User’s Manual
FT100 Electromagnetic Energy Meter

FTI.INC CN19151325

Table of contents

User's manual
Electromagnetic Flowmeter Converter

1. Wire connection of Converter

1.1 Terminal wiring and labeling

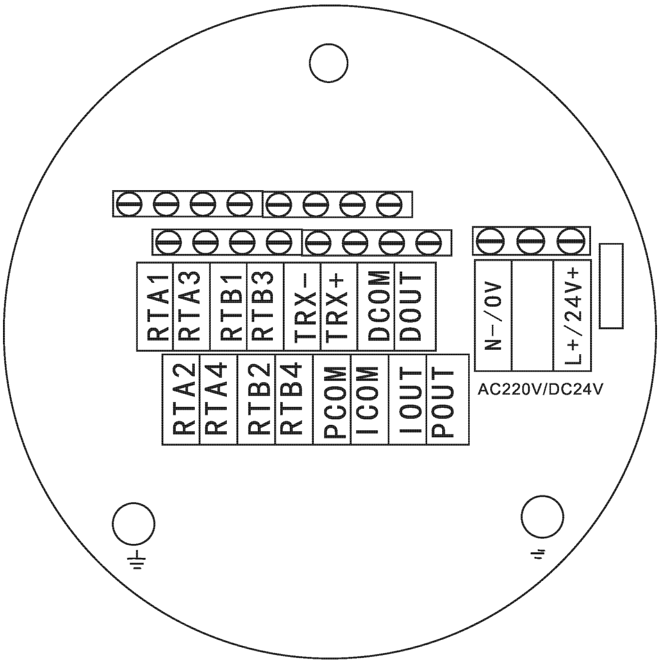


Fig.1.1 Wiring terminals

Definition of Switch K:

ON: Connection with RS485 communication terminal resistance (Standard resistance: 120Ω) ;

OFF: No connection.

Note: Terminal resistance is only for long-distance communication. No terminal resistance connected for short distance.

Temperature sensing unit

Wiring terminals：

RTA1：	(High temperature) temperature input	Red terminal
RTA2：	(High temperature) temperature input	Black terminal
RTA3：	(High temperature) temperature input	Black terminal
RTA4：	Inlet temperature input	
RTB1：	(Low temperature) temperature input	Red terminal
RTB2：	(Low temperature) temperature input	Black terminal
RTB3：	(Low temperature) temperature input	Black terminal
RTB4：	Outlet temperature input	
POUT：	Frequency/pulse output	
PCOM	Frequency/pulse output ground	
ICOM：	Current output ground	
IOUT：	Current output	
DOUT:	Reserved	
DCOM	Reserved	
TRX-：	Communication input (RS485-B)	
TRX+	Communication input (RS485-A)	

N/24V- ：	AC/DC Power supply input
L/24V+ ：	AC/DC Power supply input

Note: The pulse signal is passive, I max: 250mA

1.2 Wire Connection with sensor

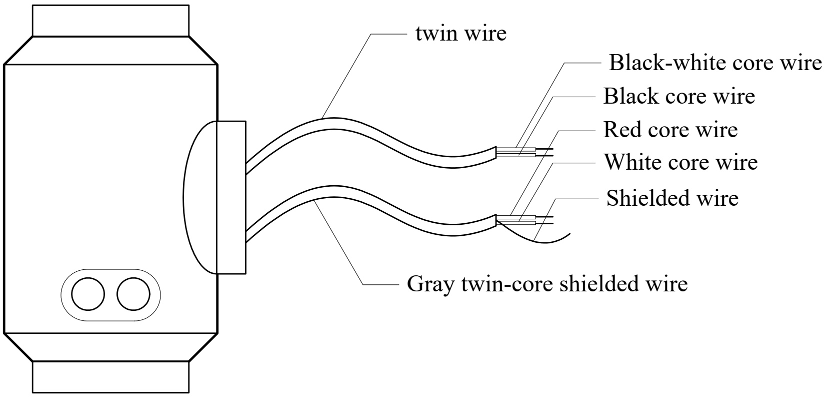


Fig. 1.2 Signal wires

Signal wires are marked as follows:

Twin wire： Black-white 12-core wire
Black 12-core wire
} Connecting field current

Gray twin shielded wire：Red 10-core wire connecting with "signal 1"

White 13-core wire connecting with "signal 2"

Shielded wire connecting with "signal ground"

1.3Wire and cable characteristics & requirements for connection

1. 3. 1 **Flow signal wire**

When split type converter is used with the sensor, shielded signal cable of polyvinyl chloride sheathed metal mesh can be used as flow signal transmission cable on condition that the conductivity of the measured fluid is greater than 50μS/cm, and the recommended model is PVVP 2*0.2mm^2. The length should not be more than 100m. The signal cable is supplied with the sensor. Signal line can be performed as shown in Figure 1.1.

The converter provides an equipotential excitation shielded signal output voltage to reduce the influence of the distributed capacitance of cable transmission on the flow signal measurement.

When the conductivity under test is less than 50μS/cm or transmission is over long distances, a dual-core double-shielded signal cable with equipotential shielding can be used. Examples include STT3200 special cables or BTS triple-shielded signal cables.

1. 3. 2 **Excitation current wire**

A two-core insulated rubber flexible cable can be used as excitation current wire and the recommended model is RVVP2*0.3mm^2. The length of the excitation current line is the same as that of the signal cable. When using STT3200 special cables, the excitation cable is combined with the signal cable into one.

