



WP-EMF series
electromagnetic flowmeter

OPERATING MANUAL



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NOTE

- The instruments have been comprehensive debugging. In order to use correctly, please read operating manual before.
- The installation should be finished by technicians.
- The install place should avoid direct sunlight.
- The connection between flowmeter and pipeline should have grounding, see “12. Installation and Commissioning”

1、 Scope and application of the product

Electromagnetic flowmeters are widely used to measure the volume flow rate of liquid and liquid-solid two-phase fluids with electrical conductivity greater than 5 $\mu\text{s}/\text{cm}$ in closed pipelines. The electrical conductivity in a large range of changes will not affect the measurement results. Therefore, the electromagnetic flowmeter is a real volumetric flowmeter, which can be used to measure the flow rate of other conductive liquid or liquid-solid two-phase fluid without any correction.

Due to electromagnetic flowmeter has so many advantages in the measurement, so widely used in chemical, food, papermaking, sugar-making, mining and metallurgy, water supply and drainage, environmental protection, water conservancy, steel, petrochemical, oil fields, the pharmaceutical industry, which is used to measure all kinds of acid, alkali, salt solution, slurry, pulp, paper and pulp, coal water slurry, corn starch, syrup, lime slurry, sewage, raw water cooling, salt water, hydrogen peroxide, malt extract, all kinds of beverage, liquor, green liquid, liquid such as conductive fluid volume flow.

It conforms to the standards of GB3836.1-2010 《explosive environment -- part 1: general requirements for equipment》 ; GB3836.2-2010 《explosive environment -- part 2: equipment protected by flameproof enclosure "d"》 ; GB3836.4-2010 《explosive environment -- part 4: equipment protected by intrinsically safe "I"》 ; GB3836.9-2014 《explosive environment -- part 9: equipment protected by "m" 》 ; Explosion-proof marks for the Ex d ib MB IIC T5 Gb, it apply to 1 zone and 2 zone, containing II A ~ IIC class, T1 ~ T5 sites with explosive air mixture.

Note

Before installation, check the name plate, specifications and explosion-proof type.

- 1) No charged open.
- 2) When wiring, multiple strands of wire must be safely pressed in the bow gasket, there should be no scattered outside the end, so as to avoid the formation of discharge. Mess up the outside end of the line so as not to form a discharge.
- 3) The qualified products are not allowed to change components or structure at will, so as not to affect the explosion-proof performance.
- 4) During maintenance, pay attention to protect the flameproof surface, all flameproof surface must not be damaged or corroded.

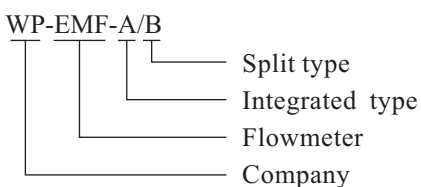
2、 The meaning of product model and explosion-proof mark

2.1 Model

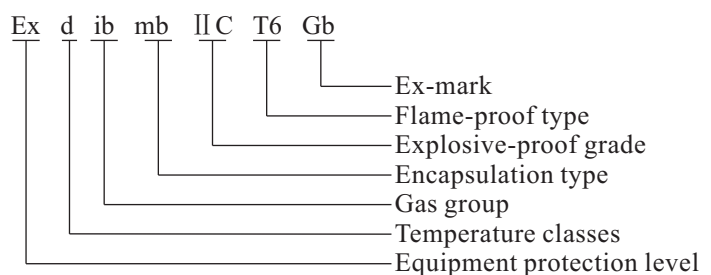
Type	Instruction	
WP-EMF-A	Integrated type	a) The explosion-proof certificate
WP-EMF-B	Split type	b) Ex-mark: Ex d ib mb IIC T6 Gb

2.2 Definition of model and explosion-proof mark:

a) Types of meaning



b) Ex-mark



2.3 Explosion-proof service instruction

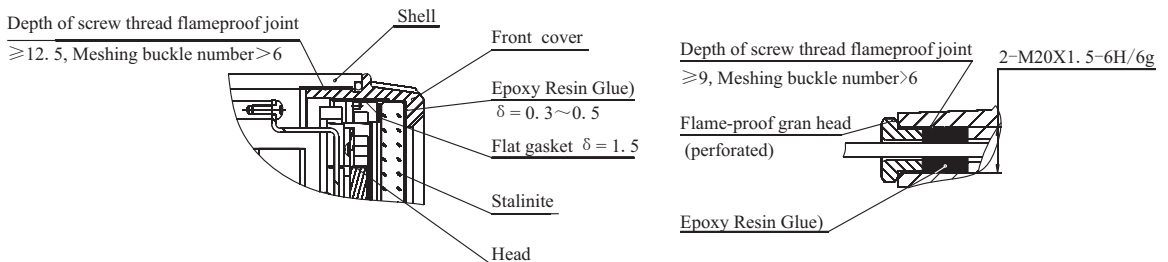
- Product operating environment: sensor $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$, converter $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$;
- The warning of "open cover after power off" should be observed in site use.
- The shell should be grounded reliably when the product is in use.
- The user shall not replace the parts and components of the product by himself;
- Highest surface temperature of electrical equipment enclosure T6 ($\leq 80^{\circ}\text{C}$);
- The installation, use and maintenance of the product shall comply with the product operation manual in strict accordance with GB3836.1-2010 《explosive gas environment Electrical equipment for use - part 15; Installation of electrical installations in dangerous places (except coal mines)》

3、 Basic Parameters

- Range:** 0.1 ~ 12m/s
- Accuracy:** 0.2, 0.5, 1.0
- Measured medium temperature:** according to the choice of lining materials to determine
- Conductivity:** $\geq 5\mu\text{s/cm}$
- Output signal:**
 - Main output
current output: 4 ~ 20mA pulse output: x..xxxx m³/cp or frequency output: 1~5000Hz
 - Control output
Alarm output: ALMH----upper limit alarm; ALML----lower limit alarm
- Other function:**
Small signal removal adjustable(0~20%) Time damping is adjustable(0~90sec)
4~20mA Circuit breakage detection Field coil breakage detection
Positive flow, reverse flow, net accumulation respectively permanent register Atc testing
Instantaneous flow rate (6 digits), net cumulative amount (10 digits) simultaneous display
- Communication:** RS-485, HART
- Power supply:** AC220V or DC24V
- Instrument consumption:** $\leq 5\text{VA}$
- Explosion-Proof:** Ex d ib mb IIC T6 Gb
- Woking condition:**

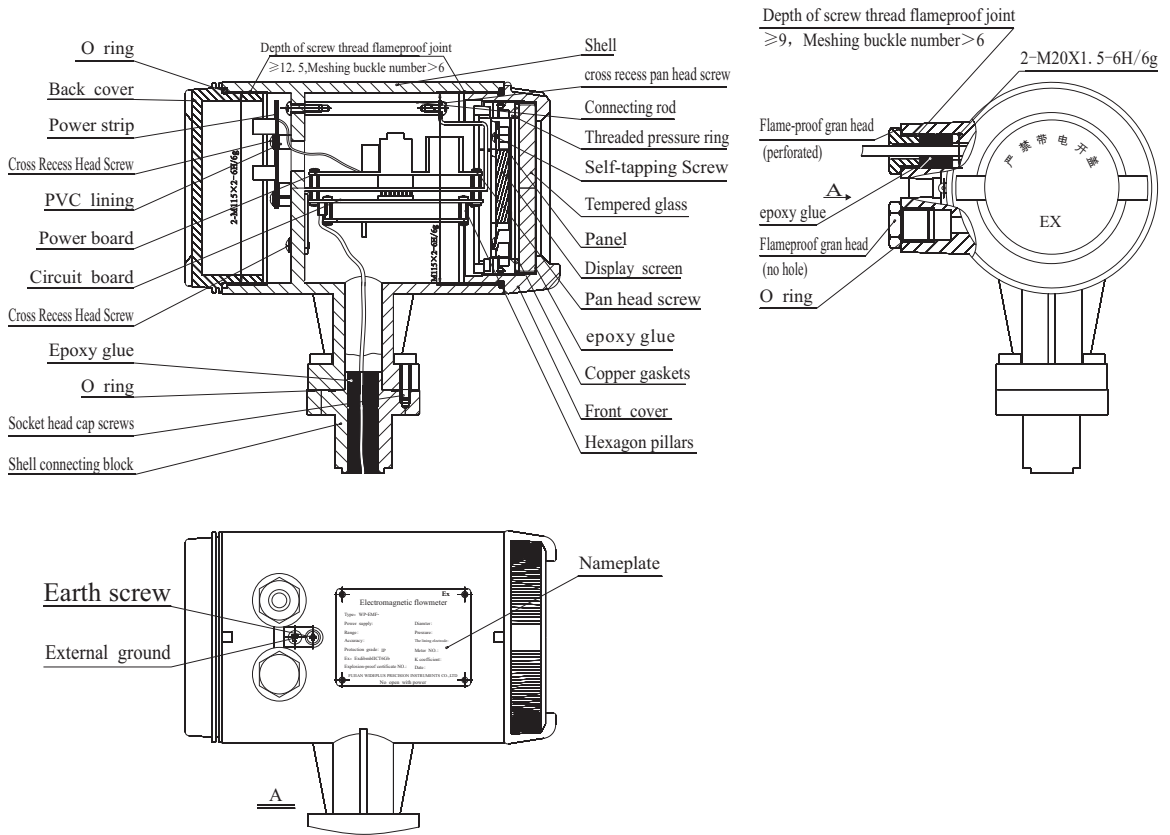
	Split type		Integrated type
	Sensor	Convertor	
Ambient Temperature	$-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$	$-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$	$-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$
Relative Humidity	5% ~ 95%	5% ~ 90%	5% ~ 90%

4、 Structural Features

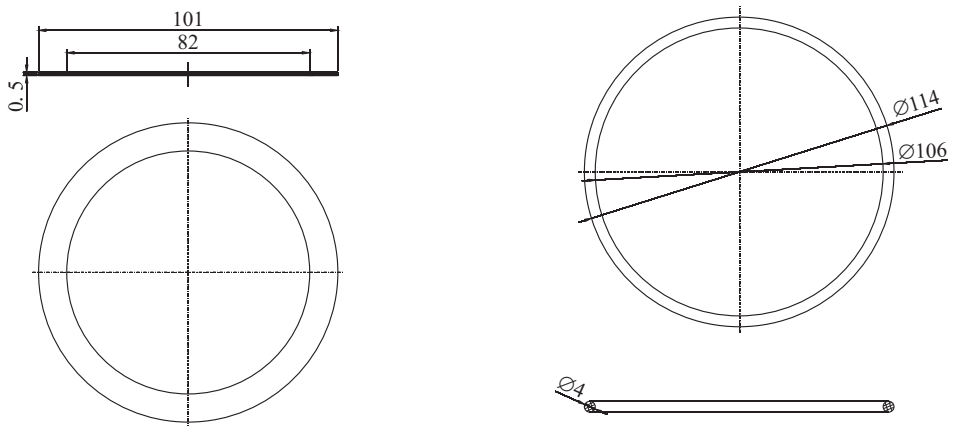


5、 Structure schematic diagram and wearing parts

5.1 Structural schematic



5.2 Quick-wear part



6、 Converter operation

6.1 Converter figure



Circular graph



Square graph

6.2 Keyboard definition and display

6.2.1 Keyboard definition and liquid crystal display of square meter

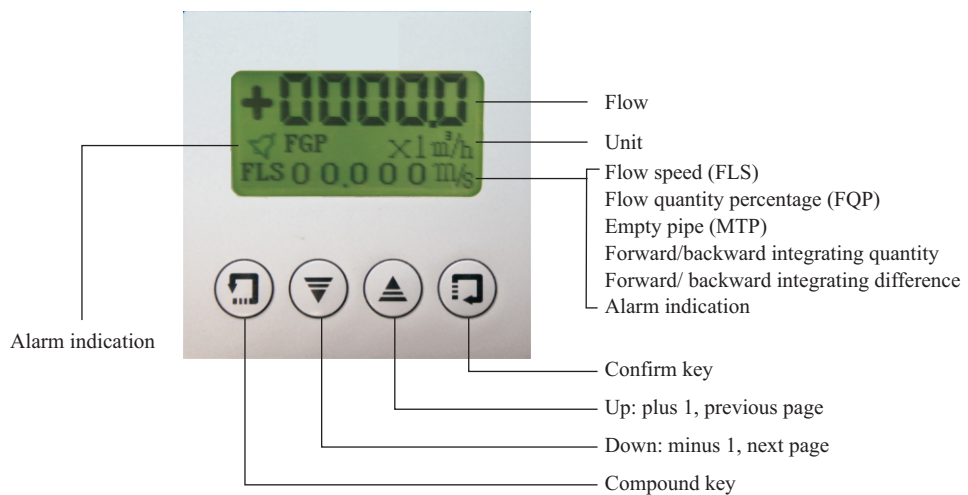


Fig. 6.2.1 Keyboard definition and liquid crystal display of square meter

6.2.2 Keyboard definition and liquid crystal display of circular meter

Explanation: under measuring state, press “enter + confirm key”, appear converter function option picture “parameter setting”, press confirm key, the instrument appears input password state, based on security grade, according to security grade to do corresponding modification by our factory provided password. After press “enter + confirm key” again, then enter required parameter setting state. If want to return to running state, please press confirm key for several seconds.

