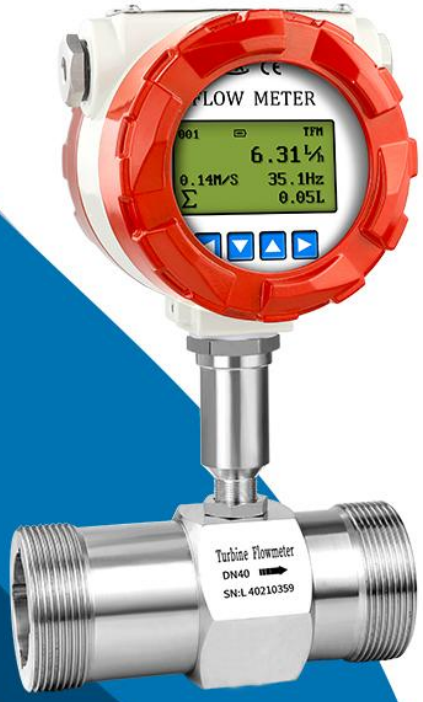
Liquid Turbine Flow Meter

— User Instruction Manual



CM Series

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Chapter 1. Safety Guidance

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The manufacturer is not responsible for any kind of damage caused by the use of the product, including direct, indirect, accidental or consequential damages or penalties.

This exclusion of liability is void if the manufacturer acts intentionally or with gross negligence. the above exclusions or limitations may not apply to you in part or at all if the applicable law does not allow limitations on the

implied warranties of the products, or does not allow or limit certain types of damages, and these rights also apply to you.

For each purchased product, the applicable product documents and the sales terms of the manufacturer.

The manufacturer reserves the right to modify the contents of the document including this exemption clause in any way, at any time, for any reason and without prior notice, and will not be responsible for any consequences caused by any form of modification.

1.1. Product liability and warranty

The buyer shall judge whether the flowmeter is suitable for the purpose by itself, and shall be responsible for it. The manufacturer will not bear the consequences caused by the wrong use of instruments by the buyer. Wrong installation and operation of flowmeter or system will lose the right of warranty. In addition, the corresponding "standard sales terms" also apply, which is the basis of the purchase contract.

1.2. Information about Documentation

In order to avoid harm to the user or damage to the instrument, please read the information in this document carefully. In addition, you must abide by the relevant standards, safety regulations and accident prevention rules of your country.

If you can't understand the contents of the document, please seek help from the manufacturer or instrument sales. If the information contained in this

document can't be correctly understood, and the property or personnel are injured, the manufacturer will not be responsible. This document will help you establish correct operating conditions to ensure that you can use the instrument safely and effectively.

1.3. Safety Instruction for Operators

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

▲ Only those who have received relevant training and certificates are allowed to install, use, operate and maintain the instrument.

▲ When measuring flammable media, please use explosion-proof flowmeter to prevent fire or explosion.

▲ When working in a dangerous environment, you must follow the correct operation steps.

▲ When the flowmeter is dismantled, it may cause medium splash. Please follow the safe operation specifications of fluid equipment manufacturers to prevent splashing.

▲ Do not purge the flowmeter with compressed air.

▲ Pay attention to the turbine blade inside the flowmeter, even a small scratch or notch will affect the accuracy.

▲ In order to achieve the best effect, the longest calibration period of the instrument should not exceed one year.

Chapter 2. Instrument Description

2.1. Delivery Scope

Please carefully check whether the packing box is damaged or has been handled savagely. If there is any damage, please report the damage to the deliveryman, manufacturer or instrument consignor. Please check the packing list to confirm that the goods you received are complete.

Please check the nameplate of the instrument and confirm whether the supplied content is the same as your order. Check whether the power information on the nameplate is correct. If not, please contact the manufacturer or instrument dealer.

2.2. Measurement Principle

When the measured liquid flows through the sensor, under the action of the fluid, the impeller is forced to rotate, and its speed is directly proportional to the average velocity of the pipeline. The rotation of the impeller periodically changes the magnetic resistance of the magnetic circuit, and the magnetic flux in the detection coil periodically changes, resulting in the induced electromotive force with the same frequency as the blade rotation frequency, which is amplified, converted and processed.

The practical flow equation of turbine flowmeter is:

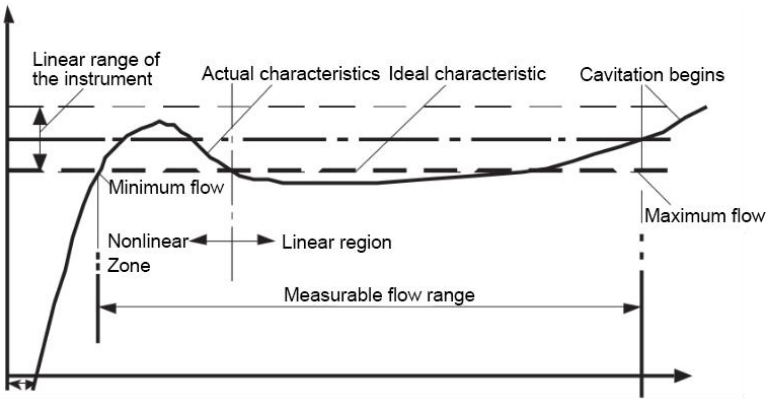
$$Q_v = f / K$$

Q_v ... ... Volume flow, m^3/s

f ... ... The frequency of the flowmeter output signal, Hz

K ... ... The instrument coefficient of a flowmeter, L/m^3

The relationship curve between flowmeter coefficient and flow rate (or Reynolds number) is shown in the figure. It can be seen from the figure that the instrument coefficient is divided into two sections, namely linear section and nonlinear section. The linear segment is about two-thirds of its working segment, and its characteristics are related to the sensor structure size and fluid viscosity. The nonlinear characteristics of the segment are greatly influenced by bearing friction and fluid viscous resistance. When the flow rate is lower than the lower limit of the sensor flow rate, the meter coefficient changes rapidly with the flow rate. When the flow rate exceeds the upper limit of the flow rate, attention should be paid to prevent cavitation.



2.3. Application Range

Turbine flow sensor (hereinafter referred to as sensor) is based on the principle of moment balance and belongs to speed flow meter. The sensor has the characteristics of simple structure, light weight, high precision, good repeatability, quick response, convenient installation, maintenance and use, etc. It is widely used in petroleum, chemical industry, metallurgy, water supply, paper making and other industries, and is suitable for measuring the liquid in closed pipelines which does not corrode stainless steel 1Cr18Ni9Ti, 2Cr13, corundum AI203 and hard alloy, and has no impurities such as fibers and particles.

If it is matched with a display instrument with special functions, it can also be used for quantitative control, excessive alarm, etc. The explosion-proof type of this product (ExdIICT6 Gb) is selected, which can be used in the environment with explosion danger. The sensor is suitable for the medium with viscosity less than 5× 10-6m/s at working temperature. For the liquid with viscosity greater than 5× 10-6m/s, the sensor should be calibrated before use.

