bd flow

flow, level, pressure, temperature

Product Catalog

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1. Introduction

The intelligent electromagnetic flowmeter is a high-tech product developed with micro-intelligent technology. The design, production and calibration of electromagnetic flowmeters comply with the "JB/T9248-2015 Electromagnetic Flowmeter" standard. Before leaving the factory, it has passed strict testing of multiple technical indicators to ensure product accuracy and reliability.

This flowmeter is suitable for flow measurement of all conductive liquids with conductivity greater than 5ÿS/CM. There are no moving and blocking parts in the measuring tube, the resistance loss is very small, and there is no blockage. The performance of the flowmeter is not affected by changes in the pressure, temperature and density of the liquid. The sensor adopts low-frequency multi-state excitation, which is not affected by power frequency and various on-site disturbances, and has high measurement accuracy, good stability and low installation requirements.

1.1 Measurement principle

The measurement principle is based on Faraday's law of electromagnetic induction. That is: when the conductive liquid moves in the magnetic field to cut the magnetic lines of force, the conductor generates an induced electromotive force (as shown in Figure 1), and its induced electromotive force E is:

$$E=KBVD$$

Among them: K: Instrument constant;

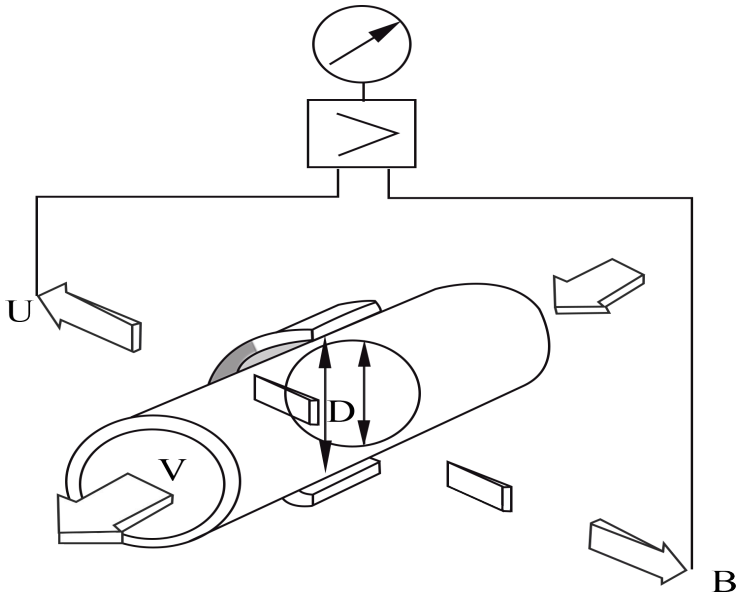
B: Magnetic induction intensity;

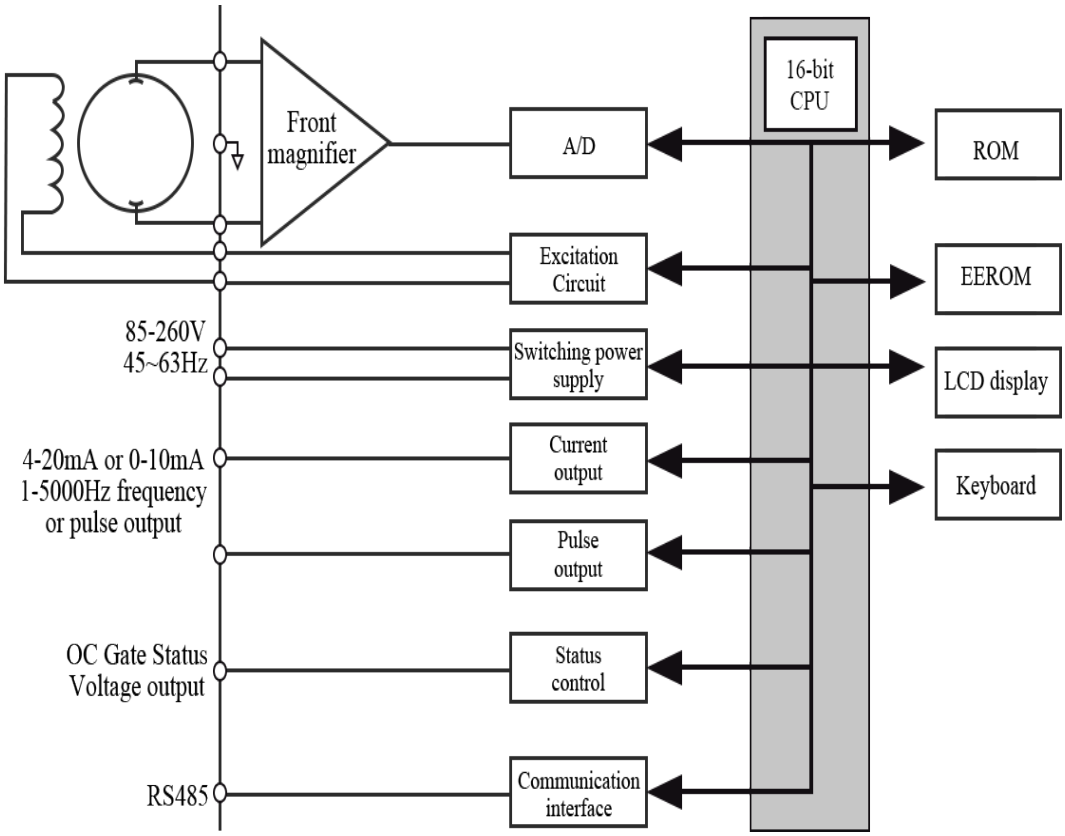
V: Average flow velocity in the measuring section;

D: The inner diameter of the measuring tube.

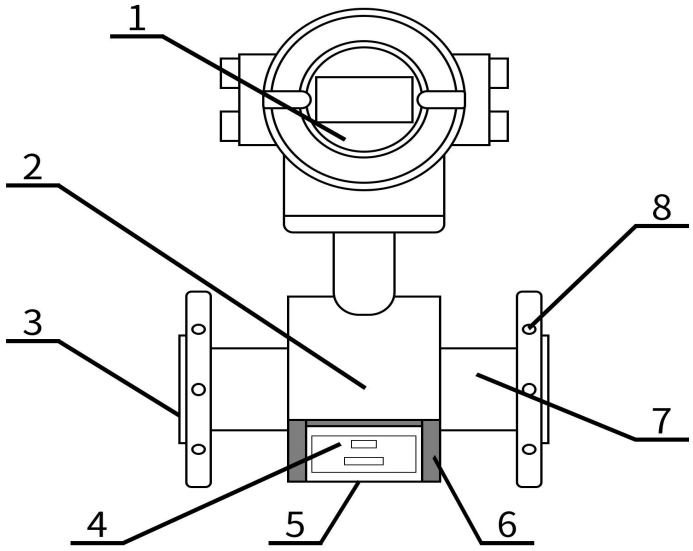
On the one hand, the electromagnetic flow converter provides a stable excitation current to the excitation coil of the electromagnetic flow sensor, so that B is a constant; at the same time, it amplifies and converts the electromotive force induced by the sensor into a standard current signal or frequency signal, which is convenient for flow display, control and adjustment . When measuring the flow, the liquid cuts the magnetic field perpendicular to the flow direction, and the flow of the conductive liquid induces a voltage signal proportional to the average flow rate (that is, the volume flow), so the liquid to be measured is required to have a minimum conductivity. This signal is detected by two electrodes in direct contact with the liquid and transmitted to the converter via a cable. It is then converted into a unified standard signal. After a series of digital processing, the cumulative flow and instantaneous flow are simultaneously displayed on the converter screen.