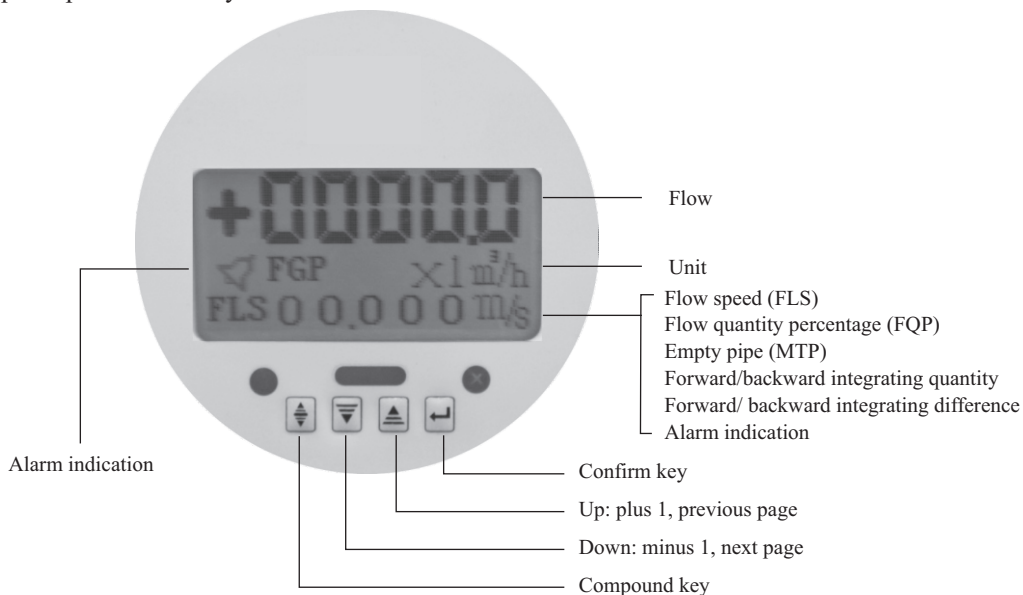


Fig. 6.2.1 Keyboard definition and liquid crystal display of circular meter

6.3 Converter wiring diagram

6.3.1 Terminal wiring and labels of square meter

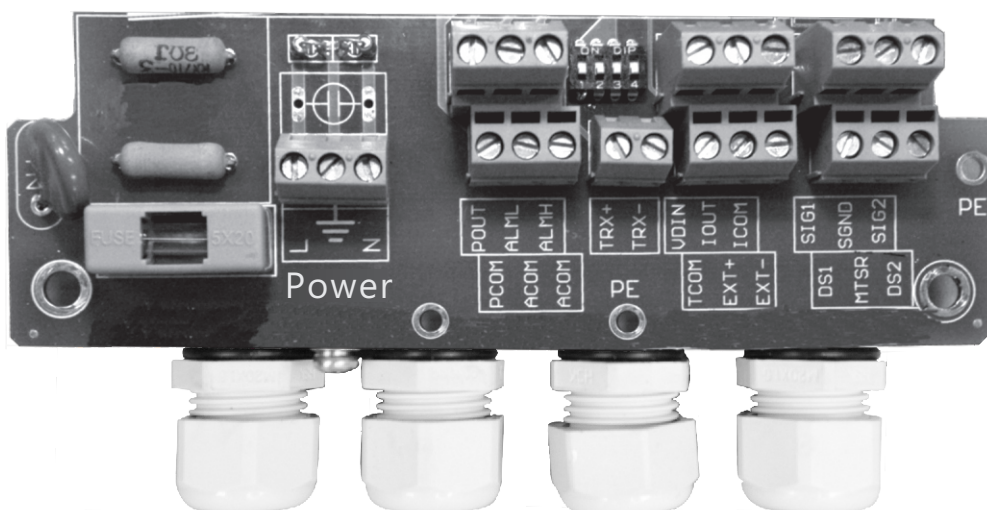


Fig. 6.3 (a) Wiring terminal diagram of square meter

Labels meanings of each wiring terminal are as follows:

SIG 1	Signal 1	}	Connect split-type sensor
SGND	Signal ground		
SIG 2	Signal 2		
DS 1	Excitation shield 1		
DS 2	Excitation shield 2		
EXT +	Excitation current +		
EXT -	Excitation current -		
VDIN	Current two-wire system 24V Joint	}	Analog current output
IOUT	Analog current output		
ICOM	Analog current output ground		
POUT	Flow frequency (pulse) output	}	Frequency or pulse output
PCOM	Frequency (pulse) output ground		
ALMH	High limit alarm output	}	Communication input
ALML	Low limit alarm output		
ACOM	Alarm output ground		
TRX +	Communication input	}	Communication input
TRX -	Communication input		
TCOM	232 communication ground		

6.3.2 Signal wires processing and labels of connection of square meter and sensor

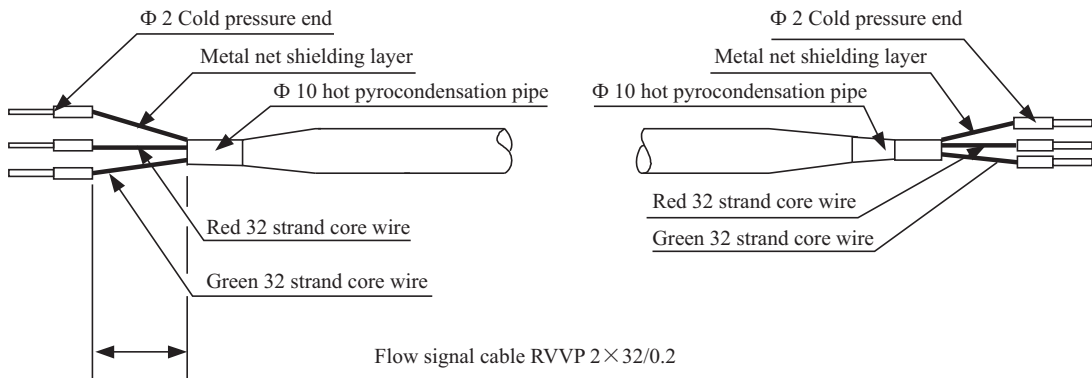


Fig. 6.3 (b) Signal wires processing and labels of connection of square meter and sensor

6.3.3 Terminal wiring and labels of circular meter

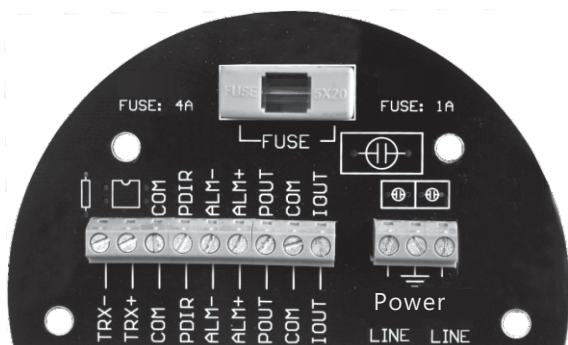


Fig. 6.3.3 Wiring terminal diagram of circular meter

The label definition of each wiring terminal of circular meter:

- IOUT : Flow current output
- POUT : Two-way flow frequency (pulse) output
- ALM- : Lower alarm output
- COM : Police outlet
- COM : Police outlet
- TRX- : Communications input
- LINE : 220V(24V)power input
- COM : Where the current is delivered
- COM : Frequency (pulse) source
- ALM+ : Upper alarm output
- TRX+ : Communications input
- TCOM : 232 communication
- LINE : 220V(24VDC)power input

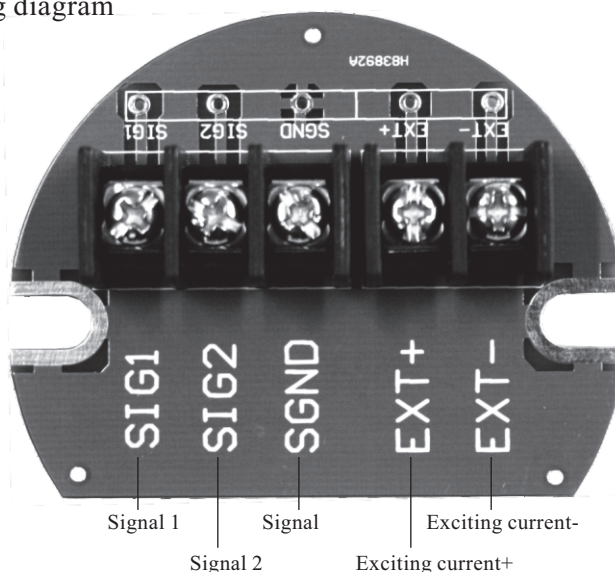


Fig. 6.3.4 Wiring terminal diagram of circular meter

The label definition of each wiring terminal of circular meter:

- I+ : Flow current output
- COM : Where the current is delivered
- P+ : Two-way flow frequency (pulse) output
- COM : Frequency (pulse) source
- AL : Lower alarm output
- AH : Upper alarm output
- COM : Police outlet
- FUSE : Enter power fuse
- T+ : Communications input
- T- : Communications input
- G : RS232
- L1 : 220V(24V)power input
- L2 : 220V(24V)power input

6.3.5 Split box wiring diagram



6.4 Electrical connection characteristics and connection requirements

6.4.1 Flow signal wire

When split-type converter and sensor are corollary used, for the situation that conductivity of measured liquid is more than $50 \mu\text{S}/\text{cm}$, flow signal transmission cable can use PVVP2* 0.2mm^2 type polyvinyl chloride sheath metal net shielding signal cable. The using length should be not more than 100 m. signal wires and the sensor are matching ex-factory.

This converter provides equipotential excitation shielding signal output voltage, in order to reduce effect from distributed capacitance of cable transmission to flow signal measurement. When measured conductivity is less than $50 \mu\text{S}/\text{cm}$ or long-distance transmitting, can use double-core double shielding signal cable with equipotential shielding. For example, STT3200 special cable or BTS type triple shielding signal cable.

6.4.2 Excitation current wire

Excitation current wire can adopts two-core insulation rubber soft cable wire, suggested model number is RVVP2* 0.3mm^2 . The length of excitation current wire is the same as signal cable'. When using STT3200 special cable, excitation cable and signal cable are combined as one cable.

6.4.3 Output and power wire

All output and supply wires are prepared by users themselves according to actual situation. But please pay attention to satisfy load current requirement.

Notice: when DIP switch next to wiring terminals is switched to ON places, the converter from its inside can provide +28V power supply to frequency output (POUT) and alarm output (ALMH, ALML) of isolated OC gate. Therefore, when converter has frequency output and works with sensor together, DIP switch can be switched to ON, getting frequency signals from POUT and PCOM wiring.

Pulse current output, alarm current output, external-connection of supply power and load see Fig. 1.4. When using inductive load should as shown in figure to add freewheeling diode.