2.4. Description of the Nameplate

Please check the instrument nameplate, make sure whether the supply content is the same as your order, and check whether the power supply on the nameplate is correct. The following figure shows the contents of the nameplate:

Intelligent Turbine flowmeter MC

Models:		Range:	
pressure level:		Power Supply:	
Output:		Accuracy:	
No:		Date:	

Chapter 3. Installation

3.1. Installation Inspection

Please carefully inspect the box for damage or if it has been brutally loaded or unloaded. If there is damage, report the damage to the delivery person and the manufacturer or meter shipper.

Please check the packing list to confirm that the goods you received are complete.

Please check the nameplate of the meter and confirm that the contents of the delivery are the same as your order. Check that the power information on the nameplate is correct. If it is incorrect, please contact the manufacturer or instrument dealer.

3.2. Storage

Please store the instrument in a dry and dust-free place;

Please avoid prolonged exposure to direct sunlight;

The instrument should be stored in the original packing box.

3.3. Installation Tips

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

Leave enough space on the side;

Do not subject the flowmeter to violent vibration.

3.4. Pipeline Design

The following items should be considered in pipeline design:

(1)Installation environment

▲It is best to install the flowmeter indoors. If it is necessary to install it outdoors, measures should be taken to avoid direct sunlight and rain.

▲The flowmeter should be avoided to be installed in places with high temperature, heat radiation from equipment or corrosive gas. If necessary, heat insulation and ventilation measures should be taken.

(2)Avoiding magnetic field interference

▲The turbine flow sensor should not be installed near the motor, transformer or other power sources which are easy to cause electromagnetic interference.

▲Do not install the turbine flow sensor near the inverter or get power from the inverter distribution cabinet to avoid interference.

(3)Maintenance space

▲For the convenience of installation and maintenance, there should be plenty of installation space around the turbine flowmeter.

(4)Support of flowmeter

▲The turbine flow sensor should be avoided to be installed on the pipeline with mechanical vibration. If it needs to be installed,

Damping measures must be taken, such as installing hose transition, or installing pipeline fixed support points and shockproof pads at 2DN upstream and downstream of flowmeter.

▲As far as possible, the flowmeter should be avoided to be installed on a long overhead pipeline, because the sagging of the pipeline will easily lead to the sealing leakage between the flowmeter and the flange. If installation is necessary, pipeline support points shall be set at 2D upstream and downstream

of the flowmeter respectively.

(5)Requirements for pipelines

▲The horizontal sensor installation requires that the pipeline should not be tilted visually (generally within 5°), and the verticality deviation of the vertical sensor installation pipeline should also be less than 5° .

▲The pipeline must be filled with liquid. If the measured liquid contains gas, a getter should be installed at the upstream side of the sensor. The sewage outlet and degasser of the filter and degasser should lead to a safe place.

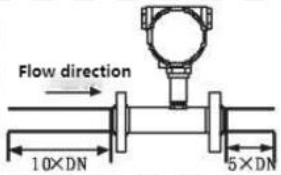
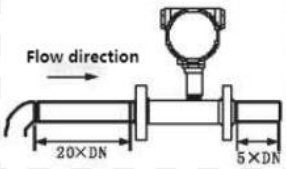
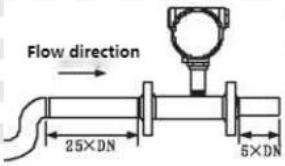
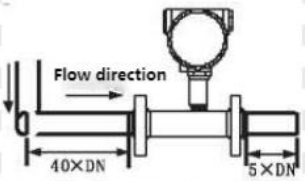
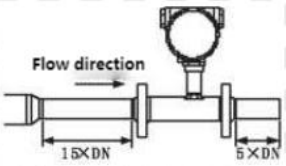
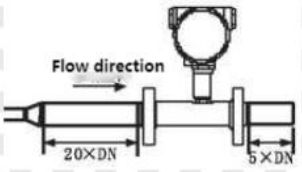
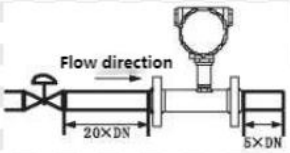
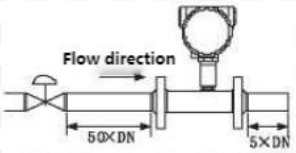
(6)Length of straight pipe section

▲Turbine flowmeter is sensitive to the distortion of the flow velocity distribution and rotating flow in the pipe, into the sensor should be fully developed turbulent flow, therefore, according to the sensor upstream side of the type of flow blocker equipped with the necessary straight pipe section or rectifier, the length of the inlet section and outlet section straight pipe section required, as shown in the figure.

The dimension shown is the minimum required installation length of straight pipe section to ensure accuracy. If the length of straight pipe section is doubled, the accuracy can be improved.

Upstream: the minimum allowable straight pipe length is at least 10 times the pipe diameter.

Downstream: the minimum allowable straight pipe length is at least 5 times the pipe diameter.

Flow component type at entrance section	Installation conditions			Installation conditions	
	Entrance section	Exit section		Entrance section	Exit section
General			Two 90-degree bends in the same plane		
Two 90-degree bends in the same plane			Two 90 degree bends in different planes		
Retraction Pipe			Expanding Pipe		
Fully open valve			Half-open valve		

3.5. Mechanical Installations

Instrument operation instructions

(1) Be careful when unpacking, and don't break the instrument.

It is best not to unpack the instrument until it is delivered to the installation site to avoid damage. Do not use a rod or rope to lift the instrument through the sensor measurement tube.

（2）Prevents vibration of the meter

To prevent heavy falling, heavy pressure instrument, especially the surface of the flange can not be forced, may damage the sealing surface.

（3）Protection of sensor flange surface

Pay attention to the protection of the flange after unpacking the instrument, and do not arbitrarily place the flange on the ground without gasket or other uneven surfaces.

（4）The instrument is not used for a long time.

After installation, avoid prolonged non-use of the instrument. If the instrument is not used for an extended period of time, the following measures must be taken with the instrument:

A: Check the sealing of end caps and junction ports to ensure that moisture and water do not enter the instrument. Periodic inspection, check the above mentioned measures and the condition of the junction box, at least once a year.

B: In case of possible water immersion in the instrument (such as after heavy rain and lightning), the instrument should be checked immediately.

3.5.1 Installation of pipes

▲Before the flowmeter is installed, the pipeline should be calibrated to ensure that the diameter of the meter has a good concentricity with the user's pipeline. Therefore, the flowmeter needs to be grounded on many occasions, and its function is to form an internal space shielded from external interference through the shell of the flowmeter, thus improving the measurement accuracy.

▲Newly installed pipelines generally have foreign matter (such as welding slag),

and the flow meter should be rinsed before installation, so that not only the lining is damaged, but also the measurement error caused by foreign matter passing through the measuring tube during the measurement can be prevented.