The circuit block diagram of the electromagnetic flowmeter converter is as follows:





1.2 Structure of electromagnetic flowmeter



1.Converter; 2.Electrode; 3.Insulation lining;
4.Excitation coil; 5.Housing; 6.Stall ring;
7.Measurement tube; 8.Flange;

1.3 Main technical parameters

Diameter	DN3-DN1000
Accuracy	0.5%, 1.0%
Electrode material	316, 316L, HB, HC, Ti, Ta, Pt
Lining material	Polychloroprene, Polychloroester, Teflon (F4), F46, PFA, PE
Medium	Conductive liquid
Measurement Error	±0.5%, ±1.0% flow rate (by caliber)
Conductivity of the Medium	>5us/cm(Water>20us/cm)
Velocity Range	0.3-10.0m/s (Velocity unit optional)
Connecting Flange	HG20592-97, GB9112-2000, DIN, ANSI, JIS
Medium Temperature	-25°C to +80°C (rubber lining 65°C)
Rated Voltage	0.6MPa-4.0MPa (higher pressure can be customized)
Output Signal	4~20mA current output, 0~5KHz frequency/pulse output
Protection Level	IP65, IP67, IP68 (split)
Network Function	MODBUS, RS-232, RS-485, HART communication interface
Application	Acid, alkali, water supply and drainage, food, pulp, etc.
Display	Flow, positive&negative cumulative flow&difference value, percentage, empty pipe ratio, flow rate
Language	Chinese/English
Power Supply	220VAC, 24VDC
Assembly Forms	One-piece type, split type
Installation Methods	Flange type, clamp type

2. Installation of electromagnetic flowmeter

2.1 Requirements for the external environment

2.1.1 Electromagnetic flowmeters should be avoided to be installed in places with large temperature changes or high temperature radiation of equipment. If installation is necessary, heat insulation and ventilation measures must be taken;

2.1.2 The electromagnetic flowmeter is best installed indoors. If it must be installed outdoors, it should avoid rainwater, flooding and sun exposure, and must have moisture-proof and sun-proof measures;

2.1.3 The electromagnetic flowmeter should be avoided to be installed in the environment containing corrosive gas, and ventilation measures must be taken when it must be installed;

2.1.4 For the convenience of installation, maintenance and maintenance, there should be ample installation space around the flowmeter;

2.1.5 The electromagnetic flowmeter installation site should avoid magnetic fields and strong vibration sources. There are supports for fixed pipes.

2.2 Installation method

2.2.1 It should be installed at the lower part of the horizontal pipeline and vertically upward, and avoid installing it at the highest point and the vertical downward part of the pipeline;

2.2.2 It should be installed at the rising place on the pipeline;

2.2.3 When installed in an open discharge pipeline, it should be installed at the lower part of the pipeline;

2.2.4 If the pipeline drop exceeds 5m, install an exhaust valve downstream of the sensor;

2.2.5 The control valve and shut-off valve should be installed downstream of the sensor, but not upstream of the sensor;

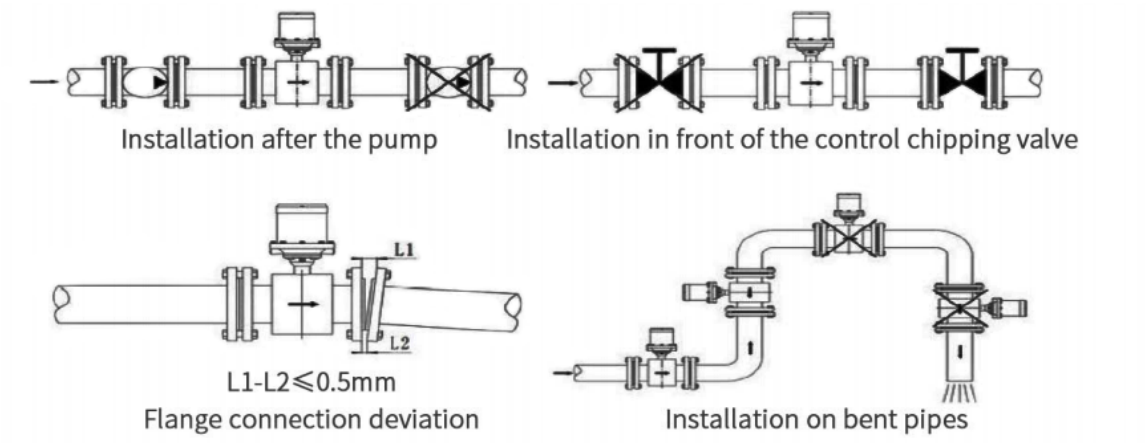
2.2.6 The sensor must not be installed at the inlet and outlet of the pump, but should be installed at the outlet of the pump.

2.3 Requirements for straight pipe sections

Inlet/outlet straight pipe section: the inlet should be ≥ 10×DN (pipeline); the outlet should be ≥ 5×DN

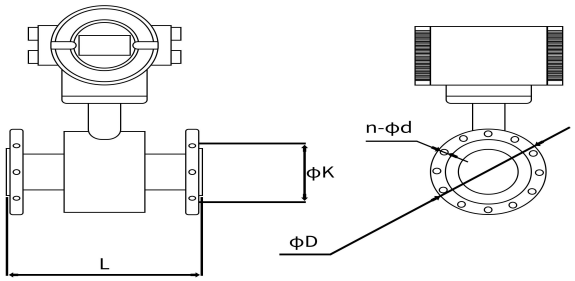
2.4 Docking site requirements

In order to make the instrument work reliably and improve the measurement accuracy, it will not be disturbed by the external parasitic potential / the sensor should be well grounded, and the grounding resistance should be less than 10. (If the metal pipe is well grounded, no special grounding device is required).

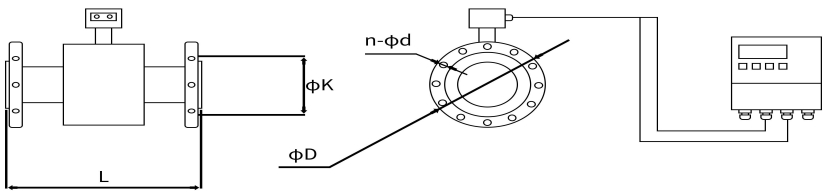


The electromagnetic flowmeter can be installed in two ways: flange type and clamp type.

The assembly form of electromagnetic flowmeter has two forms: integrated type and split type.



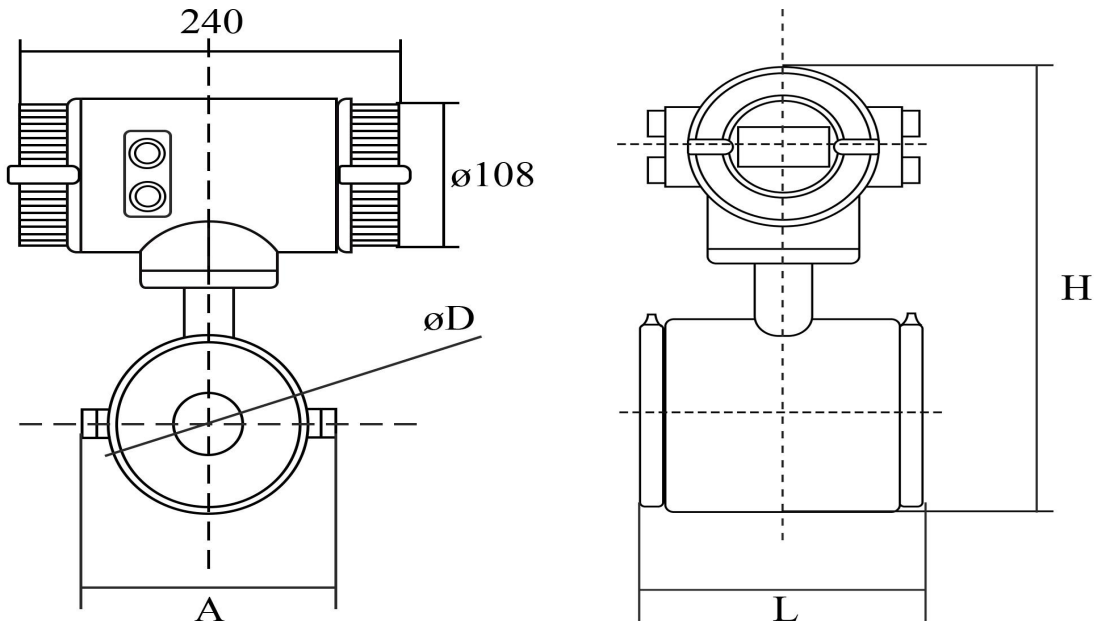
One-piece electromagnetic flowmeter shape structure diagram



Split type electromagnetic flowmeter shape structure diagram

Outline and installation dimensions of flanged electromagnetic flowmeter

Diameter (mm)	Nominal pressure ((Mpa)	Dimensions			Connection size	
		L	H	D	K	n-F
10	4.0	200	275	90	60	4*14
15	4.0	200	280	95	65	4*14
20	4.0	200	290	105	75	4*14
25	4.0	200	300	115	85	4*14
32	4.0	200	325	140	100	4*18
40	4.0	200	335	150	110	4*18
50	4.0	200	350	165	125	4*18
65	1.6	200	370	185	145	4*18
80	1.6	200	385	200	160	8*18
100	1.6	250	405	220	180	8*18
125	1.6	250	435	250	210	8*18
150	1.6	300	465	285	240	8*22
200	1.6	350	520	340	295	8*22
250	1.0	450	575	395	350	12*23
300	1.0	500	630	445	400	12*23
350	1.0	500	690	505	460	16*23
400	1.0	600	750	565	515	16*26
450	1.0	600	800	615	565	20*26
500	1.0	600	855	670	620	20*26
600	1.0	600	965	780	725	20*30
700	1.0	700	1080	895	840	24*30
800	1.0	800	1200	1015	950	24*35
900	1.0	900	1300	1115	1050	28*35
1000	1.0	1000	1415	1230	1160	28*35