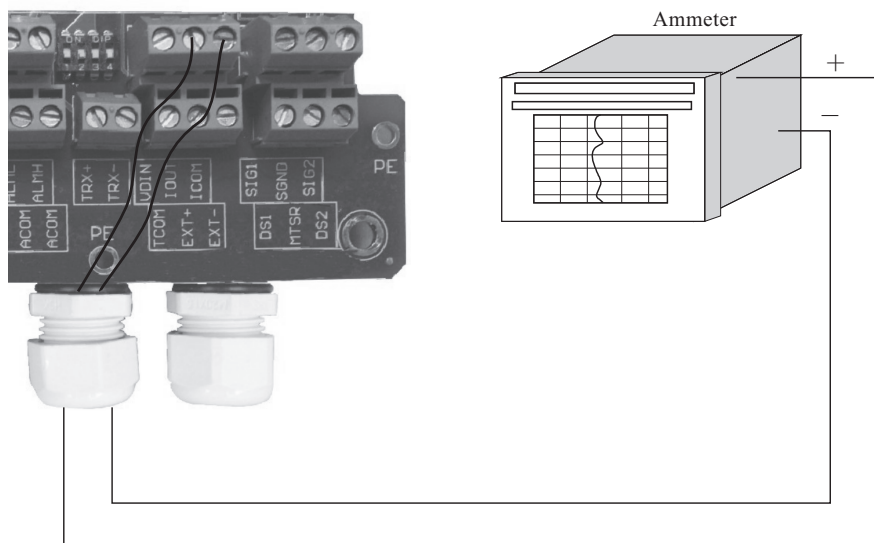


Fig. 6.4 (a) Wiring diagram of square meter current output

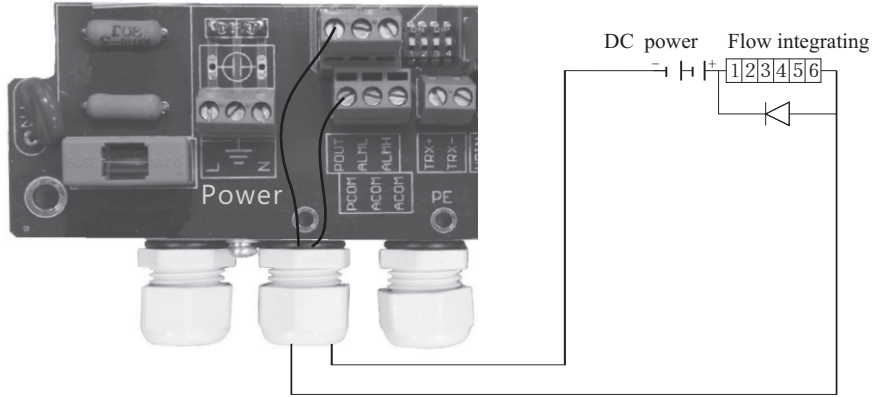


Fig. 6.4 (b) Electromagnetic counter wiring of square meter

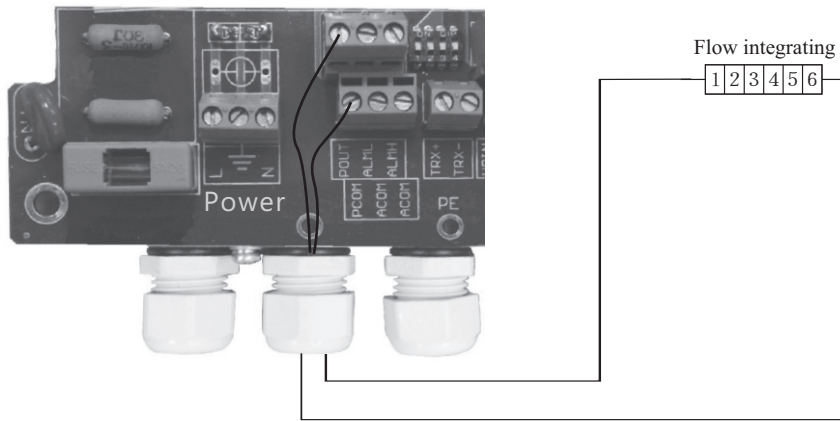


Fig. 6.4 (c) Electronic counter wiring of square meter

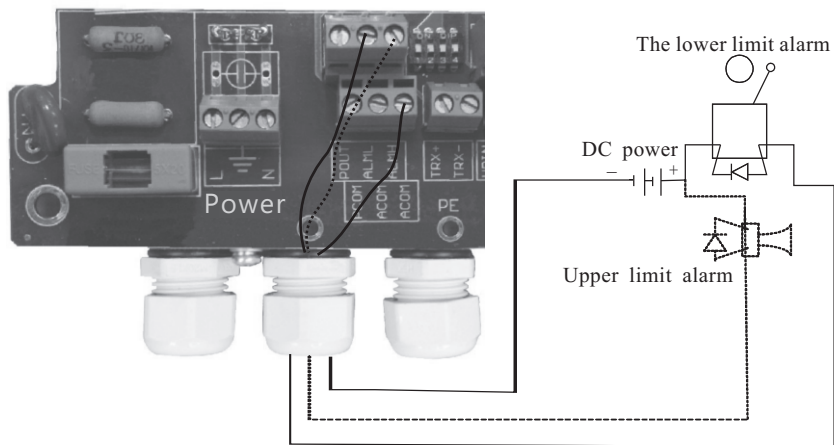


Fig. 6.4 (d) Alarm output wiring of square meter

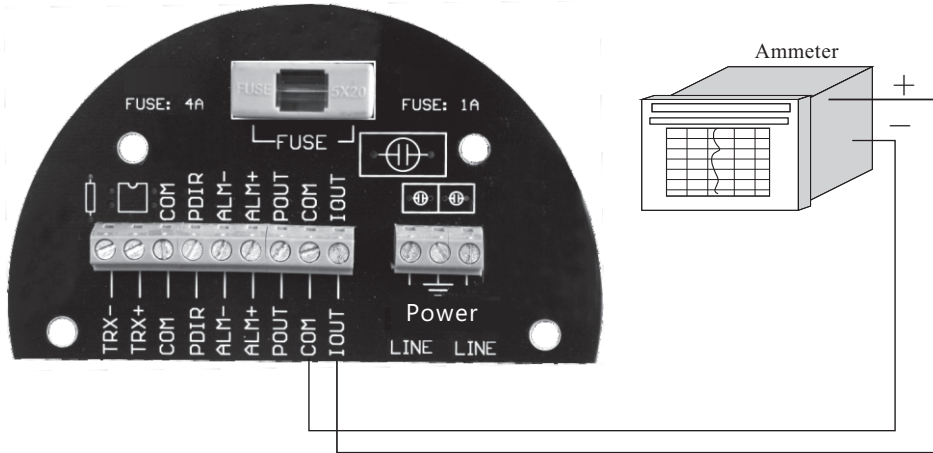


Fig. 6.4 (e) Wiring diagram of circular meter current output

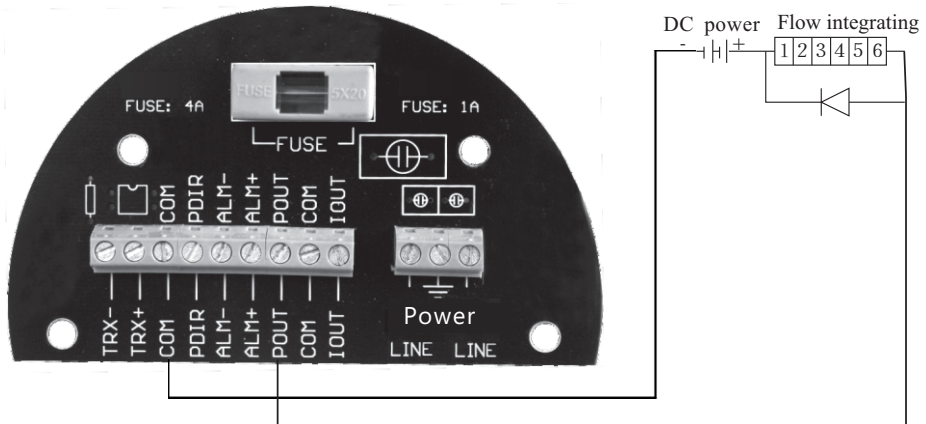


Fig. 6.4 (f) Electromagnetic counter wiring of circular meter

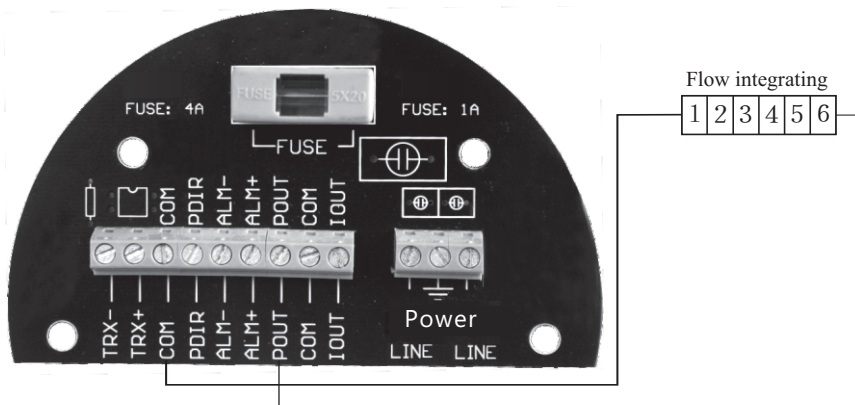


Fig. 6.4 (g) Electronic counter wiring of circular meter

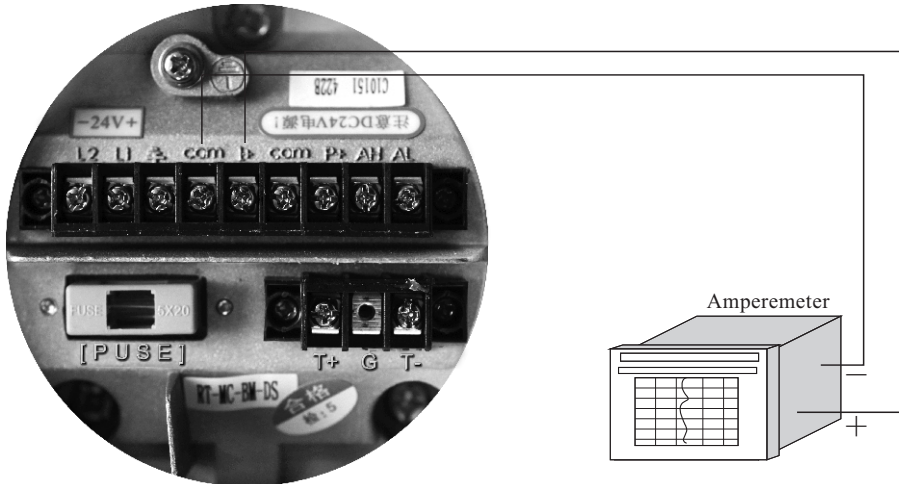


Fig. 6.4 (h) Circular meter current output

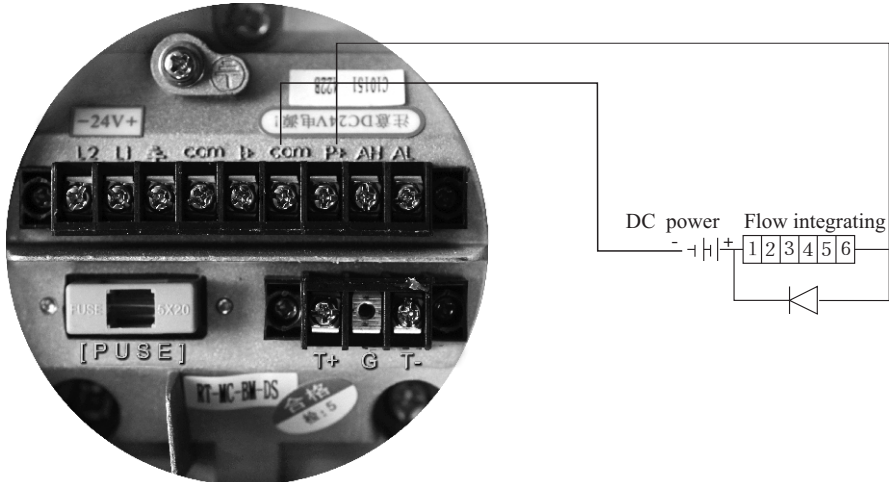


Fig. 6.4 (i) Electromagnetic counter wiring

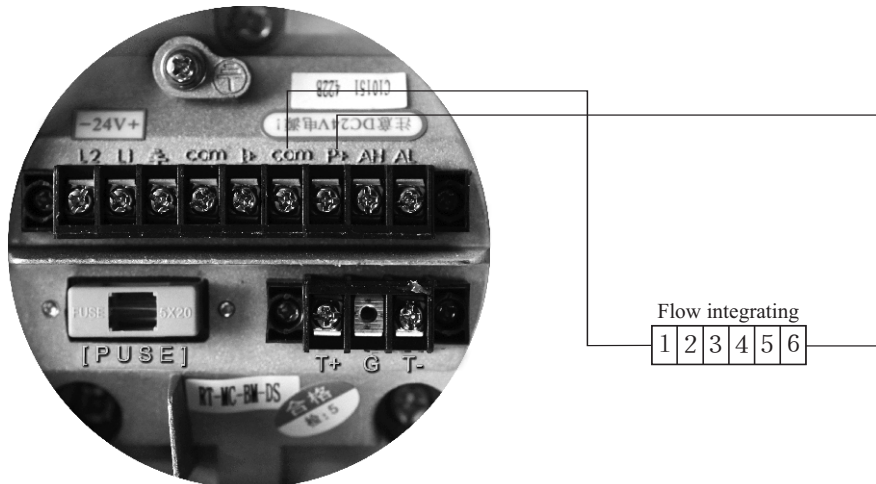


Fig. 6.4 (j) Electronic counter wiring

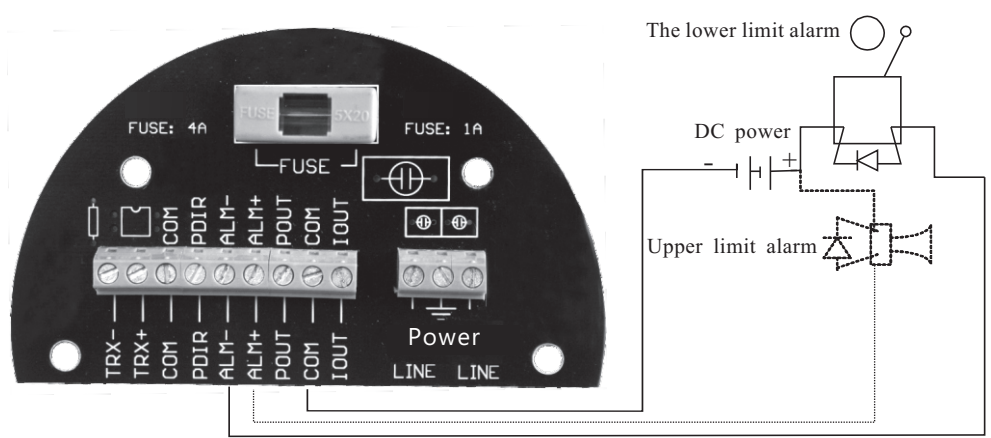


Fig. 6.4 (k) Alarm output wiring of circular meter

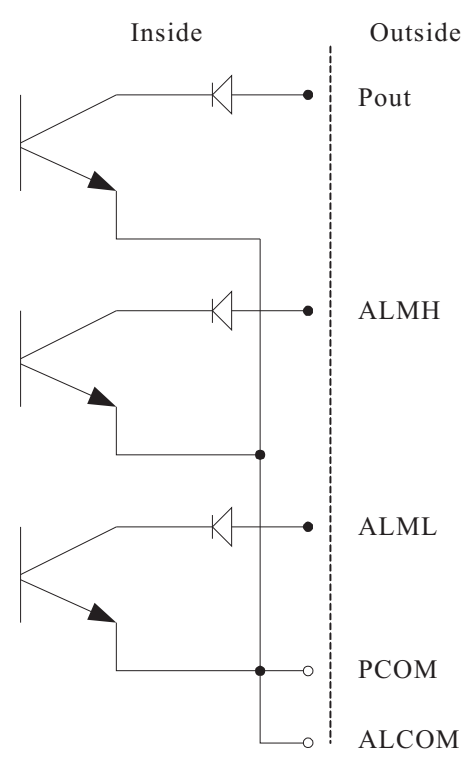


Fig. 6.4 (l) Meter inside OC gate connection mode

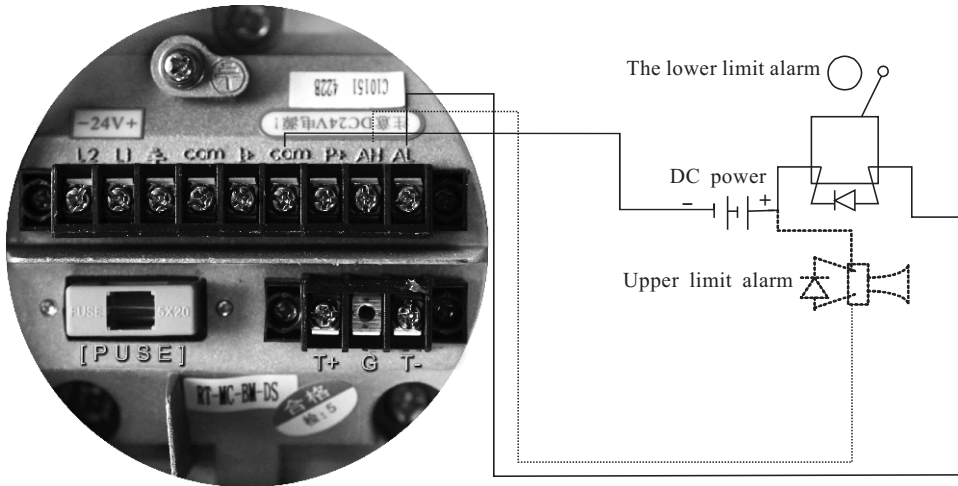


Fig. 6.4 (m) Alarm output connection

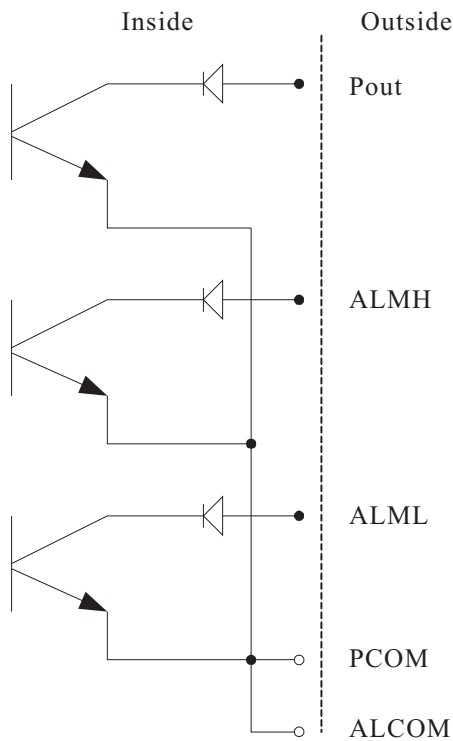


Fig. 6.4 (n) Connection mode of OC gate in table

6.4.4 Grounding wire connection

Shell grounding terminal PE of the converter should adopt grounding copper wire which is at least 1.6 mm² to connect ground. The grounding resistance from converter shell to ground should be less than 10Ω.