▲Open the pipe according to the requirements of the opening size, and make the position of the opening meet the requirements of the straight pipe section. Place the complete set of flowmeters connected to the flange into the open pipe.

▲Spot welding and positioning of the flange and the pipe, spot welding and positioning should be removed after the flowmeter, not with the flowmeter welding. Remove the flowmeter, weld the flange as required, and clean up all the protruding parts in the pipeline.

▲In the inner groove of the flange is fitted with the same sealing gasket as the pipe diameter, the flowmeter into the flange, the flowmeter flow mark should be the same as the fluid direction, and then fastened with the bolt.

3.5.2 Installation of pipeline flowmeter

▲Installation direction, the flow direction of the measured fluid and the flow direction mark of the flow meter should be consistent.

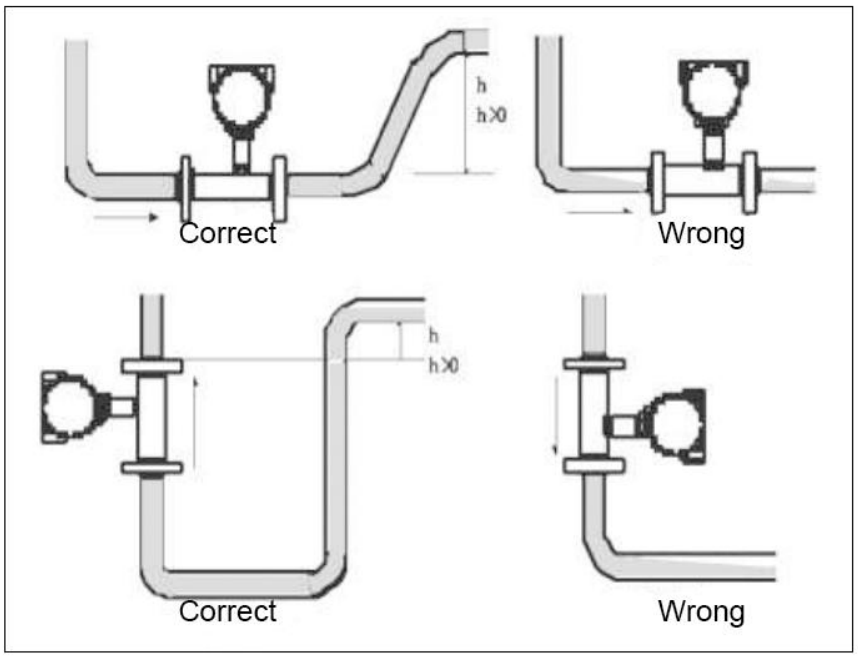
▲The flange gasket installed between the flanges should have good corrosion resistance, and the gasket must not extend into the inside of the pipe.

▲During installation, the flange on the sensor and the flange on the pipeline are connected by bolts, and the bolts and nuts for fastening the instrument should be intact and well lubricated. At the same time, it should be matched with flat pad and spring pad. If possible, use a torque wrench to tighten the fastening bolts according to the flange size and torque. In daily use, the bolts should

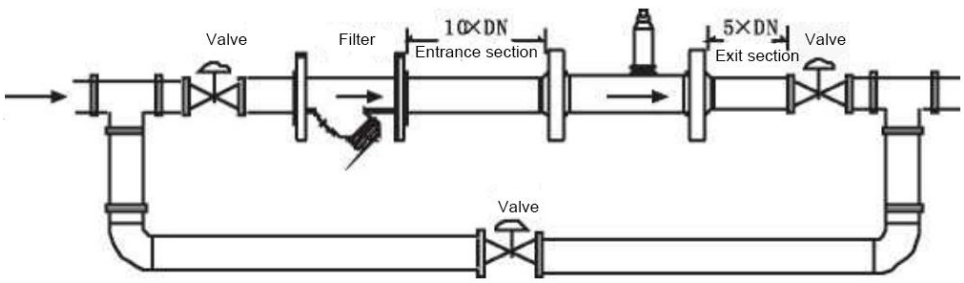
be tightened regularly to prevent them from loosening.

3.5.3 Location of the flow meter

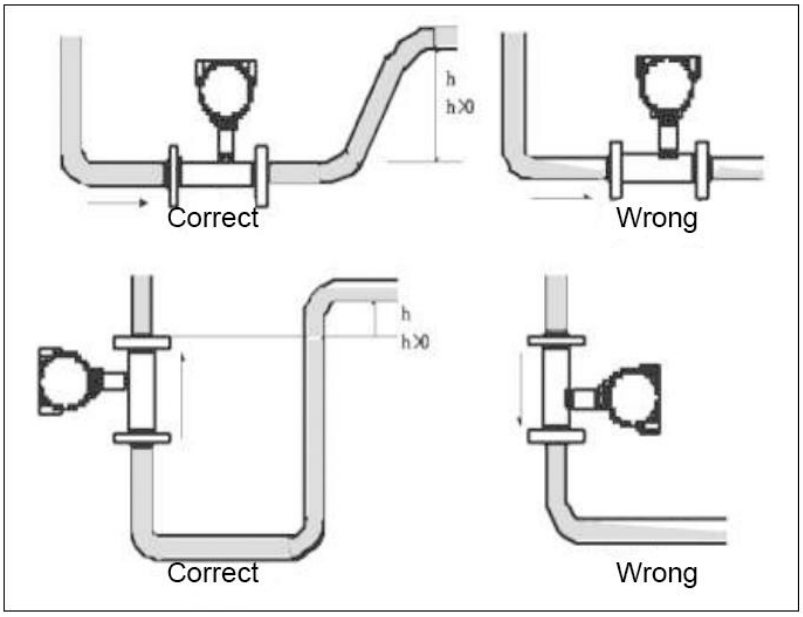
The pipeline must be completely filled with liquid. It is important to keep the pipeline completely filled with liquid at all times, otherwise the flow display will be affected, which may lead to measurement errors.



Avoid bubbles. If air bubbles enter the measuring tube, the flow display may be affected, which may lead to measurement errors.



3.5.4 Typical installation pipeline form of turbine flow sensor



The sensor should be installed in a place convenient for maintenance, where the pipeline is free from vibration, strong electromagnetic interference and thermal radiation. In places where the flow cannot be stopped, a bypass pipe and a reliable cut-off valve (see the above figure) should be installed, and no leakage of the bypass pipe should be ensured during the measurement.
At the position where the sensor is installed in the newly laid pipeline, connect a short pipe instead of the sensor, and then connect the sensor formally after the "line sweeping" is finished and it is confirmed that the pipeline is clean.
When the sensor is installed outdoors, measures should be taken to avoid direct sunlight and rain.