Outline structure diagram of clamped electromagnetic flowmeter

Outline and installation dimensions of clamped electromagnetic flowmeter

Nominal Diameter (mm)	Dimensions (mm)				Weight (kg)
	H	A	L	ÿD	
10	220	90	85	50	4.8
15	220	90	85	50	4.8
25	238	108	95	68	4.9
40	256	126	105	86	5.6
50	269	139	120	99	6.8
65	288	158	120	118	7.6
80	302	182	160	132	10.2
100	325	195	180	155	13.4
125	347	215	230	175	18.0
150	370	270	230	200	24.5
200	450	340	300	280	45.0

3. Preparations before operation

When the instrument is put into operation, follow the steps below:

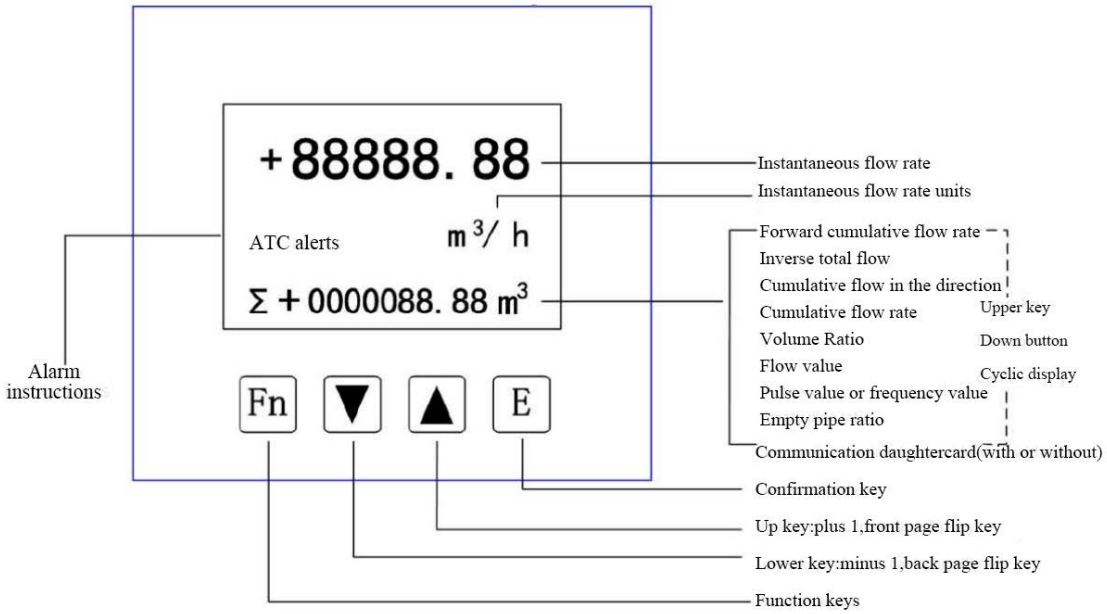
3.1 Open the front and rear valves of the sensor to fill the measuring tube with liquid;

3.2 Check whether the output wiring of the converter and the power supply wiring are consistent with the corresponding wiring diagram; if there is a certain flow in the pipe, the converter should indicate a certain value;

3.3 Adjust the zero position. After the instrument is powered on for half an hour, first close the downstream valve, and then close the upstream valve. When the fluid in the pipeline is still and there is no leakage, the flow is zero. If instructed, please refer to "Instrument Parameter Setting Flow Zero Correction" for the specific debugging method.

4. Instrument parameter setting and description

4.1 Definition of LCD and keyboard



After the instrument is powered on, it enters the automatic measurement state, realizes various measurement functions and displays the corresponding measurement data. By operating the four panel keys, the instrument parameters can be set and displayed.

4.2 Key functions

The instrument has four keys, which are function key, down key, up key, and exit key.

Up key: The number at the cursor is incremented by 1, and the content displayed on the upper line of the screen is cyclically selected.

Down key: the number at the cursor is reduced by 1, and the content displayed in the lower part of the screen is cyclically selected.

Function key: return to the previous menu, move the cursor to the right, cancel saving; enter the setting menu (in the main menu).

Function key + Up key: Increase LCD contrast (in the main menu).

E Confirm key: Enter, confirm and save.

E Confirm key: Enter, confirm and save.

4.3 Password

The meter is designed with a 3-level password. Level 1 user password can modify the password value of this level; level 2 factory password can modify the password of this level, and you can view the password value of level 1;

The user password is "90000", after entering the menu with the password, you can operate the corresponding password level, enter the password 90000, if it is correct, press the enter key to enter the menu, if the input is wrong or not, press the enter key to return to the main menu.

4.4 Instrument menu

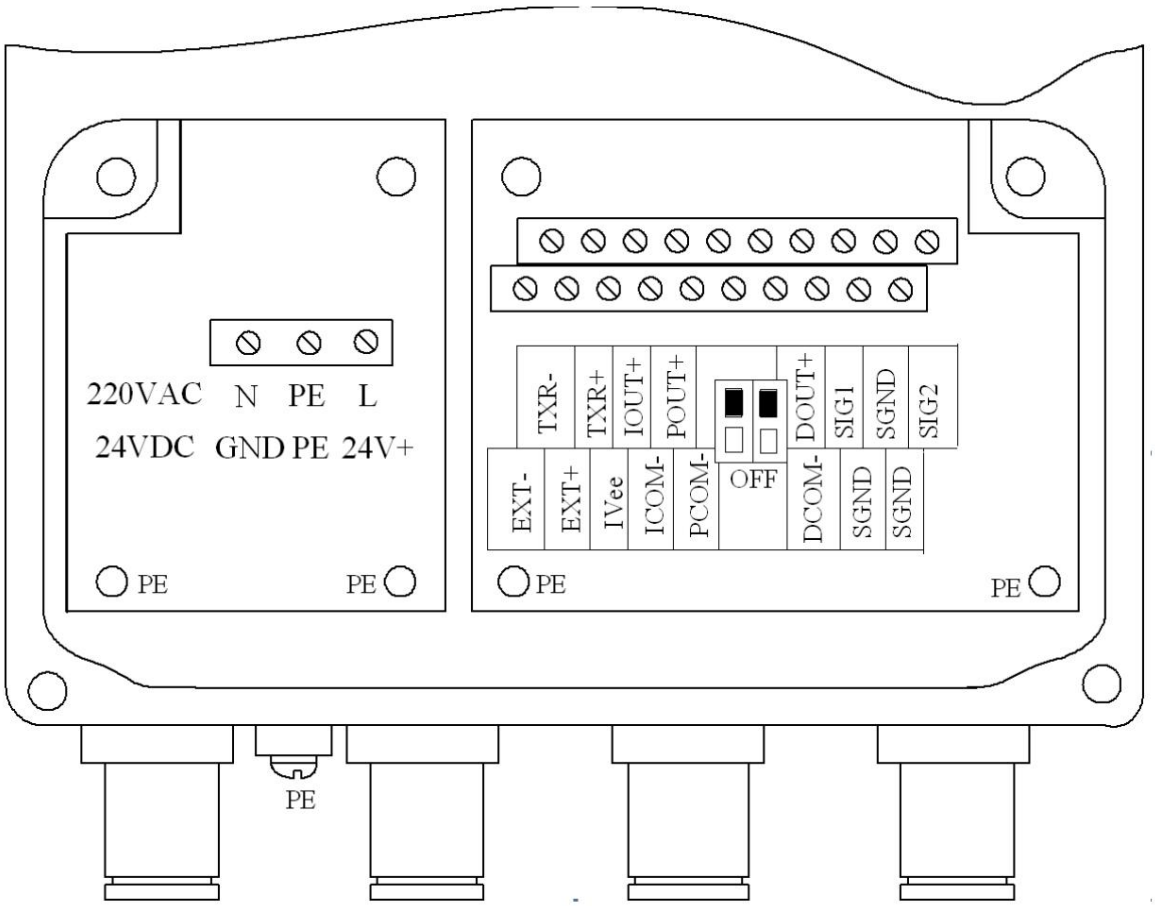
The instrument menu adopts a structured design method, with reasonable classification, clear levels, and easy operation and use.