6.5 Digital output and calculation

Digital output means frequency output and pulse output. The output point used for frequency output and pulse output on the wiring is the same one. Therefore, users can't use frequency output and pulse output simultaneously, but only select one of them.

6.5.1 Frequency output:

The scope of frequency output is 0~5000Hz, frequency output is corresponding to flow percentage,

$$F = \frac{\text{Measured value}}{\text{Full range value}} \bullet \text{Frequency scope}$$

The upper limit of frequency output is adjustable. Users can select 0~5000Hz, also can select lower frequency: such as 0~1000Hz or 0~5000Hz etc.

Frequency output mode is generally used for control application, because it reflects percentage flow, if users use it for measurement application, then should select pulse output mode.

6.5.2 Pulse output mode:

Pulse output mode is mainly used for measurement mode, output an pulse, means an equivalent fluid flowing through pipeline, such as an pulse means 1L or 1M³ etc.

Pulse equivalences can be divided into: 0.001L, 0.01L, 0.1L, 0.001 M³, 0.01 M³, 0.1 M³, 1 M³. When users select pulse equivalences, should pay attention that flow scopes of flowmeter match pulse equivalences. For volume flow, calculation formulas are as follows:

$$Q_L = 0.0007854 \times D^2 \times V \text{ (L/S)}$$

$$\text{or } Q_M = 0.0007854 \times D^2 \times V \times 10^{-3} \text{ (M}^3/\text{S)}$$

Here: D pipe diameter (mm) V flow rate (m/s)

If pipeline flow is too large but pulse equivalence is too small, will cause pulse output exceeds upper limit, so pulse output frequency should be limited below 3000Hz. Pipeline flow is small but selected pulse equivalence is too large that will cause the instrument not input an pulse until a long time.

In addition, should explain that pulse output is different from frequency output, pulse output can output an pulse if accumulate enough an pulse equivalence, therefore, pulse output is not very homogeneous. Generally, should select counter instrument to measure pulse, but should not select frequency meter instrument.

6.5.3 Wiring of digital quantity output

Digital quantity output has two contacts: digital output contact, digital ground wire contact, symbols are as follows:

POUT—Digital output contact; PCOM—Digital ground wire contact;

POUT is collector open-circuit output, when wiring user can refer to the following circuit:

6.5.3.1 Digital quantity electrical level output wiring method

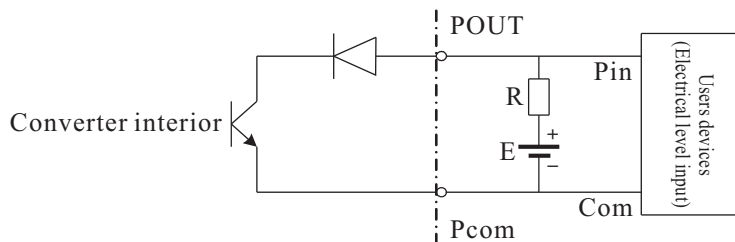


Fig. 6.5 (a) Digital quantity electrical level output wiring method

6.5.3.2 Digital quantity output connects photocoupler (such as PLC etc.)

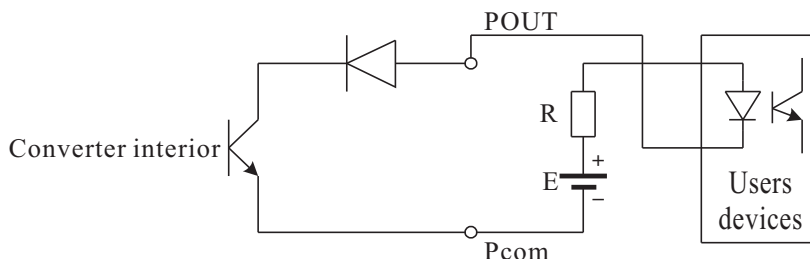


Fig. 6.5 (b) Digital quantity output connects photocoupler

Generally, user photocoupler need current about 10 mA, therefore, $E/R=10\text{mA}$ or so, $E=5\sim 24\text{V}$.

6.5.3.3 Digital quantity output connects relay

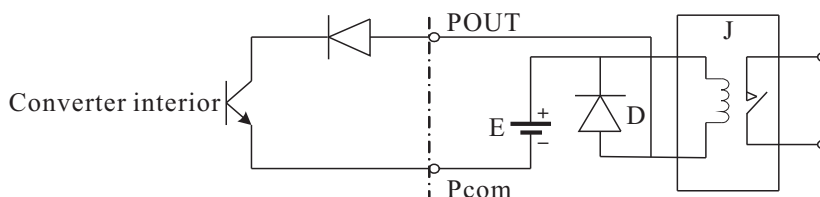


Fig. 6.5 (c) Digital quantity output connects relay

Generally, the required E of intermediate relay I is 12V or 24V. D is freewheeling diode. At present, most intermediate relays have this diode in interior. If intermediate relay itself does not have this diode, user should connect one in exterior.

Digital quantity output parameters table is as follows:

POUT

Parameters	Testing conditions	Minimum value	Typical value	Maximum value	Unit
Working voltage	$I_C=100\text{mA}$	3	24	36	V
Working current	$V_{ol}=1.4\text{V}$	0	300	350	mA
Working frequency	$I_C=100\text{mA}$ $V_{cc}=24\text{V}$	0	5000	7500	HZ
High electrical level	$I_C=100\text{mA}$	V_{cc}	V_{cc}	V_{cc}	V
Low electrical level	$I_C=100\text{mA}$	0.9	1.0	1.4	V

6.6 Analog output and calculation

6.6.1 Analog quantity output

Analog quantity output can be divided into two signal systems: 0~10mA and 4~20mA signal system. When using, users can select one of two signal systems by parameter setting.

Analog quantity current output interior is 24V power supply, under 0~20mA signal system, can drive load resistance of 750Ω.

Analog quantity current output correspondent to percentage flow of flow, namely:

$$I_0 = \frac{\text{Measured value}}{\text{Full range value}} \bullet \text{Current range} + \text{Current zero}$$

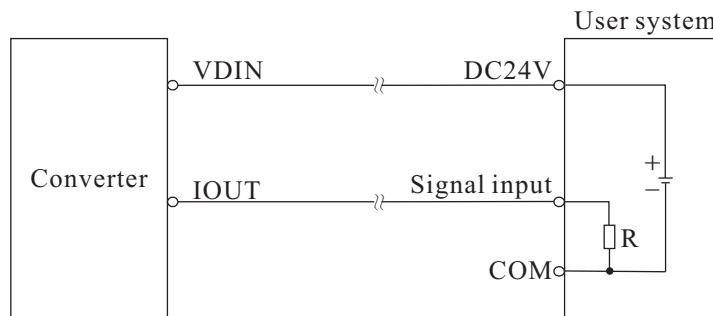
For 0~10mA signal system, current zero is “0”.

For 4~20mA signal system, current zero is 4mA.

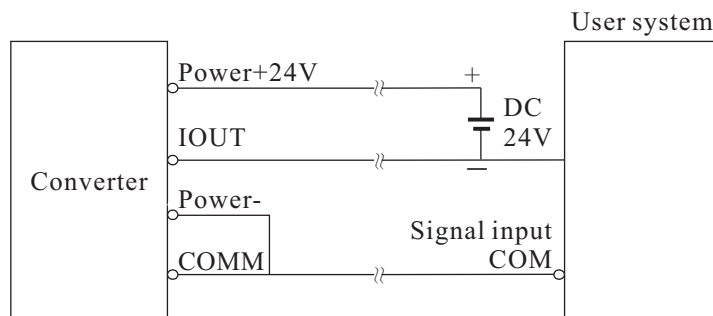
Therefore, in order to improve resolution of output analog quantity current, users should select the range of flowmeter properly.

When flowmeters are out off factory, every parameter of analog quantity output has been calibrated by manufactory. Under general condition, users do not need to adjust again. If abnormal condition occurs and need to calibrate analog quantity output, user can operate according to following operating regulations.

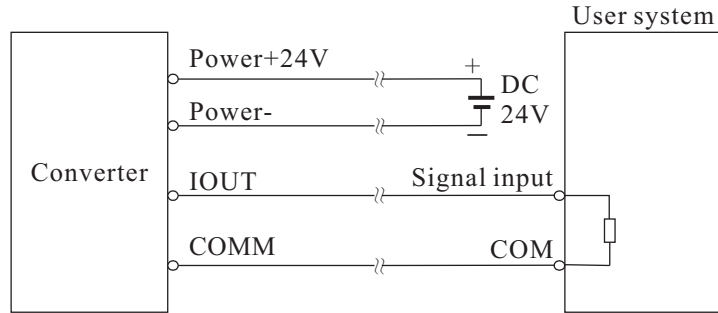
6.6.2 Current output wiring of the electromagnetic flowmeter converter



6.6a Two-wire system wiring method (Square converter)



6.6b Three-wire system wiring method (supply power and current output isolation mode)



6.6c Four-wire system wiring method (supply power and current output isolation mode)

7、Parameter setting

After the electromagnetic flowmeter converter and sensor connect to fluid pipeline (either calibration or use), should do the following work at first:

- Use copper wires to connect fore and after pipes of sensor firmly;
- Make sensor connect ground well;
- Ensure fluid in the pipeline is static when adjust zero-point of the instrument;
- Ensure electrode oxide film of sensor can stably generate (electrode connects fluid continuously for 48 hours).

7.1 Parameters and operation

When the instrument power-up, automatically enter measuring state. Under auto-measuring state, the instrument automatically finishes every measuring function and displays correspondent measured data. Under parameter setting state, users use four panel keys to finish parameter setting of the instrument.

7.1.1 Key-press function

a) Key function under auto-measuring state

Up key: circulating select displayed contents on the lower-line of screen;

Compound key + Enter key: enter parameter setting state;

Enter key: return to auto-measuring state.

Under measurement state, the adjustment method of LCD indicator contrast. By “compound key + up key” or “compound key + down key” to adjust proper contrast.

b) Every key functions under parameter setting state

Down key: digit minus 1 at cursor place

Up key: digit add 1 at cursor place

Compound key + down key: cursor move left;

Compound key + up key: cursor move right;

Enter key: enter / exit submenu;

Enter key: under any state, press continuously for two second, return to auto-measuring state.

Note:

(1) When using “compound key”, should press compound key at first and then press “up key” or “down key” at the same time.

(2) Under parameter setting state, the instrument automatically return to measuring state if there is no key-press operation within three minutes.

(3) Flow direction selection of flow zero correction, can move cursor to leftmost “+” or “-”, use “up key” or “down key” switch to make it be opposite to actual flow direction.

7.1.2 Parameter setting functions and function key operation

In order to do parameter setting or modification of the instrument, should make the instrument enter parameter setting state from measuring state. Under measuring state, press “compound key + Enter key”, the instrument enters function selection picture “parameter setting”, and then press enter key to enter input password state, “00000” state, input password to enter, press “compound key + Enter key” to enter parameter setting picture.

The instrument has been designed with 6 grades passwords, where users can set up password value for 4 grades by themselves, the highest 2 grades is fixed password value, 6 grades passwords are used respectively for operators of different security grades.

7.1.3 Function selection picture

Press “compound key + Enter key” to enter function selection picture, then press “up key” or “down key” again to select, there are three functions can be selected in this picture:

Parameter number	Function contents	Explanation
1	Parameter Set	Select this function, It can enter parameter menu
2	Clr Total Rec	Select this function, Total flow will be reset
3	Fact Modif Rec	Select this function, can browse modification records of flow coefficients.

7.1.3.1 Parameter setting

Press “Compound key + Enter key”, display “parameters set” function, the instrument enter function selection picture “parameters set”, and then press enter key to enter input password state, “00000” state, input password to enter, press “compound key + Enter key” to enter parameter setting picture.

7.1.3.2 Clr Total Rec

Press “Compound key + Enter key” to display “parameters set” function, and then press “up key” turn page to “Clr Total Rec”, input password of total flow clear, press “Compound key + Enter key”, after password of total flow clear auto-change to “00000”, clear function of the instrument finished, total flow of the instrument interior is 0.