3.6 Installation dimension drawing

Flange-connected turbine flow sensor

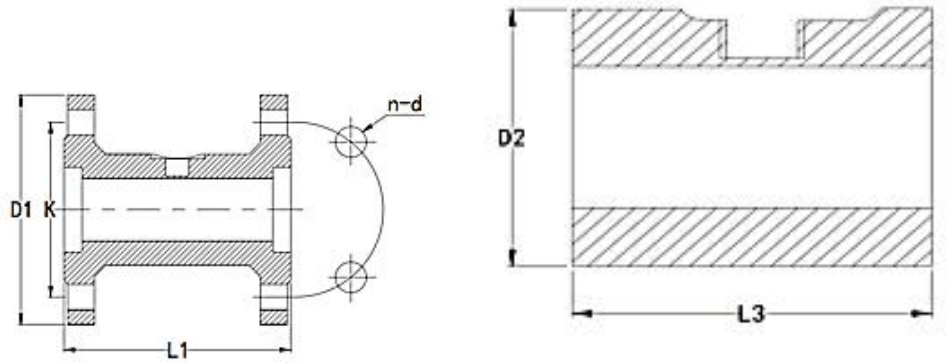
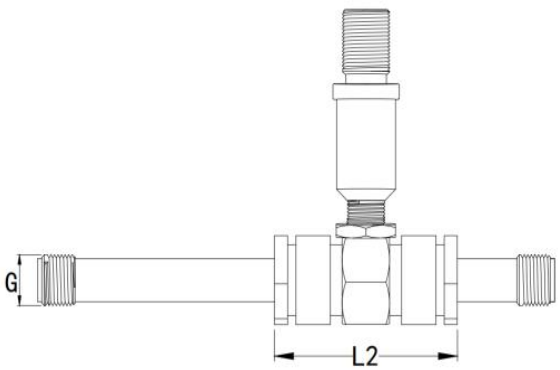


Figure 3.6(A) DN15~DN200 flange connection turbine flow sensor size drawing

Figure 3.6(B) DN4~DN200 flange clamping type Turbine flow sensor size drawing



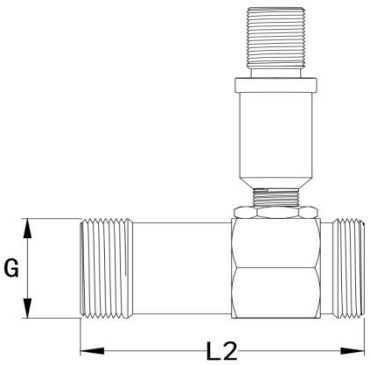


Figure 3.6(C) DN4~DN10 threaded turbine flow sensor (including straight pipe section) dimensional drawing

Figure 3.6(D) DN15~DN50 threaded connection type turbine flow sensor (excluding straight pipe section) dimensional drawing

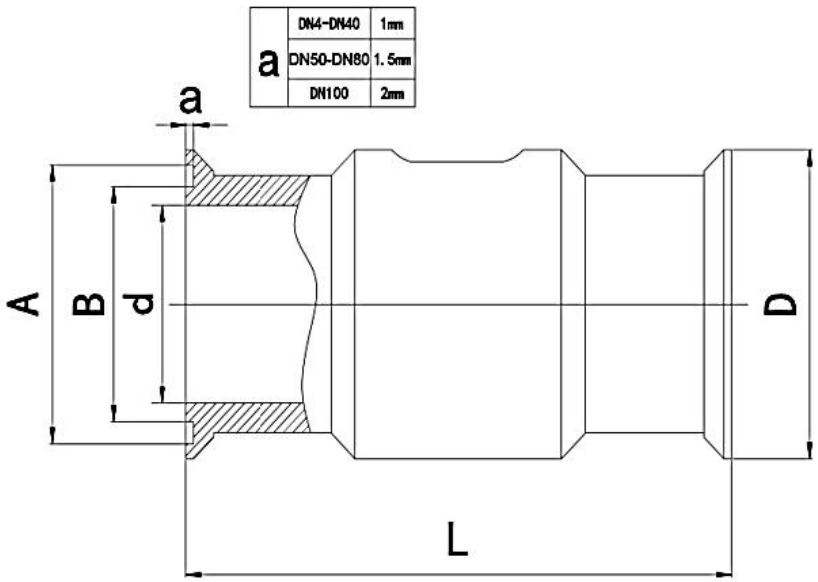
Installation dimension table of turbine flow sensor

DN (mm)	Flange Connection					Thread Connection		Clamp Flange Connection	
	L1	D1	K	D	n (Number of hole)	L2	G(Male Thread)	L3	D2
4						225	G1/2	50	38
6						225	G1/2	50	38
10						345	G1/2	50	38
15	75	95	65	14	4	75	G1	55	47
20	85	105	75	14	4	85	G1	60	54
25	100	115	85	14	4	100	G5/4	60	57
32	140	140	100	18	4	140	G3/2	70	66
40	140	150	110	18	4	140	G2	70	72
50	150	165	125	18	4	150	G5/2	70	92
65	170	185	145	18	4			80	100
80	200	200	160	18	8			90	112
100	220	220	180	18	8			100	137
125	250	250	210	18	8			120	165
150	300	285	240	22	8			150	190
200	360	340	295	22	12			150	243

Note: The above flange clamp type turbine flow sensor with pressure rating of 1.6MPa. The above dimensions are only for reference in design and selection, and the actual dimensions are subject to confirmation at the time of delivery or ordering. The dimensions of high-temperature and high-pressure models shall be subject to confirmation at the time of delivery or ordering. The installation flange of flowmeter adopts the enterprise standard, or other national department or industry

standards or other national standards (American standard, German standard, Japanese standard, etc.) according to users' needs. If you need special standards, please indicate them when ordering.

Outline dimension drawing of sanitary turbine sensor



Diameter Size	D(mm)	A(mm)	B(mm)	d(mm)	L(mm)
DN4	50.5	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	68	50	150
DN65	91	86	80.5	65	170
DN80	106	100.5	94	80	200
DN100	119	113	106	100	220

The D size is the inner diameter size of the matching clamp

The conventional pressure rating of sanitary turbine sensor is 1.0MPA.

Chapter 4. Electrical Connection

4.1. Safety Tips

All work related to electrical connection must be carried out with the power cut off. Please pay attention to the power data on the nameplate.

Please observe the relevant national installation regulations and specifications.

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

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 not, please contact the manufacturer or instrument seller.

4.2.Tips for electrical cables and signal cables for instruments

After the signal cable with double shielding is effectively grounded to the shielding layer, the interference in the transmission of measured values can be greatly reduced.

Please pay attention to the following tips:

Please lay the signal cable firmly.

Allow the signal cable to be laid in water or soil.

Comply with EN5062, IEC60322-1 and other related standards, and the insulation materials shall be flame retardant.

The signal does not contain sleeping or plasticizer, and it is still flexible at low temperature.

The internal shield is connected by multi-strand drain wires.

It is recommended to choose "RVVP" shielded cable for electrical cables. The 24V power line is connected from one side wiring hole, and the 4 ~ 20mA signal line is connected from the other side wiring hole.