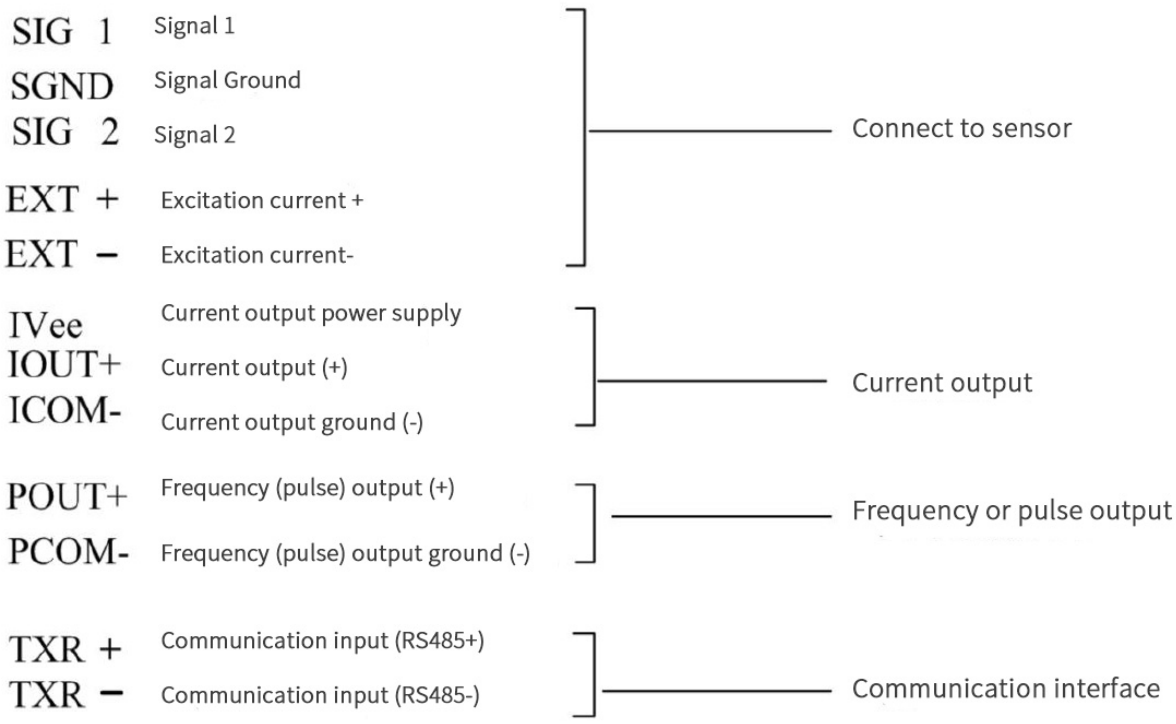
The meter menu list is shown as below.

First- level Menu	Second-level Menu	Three-level Menu
Parameters Settings	Measurement direction	Forward or reverse. Use this function if the traffic is installed in reverse
	Instrument range	0~99999m³/h (related to the frequency output of 4~20mA output)
	Unit of flow	L/h, L/m, L/s, m3/h, m3/m, m3/s, t/h, t/m, t/s, kg/h, kg/m, kg/s
	Decimal place settings for flow	Automatic, manual; when manually set, the instantaneous flow can be set to 0~3 decimal places
	Cumulative flow unit	0.001m³, 0.01m³, 0.1m³, 1m³, 0.001L, 0.01L, 0.1L, 1L, 1t, 1kg
	Cut-off point for small signal	Settings: Cut out small signal wobbles
	Damping time setting	The larger the display, the more stable the instantaneous flow and the larger the delay
	Liquid Density	Settings: Be sure to set density when using weight units
	Upper limit alarm value	Setting
	Lower limit alarm value	Setting
	Alarm hysteresis	Settings: Reasonable settings to prevent frequent actions
Function Setting	Reverse Measurement Allow	Off, On (default ' on')
Flow Query	Accumulation Total Reset	Yes, No
	Forward Accumulation Preset	Setting
	Reverse Accumulation Preset	Setting
Output Settings	Modbus settings	Device address, baud rate, parity bit, corresponding delay
	Pulse output mode	Pulse, frequency
	Pulse output setting	Pulse equivalent
	Frequency output settings	Frequency range
	Alarm output settings	Alarm output type selection
Diagnostic Tests	4-20mA output test	simulated current output
	Flow velocity test	simulating the flow status in the pipeline (frequency, pulse and current output)
	Pulse output test	simulate pulse output
	Frequency output test	simulate frequency output
Calibration Settings	Pipe setting	Diameter DN3~1000
	Flow zero point setting	Flow zero point correction, automatic zero point correction
	Sensor coefficient	Setting and sensor coefficient integration
System Settings	Factory reset	Yes/no
	LCD contrast	Setting
	LCD backlight time	Setting

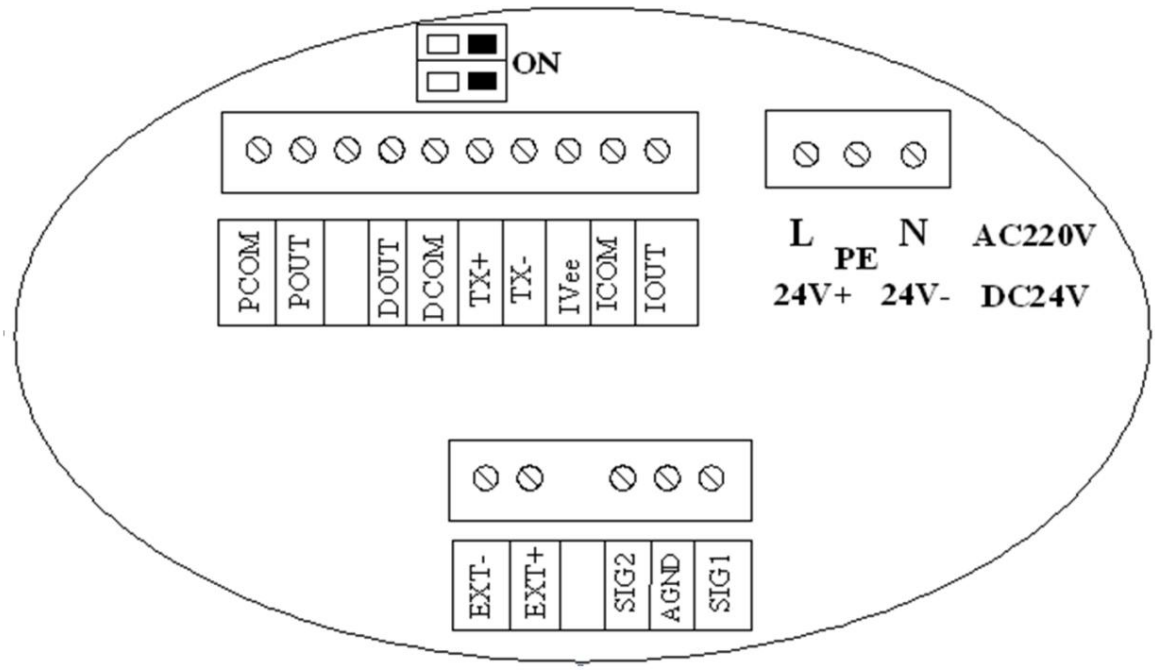
5. Converter wiring diagram and signal definition

5.1 Split converter





5.2 All-in-one converter



6. Frequency pulse output interface

Frequency output and pulse output share a set of terminals POUT (P+) and PCOM (P-), Select frequency or pulse output through the menu.

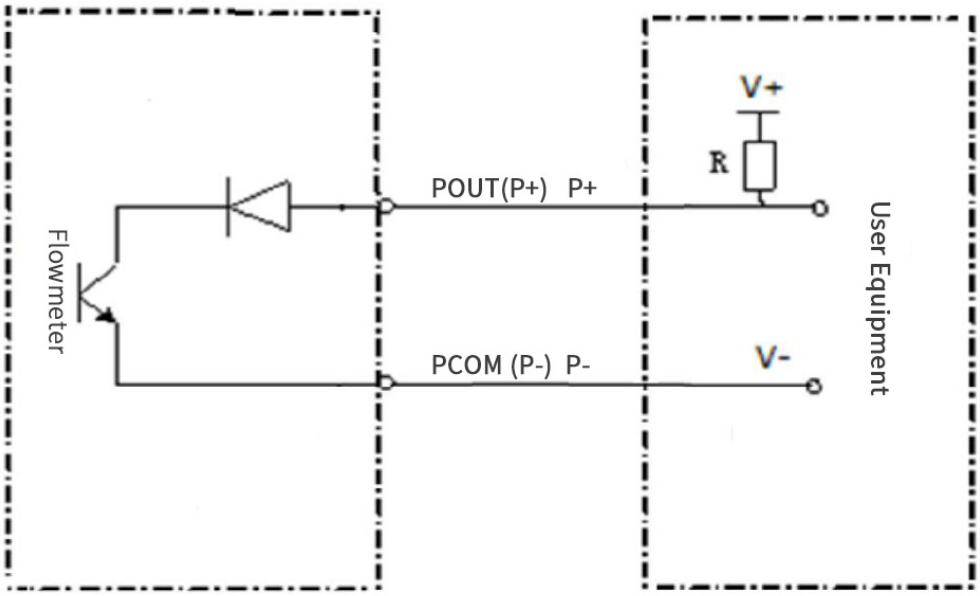
Frequency/pulse output supports three output modes.

