/s Default value: m3/h Select the unit of instantaneous flow m3 (cubic meter), L (liter), USG (U.S. gallon), gal (gallon), kg (kilogram), t (ton) /h (hours) /m (minutes), /s (seconds)
Several Decimal Places In a Moment	Options: 0， 1 ， 2 ， 3 Default value:1 Select the number of decimal places to display the instantaneous flow value
Signal Removal	Floating-point input Default value:0.0 Hz Flow rates below this value are forced to zero. According to the input frequency value, the instantaneous time corresponding to the cut-off point will be prompted flow,Current value, percentage.
High Alarm	Floating point numbers:100～ 0.00% Default value:0 % This setting value is the range (full scale)percentage of . For example:If this value is set to 15%, Range (full scale)100,100×15%=15, So , when the instantaneous flow rate is greater than 15 The high alarm contact is disconnected. Otherwise the contacts are closed .
Low Alarm	Floating point numbers:100～ 0.00% Default value:0 % This setting value is the range (full scale)percentage of . For example:If this value is set to 75%, Range (full scale)100,100×75%=75, So , when the instantaneous flow rate is less than 75 The low alarm contact is disconnected. Otherwise the contacts are closed .
Damping Time	Floating point numbers:30.0～0.1, default value:1, The instantaneous flow value within the set time is averaged.

5.4.2 Cumulative Flow

Total Quantity Unit	Default value ： m³ Select the unit for total flow m3 (cubic meter), L (liter), USG (U.S. gallon), gal (gallon), kg (kilogram), t (ton)
The Total Amount Has Several Decimal Places.	Options: 0 1 2 3 Default value : 1 Select the number of decimal places to display for the cumulative flow value
Reset Cumulative Total	Set the cumulative flow rate to 0
Pre-Set Accumulation	Floating point numbers Set the total flow to the input value

5.4.3 Factory Parameters

Basic parameters

Sensor Aperture	Floating point number, default value: 50mm Specify this value to display the correct flow rate. Flow rate = instantaneous flow / cross-sectional area. The cross-sectional area is related to the sensor diameter.
Instrument Coefficient	Floating-point number, default value: calibrated result. Q=f/k Q Instantaneous flow rate (liters per second) f Measurement frequency (Hertz) k Instrument coefficient (pulses per liter)
Medium Density	Floating-point number, default value: 1000 kg/h. Used for conversion from volume to mass
Full-Scale Setting	Floating point number, default value: 100 m³/h Define the maximum measurement value (range) Corresponding to 20mA, the instantaneous flow rate Instantaneous flow rate percentage = (Instantaneous flow rate / Full scale) * 100%

Pulse Output	Options: Signal Output, Equivalent Output, Frequency Output, Output Shutdown. Set the digital output mode. Signal Output: Outputs the original sensor signal frequency. The instantaneous flow can be calculated based on the instrument coefficient. See the instrument coefficient calculation formula. Equivalent Output: Directly defines how much flow is represented by one pulse output. This option allows input of equivalent values and the unit can be changed. Frequency Output: Outputs the frequency proportionally. The maximum frequency corresponds to the full-scale flow. This option allows input of the maximum frequency (MAX), the default value. 2000HZ Output Shutdown: Disable Digital Output
Password Modification	Custom access password
Battery Backlighting	Options: Automatic, Enable, Disable Display screen backlight control in battery-powered mode to extend battery life The backlight power consumption is approximately half of the total power consumption.

Calibration parameters

Current Zero-Point Calibration	Floating point number default value: 4.000 mA After entering this menu, the 4-20 mA output is forcibly set to 4.000 mA. If the actual measured value is not equal to 4.000 mA, then input the actual measured value, and the system will calibrate based on the difference.
Current Full-Scale Calibration	Floating point number default value: 20.000 mA After entering this menu, the 4-20mA output is forcibly set to 20.000 mA. If the actual measured value is not equal to 20.000 mA, then input the actual measured value, and the system will calibrate based on the difference.

Communication parameters

Communication Mode	Options： RTU， ASCII Default value:RTU
Baud Rate	Options: 1200, 2400, 4800, 9600, 19200, 38400 Default value:9600
Verification Method	Options： NONE， ODD， EVEN Default value: NONE
Device Address	Integer 1-254 Default value 1 Slave Address, stack address, device ID

language

Language	Options:Chinese,English Default value:Chinese

5.5Communication

[Communication Protocol] The instrument uses RS485 or RS232 serial communication, the standard ModBus RTU communication protocol, with CRC verification, and operates in a passive transmission mode. The following details the specific protocol content.

Read the measured display value of the instrument (the parameter reading uses command Ox03).