The shielded cable connecting the flowmeter should be far away from places with strong electromagnetic interference, and it is absolutely not allowed to be laid together with high-voltage cables. The shielded wire should be shortened as far as possible, and should not be coiled to reduce the distributed inductance, and the maximum length should not exceed 500m.

4.3.Connecting electrical cables

Signal and power leads are only allowed to be connected if the power supply is cut.

The meter must be connected to the protective grounding terminal as specified to protect the operator from electric shock.

For those instruments used in areas with a risk of explosion, it is also necessary to pay attention to the safety technical tips given in the special explosion-proof instructions.

Please strictly comply with local occupational health and safety regulations. Only properly trained personnel are allowed to work on electrical equipment. No voltage difference between the measuring sensor and the protective ground of the housing or converter is allowed.

The measurement sensor must be fully grounded, which can refer to the grounding requirements of the relevant standard (HVT20513-2014 Design Code for Grounding System for Instrumentation Systems).

The grounding conductor should not transmit any interfering voltage.

It is not allowed to connect other electrical devices at the same time on the grounding conductor.

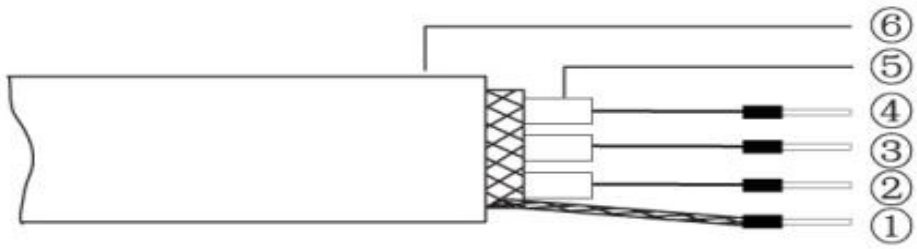
4.4. Electrical wiring

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

N-type (basic pulse) terminal diagram and wiring instructions for the construction of the signal cable.

Signal cable is a shielded cable, which is used to transmit the signal of turbine flowmeter.

Bending radius > 50mm/2 ″



① Signal shielding wire-(cable shielding layer)

② Sensor power supply line-positive (red)

③ Sensor power supply negative, signal negative common ground-ground (blue)

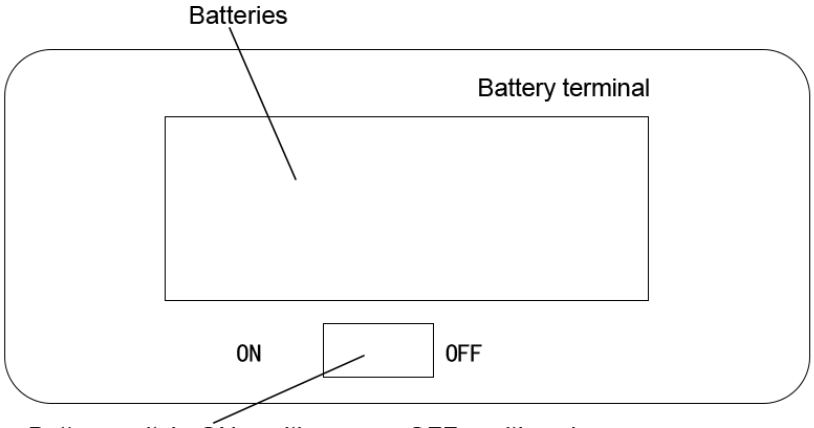
④ Sensor signal wire-positive (yellow)

⑤ Protective layer of copper core wire outer skin

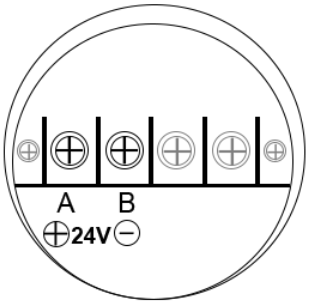
⑥ Cable sheath protective layer

Type A (two-wire current output) wiring

CM0 model (Dispaly +Lithium battery power supply) Wiring instructions

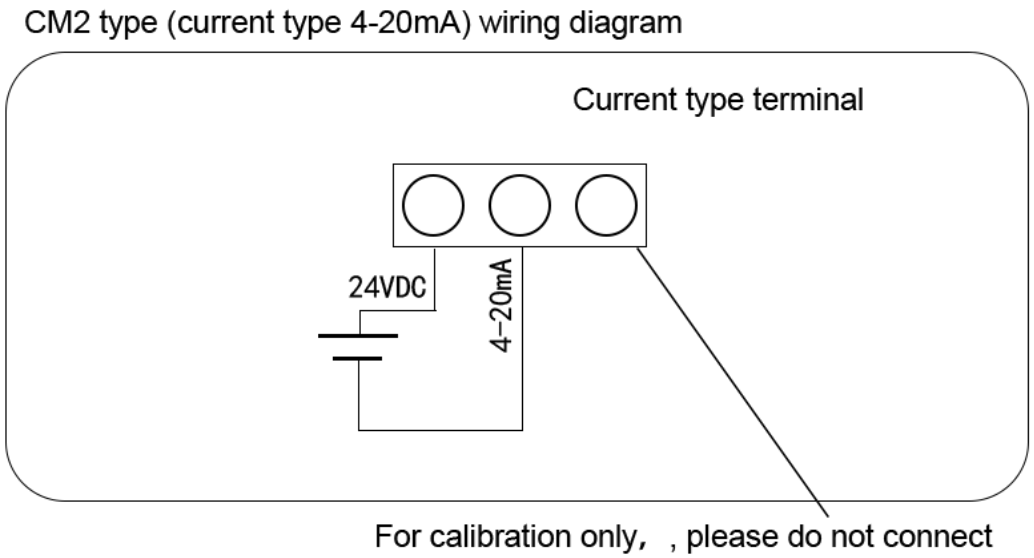


Battery switch, ON position open, OFF position close



“A” for 15 ~ 24V power supply“+” terminal
“B” for 4 ~ 20mA current output terminal

"A" is connected to 24V external power supply, and the current output flows from "B" end to the sampling resistance of the computer or display table, and flows back to the "-" end of the power supply after load such as sampling resistance.