Output mode 1: OC gate passive output, pull-up resistor connected to the user side.

The two-position DIP switch on the board of the split converter (the red DIP switch in the wiring cavity) is all turned outward (OFF position),and the two on-board DIP switches of the integrated wiring board are all turned down (OFF position) .

POUT (P+) output frequency/pulse signal.

The external power supply V+ can be 5V/12V/24V, and the resistance value of the pull-up resistor R ranges from 2k to 10k.



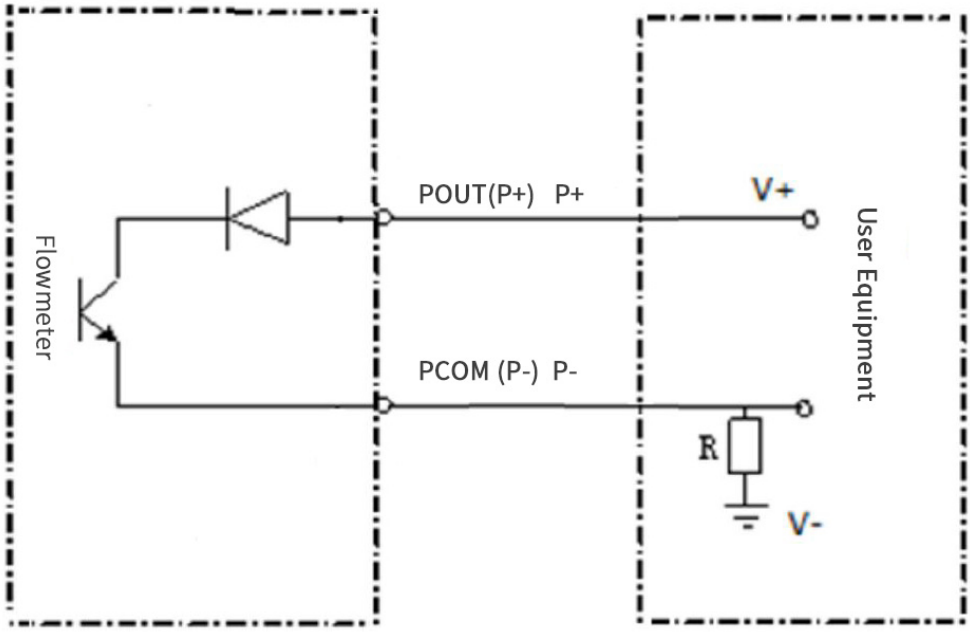
Output mode 2: OC gate passive output, pull-down resistor connected to user side.

The two-position DIP switch on the board of the split converter (the red DIP switch in the wiring cavity) is all turned outward (OFF position), and the two on-board DIP switches of the integrated wiring board are all turned down (OFF position) .

PCOM (P-) output frequency/pulse signal.

POUT (P+) is directly connected to the external power supply V+.

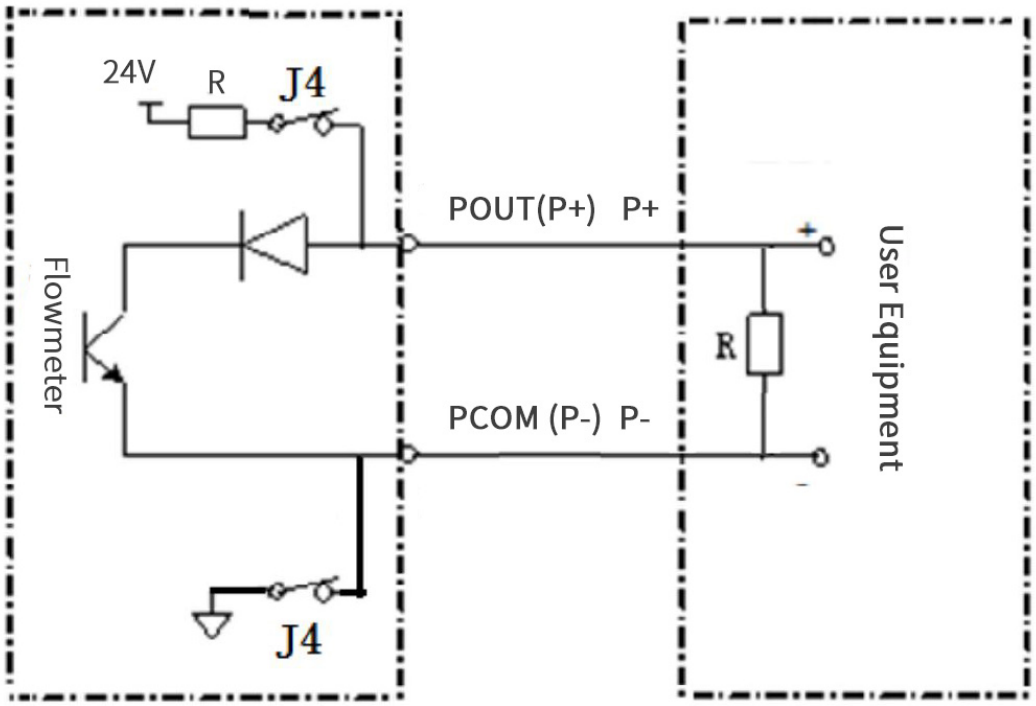
This mode is more common in the combined system of flowmeter and PLC.



Output mode 3: Active output in level mode, which can directly drive the load.

The two-position DIP switch on the board of the split converter (the red DIP switch in the wiring cavity) is all turned inward (ON position), and the two on-board DIP switches of the integrated wiring board are all turned up (ON position) .

POUT (P+) output frequency/pulse signal.



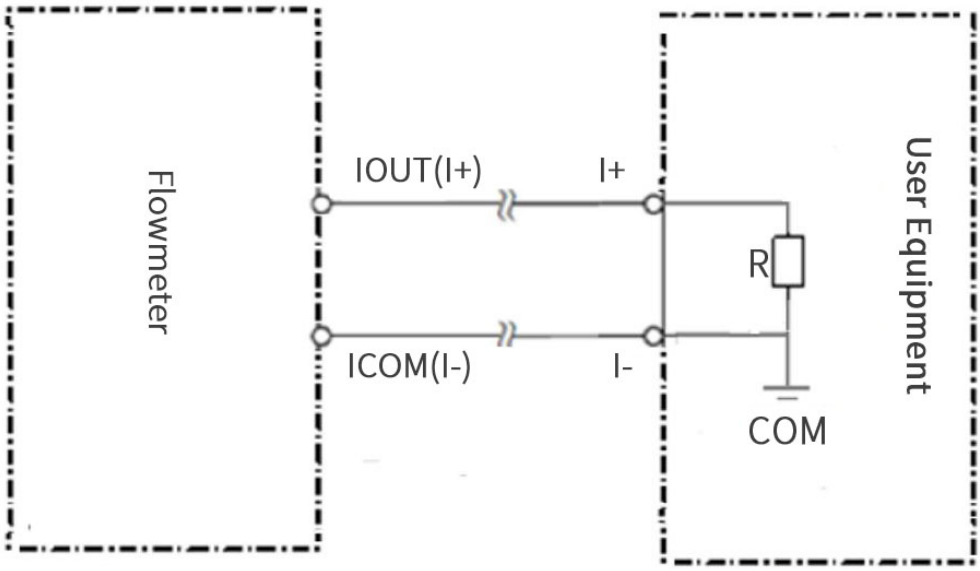
7. Current output interface

The current output is designed with a high-precision large-scale integrated circuit chip, without zero and full scale calibration, the output is stable and reliable, and has good interoperability and temperature stability.