5.5.1 Frame Format Sent by the Host Computer

Order	Code	Illustrate
1	Instrument address	
2	03H	Function code
3	Number of bytes in the echo data field (M)	
4	First register data	Low first
.....	.....	
M+4	Low byte of CRC16 checksum	
M+5	CRC16 Checksum (High Byte)	

5.5.2 Instrument Response Data Format

order	Code	illustrate
1	Instrument address	
2	03H	Function code
3	Register start address high byte	Register starting address
4	Register start address low byte	
5	Register start address low byte	Number of registers read

6	Register read count low byte	
7	CRC16Check low byte	CRC check data
8	CRC16Check high byte	

5.5.3 Table of Register Addresses for Instrument Display Values

Register Address (Hexadecimal)	Meaning	Value Range
0×0200	Accumulated clear (write 1)	Unsigned 16-bit integer;

Register Address	Meaning	Value
0×0100~0×0101	Cumulative amount	32bit floating point data;
0×0102~0×0103	Real-time traffic	32bit floating point data;
0×0104~0×0105	frequency	32bit floating point data;
0×0106~0×0107	flow rate	32bit floating point data;
0×0000	Instantaneous flow decimal point	Unsigned 16Bit integer;
0×0001	Instantaneous flow measurement unit	Unsigned 16Bit integer;
0×0002	density	Unsigned 16Bit integer;
0×0003~0×0004	Flow range upper limit	Unsigned32Bit integer;
0×0005~0×0006	Kcoefficient	Unsigned32Bit integer;
0×0009	Small signal cutoff (Hz)	Unsigned 16Bit integer;
0×000d	Instrument address	Unsigned 16Bit integer;
0×000e~0×000f	Clear value	Unsigned32Bit integer;

5.5.4 Modify the Parameter Instrument Response Data Format Sequence

Order	Code	Illustrate
1	Instrument address	
2	06H	Function code
3	Register start address high byte	Register starting address
4	Register start address low byte	

5	Data high byte	Data Domain
6	Data low byte	
7	CRCCheck low byte	CRCVerify data
8	CRCCheck low byte	

Communication test example:

Sending data: 01 03 01 00 00 04 45 F5

Data parsing: 01: Instrument address 03: Function code

01 00: Register address 257 = 256 + 1

00 04: Number of returned data 4 groups

45 F5: CRC check

Received data: 01 03 08 2B 02 3E C7 00 00 00 00 44 B3

Data parsing: 01: Instrument address

03: Function code

08: Data length: 2B 02 3E C7 00 00 00 00

2B 02 3E C7: Cumulative quantity, 32-bit floating-point number, converted to.389

00 00 00 00: Instant quantity, 32-bit floating-point number, converted to.00

44 B3: CRC check code

Example of reset instruction:

Sending data: 01 06 02 00 00 01 49 B2

Data parsing: 01: Instrument address 06: Instruction (function code)

02 00: Register address

00 01: Set 1 to reset

49 B2: CRC check

Receive data: 01 06 02 00 00 01 49 B2 (Data returned. Reset completed.)

Chapter 6 Technical Parameters

6.1 General Technical Indicators

<table>
<tr><td>Measured Medium</td><td colspan="5">Pure substance, low viscosity, and non-corrosive to a great extent.</td></tr>
<tr><td>Implementation Standards</td><td colspan="5">Turbine flow sensor (JB/T9246-1999)</td></tr>
<tr><td>Verification Procedures</td><td colspan="5">Turbine Flowmeter (JJG1037-2008)</td></tr>
<tr><td rowspan="3">Instrument Caliber and Connection Method</td><td>Flange Connection</td><td colspan="4">DN15-DN200</td></tr>
<tr><td>Threaded Connection</td><td colspan="4">DN4-DN50</td></tr>
<tr><td>Clip-On Connection</td><td colspan="4">DN4-DN200</td></tr>
<tr><td rowspan="3">Flange Standards</td><td>Conventional Standard</td><td colspan="4">HG / T 20592-2009</td></tr>
<tr><td rowspan="2">Other Standards</td><td>International pipe flange standards</td><td colspan="3">Such as German standard DIN, American standard ANSI,
Japanese standard JS</td></tr>
<tr><td>Domestic pipe flange standards</td><td colspan="3">Such as the standards of the Ministry of Chemical Industry and the Ministry of Machinery</td></tr>
<tr><td rowspan="2">Thread Specifications</td><td>General Specifications</td><td colspan="4">British pipe thread (external thread)</td></tr>
<tr><td>Other Specifications</td><td colspan="4">Internal thread, spherical thread, NPTThread, etc.</td></tr>
<tr><td rowspan="2">Accuracy Grade and Corresponding Repeatability</td><td>Accuracy Grade*1</td><td>±1%R</td><td>±0.5%R</td><td colspan="2">±0.2%R
(Customization required)</td></tr>
<tr><td>Linearity</td><td>≤0.15%</td><td>≤0.1%</td><td colspan="2">≤0.03%</td></tr>
<tr><td>Turndown Ratio</td><td>Frequency Decimal Point</td><td colspan="4">10:1~20:1</td></tr>
<tr><td rowspan="3">Verification Conditions</td><td>Calibration Device</td><td colspan="4">Standard meter method liquid flow calibration device Static mass method liquid flow calibration device</td></tr>
<tr><td rowspan="2">Environmental Conditions</td><td colspan="2">Ambient temperature</td><td colspan="2">20℃</td></tr>
<tr><td colspan="2">Ambient temperature</td><td colspan="2">65%</td></tr>
<tr><td rowspan="4">Service Conditions</td><td rowspan="2">Medium Temperature</td><td colspan="2">Standard</td><td colspan="2">-20℃~80℃</td></tr>
<tr><td colspan="2">T</td><td colspan="2">-40℃~180℃</td></tr>
<tr><td>Ambient Temperature</td><td colspan="2">-20℃~60℃</td><td>Relative humidity</td><td>5%~90%</td></tr>
<tr><td>Atmospheric Pressure</td><td colspan="4">86Kpa ~106Kpa</td></tr>
</table>