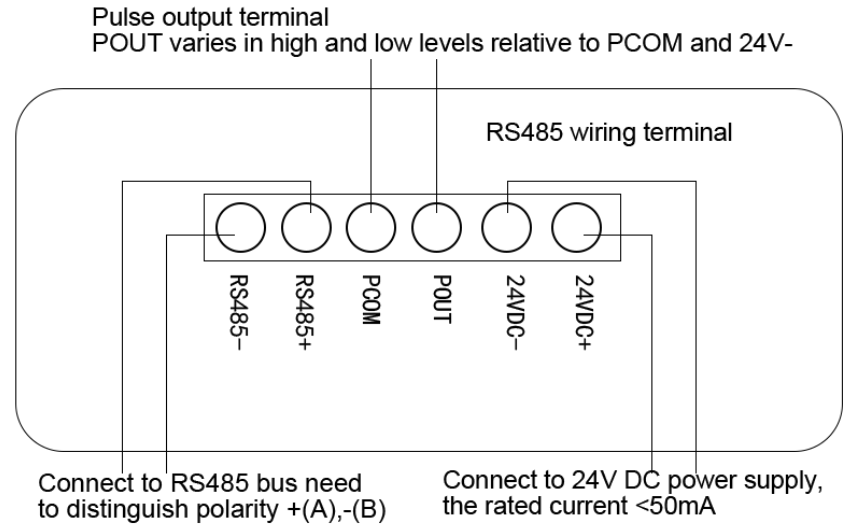


"—" is the 4-20mA current output

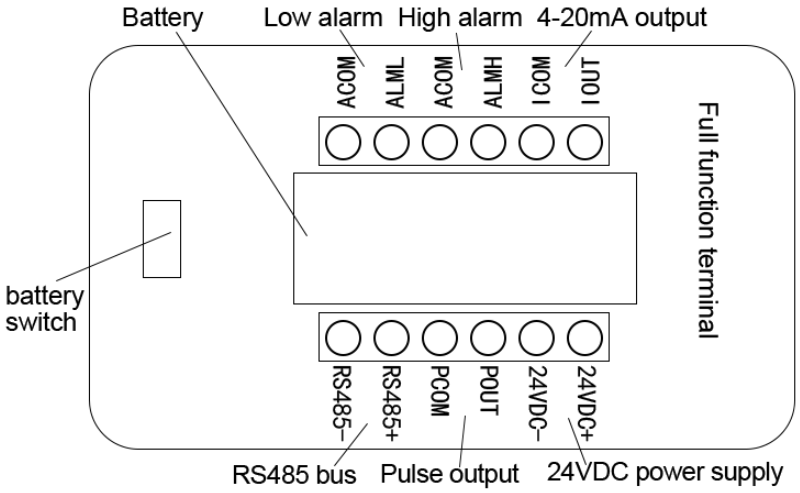
"+" is the "+" terminal of the 24V supply

Connect the +24V external power supply, and the current output flows from the terminal to the sampling resistor of the computer or display meter, and then flows back to the power supply terminal after passing through the load such as the sampling resistor.

CM3 (RS485 communication/pulse) terminal diagram and wiring description



CM4 (4~20mA/RS485 communication/pulse) terminal diagram and wiring description



3.6V lithium battery auxiliary power supply:

The battery can be turned on or off by the "battery switch". When only the battery is powered, each output (e.g. RS485, 4-20mA) will not work, and only the flow rate and total amount will be displayed. After receiving 24V DC power supply, it will automatically switch to 24V power supply.

Two-wire current working mode:

24V DC power supply, anode connected to 24VDC+, cathode connected to IOUT. The current of the instrument control circuit is 4-20mA in two-wire system. In this mode, other outputs (such as RS485 and pulse) are turned off.

Full function mode:

24V DC power supply, anode connected with 24VDC+ and cathode connected with 24VDC-. Each output is open and independent.

Pulse output: POUT changes in high and low levels relative to PCOM and 24VDC-.

4-20mA output: After IOUT forms a loop with ICOM and 24VDC-, the current on the IOUT line changes to 4-20mA.

RS485 communication: Access RS485 bus and support ModBus protocol based on RS485.

High alarm: when alarming, ALMH is disconnected from ACOM, otherwise it is turned on (direct voltage, the maximum current is 30mA)

Low alarm: same as high alarm, it is recommended to use intermediate relay to drive high-power equipment.

4.5.Connect to power supply

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

Included in the allowable range: 12VDC/24VDC or powered by lithium battery.

Please select the corresponding wiring mode below according to the purchased flowmeter model and power supply type.

Chapter 5. Start-up operation

5.1.Turn on the power

Before turning on the power supply, please check whether the instrument is installed correctly, including: the flowmeter must be installed safely and in compliance.

The connection of power supply should be carried out according to the regulations.

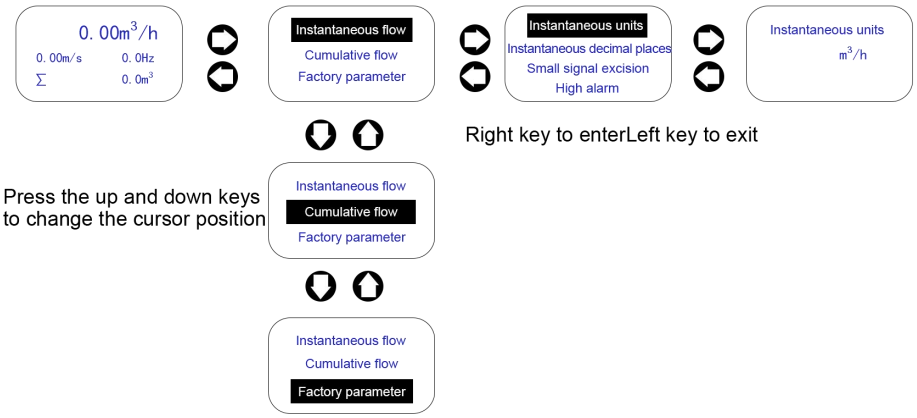
Cover the protective cover of the electrical connection room and tighten the cover plate.