The current output has three terminals IOUT(I+), ICOM(I-) and IVee, which support two current output modes:

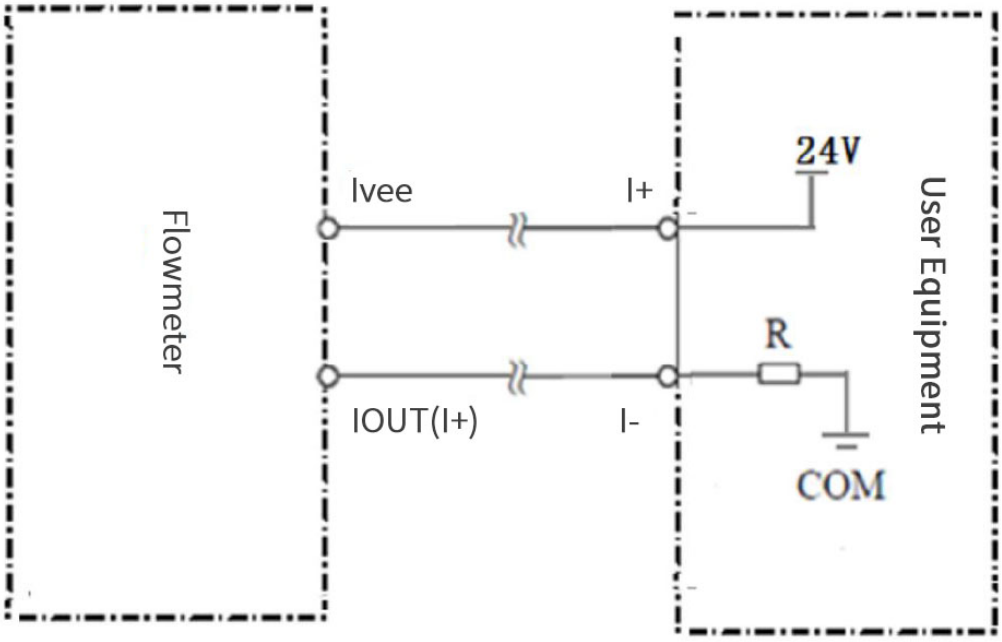
Two-wire active current output and two-wire passive current output.

Output mode 1: two-wire active current output



Output mode 2: two-wire passive current output

The terminals are IOUT(I+) and IVee.



8. Communication Protocol

The converter supports standard RS-485/422 communication interface and ModBus communication protocol, which has been widely used as a system integration standard in domestic and foreign instrumentation industry and industrial control industry.

Information is transferred asynchronously and in bytes. Communication data (information frame) format

Data Format:	Address Code	Function Code	CRC Calibration
Data Length	1 Byte	1 Byte	16-bit CRC code (redundant cyclic code)

The protocol supports function codes 03 and 10. Function code 03 is used to read multiplex registers; function code 10 is used to write ***multiplex*** registers. This protocol supports reading common registers such as cumulative flow, and also ***supports reading and modification of instrument constants such as aperture zero sensor coefficients. At the same time, this protocol provides the function of clearing the accumulated amount, which is used for batch control and other control occasions. For details, please refer to the communication protocol specification. This manual only lists some commonly used registers.***

The common register addresses of the flowmeter are defined as shown in the following table.

(SF is single precision floating point format DW is long integer format W is integer format)

Register Address		Unit	Number of Bytes	Property	Format	Register Definition
4	0x04	Consistent with the display	4	RO	SF	Forward cumulative flow - floating point format
6	0x06	Consistent with the display	4	RO	SF	Reverse cumulative flow - floating point format
8	0x08	Consistent with the display	4	RO	SF	Total cumulative flow - floating point format
1030	0x406	Write 90900	4	RW	SF	Accumulated flow reset
0	0x00	Consistent with the display	4	RO	SF	Flow - floating point format
2	0x02	Consistent with the display	4	RO	SF	Flow rate - floating point format
4116	0x1014	%	4	RO	SF	Flow Percentage - Float Format
112	0x70		2	RW	SF	Liquid density
4133	0x1025		2	RO	SF	System alarm
4132	0x1024		2	RO	SF	Empty pipeline alarm
128	0x80		2	RO	SF	Instrument alarm
106	0x6a		4	RW	SF	Instantaneous flow unit

The flow unit values are as follows:

0: L/H 1: L/M 2: L/S 3: M^3/H 4: M^3/M 5: M^3/S 6: KG/H

7: KG/M 8: KG/S 9: T/H 10: T/M 11: T/S

Communication protocol example description

Get the forward cumulant (floating point data format):

Register Address: 4 (0x04)

Host sent: 01 03 00 04 00 02 85 CA

Detailed description:

Data field	Byte count	Content sent	Annotation
Slave address	1	01	Slave address is 01
Function code	1	03	Read command
Register start address	2	00 04	Floating point format, the forward cumulant address is 0x0004
Register length	2	00 02	The cumulant is 32 bits and the length is two registers
CRC code	2	85 CA	CRC check code high byte is ahead

Slave response: 01 03 04 40 A4 22 F8 B7 32

Detailed description:

Data field	Byte count	Content sent	Annotation
Slave address	1	01	Slave address is 01
Function code	1	03	Read command
Number of bytes returned	4	04	Two registers 4 bytes total
Register data 1	2	40 A4	Floating point format, forward cumulant, high 16 bits, high order first
Register data 2	2	22 F8	Floating point format, forward cumulant, low 16 bits, high order first
CRC code	2	B7 32	CRC check code high byte is ahead

The cumulative amount is 5.129269 m^3 (float format 40 A4 22 F8 byte 1 to byte 4)

Get the instantaneous flow (floating point data format):

Register address: 0(0x00)

Host send: 01 03 00 00 00 02 C4 0B

Detailed description:

Data field	Byte count	Content sent	Annotation
Slave address	1	01	Slave address is 01
Function code	1	03	Read command
Register start address	2	00 00	The flow address is 0x0000
Register length	2	00 02	32-bit flow length is two registers
CRC code	2	C4 0B	CRC check code high byte is ahead

Slave response: 01 03 04 41 94 6E A5 43 F8

Detailed description:

Data field	Byte count	Content sent	Annotation
Slave address	1	01	Slave address is 01
Function code	1	03	Read command
Number of bytes returned	4	04	Two registers 4 bytes in total
Register data 1	2	41 94	Flow high 16 bits high order first
Register data 2	2	6E A5	Flow low16 bits high order first
CRC code	2	43 F8	CRC check code high byte is ahead

The flow is 18.554 m^3 (float format 41 94 6E A5 byte 1 to byte 4)

Extended registers (compatible):

Register Address	HEX	Type	Register Definition
4112	0x1010	Float	Instantaneous flow, floating point representation
4114	0x1012	Float	Instantaneous flow rate, floating point representation
4118	0x1016	Float	Fluid conductance ratio, floating point representation
4120	0x1018	Float	Positive cumulative value, integer part
4122	0x101A	Float	Positive cumulative value, fractional part
4124	0x101C	Float	Reverse cumulative value, integer part
4126	0x101E	Float	Reverse cumulative value, fractional part
4128	0x1020	Float	Unit of instantaneous flow
4129	0x1021	Float	Unit of cumulative total
4130	0x1022	Float	Upper limit alarm
4131	0x1023	Float	Lower limit alarm

9. Troubleshooting of the instrument

Fault Phenomenon	Possible Reasons	Check for Exclusions
There is liquid flowing through and the meter has no indication or no signal output	1. The power cord is not properly connected or the power circuit is faulty	Use a multimeter to check whether the power circuit is in good condition
	2. Failure of the connecting cable (excitation, signal circuit) system	Check whether the excitation and signal system cables are connected separately
	3. Failure in fluid flow condition	Check that the fluid flow direction matches the arrow on the sensor housing
	4. Damage to sensor parts	If the terminal is damp, dry it with a hair dryer to restore it
	5. The electrode surface is oxidized or has deposits	Remove the sensor to clean the electrode surface
	6. Converter failure	Check fuses, supply voltage, troubleshoot by substitution
The output signal is shaking	1. The fluid itself is fluctuating or pulsating or the process conditions themselves	Keep the sensor away from the pulsation source or install a buffer at the appropriate position in the pipeline to absorb pulse
	2. The pipeline is not filled with liquid or the liquid contains air bubbles	Retrofit the flowmeter to the correct installation location
	3. Interference from external stray currents, static electricity, electromagnetic waves and magnetic fields	To ensure a good ground condition, the resistance to ground is usually small
	4. When the liquid conductivity is uneven or the conductivity is too low; it contains more particles and fibers	Change the installation position; increase the excitation frequency
	5. The liquid does not match the electrode material	Change the electrode material of the sensor to match the liquid
Zero point is unstable	1. The pipeline is not filled with liquid or the liquid contains air bubbles; the process design of the pipeline network is poor or caused by related equipment	Retrofit the flowmeter to the correct installation location
	2. Subjectively think that there is no flow of liquid in the piping system, but there is actually a small flow	It is not the fault of the electromagnetic flowmeter, but it reflects the flow condition truthfully
	3. The grounding of the sensor is not perfect, and it is subject to external interference such as stray current	Improve the grounding condition, make the grounding resistance less than 10Ω
	4. The conductivity of the liquid varies or is uneven; the degree of contamination of the electrodes is inconsistent	The flow meter should be on the injection point or the chemical reaction section of the pipeline
	5. Signal line insulation drops	Replace the cable; do an insulation check on the sensor electrodes
The output signal is over full scale	1. There is no liquid communication between the electrodes, and interference is introduced from the liquid	Find a better installation location
	2. Poor grounding	Check the signal shield and ground point resistance, reinstall
	3. The cable is disconnected and the wiring is wrong	Rewire
	4. Converter and sensor matching error	Reset
Meter measured value does not match actual flow	1. The set value of the converter is incorrect	Review converter settings, check zero and span values
	2. The installation position of the sensor is incorrect, the tube is not full or there are air bubbles in the liquid	Check the technological process and improve the installation method
	3. Zero position change causes measurement error	Poor grounding or contaminated electrodes, check and eliminate it
	4. The value of the calibration coefficient of the converter is incorrect, and the flow condition upstream of the flowmeter	Re-adjusted according to the range calibration index value, and improved the flow process condition
	5. There are unknown branch pipes in the measurement system	
	6. Actual flow measurement method for comparison with electromagnetic flowmeters	Compare with standard flow meter