7.1.3.3 Fact Modif Rec

To press “Compound key + Enter key” to display “parameters set” function, and then press “up key” to turn page to “Fact Modif Rec” (see Appendix 1)

7.1.4 Parameters set in menu

There are 55 parameters, when using the instrument, users set up every parameter according to concrete situation. Parameters list is as follows:

Parameters setting menu list table

Parameter number	Parameter character	Setting mode	Parameterope	Password grade
1	Language	Option	Chinese, English	2
2	Communication address	Set count	0~99	2
3	Communication speed	Select	300~38400	2
4	Measurement pipe size	Select	3~3000	2
5	Measurement unit	Option	L/h, L/m, L/s, m ³ /h, m ³ /m, m ³ /s, T/h,T/m,T/s, USG	2
6	Flow range	Set count	0~99999	2
7	Damping time measurement	Select	1~50	2
8	Flow direction	Select	Plus/Reverse	2
9	Flow zero modification	Set count	0~±9999	2
10	Flow excision	Set count	0~599.99%	2
11	Allow excision display	Select	Enable/Disable	2
12	Total unit	Select	0.001 m ³ ~1 m ³ , 0.001T~1T 0.001USG~1USG	2
13	Fluid density	Set count	0~3.999T/ m ³	2
14	Reverse output allows	Select	Enable/Disable	2
15	Current output type	Select	0~10mA/4~20mA	2
16	Pulse type	Select	Frequency /pulse	2
17	Pulse Fact	Select	0.001 m ³ ~1 m ³ , 0.001T~1T 0.001USG~1USG	2
18	Frequency output range	Select	1~5999 Hz	2
19	ATC alarm allow	Select	Enable/Disable	2
20	ATC alarm threshold	Set count	59999%	2
21	Alarm High Enable	Select	Enable/Disable	2
22	Alarm High Value	Set count	000.0~599.99%	2
23	Alarm Low Enable	Select	Enable/Disable	2
24	Alarm Low Value	Set count	000.0~599.99%	
25	Excitation alarm allow	Select	Enable/Disable	2
26	Clr Sum Key	Set count	0~99999	3
27	Sensor Code 1	User set	Finished YM	4
28	Sensor Code 2	User set	Product number	4
29	Field Type	Select	Type 1, 2, 3	4
30	Sensor Fact	Set count	0.0000~5.9999	4
31	Line CRC Enable	Select	Enable/Disable	4
32	Lineary CRC1	User set	Set Velocity	4

Parameter number	Parameter character	Setting mode	Parameterope	Password grade
33	Lineary Fact 1	User set	0.0000~1.9999	4
34	Lineary CRC2	User set	Set Velocity	4
35	Lineary Fact 2	User set	0.0000~1.9999	4
36	Lineary CRC3	User set	Set Velocity	4
37	Lineary Fact 3	User set	0.0000~1.9999	4
38	Lineary CRC4	User set	Set Velocity	4
39	Lineary Fact 4	User set	0.0000~1.9999	4
40	Forward total flow low level	Correctable	00000~99999	5
41	Forward total flow high level	Correctable	0000~9999	5
42	Rev Total Lo	Correctable	00000~99999	5
43	Rev Total Hi	Correctable	0000~9999	5
44	Spike suppress allowance	Select	Enable/Disable	5
45	Spike suppress Value	Select	0.010~0.800m/s	5
46	Spike suppress time	Select	400~2500ms	5
47	Password 1	User correct	00000~99999	5
48	Password 2	User correct	00000~99999	5
49	Password 3	User correct	00000~99999	5
50	Password 4	User correct	00000~99999	5
51	Current zero point correction	Set count	0.0000~1.9999	5
52	Current full-scale correction	Set count	0.0000~3.9999	5
53	Meter Fact	Set count	0.0000~5.9999	5
54	Meter Code 1	Factory set	Finished Y/M	6
55	Meter Code 2	Factory set	Product Serial No.	6

Parameters of the instrument determine running state, calculation method, input mode and state of the instrument. Select and set up parameters of the instrument properly, can make the instrument running under best state, and obtain higher measuring display precision and measuring output precision.

Parameters setting function of the instrument set up 6 grades passwords, where 1~5 grades are user passwords; sixth grade is manufactory password. Users can use fifth password to reset up the 1~4 grades passwords.

No matter which grades password is used, users all can inspect parameters of the instrument. But if users want to modify parameters of the instrument, then use password of different grade.

First grade password (ex-factory value 00521): users can only inspect parameters of the instrument;

Second grade password (ex-factory value 03210): users can change 1~24 parameters of the instrument;

Third grade password (ex-factory value 06108): users can change 1~25 parameters of the instrument;

Fourth grade password (ex-factory value 07206): users can change 1~29 parameters of the instrument;

Fifth grade password (fixed value): users can change 1~43 parameters of the instrument;

It is suggested that users who are higher grade personnel to master the fifth grade password; fourth grade password, mainly used for set total flow; 1~3 grade passwords, users determine which grade personnel to master.

7.2 Parameter description

7.2.1 Languages

The electromagnetic converter has two kinds of languages that are Chinese and English, users can select operation by themselves.

7.2.2 Communication address of the instrument

It means that communication address of this meter when multi-instrument communication, optional scope: 01~99 addresses, 0 address retain.

7.2.3 Communication speed of instrument

Option scope for communication baud rate of the instrument: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.

7.2.4 Measuring pipeline aperture

Aperture scope of matching sensor of the electromagnetic flowmeter converter is: 3~3000 mm.

7.2.5 Flow units

Select flow displayed units in parameters, flow displayed units of the instruments are: L/s, L/m, L/h, T/h, T/m, T/s, USG, m³/s, m³/m, m³/h, users can select a proper flow displayed unit according to technology requirements and usage habit.

7.2.6 Range setting of the instrument

Range setting of the instrument means that determine upper limit flow value, lower flow value of the instrument is automatically set as "0".

Therefore, range setting of the instrument determines range scope of the instrument, namely determines percentage display of the instrument, frequency output of the instrument, corresponding relation between current output and flow of the instrument:

Percentage displayed value of the instrument= (flow measuring value/range scope of the instrument)*100%;

Frequency output of the instrument= (flow measuring value/range scope of the instrument)*frequency full range value;

Current output value of the instrument= (flow measuring value/range scope of the instrument)*current full range value + base;

Pulse output value of the instrument does not been affected by range setting of the instrument;

7.2.7 Measuring filter time (measuring damping time)

Long measuring filter time can improve flow displayed stability and output signal stability of the instrument, apply to pulse flow measurement of total flow accumulation. Short measuring filter time is expressed by quick measuring response speed, apply to production process control. The setting of measuring filter time adopts selection mode.

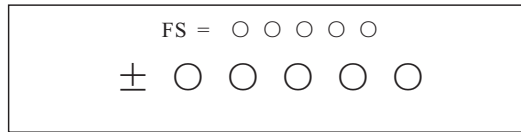
7.2.8 Option of flow direction

If users think when adjusting fluid direction is different to designed one, users do not need to change excitation wire or signal wire connection, but by change setting parameter of flow direction.

7.2.9 Flow zero-point correction

When correcting zero-point, should ensure that sensor pipelines is filled with liquid, and liquid is under static state. Flow zero-point is expressed by flow-rate, unit is mm/s.

Flow zero-point correction of the converter is shown as follows:



Up-row small characters display: FS means zero-point measuring value of the instrument;

Down-row big characters display: flow-rate zero-point corrected value;

When FS display is not “0”, should adjust corrected value to make FS=0. Attention: if change corrected value, FS value increases, need to change positive sign/negative sign of downlink numerical value, make FS is able to be corrected as zero.

Corrected value of flow zero-point is matching constant value of the sensor, should record recording sheet of the sensor and sensor marker. When recording, zero-point value of the sensor is flow-rate value which unit is mm/s, its sign is opposite to corrected value’s.

7.2.10 Small signal excision point

Small signal excision point setting is expressed by percentage flow of range. When small signal excising, users can select excision flow, flow-rate and percentage display and signal output at the same time; can also select only excise current output signal and frequency (pulse) output signal, keep flow, flow-rate and percentage display.

7.2.11 Flow integrating unit

The indicator of converter is 9-bit counter, max. permissible count value is 999999999.

Using integrating units are:USG, m³, L, T

Flow-integrating equivalents are 0.001L, 0.010L, 0.100L, 1.000L, 0.001T, 0.010T, 0.100T, 1.000T, 0.001m³, 0.010 m³, 0.100 m³, 1.000 m³; 0.001USG, 0.010USG, 0.100USG, 1.000USG.

7.2.12 Fluid density

It’s used when measure quantity flow, the unit is T/ m³ , users should put the measured liquid density into parameter.

7.2.13 Backward output allowance function

When backward output allowance parameter is set under “allowance” state, only if liquid flows, the converter outputs pulse and current according to flow value. When backward output allowance parameters is set under “prohibition” state, if liquid flows reversely, converter output pulse is “0”, current output is signal “0” (4mA or 0mA).

7.2.14 Current output types

Users can select 0~10 mA or 4~20 mA current outputs in current output types.

7.2.15 Pulse output modes

There are two kinds of pulse output modes for selection, viz. frequency output and pulse output:

- Frequency output mode: frequency output is continuing square-wave, frequency value is corresponding to flow percentage.
Frequency output value = (flow measuring value / range scope of the instrument) * frequency full range value;

- Pulse output mode: pulse output is rectangular wave pulse train, every pulse means a flow equivalent flows pipeline, pulse equivalent is selected by the following “pulse equivalent unit” parameter. Pulse output mode is mostly used in total flow accumulations, generally connect with integrating instruments.

Generally, frequency output and pulse output is OC gate form. Therefore, should connect DC power and load outside. The details see 6.5.

7.2.16 pulse equivalent unit

Pulse unit equivalent means one pulse expressed flow value, option scope for pulse equivalent of the instrument is:

Number	Pulse equivalent	Number	Pulse equivalent	Number	Pulse equivalent	Number	Pulse equivalent
1	0.001L/cp	5	0.001m ³ /cp	9	0.001USG/cp	13	0.001T/cp
2	0.01L/cp	6	0.01m ³ /cp	10	0.01 USG/cp	14	0.01T/cp
3	0.1L/cp	7	0.1m ³ /cp	11	0.1 USG/cp	15	0.1T/cp
4	1.0L/cp	8	1.0m ³ /cp	12	1.0 USG/cp	16	1.0T/cp

Under the same flow, pulse equivalent is small, then output pulse frequency is high, accumulation flow error is small.

7.2.17 Frequency output scope

Frequency output scope of the instrument is corresponding to upper limit of flow measuring, namely 100% of percentage flow. Upper limit value of frequency output can be arbitrary set up in the scope of 1~5000Hz.

7.2.18 Empty pipe alarm allowance

Have empty pipe inspection function, and without adding electrode. If users select allowance empty pipe alarm, instrument can inspect an empty pipe state when fluid in the pipe is lower than measuring electrode. After empty pipeline state is examined, the instrument's analog output and digital output value are set signal zero, at the same time, flow of the instrument displays zero.

7.2.19 Empty pipe alarm threshold value

Under fluid full-pipe situation (whether have flow-rate or not is OK), modify empty alarm setting for users to use it conveniently, the upline of empty pipe alarm threshold value parameter displays actual measured conductivity, downline set up empty pipe alarm threshold value. When set up empty pipe alarm threshold value, can depend on actual conductivity to set up, namely, it can be set as 3~5 times of the conductivity.

7.2.20 Upper limit alarm allowance

Users select allowance or prohibition

7.2.21 Upper alarm numerical value

Upper limit alarm can be calculated by range percentage, this parameter adopts numerical value setting mode, users set up a numerical value among 0%~199.9%. When the instrument satisfies alarm conditions on running, the instrument will output alarm signal.

7.2.22 Lower limit alarm

The same as upper limit alarm

7.2.23 Excitation alarm

Select allowance, with excitation alarm function; select prohibition, cancel excitation alarm function.

7.2.24 Total flow clear password

Users use password that above third grade can set up this password, and then set up this password in total flow clear.

7.2.25 Sensor coding

Sensor coding can be used for mark ex-factory time and number of matching sensors, so that to fit set up sensor coefficients.

7.2.26 Sensor coefficient value

Sensor coefficient: namely, electromagnetic flowmeter whole-machine calibration coefficient, this coefficient is obtained by actual calibration, and imprint steel seal on sensor label. User must take this coefficient set into converter parameter table.

7.2.27 Excitation modes selection

Electromagnetic converter provides three options of excitation frequency: namely, 1/10 power frequency (mode 1), 1/16 power frequency (mode 2), 1/25 power frequency (mode 3). Excitation system inductance value of sensor with small aperture is small, should select 1/10 power frequency. Excitation system inductance value of sensor with big aperture is big, users only can select 1/16 power frequency or 1/25 power frequency. During using, select excitation mode 1 at first, then select mode 2 or mode 3 successively if flow-rate zero point of the instrument is too high. Attention: should calibrate and operate under the same excitation mode.

7.2.28 Forward total flow high level/ low level

Total flow high-low level setting can change numerical values of forward accumulation total flow and backward accumulation total flow, mainly use for instrument maintenance and instrument replacement.

Users use 5 grades passwords to enter, can modify forward accumulation quantity ($\Sigma+$), general set accumulation quantity can't exceed max. numerical value that calculated by counter (999999999).

7.2.29 Backward total flow high level/ low level

Users use 5 grades passwords to enter, can modify backward accumulation quantity ($\Sigma-$), general set accumulation quantity can't exceed max. numerical value that calculated by counter (999999999).

7.2.30 Spike suppress allowance

For the flow measurement of seriflux, such as paper pulp and slurry and so on, the solid granule in the fluid will clash or strike measuring electrodes and form "pointed shape disturbance". In order to overcome this kind of disturbance, converter adopts changing rate suppress algorithm. The converter has three parameters, which can conduct selection on changing rate suppress characteristics.

Set this parameter as "allowance", start changing rate suppress algorithm. Set this parameter as "prohibition", close changing rate suppress algorithm.

7.2.31 Spike suppress coefficient

This parameter designates the changing rate to suppress pointed shape disturbance. Calculated by the percentage of flow rate, divided into 0.010m/s, 0.020m/s, 0.030m/s, 0.050m/s, 0.100m/s, 0.200m/s, 0.300m/s, 0.500m/s, 0.800m/s these ten grades. The smaller grade percentage is, the higher the sensitivity of pointed shape disturbance suppress is. Note, in application, higher sensitivity does not mean better effect, should select according to actual situation.

7.2.32 Spike suppress time

This parameter selected time width of desire inhibition sharp interference, the unit is msec.. Duration time is less than flow change of selected time; the converter is regarded as sharp

interference. Duration time is more than flow change of selected time, the converter is regarded as normal flow change. Also should depend on actual situation, try to select this parameter.

7.2.33 Users password 1~4

Users use 5 grades passwords to enter, can modify this password;

7.2.34 Current zero point correction

Adjustment for ex-factory current output zero point of the converter, make current output is 0mA or 4mA accurately.

7.2.35 Current full-scale correction

Adjustment for ex-factory current output full-scale of the converter, make current output calibration is 10mA or 20mA accurately.