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

5.2. Menu Operations

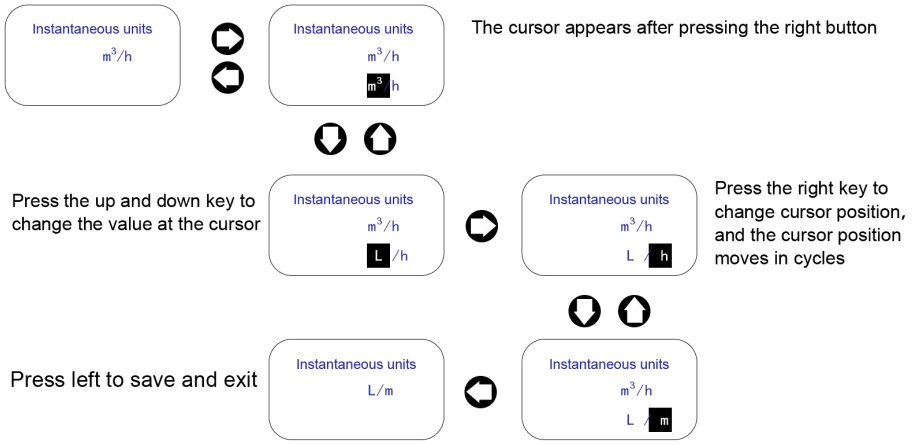
Parameters are set through four keys

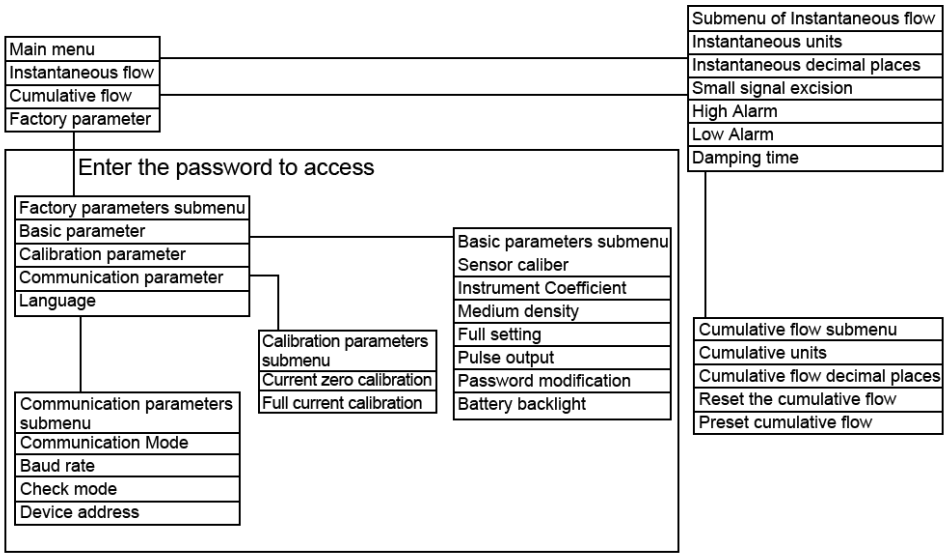
1. Enter and exit the menu operation



5.3. Menu Structure

2. Operations to modify parameters





5.4. Parameter Description

5.4.1 Instantaneous flow

Instantaneous unit	Option: 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 Metre), L(Liter), USG（American gallon）, gal(Gallon), kg（Kilogram）, t(Ton) /h(Hour)/m(Minute), /s(Second)

Instantaneous several decimal places	Option: 0, 1 , 2 , 3 Default value: 1 Select the instantaneous flow value to display several decimal places.
Small-signal excision	Floating point number input Default value: 0.0Hz Flows smaller than this value are forced to zero. According to the input frequency value, the instantaneous flow rate, current value and percentage corresponding to the cutting point will be prompted .
High alarm	Floating-point number: 100～ 0.00 % Default value: 0 % This setting value is a percentage of the range (full scale). For example, if this value is set to 15%, and the measuring range (full scale) is 100, 100×15%=15, then the high alarm contact will be opened when the instantaneous flow rate is greater than 15, otherwise the contact will be closed.

Low alarm	Floating-point number: 100～ 0.00 % Default value: 0 % This setting value is a percentage of the range (full scale). For example, if this value is set to 75% and the range (full scale) is 100, 100×75%=75, then the low alarm contact will be opened when the instantaneous flow rate is less than 75, otherwise the contact will be closed.
Damping time	Floating-point number: 30.0～0.1, Default value: 1, The instantaneous flow value is averaged within the set time.

5.4.2 Cumulative flow

Total units	Default value : m^3 Select the unit of cumulative flow. m3(Cubic Metre), L (Liter), USG（American gallon）, gal(Gallon), kg（Kilogram）, t(Ton)
Several decimal places of total amount	Option: 0 1 2 3 Default value : 1 Select the cumulative flow value to display several decimal places.

Clear accumulation	Set cumulative flow to 0.
Preset accumulation	Floating-point number Set the cumulative flow as the input value.

5.4.3 Factory parameters

Basic parameter

Sensor diameter	Floating-point number , Default value : 50mm Determine this value to show the correct flow rate. Flow rate = instantaneous flow rate / cross-sectional area. The cross-sectional area is related to the sensor diameter
Instrument coefficient	Floating-point number , Default value: Calibration result Q=f/k Q Instantaneous flow (liters per second) f Measuring frequency（Hz） k Instrument coefficient (pulse per liter)
Medium density	Floating-point number , Default value: 1000kg/h。 Used for volume-to-mass conversion

Full scale setting	Floating-point number , Default value: 100m³/h Define the maximum measured value (range) Instantaneous flow corresponding to 20mA Instantaneous flow percentage = (instantaneous flow/full scale) *100%
Pulse output	Option: Signal output, equivalent output, frequency output, output off. Set the digital output method. Signal output: output the original sensor signal frequency, can calculate the instantaneous flow rate according to the meter coefficient See calculation formula of instrument coefficient. Equivalent output: directly defines how much flow is represented by one pulse output Under this option, you can enter the equivalent value, and the unit can be changed Frequency output: proportional output frequency, the maximum frequency corresponds to the full scale of flow The maximum frequency (MAX) can be input under this option, default value 2000HZ Output off: turn off the digital output
Change password	Customized access password

Battery backlight	Options: Auto, Enable, Disable Display screen backlight control in battery-powered mode to extend battery life Battery powered The backlight consumes about half of the total power.

Calibration parameters:

Current zero calibration	Floating-point number Default value : 4.000mA After entering this menu, the 4-20mA output is forced to 4.000mA. If the actual measurement value is not equal to 4.000mA, enter the actual measurement value, the system calibrates according to the difference value
Current full scale calibration	Floating-point number Default value : 20.000mA After entering this menu, the 4-20mA output is forced to 20.000mA. If the actual measured value is not equal to 20.000mA, enter the actual measured value, and the system calibrates according to the difference value.

Communications parameters

Communication Mode	Options: RTU, ASCII Default value: RTU
Baud rate	Options: 1200, 2400, 4800, 9600, 19200, 38400 Default value: 9600
Verification mode	Options: NONE, ODD, EVEN Default value: NONE
Equipment address	Integer 1-254 Default value 1 Slave machine address, stack address, device ID
Language	Options: Chinese, English Default value: Chinese

5.5.Communication

[Communication Protocol] The instrument adopts RS485 or Rs232 serial communication, standard ModBus RTU communication protocol, CRC check and passive transmission mode. The following details of the agreement are introduced. Read the measured display value of the instrument (the reading parameter adopts the 0x03 command).