10. Electromagnetic flowmeter range selection table

Nominal diameter	Measuring range
DN10	0.14~1.4m³/h
DN15	0.3~3m³/h
DN20	0.6~6m³/h
DN25	0.9~9m³/h
DN32	1.4~14m³/h
DN40	2.3~23m³/h
DN50	3.5~35m³/h
DN65	6~60m³/h
DN80	9~90m³/h
DN100	14~141m³/h
DN125	22~220m³/h
DN150	32~318m³/h
DN200	57~565m³/h
DN250	88~883m³/h
DN300	127~1272m³/h
DN350	173~1731m³/h
DN400	226~2261m³/h
DN450	286~2862m³/h
DN500	353~3534m³/h
DN600	509~5089m³/h

Appendix 1. Detailed parameter description

Parameter Settings:

Measuring the diameter of the pipe:

Electromagnetic flowmeter converter matching sensor diameter range: 3 ~ 3000 mm.

At the same time, you can set the caliber fine-tuning, which is used for non-universal calibers or when the caliber error is large. e.g. 50 – 01mm(49mm) 50 + 01mm (51mm)

Damping time setting:

Long measurement damping time can improve the stability of meter flow display and output signal, and is suitable for total cumulative pulsating flow measurement. Short measurement damping time shows fast measurement response speed, which is suitable for production process control. The measurement damping time can be set arbitrarily in 1-99.

Flow unit:

Select the flow display unit in the parameters, the flow display unit of the meter is: L/s, L/m, L/h, m3/s, m3/m, m3/h The user can select an appropriate flow display unit according to the process requirements and usage habits.

Flow decimal place setting:

When setting the decimal display digits of the instantaneous flow rate, it is divided into automatic setting and manual setting.

* In the automatic setting state, the decimal places of the instantaneous flow are automatically selected according to the size of the aperture;

* In the state of manual setting, the decimal places of instantaneous flow are set according to user settings, which can be set 0,1,2,3 digits;

Users can set according to different application conditions and different measurement ranges.

Flow Accumulation Unit:

The converter display is a 9-digit counter with a maximum allowed count value of 999999999. The cumulative unit used is L, m^3 (liter, cubic meter).

The cumulative equivalent of flow is: : 0.001L, 0.010L, 0.100L, 1.000L,
0.001m^3, 0.010m^3, 0.100m^3, 1.000m^3;

Meter range:

The instrument range setting refers to determining the upper limit flow value, and the lower limit flow value of the instrument is automatically set to "0". Therefore, the meter range setting determines the meter range range, and also determines the corresponding relationship between the meter percentage display, the meter frequency output, the meter current output and the flow rate:

* Percentage value = (flow measurement value / meter range) * 100 %;

* Frequency output value = (flow measurement value/meter range) * frequency full scale value;

* Current output value = (flow measurement value/meter range) * current full scale value + base point;

* The instrument pulse output value is not affected by the instrument range setting;

Excitation frequency

Excitation current

Fluid Density

Function settings:

Measurement direction selection:

If the user thinks that the fluid direction during debugging is inconsistent with the design, the user does not need to change the connection of the excitation line or the signal line, but just use the flow direction to set the parameters to change.

Reverse measurement allows:

The user chooses to allow or prohibit.

When the reverse output allowable parameter is set to the "allowed" state, as long as the fluid flows, the converter measures and displays the fluid flow in real time. When the flow value is negative, it means the fluid flows in reverse. When the reverse measurement allowable parameter is set to "prohibit", if the fluid flows in reverse, the flow display data is "0".

Reverse output allows:

The user chooses to allow or prohibit.

When the reverse output allow parameter is set to the "allow" state, as long as the fluid flows, the converter outputs pulses and currents according to the flow value. When the reverse output allow parameter is set to "prohibit", if the fluid flows in reverse, the converter output pulse is "0", and the current output is a signal of 4mA.

Allow to cut off the display:

The user chooses to allow or prohibit.

When the allowable cut-off display parameter is set to "allow", when the flow percentage is less than or equal to the small signal cut-off point, the flow is cut off and displayed as "0". When the cut-off display parameter is set to "Disabled", no cut-off is performed regardless of the flow percentage.

Small signal excision point:

The small signal cutoff point setting is expressed in percent flow of span. When the small signal is cut off, the display and signal output of flow rate, flow rate and percentage are cut off at the same time.

Strong steady flow allows:

The user chooses to allow or prohibit.

Strong steady flow coefficient:

Set up.

The instrument alarm allows:

The user chooses to allow or prohibit.

When the alarm permission parameter of the instrument is set to the "permitted" state, the system will work according to the setting state of each alarm. When the instrument alarm permission parameter is set to "disable", the system closes all alarm states.

Excitation alarm allows:

The user chooses to allow or prohibit.

Empty traffic alarm allows:

The user chooses to allow or prohibit.

The converter features empty pipe detection and no additional electrodes are required. If the user chooses to allow the empty pipe alarm, the instrument can detect an empty pipe state when the fluid in the pipeline is lower than the empty pipe measurement threshold. After the empty pipe state is detected, the analog output and digital output of the instrument are set to signal zero, and the flow rate of the instrument is displayed as zero.

Empty pipe alarm threshold:

When the fluid is full (with or without flow rate), the user can adjust the empty pipe alarm threshold according to the "empty pipe ratio" data on the measurement page.

The upper limit alarm allows:

The user chooses to allow or prohibit.

Upper alarm threshold:

The upper limit alarm value is calculated as a percentage of the range. This parameter adopts a numerical setting method. The user can set a value between 0% and 199.9%. When the alarm conditions are met during the operation of the instrument, the instrument will output an alarm signal.

The lower limit alarm allows:

The user chooses to allow or prohibit.

Lower alarm threshold:

Same as upper alarm threshold

The battery level alarm allows:

The user chooses to allow or prohibit.

If the user selects the battery power alarm to allow, when the system detects that the battery power is less than the normal working voltage of the lithium battery, the instrument sends an alarm signal.

Battery level indicator:

Displays the current percentage of lithium battery power in real time.

Communication settings:

Modbus communication settings

Mailing address settings:

Refers to the communication address of this watch during multi-machine communication. The optional range is: address 01 ~ 99, address 0 is reserved.

Communication baud rate setting:

Instrument communication baud rate selection range: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.

Communication check digit setting:

Can be set to no parity, odd parity and even parity.

Output settings:

Pulse output type:

There are two options for pulse output: frequency output and pulse output:

* Frequency output: The frequency output is a square wave, and the frequency value corresponds to the flow percentage.

* Frequency value = (flow measurement value/meter range) * frequency full scale value;

* Pulse output: The pulse output is a rectangular wave pulse train, each pulse represents a flow equivalent flowing through the pipeline, and the pulse equivalent is selected by the "pulse unit equivalent" parameter. The pulse output mode is mostly used for total accumulation, which is generally connected with the totalizing instrument.

Pulse unit equivalent:

Pulse unit equivalent refers to the flow value represented by one pulse, and the selection range of pulse equivalent is 0.001L~20000L.

Note: Under the same flow, the pulse equivalent is small, the frequency of the output pulse is high, and the accumulated flow error is small.

Pulse width:

Set the pulse width of the instrument pulse output, the unit is ms. The user can arbitrarily set between 0.1ms and 100ms according to the application conditions.