7.2.36 Ex-factory calibration coefficient

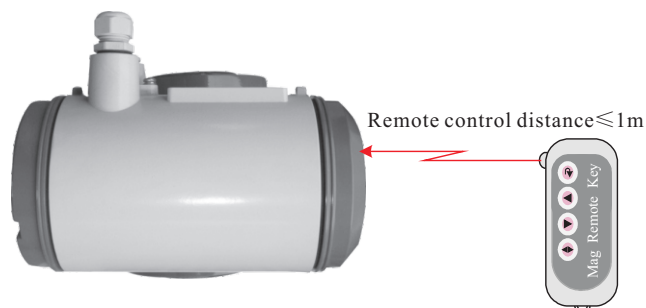
This coefficient is special coefficient of converter manufactory, converter manufactory uses this coefficient to make normalization of electromagnetic converter measuring circuit system so that ensure interchange ability among all electromagnetic converter reach 0.1%.

7.2.37 Coding 1 and 2 of the instrument

The coding of converter records converter ex-factory time and coding.


8、 Infrared handheld remote control keyboard

Infrared hand-held remote control operation keyboard of the instrument, its operation is the same as keyboard operation of the instrument, when operating, please make infrared emission port of infrared hand-held remote control operation keyboard and infrared receive port of the instrument put parallel at the same level, distance L about 1m, concrete operation see the following figure:



9、 Alarm information

Printed circuit board of electromagnetic flow converter adopts surface welding technology, as for users, it is non-repairable. Therefore, users can't open the converter shell.

Intelligent converter has self-diagnosis function. It can correctively give alarm information for faults occurred in general application excepted power and hardware circuit faults. These information suggest that “” on the left side of the indicator. Under measuring state, the instrument automatically display faults contents as follows:

- FQH --- flow upper limit alarm; FQL --- flow lower limit alarm;
- FGP --- fluid empty pipe alarm; SYS --- system excitation alarm;
- UPPER ALARM --- flow upper limit alarm;
- LOWER ALARM --- flow lower limit alarm;
- LIQUID ALARM --- liquid empty pipe alarm;
- SYSTEM ALARM --- system excitation alarm;

10、 Fault treatments

10.1 No display

- * Check power whether turn on or not;
- * Check power fuse whether fine or not;
- * Check supply voltage whether meet requirements or not;

10.2 Excitation alarm

- * Whether excitation wiring EX1 and EX 2 is open circuit or not;
- * Whether total resistance of sensor excitation coil is less than 150Ω or not;
- * If both item a and b are normal, then the converter has fault.

10.3 Empty pipe alarm

* Measure whether fluid is filled in the measuring pipe of sensor;
 * Use wire to make converter signal input ends SIG 1. SIG2 and SIGGND short circuiting, if “Empty pipe” suggest cancel at the moment, it shows the converter is normal, maybe conductivity of measured fluid is low or empty pipe threshold value and range setting error;

- * Check whether signal wiring is correct or not;
- * Check whether sensor electrode is normal or not;

Make flow as zero; observe displayed conductance ratio should be less than 100%;

Under flow existing state, measure respectively resistance of ends SIG1 and SIG2 to SIGGND which should be less than 50 kΩ (as for measuring value of water. It is best to use pointer multimeter for measuring, and can see charge and discharge phenomenon during measuring process).

* DC voltage that is measured between DS1 and DS 2 by multimeter should be less than 1V, otherwise explain sensor electrode is polluted, should provide cleaning.

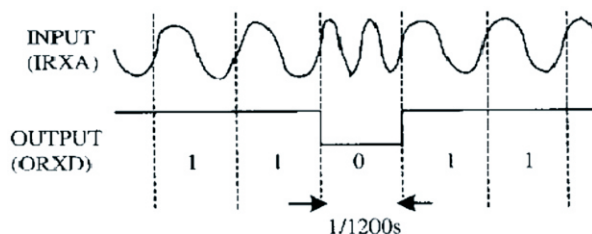
10.4 The measured flow rate is inaccurate

- * Measure whether fluid is filled in the measuring pipe of sensor;
- * Whether signal wiring is normal or not;
- * Check whether sensor coefficient, sensor zero point is set up depends on sensor mark or ex-factory check list.

11、 HART function declaration

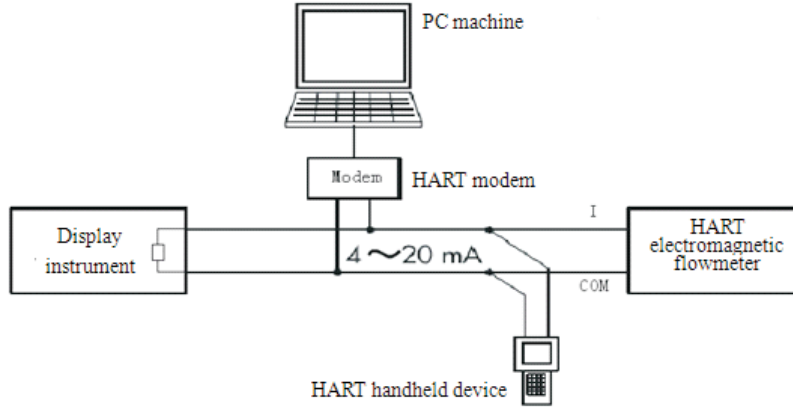
11.1 HART description

HART bus is a data communication bus which applies to field devices and developed by Rosemount Company in 1993, it is the short form of “Highway Addressable Remote Transducer”, the meaning is “addressable remote transducer data path”. Its data signal transmission method is to stack a current frequency modulated signal on 4-20mA signal, where logic “1” is expressed by 1200 Hz signal, logic “0” is expressed by 2200Hz signal, baud rate is 1200 bps. Its signal modulation waveform shown as the figure below:



11.2 HART grid chart

The characteristics of HART bus is to transmit data signals by making use of 4-20mA signal wire, which can not only save data communication line on the field, but also can realize datacommunication. So it is very suitable to field application. The field network composed by HART bus is shown as the following Fig.



11.3 HART use function considerations

- 1) Handheld device and HARTMODEM parallel connect to the two ends of electromagnetic flowmeter current output load without polarity;
- 2) The resistance in the loop should be more than 200Ω and less than 500Ω;
- 3) Handheld device, HART MODEM can't connect to current loop;

Note:

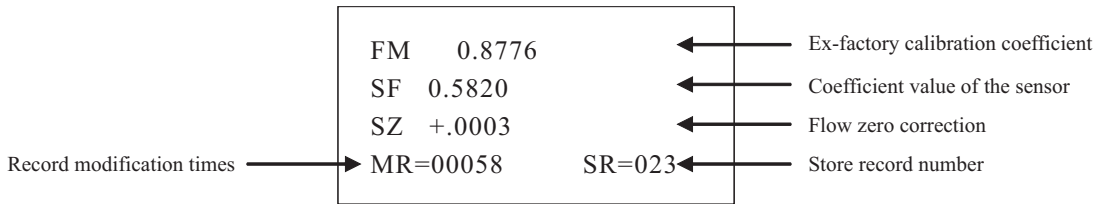
1. Electromagnetic flowmeter uses handheld device and HARTMODEM to set parameters. The communication address of instrument is a nonzero value, baud rate is 4800.
2. If the instrument communication mode, address and baud rate settings are not correct, handheld device and HART MODEM can not set parameters.

Appendix 1: The function of modification records of flow coefficients

According to new rules of “National Metrology Verification of Electromagnetic Flowmeter”, electromagnetic flow converter records one group (3) flow characteristic parameters, they are respectively correction coefficient of the converter (ex-factory calibration coefficient), calibration parameter of the sensor (coefficient value of the sensor), sensor zero (flow zero correction), meanwhile, automatically record modification times of flow characteristic parameter (MR number). To modify any parameter in the flow catachrestic parameter group, the modification times records plus 1, user can't change numerical value of correction times records. User should record flow calibration coefficient of the sensor and modify times record (MR number) in the verification-book, any following modification will produce different modification times records, browse the modification record times will know whether flow characteristic parameter is modified or not.

Electromagnetic flow converter can store 32 groups of history records of flow characteristic parameters so that user can browse it. Concrete operating methods as follows:

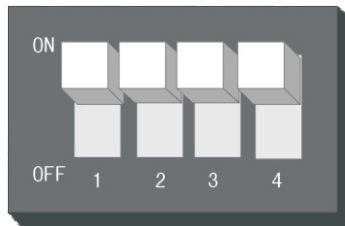
1. Under measuring state, press “compound key + enter key”, appear the converter’s function selection picture “parameter setting”, and the press “up key” turn page to “coefficient modification record”, press “compound key” for a time, enter to browse the picture of coefficient modification record.



※ **Note:**

The serial number of the last corrected feature coefficient is displayed when entering this parameter. If you want to browse the history records press “down key”, and could search for the last record to the thirty-two record ahead. Finally the times of record modified (MR) should be written down on the paper before next time test.

Appendix 2: Instruction for dial code switch



Switch1:

ON supply upper power(24V) for ALML alarm output.
OFF is no connection.

Switch2:

ON is OC door for pulse output, connect to pull-up resistor (pull up slightly, 10k)
OFF is no connection.

Switch3:

ON supply upper power(24V) for ALML alarm output.
OFF is no connection.

Switch4:

ON is terminal resistance for RS485 (standard resistance: 120Ω) .
OFF is no connection.

※ **Note:**

Terminal resistance is used for long-distance communication which can't be connected in a short distance.

12、 Installation and commissioning

If electromagnetic flowmeter installation is not correct will obviously affect its measuring accuracy and other performance, even seriously make it can't normal work, before install, users must carefully read instruction and strictly abide by related stipulation of this instruction so ensure the meter can normally work.

12.1 Installation environment selection

According to working characteristics and specifications of the electromagnetic flowmeter, we shall pay attention to the following several requirements while choosing installation environment:

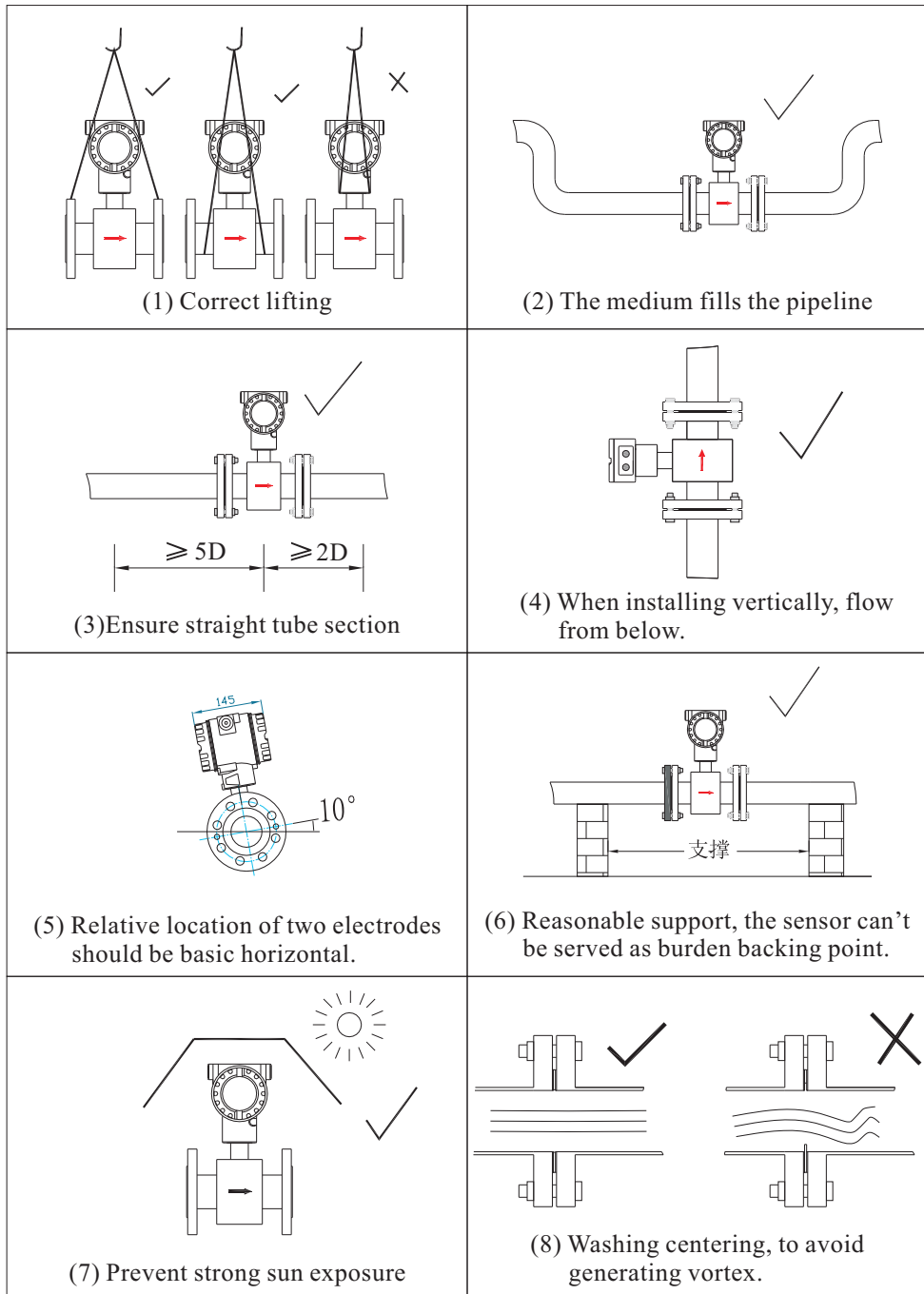
- 1) The flowmeter should be mounted on the dry and ventilated place, but not mounted on the wet place.
- 2) The flowmeter should avoid mounting on the occasion where temperature variation is very large and suffer high-temperature radiation from the device, if need to install, must take heat insulation and ventilation measures.
- 3) The flowmeter should avoid mounting on the environment including corrosion gas (such as free ammonia, acid mist and so on), if need to install, where must have ventilation measure.
- 4) Avoid being exposed to rain and run, and prevent ambient temperature too high, outdoor installation should have shelter from rain facilities.
- 5) Installation place shouldn't have strong shock. If shock of the pipeline is too strong, then at two sides of the flowmeter should have fixed pipeline support.
- 6) Installation place should try to avoid the device with strong magnetic field like large electric machine, large transformer etc.
- 7) The pipeline of fix flowmeter don't exist larger leakage current before install, and its nearby place should have good ground condition.
- 8) In order to conveniently install and maintain, around the flowmeter must have enough installation space.