6.2 Electrical Specifications

Output Function	Signal Output	Pulse signal, 4-20mASignal	
	Communication Output	RS485Communication, HART protocol	
Working power supply	External Power Supply	+24VDC, suitable for 4-20mA output, pulse output, RS485, etc.	
	Internal Power Supply	CM0.CM2, CM3.CM4	1 set of 3.6V 19Ah lithium batteries
Signal line interface	NType	Horsman connector DIN43650 or aviation plug CX165P	
	Full Range	Metal waterproof buckle internal thread M20×1.5	
Explosion-proof grade	ExdllC T6 Gb		
Protection level	IP65 or higher (customizable)		

6.3 Flow Range

Measuring range

Instrument Diameter (Mm)	Normal Flow Range (m3/h)	Extended Flow Range (m3/h)
DN 4	0.04~0.25	0.04~0.4
DN 6	0.1~0.6	0.06~0.6
DN 10	0.2~1.2	0.15~1.5
DN 15	0.6~6	0.4~8
DN 20	0.8~8	0.45~9
DN 25	1~10	0.5~10
DN 32	1.5~15	0.8~15
DN 40	2~20	1~20
DN 50	4~40	2~40
DN 65	7~70	4~70
DN 80	10~100	5~100
DN 100	20~200	10~200
DN 125	25~250	13~250
DN 150	30~300	15~300
DN 200	80~800	40~800

Typical instrument factors and frequency bands

Instrument Diameter (Mm)	Instrument Factor (SecondL)	Frequency Band (Hz)
DN 4	19000	177.8-1111
DN 6	12000	227.8-1366
DN 10	1500	100.0-600
DN 15	900	138.3-1383
DN 20	355	80-800
DN 25	200	58.9-588
DN 32	160	62.5-625
DN 40	68	42.8-427
DN 50	26.6	30.0-300
DN 65	12.2	23.5-235
DN 80	5.8	16.9-169
DN 100	4.2	23.8-238
DN 125	3.2	21.5-215
DN 150	2.8	18.3-183
DN 200	1.3	26.7-266

6.4 Troubleshooting

Common troubleshooting

Serial Number	Fault Phenomenon	Fault Analysis And Solutions
1	There is flow passing through, and the instantaneous flow rate is zero.	(1) Wiring error. Check the instrument wiring. (2) The internal parameters of the instrument have been modified. Check the instrument parameters according to the identification certificate. (3) The signal acquisition coil is damaged, affecting the signal transmission. Even if there is flow, the signal cannot be transmitted to the converter. Use a magnetic screwdriver to slide the signal acquisition coil. (4) The impeller is stuck. Check the impeller.
2	When there is no flow through the instrument, the instrument will display the instantaneous flow value.	(1) There is severe vibration in the pipeline. It is recommended to take vibration reduction measures. (2) Is the instrument well grounded? Check the grounding. (3) There is magnetic field interference on site, such as frequency converter, self-motor, solenoid valve, etc. (50HZ power frequency interference on site. To a certain extent, it may affect the use of the instrument. The calculation of power frequency interference is Q=3600f/k (f=50HZ, k=coefficient of the instrument). Through calculation, it can be judged whether there is power frequency interference in the instrument. It is recommended to change the installation location. (4) The pipeline stop valve of the instrument is not completely closed. Check valve 1
3	The instrument is measuring normally, but the measured value is inaccurate	(1) There is a problem with the instrument's internal parameters. Check the instrument parameters according to the identification certificate. (2) The on-site pipeline does not meet the requirements, contains gas or has high viscosity. Strictly follow the installation instructions and precautions in the manual. (3) There is a problem with the instrument movement. Remove the instrument and blow on the impeller with your mouth. It should run smoothly and quickly. If there is any damage, please contact the manufacturer.
4	For the LWGY-CM2 series meters, the meter is measuring normally, the on-site LCD display is normal, but the meter's current output is incorrect.	(1) Check the fourth screen of the instrument parameters to see if the instrument range is the same as the upper limit of the range indicated on the instrument nameplate. (2) The instrument current output chip is damaged.