Frequency output range:

The meter frequency output range corresponds to the upper flow measurement limit, which is 100% of the percent flow. The upper limit value of frequency output can be set arbitrarily within the range of 1 to 10000Hz.

Diagnostic tests:

4-20mA output test

Flow rate test Pulse

Output test

Frequency output test

System settings:

Software version:

Displays the software version number of the current flowmeter.

To restore factory settings:

To save the factory settings:

LCD contrast setting

LCD backlight switch setting

The LCD backlight switch setting is used to set the status of the LCD backlight, and you can choose to always turn on or timed off; if you choose always on, the LCD backlight will always be in a long-bright state, and if you choose timed off, the system will select according to the menu of the LCD backlight off time. , turn off the backlight after a certain delay.

It is recommended that users adopt the timing off setting, which is beneficial to prolong the life of the LCD.

LCD backlight off time

The LCD backlight off duration is used to set the LCD backlight to turn off the backlight after a certain time delay when there is no key operation.

Record clear

Forward total preset

The positive total preset setting can change the value of the positive cumulative total, which is mainly used for instrument maintenance and instrument replacement.

The user can use the level 2 password to enter, and can modify the forward accumulator (Σ+). Generally, the accumulator cannot exceed the maximum value (999999999) calculated by the counter.

Reverse total preset

The reverse total preset setting can change the value of the reverse accumulated total, which is mainly used for instrument maintenance and instrument replacement.

The user can use the level 2 password to enter, and can modify the forward accumulative amount (Σ-), and the accumulative amount generally set cannot exceed the maximum value (999999999) calculated by the counter.

Clear the accumulated total

Password display

The user can use the high-level password to query the password value of the low-level password.

Password setting

Users can use the original password for each level to set a new password for the current level respectively.

System date setting

System time setting

Sensor factory date

Sensor factory number

The date of manufacture of the instrument

Instrument product number

Date of last calibration

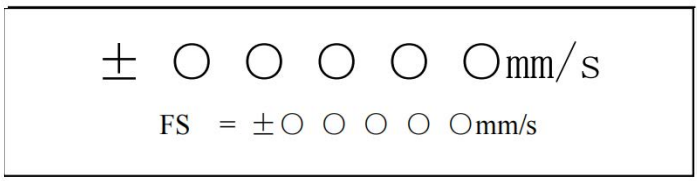
Last maintenance date

Calibration settings:

Flow zero correction:

During zero point correction, make sure that the sensor tube is filled with fluid and the fluid is in a static state. The flow zero point is expressed in terms of flow velocity in mm/s.

The converter flow zero correction is displayed as follows:



* Lower display: FS represents the actual measured value of the zero point of the instrument;

* Up display: flow rate zero correction value;

* Note: FS is the actual measurement value of the instrument, which is not affected by the zero point correction value. During use, just adjust the zero point correction value to the same size as FS, and in the opposite direction.

The correction value of the flow zero point is the matching constant value of the sensor, which should be recorded in the sensor record sheet and sensor label. The sensor zero value is entered as the flow velocity value in mm/s with the opposite sign of the correction value.

Automatic zero point correction: enable or disable.

Auto correction time: the time for automatically calculating the zero point correction value, which can be set within 10~99 seconds.*Sensor coefficient:*

Sensor coefficient: the calibration coefficient of the whole electromagnetic flowmeter. The coefficient is obtained from the real standard and marked on the sensor plate. The user must place this factor in the converter parameter table.

Calculation of sensor coefficient:

It is used to automatically calculate the calibration coefficient (sensor coefficient) of the whole electromagnetic flowmeter. When using, please input the standard flow and save (function key + exit key). For example, the local flow rate is 9m3/h during calibration (real-time display in the last line), and the measured standard flow rate is 10 m3/h; input 10 m3/h in the main screen and save it.

Flow line correction allows:

Flow linearity correction point:

Flow linear correction value:

Traffic segment correction settings:

Flow correction unit:

Set the flow correction point unit, select m^3/h, m^3/m, m^3/s, kg/h, kg/m, kg/s, t/h, t/m, t/s, GPM, m/s, L/h, L/m, L/s.

Flow correction point 1

Please refer to Appendix 1 for the description of the flow correction function.

Standard Flow 1

Flow correction point 2

Standard flow 2

Flow correction point 3

Standard flow 3

Flow correction point 4

Standard flow 4

Flow correction point 5

Standard flow 5

Traffic segmentation correction allows:

The user chooses to allow or prohibit. The submenu in the flow correction setting can only take effect when it is allowed.

Appendix II. Corrosion Resistance of Commonly Used Electrode Materials

Electrode Material	Corrosion Resistance
oCr18Ni14Mo2Ti(316L) 1Cr18Ni9Ti (304)	It is used for industrial water, domestic water, sewage, and weakly corrosive media, and can be widely used in petroleum, chemical urea, vinylon and other industries
Stainless Steel Coated Tungsten Carbide	For non-corrosive, highly abrasive media
Hastelloy B (HB)	It has good corrosion resistance to all concentrations of hydrochloric acid below the boiling point, and is also resistant to corrosion by non-oxidizing acids, alkalis, and non-oxidizing salt solutions such as sulfuric acid, phosphoric acid, and organic acids.
Hastelloy C (HC)	Resistant to oxidizing alkalis. Such as the corrosion of nitric acid, acid or mixed media of chromic acid and sulfuric acid, it is also resistant to oxidative salts. Such as Fu3+, Cu2+, or corrosion with other oxidants. Such as the corrosion of hypohydrogenate solution at higher than normal temperature, oil and water
Titanium (Ti)	It is resistant to corrosion by oil and water, various chlorides and hypochlorites, oxidizing acids, organic acids, alkalis, etc. It is not resistant to the corrosion of purer reducing acids (such as sulfuric acid and hydrochloric acid), but if the acid contains a hydrogenating agent, the corrosion will be reduced.
Tantalum (Ta)	It has excellent corrosion resistance, very similar to glass. Except for hydrofluoric acid, fuming sulfuric acid and alkali, it is resistant to almost all chemical media.
Platinum (Pt)	Works with almost all chemicals, but not with aqua regia and ammonium salts

Appendix III. Selection of Electromagnetic Flowmeter Lining Materials

Material		Main performance	Scope of application
Polyurethane rubber		1. Good wear resistance 2. Poor acid and alkali resistance	<45°C Can measure neutral and strong abrasive coal slurries, slurries and ore slurries
natural rubber (soft rubber)		1. Good elasticity and wear resistance 2. Resist general weak acid and weak alkali corrosion	<80°C sewage
Acid resistant rubber (hard rubber)		1. Can withstand the corrosion of hydrochloric acid, acetic acid, oxalic acid, ammonia water, phosphoric acid and 50% sulfuric acid, sodium hydroxide (potassium) at room temperature 2. Not resistant to corrosion by strong oxidants	-25°C~+90°C Can measure general acid, alkali and salt solution
Neoprene		1. Good elasticity and wear resistance 2. Resistant to corrosion by low-concentration acid, alkali and salt solutions, but not resistant to corrosion by oxidizing media	-40°C~+180°C Can measure concentrated acid, concentrated alkali strong corrosive solution and sanitary medium
Fluoroplastic	Polytetrachloroethylene F-4 (PTFE)	1. Resistant to boiling hydrochloric acid, sulfuric acid, nitric acid, aqua regia, concentrated alkali and various organic solvents 2. Strong wear resistance and poor adhesion	-40°C~+180°C Can measure concentrated acid, concentrated alkali strong corrosive solution and sanitary medium
	perchloroethylene propylene F-46 (PTFE)	1. Media that is not resistant to PTFE 2. Not resistant to fuming nitric acid and butyllithium	Same as PTFE, can be used for higher negative pressure
	Polyperfluorinated alkoxy(PFA)	Chemical resistance similar to FEP	Same as FEP-intolerant media

Appendix IV. Packing

The package of each electromagnetic flowmeter contains:

1. One electromagnetic flowmeter sensor;

2. One converter (the integrated sensor is connected with the converter);

3. A copy of the instruction manual;

4. A certificate of conformity;

5. Several meters of cable (applicable to split flowmeter).

Appendix V. Transportation and Storage

1. During the transportation and handling of the flowmeter (arrive at the place of use or return to the repair period), the flowmeter should be kept in the packaging state when it was shipped to prevent damage.
2. During storage, the storage location should be indoors with the following conditions, rain-proof and moisture-proof; mechanical vibration is small, and shocks are avoided; the humidity is not more than 80%; the temperature range is -20~+60℃.

Electromagnetic Flowmeter Converter Operation Manual

Software version: FL20.11.V3.10

Please read this manual thoroughly after receiving the product and before initial use, and keep it for future reference.

While this product is being improved, the information may change without notice.