12.2 Precautions for installation site

- 1) The mark of flow direction adheres on the sensor is in accordance with the medium flow direction in the pipe.
- 2) Usually, the flowmeter adopts horizontal installation; the axis of two electrodes should be sat in the same level.
- 3) Must ensure measured medium is always filled in the measuring tube of the sensor.
- 4) When metering average flow, the sensor should choose sit on the place where pipe inner flow ripple is smaller. In general conditions, the place is far from the pump, choked flow elbow and valve, such instrument indication is more stable, ripple is smaller.
- 5) For measurement of bi-phase fluid which including solid substance such as ore pulp, slurry, fiber pulp etc. should choose suitable place, in which it can't phase-separation. In addition, it best only to take vertical installation so as to make measured medium flow from down to up, in this way, can avoid solid grain deposit in the measuring pipeline, make liquid border on axisymmetric flow , and also can make sensor lining wear is uniform, prolong service life.
- 6) In order to prevent occurring negative pressure, the height of the flowmeter must below to the height of the pipeline slightly, or it is guarantee that downstream of the flowmeter has definite pressure, the sensor should try to avoid install in the pipe where present negative pressure.
- 7) Because of measured medium easy to make the measuring tube inside and electrode generate the conglutination and deposit, in order to clean measured tube and electrode under process pipeline flow without break off, the sensor adopted bypass parallel installation and with cleaning port.

8) When the pipeline caliber isn't in accordance with the sensor, reducer and divergent pipe are installed in two ends of the sensor, and then connect with the pipeline again. When adopt template pipe, you must pay attention to the center cone angle of the template pipe isn't greater than 15, the smaller the better, and consider pressure loss from this brought.

The correct installation of electromagnetic flowmeter is shown in the following drawing:



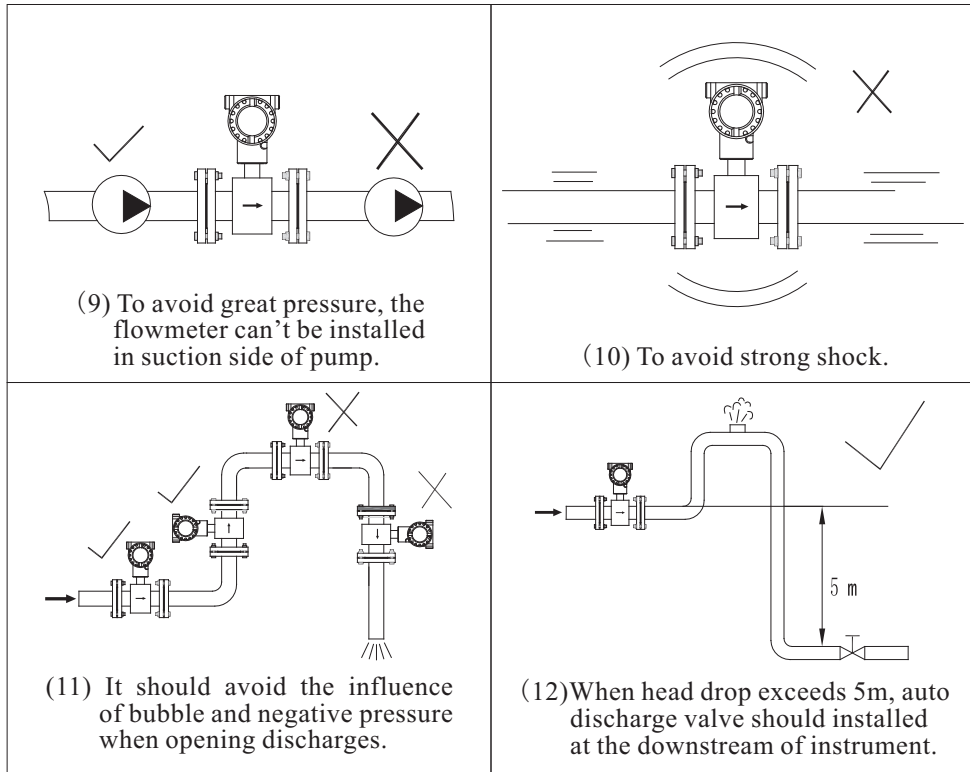


Fig. 7.2 Graphical representation electromagnetic flowmeter installation

12.3 Requirements for straight sections

It will be known from the measurement principle of an electromagnetic flowmeter, only when the flow velocity in the measuring tube of the sensor is distributed into axial symmetry, the induced electromotive force of the sensor is proportional to the average flow velocity. When the distribution of axial symmetry is damaged, especially for large caliber electromagnetic flowmeter, it will cause a bigger measurement error. So at the pipeline upstream, on the front of the electrode plane, there must be a straight pipe section whose length is more than 5 times the measuring pipe caliber. When the sensor is installed in the pipeline of a non-full open valve, then its upstream should be brought a straight pipe whose length is ten times the length of the measuring pipe caliber; the backward straight pipe length should not be less than three times the length of the measuring pipe caliber.

Installation type	Schematic drawing forms of installation	Pipeline mode	
		Forward length	Backward length m
Horizontal pipe	Figure (a)	5D	3D
Elbow pipe	Figure (b)	5D	3D
Flared tube	Figure (c)	10D	5D
Valve downstream	Figure (d)	10D	5D
Reducer	Figure (e)	10D	5D
Pump downstream	Figure (f)	15D	5D
Mixture liquid	Figure (g)	30D	3D

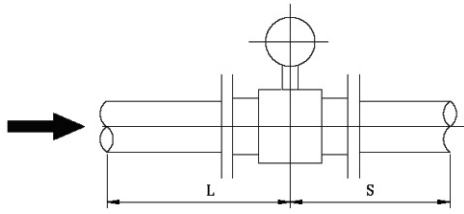


Figure (a)

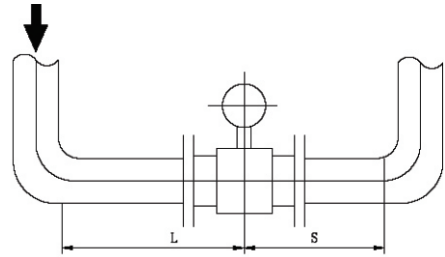


Figure (b)

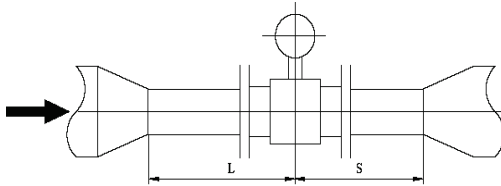


Figure (c)

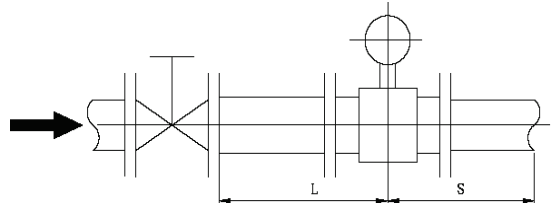


Figure (d)

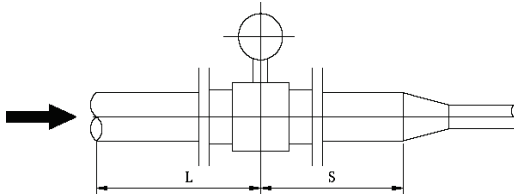


Figure (e)

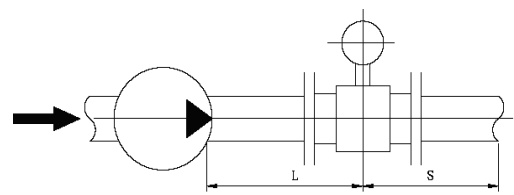


Figure (f)

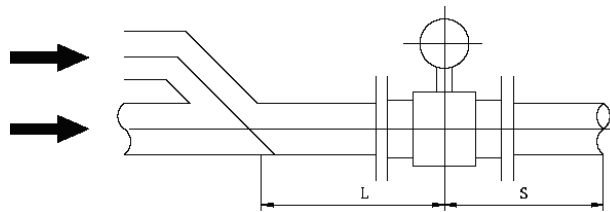


Figure (g)

12.4 Handling and hoisting

Must guard against use rope when an electromagnetic flowmeter is transporting, moving and lifting, put the bar into the measuring tube of the sensor to lift mounting (see figure 9.2), so as to avoid damaging the lining, when lift mounting, not only two ends of the flowmeter can be bound with rope to lift mounting but also can use steel rope or hook put on the flange bolt hole at the two ends of the flowmeter to lift mounting.

12.5 Installation for special use

Use condition for an electromagnetic flowmeter has varieties, here only explanation of special condition

12.5.1 Installation on insulation pipeline

Because of the electromagnetic flowmeter must be grounded while using make measured medium and the enclosure of the sensor both are on the same potential. For non-conducting nonmetallic pipeline, in order to make the instrument is zero potential by measured medium potential, that is to say, measured medium communicated with the enclosure of the sensor each

other, now should use ground ring made by metal material or metal short pipe of which without insulation lining (or without insulation coating), two ends metallic flange is embedded between sensor flanges, as shown in Fig.12.5.1:

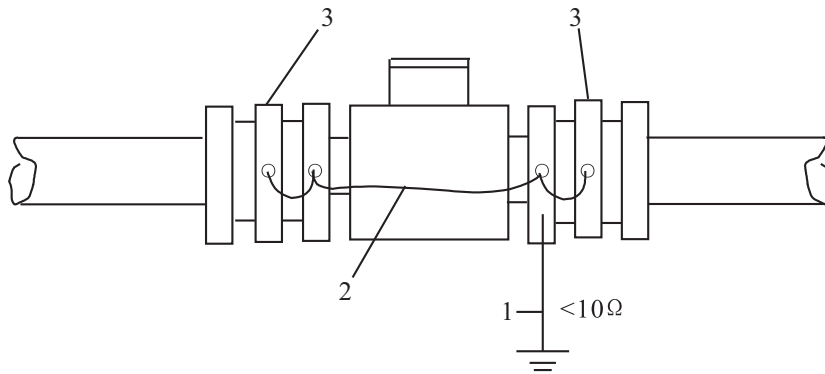


Fig.12.5.1 Installation method on the insulation pipeline

In Fig.12.5.1, measured medium contacted with ground ring or metallic pipe without lining, and then communicate with the enclosure of the sensor by connection, thus reach the purpose of measured medium communicates with the enclosure of the sensor each other

1. Measuring ground connection
2. Connecting wire (sectional area of copper core is 6 mm^2)
3. Ground ring or without insulation lining metal short-pipe

For strong corrosive measured medium neither can not use ordinary stainless steel ground ring nor can't adopt metal short-pipe of no-insulation lining, now can adopt the method of which embedding ground electrode on the insulation pipeline. Because of the material of ground electrode is very little that may be made from noble metal materials of which corrosion resistant performance very good.

12.5.2 Installation on pipeline with cathode protection potential

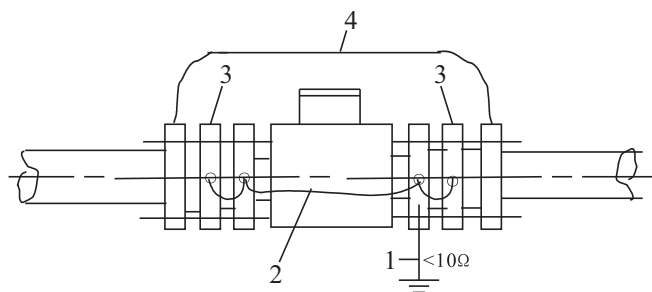


Fig.12.5.2 Installation method of the sensor is on pipeline with cathode protection potential

1. Measuring ground connection
2. Connecting wire (sectional area of copper core is mm^2)
3. Ground ring or ground flange, they must be isolated with pipeline flange
4. Connecting wire, sectional area of copper core is 6 mm^2 , isolate between cathode protection potential and the sensor.

Usually, the pipeline of cathode protection where insulation material is covered on its internal wall and external wall, so measured medium has not ground potential. Now ground ring of the sensor should be embedded between flange which on two ends of the sensor and process pipeline they must be insulated with the flange of process pipeline and connect to the sensor and ground ring through ground wire 2. Flange of process pipeline on two ends of the sensor connect each

other by copper wire 5 to isolate between cathode protection potential and sensor.

12.5.3 Installation on the pipeline with large working frequency current

In some metallic pipeline system, working frequency current via the pipeline is bigger; in order to prevent this working frequency current directly passed over the enclosure of the sensor and measured medium, to avoid producing interference potential and let the flowmeter can normally work installation method, as shown in Fig.12.5.3.

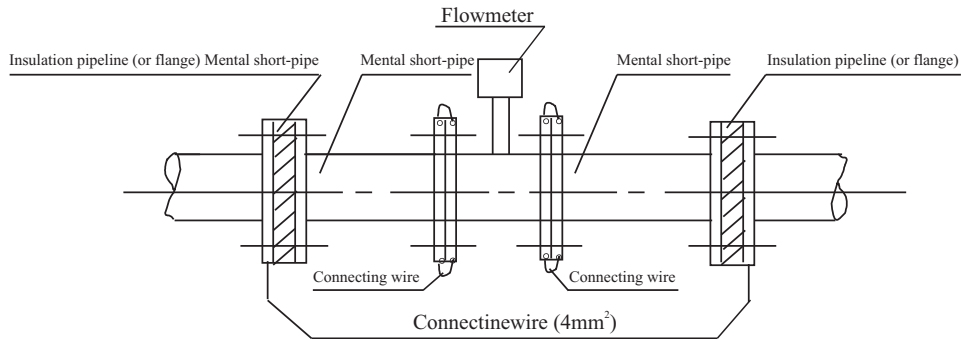


Fig.12.5.3 Installation method on the pipeline with large working frequency current

Across two ends of the sensor is connected each section of insulation pipe or flange, and ground flange or metal short-pipe is installed between the sensor and insulation pipeline, the same as general installation method, ground flange and the sensor together linked to good ground device, and link place of two insulation pipeline and process pipeline from short circuit sectional area which not less than 4 mm^2 by other use the copper wire.

12.6 Installation and grounding requirement

The electromagnetic flow sensor must have good ground. During actual measurement, we can take the whole fluid as a zero resist body. This zero resist body just became the midpoint of differential signal voltage, so measured fluid must reliable ground, otherwise if “ground” of measured fluid and converter line have not switch on, then differential signal can’t be formed, and result in the flowmeter doesn’t work. There are two things for ground requirement of the electromagnetic flow sensor:

1) Measured medium must be contacted. From the point of view of working principle of the flowmeter, the ground end of the sensor must connect electrically with measured medium.