5.5.1 Format of the frames sent by the host computer

Sequence	Code	Description
1	Instrument Address	

2	03H	Function Code
3	Number of bytes in the loopback data field (M)	
4	First register data	Low in front
.....	.....	
M+4	CRC16 Check low bytes	
M+5	CRC16 Check high byte	

5.5.2 Instrument response data format

Sequence	Code	Description
1	Instrument Address	
2	03H	Function Code
3	Register start address high byte	Register start address
4	Register start address low byte	
5	Register start address low byte	Number of registers read
6	Low byte number of register reads	
7	CRC16 Check low byte	CRC Check data
8	CRC16 Check high byte	

5.5.3 List of instrument display value register addresses

Register address (Hexadecimal)	Meaning	Range of values
0×0200	Cumulative zeroing (write 1)	Unsigned 16-bit integer

Register Address	meaning	Value
0×0100~0×0101	Cumulative amount	32-bit floating point data:
0×0102~0×0103	Real-time flow	32-bit floating point data;
0×0104~0×0105	Frequency	32-bit floating point data;
0×0000	Instantaneous flow decimal point	unsigned 16-bit integer;
0×0001	Instantaneous flow measurement unit	unsigned 16-bit integer;
0×0002	Density	unsigned 16-bit integer;
0×0003~0×0004	Flow range upper limit	unsigned 32-bit integer;
0×0005~0×0006	K factor	unsigned 32-bit integer;
0×0009	Small signal cutoff (Hz)	unsigned 16-bit integer;
0×000d	Instrument address	unsigned 16-bit integer;
0×000e~0×000f	Reset value	unsigned 32-bit integer:

5.5.4 Modify the format order of parameter instrument response data.

Sequence	Code	Description
1	Instrument Address	
2	06H	Function Code
3	Register start address high byte	Register start address
4	Register start address low byte	
6	Low data byte	

7	CRC Check low byte	CRC Check data
8	CRC Check low byte	

Communication test examples:

Sending data: 01 03 01 00 00 04 45 F5

Data Analysis: 01: Instrument Address 03: Function Code

01 00: Register Address 257=256+1

00 04: Number of data returned 4 groups

45 F5: CRC Check

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

Data Analysis: 01: Instrument Address

03: Function Code

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

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

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

44 B3:CRC Check code

Zero command example:

Sending data: 01 06 02 00 00 01 49 B2

Data Analysis: 01: Instrument Address 06: Instruction (function code)

02 00: Register Address

00 01: Set 1 to clear zero

49 B2: CRC Check

Receiving data：01　06　02 00　00　01 49　B2（data returned，Reset to complete）

Chapter 6. Technical parameters

6.1. General technical specifications

<table>
<tr><td>Measured medium</td><td colspan="3">No impurities, low viscosity, no strong corrosive liquid</td></tr>
<tr><td>Implementation Standards</td><td colspan="3">Turbine Flow Sensor（JB/T9246-1999 ）</td></tr>
<tr><td>Inspection protocols</td><td colspan="3">Turbine Flow Meter (JG1037-2008)</td></tr>
<tr><td rowspan="3">Instrument caliber and connection type</td><td>Flange connection type</td><td colspan="2">DN15-DN200</td></tr>
<tr><td>Thread connection type</td><td colspan="2">DN4-DN50</td></tr>
<tr><td>Clamp connection type</td><td colspan="2">DN4-DN200</td></tr>
<tr><td rowspan="2">Flange standard</td><td>Conventional standard</td><td colspan="2">GB/T9113-2000</td></tr>
<tr><td>Other standards</td><td>International pipe flange standard</td><td>Such as DIN of German standard, ANSI of American standard,</td></tr>
</table>

			Japanese standard JS	
		Domestic pipe flange standard	Such as the standards of the Ministry of Chemical Industry and the Ministry of Machinery in China	
Thread specification	Conventional standard	Inch pipe thread (external thread)		
	Other standards	Internal thread, spherical thread, NPT thread, etc.		
Accuracy And repeata -bility	Accuracy class*1	±1%R	±0.5%R	±0.2%R (customized)
	linearity	≤0.15%	≤0.1%	≤0.03%
Range ratio	Frequency decimal point	10:1~20:1		
Verification condition	Calibration device	Standard meter method liquid flow calibration device; Static mass method liquid flow calibration device;		
	Environmental conditions	Environmental temperature	20℃	
		Environmental humidity	65%	

Working condition	Medium temperature	T1(General type, standard)	-20℃~80℃
		T（High temperature type, customized)	-40℃~180℃
	Environment temperature	-20℃~60℃	
	Relative Humidity	5%~90%	
	Atmospheric pressure	86Kpa ~106Kpa	

6.2.Electrical specifications

Output function	Signal output	Pulse signal, 4-20mA signal	
	Communication output	RS485 communication and HART protocol	
Working power supply	External power supply	+24VDC, Applicable to 4-20mA output, pulse output, RS485, etc.	
	Internal power supply	CM0.CM2、CM3.CM4	1 set of 3.6V 19Ah lithium battery
Signal line interface	N Type	Hirschmann connector DIN43650 or aviation Plug CX165P	
	Full series	Metal waterproof buckle female thread M20×1.5	
Explosion-proof grade	ExdⅡ C T6 Gb		

Protection grade	IP65 or higher (customized)

6.3. Flow Range

Measurement Range

Instrument caliber(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 instrumentation coefficients and frequency bands

Instrument caliber(mm)	Instrument coefficient (Times/L)	Frequency band (Hz)
DN 4	19000	177.8-1111
DN 6	8450	227.8-1366
DN 10	1700	100.0-600
DN 15	820	138.3-1383
DN 20	375	80-800
DN 25	212	58.9-588
DN 32	150	62.5-625
DN 40	75	42.8-427
DN 50	27	30.0-300
DN 65	12.2	23.5-235
DN 80	6.5	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

NO.	Fault phenomenon	Fault analysis and solution

1	There is flow through, the meter instantaneous flow is zero	(1) Wiring error, check the meter wiring. (2) The internal parameters of the instrument have been modified. Check the meter parameters according to the certificate. (3) The signal acquisition coil is damaged, which affects the signal transmission, and the signal cannot be transmitted to the converter even if there is flow through. Use a magnetic screwdriver to slide the signal acquisition coil. (4) Impeller is stuck, check the impeller.
2	The meter has an instantaneous flow display when no flow is passing through the meter	(1) The pipeline has violent vibration. It is recommended to add vibration damping measures. (2) Is the instrument well grounded. Check the grounding. (3) The presence of magnetic field interference at the site, such as inverters, motors, solenoid valves, etc. (Site 50HZ of industrial frequency interference. To a certain extent, it may affect the use of the instrument, the calculation of industrial frequency interference Q = 3600f/k (f = 50HZ,k = coefficient of the instrument). By calculation, it can be read whether the instrument has industrial frequency interference. It is recommended to change the installation position. (4) The pipeline shut-off valve of the instrument is not completely closed. Check the valve.
3	The meter measure normally, but the measured value is not accurate	(1) There is a problem with the internal parameters of the instrument. Test the instrument parameters according to the identification certificate. (2) The site piping does not meet the requirements, contains gas or has too high viscosity. Please strictly operate according to the installation instructions and precautions in the manual. (3)Instrument movement problems. Remove the instrument and blow the impeller with the mouth to run quickly.In case of damage, contact the manufacturer.

4	For LWGY-CM2 series meter, the meter measures normally, the field LCD display is normal, and the meter current output is incorrect.	(1) Check the fourth screen of the meter parameters to see if the meter range is the same as the upper limit of the range indicated on the meter nameplate. (2) The damage of the meter current output chip.