2) Reliable ground, take ground as zero potential to reduce environmental interference. In generally, process pipeline are all metal pipeline, themselves are all grounded. Do this requirement is very easy. But under larger environmental electro-magnetic field interference states, especially, when stray current as working frequency on the pipeline is bigger, need other to set reliable ground device, at the more wet place, ground device general is embedded in ground copper bar which length is greater than 1 m and connect with ground location of sensor work by using conductor which area is greater than 4 mm^2 . General demand for ground resistance less than 10 ohm and must be paid attention: Ground connection of the sensor never connect on common ground of the motor or other electric equipment, so as to avoid interference influence of leakage current.

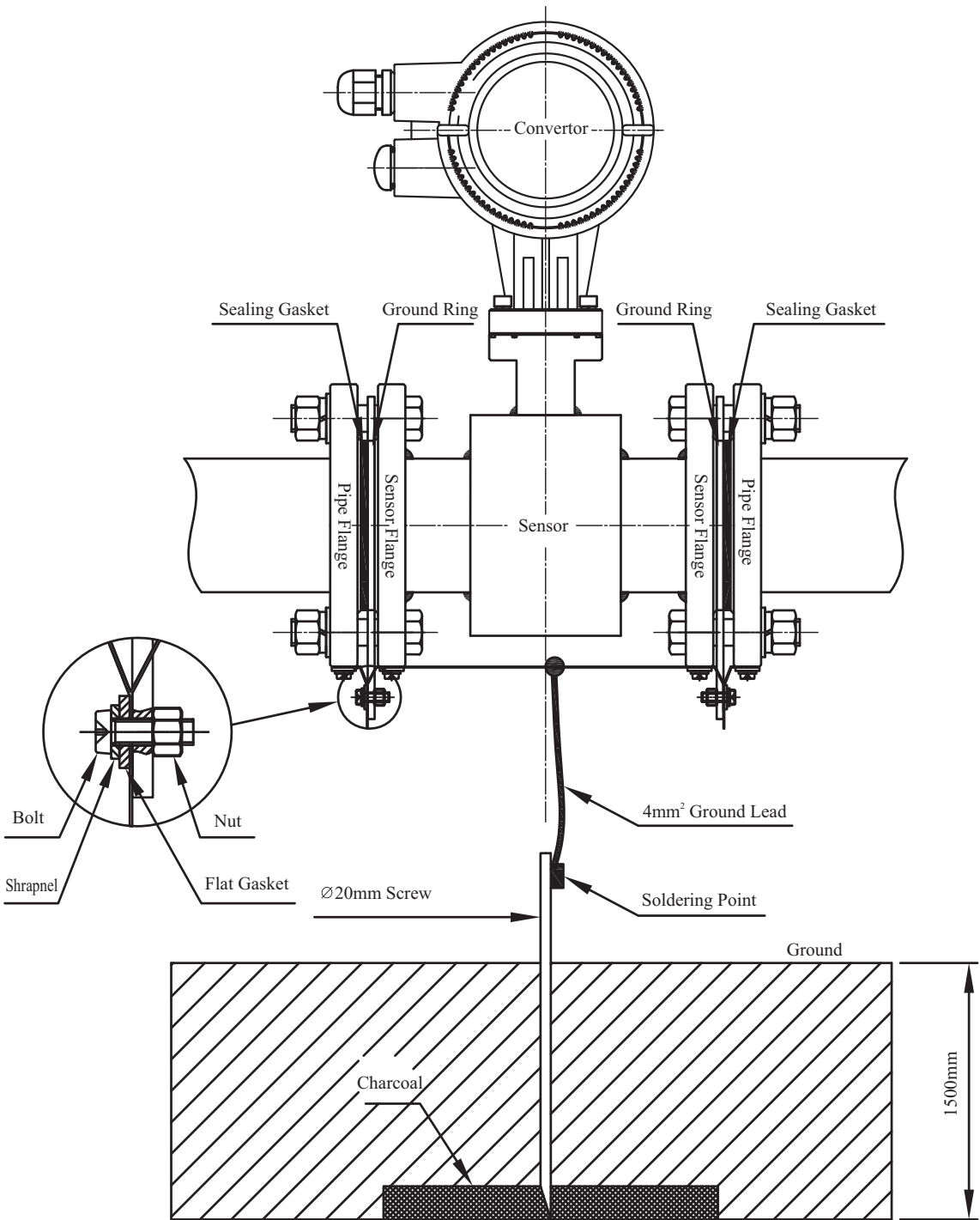


Fig. (f) Converter grounding diagram

12.7 Cable laying

1) Cable used for wiring

Serial number	Terminal	Specification Description
1	Signal line SIG1, SIG2, SGND	Three-core PVC dual shielding cable RVVP2×28/0.15 (split type)
2	Excitation line EXT+, EXT-	Three-core PVC dual-shielding cable RVVP2×28/0.15 (split type)
3	Output current line	Two-core PVC dual-shielding cable RVVP2×28/0.15
4	Power line	Three-core PVC dual-shielding cable RVVP2×28/0.15 (AC 220V/ DC 24V)

2) When lay cable points for attention (split type)

A. Input signal line A, B, C on the converter must put into the steel tube alone, the steel tube links up the ground.

B. Both signal cable and excitation cable should be avoided to parallel mounting together with other cables like motor, transformer or other power cable; its distance must be greater than 1m above at least.

C. Both signal cable and excitation cable can neither be broke nor be extended cable by using welding or other connection method.

D. Between excitation terminal X and Y can neither be short circuit nor linked up any load except excitation coil of the sensor.

12.8 Installation of detachable converter

1) Installation surrounding

A. Installation surrounding must be paid attention to keep cleaning, the surrounding has not corrosion atmosphere drying and ventilate site.

B. Ambient temperature can't exceed $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$, relative humidity can't exceed 85%, and try to avoid the devices generated strong electromagnetic field (like large motor, large transformer)

C. When installing on the wall where must be apart from the ground about 1.5 m, and be paid attention to avoid sun-scorched and rain-drenched and strong shock and impact.

2) Installation method

Wall-type converter installation may be mounted on the wall or metal bracket on the instrument's panel as well as in field instrument box. After installed the converter front and below must empty out enough space so as to obstruct the meter opening and wire connection. When installing, first fix one end of ground connection using M4 screw to ground screw of shell base, and then using four screws penetrates through inside hole, tighten up the screw, take the converter closely connected together with installation panel, then using four M5 screws penetrate through outside hole on the installation panel. At last, tighten up nut and washer, thus the converter can be firmly installed on the need bracket.

12.9 Put into operation

Before the flowmeter is formally put into operation, strictly check whether its installation and connection is correct and whether confirm to regulated requirement. It must be pointed out that the whole set of electromagnetic flowmeter has already passed over strict adjustment and actual calibration before leaving the factory. Generally speaking, users can put into operation and needn't to do any adjustment and. To the problem happened in primary operation, according to this instruction, each stated points must be checked and analyzed carefully, troubleshooting, don't move at will mix up original adjustment even damage it.

Checking the operation before power on:

1) Check whether the sensor, converter and connection with terminal wire base on flow accumulator, and intact whether each screw is tighten or not.

2) Open the valve to fill the pipeline with the fluid still and remove residual gas in the pipeline, and then observe whether leakage point exist

Check while electrifying:

After the tests is correct before electrifying, namely may try to electrify, observe whether abnormal condition. If it is found that it occurs failure, power must be cutoff immediately and check connection. If without abnormal condition, the converter shows transient flow and net accumulated flow.

Put into operation:

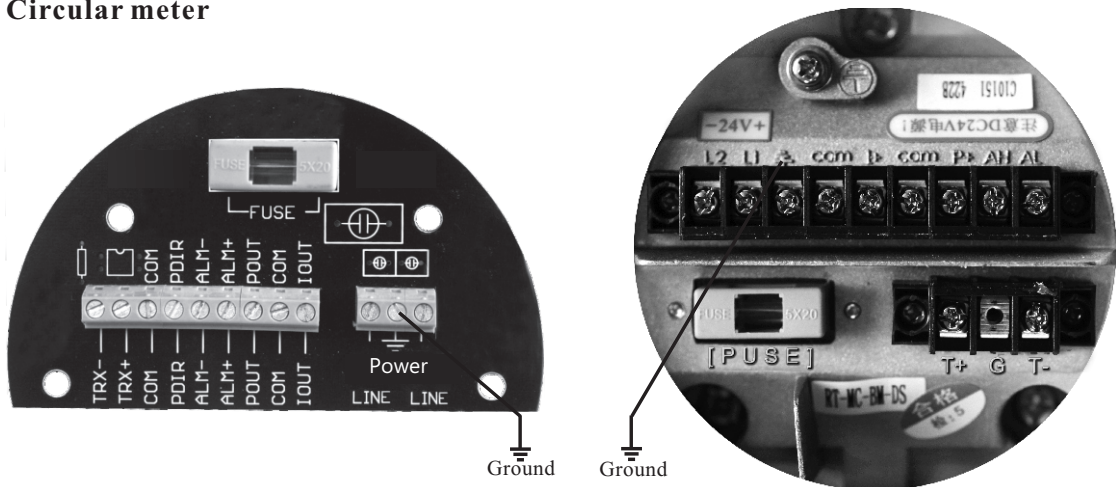
1) Open the valve to make the fluid flows, now the converter should has output current; LCD display shows transient flow and net accumulated flow.

2) To change opening of the valve, observe whether instantaneous flow value change.

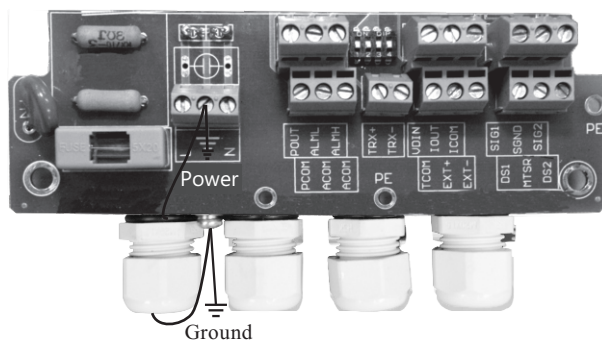
13、 Explanation of lightning protection function

When installing, user must connect the earth points of converter terminals to the shell body and then connects to the ground reliably. Because lightning protection gas discharger leads the lightning stroke current to the ground via shell body, if the shell body has not been connected to the ground reliably, once somebody operates converter when lightening stroke, it may cause person accidents. For details see connection schematic diagram:

Circular meter



Square meter



>WP-EMF-A/B flanged-type electromagnetic flow meter type spectrum table

		Model												Explanation	
EMF-		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Structure form	A													Integrated flanged-type electromagnetic flow meter	
	B													Split flanged-type electromagnetic flow meter (with ex-factory standard configuration cable 10m)	
Aperture		()											Aperture from DN10~DN2000	
Electrode		1												316 stainless steel	
		2												Halloy B (HB)	
		3												Halloy C (HC)	
		4												Pt (not provide temporarily)	
		5												Ti	
		6												Ta	
	9													Others	
Lining material		A												Chloroprene rubber (CR)	
		B												Polyurethane rubber (PU)	
		C												Polytetrafluoroethylene (PTEE, F4)	
		D												Solubility Polytetrafluoroethylene(PFA)	
		E												F46	
		G													Solubility Polytetrafluoroethylene (withstand negative pressure) (PFA)
	H													F46 (withstand negative pressure)	
Working pressure		1												4.0MPa (aperture DN10~DN80)	
		2												1.6MPa (aperture DN100~DN150)	
		3												1.0MPa (aperture DN200~DN1000)	
		4												0.6MPa (aperture DN1200~DN2000)	
		5													Other
Earth ring		A												None	
		B												General earth ring (316L)	
		C												Earth ring with neck (316L)	
		Y													Others
Protection grade		B												IP67	
		C													IP68
Output mode		0													Without output
		1													4~20mA frequency/pulse
Communication mode		1													RS485(standard)
		2													RS232C
		3													HART
		4													GPRS (battery use only)
Power supply		T													220V AC
		W													24V DC
		B													Battery power supply
Accuracy		4													0.2grade
		5													0.5 grade
		6													1.0 grade
Converter type		2													Integrated type
		3													Split I type
		6													Split III type
Flame-proof type		N													General type
		D													Flame-proof type (Exd II CT 6)
Max. flow		()												In the bracket give clear indication of max. flow, unit m ³ /h

For example: EMF-A1001A2AB10T52D(80)

>WP-EMF-C/D gripping-type electromagnetic flow meter type spectrum table

		Model												Explanation	
EMF-		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Structure form	C														Integrated gripping-type electromagnetic flow meter
	D														Split gripping-type electromagnetic flow meter (with ex-factory standard configuration cable 10m)
Aperture		()												Aperture from DN40~DN200
Electrode		1													316 stainless steel
		2													Halloy B (HB)
		3													Halloy C (HC)
		4													Pt (not provide temporarily)
		5													Ti
		6													Ta
	9														Others
Lining material		D													Solubility Polytetrafluoroethylene(PFA)
		E													F46
		G													Solubility Polytetrafluoroethylene (withstand negative pressure) (PFA)
		H													F46 (withstand negative pressure)
Working pressure		1													4.0MPa (aperture DN40~DN80)
		2													1.6MPa (aperture DN100~DN150)
		3													1.0MPa (aperture DN200)
		4													Other
Earth ring		A													None
		B													General earth ring (316L)
		C													Earth ring with neck (316L)
		Y													Others
Protection grade		B													IP67
		C													IP68
Output mode		0													Without output
		1													4~20mA frequency/pulse(Not used for battery power supply)
Communication mode		1													RS485(standard)
		2													RS232C
		3													HART
		4													GPRS (battery use only)
Power supply		T													220V AC
		W													24V DC
		B													Battery power supply
Accuracy		4													0.2grade
		5													0.5 grade
		6													1.0 grade
Converter type		2													Integrated type
		3													Split I type
		6													Split III type
Flame-proof type		N													General type
		D													Flame-proof type (Exd II CT 6)
Max. flow		()												In the bracket give clear indication of max. flow, unit m ³ /h

For example: EMF-C 1001D2AB10T52D (80)