1. 3. 3 **Grounding requirements of converter installation**

The grounding terminal of the converter housing should be connected to ground with a grounded copper wire of not less than 1.6mm^2. The ground resistance from the converter housing to ground should be less than 10Ω.

First, cut the Φ20 copper tube into 1700mm-long nails (lengthening as needed) buried 1500mm into ground (Note: when burying the nails, sprinkle a layer of crushed wood charcoal on the tip end of the nail, and then water brine);

Next, weld 4mm^2-copper wire to the ground nail, finally connect the ground wire to the sensor flange, grounding ring, and pipe flange, see Figure 1.3.

Note: Stainless steel materials are required for fixing ground wire screws, elastic pads, and flat pads.

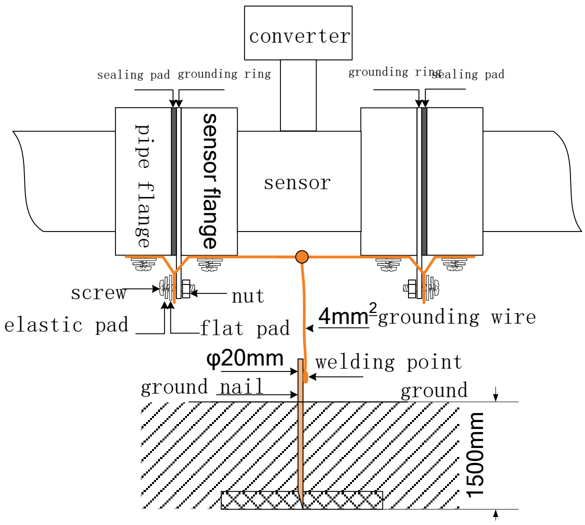


Figure 1.3 Grounding diagram of converter

1.4 Output and power cable

All output and power cables are provided by the user according to the actual situation. The cables must meet the load current requirements.

The pulse, current, and alarm outputs are connected to external power supply and load as shown in Figure1.4.1 -- Figure 1.4.2b.

When using inductive loads, a freewheeling diode should be added as shown in the figure.

1. 4. 1 **Current output wiring:**

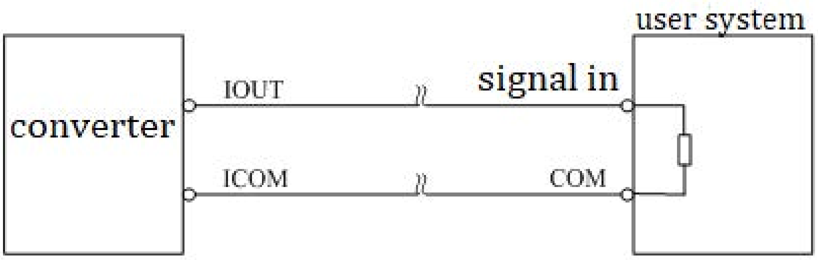


Fig. 1.4.1 4~20mA internal power supply connection method (current and pulse are not isolated in this mode)

1. 4. 2 **Pulse output wiring:**

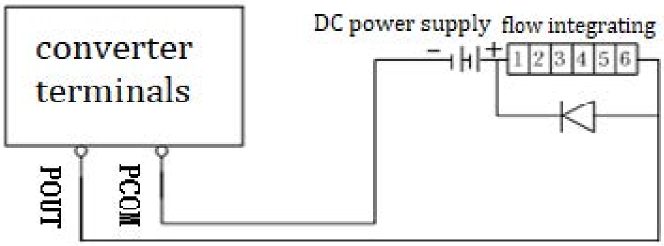


Figure 1.4.2a External power supply connecting to electronic counter

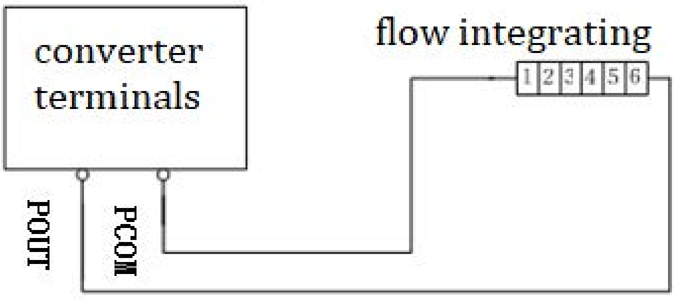


Fig. 1.4.2b-1 Internal power supply connecting to electronic counter

1. 4. 3 **Open collector connection method**

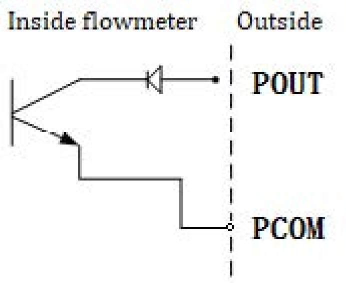


Figure 1.4.3 Open collector connection method

2. Introduction of parameters

2.1 Flow parameter setting

2.1.1Flow integrating unit

The converter display is an 8-bit counter with a maximum allowable count value of 99999999.

The only unit is m^3. Since the instantaneous flow unit of this converter is fixed at m^3/h, the flow cumulative units are: $0.001m^3$, $0.010m^3$, $0.100m^3$ and $1.000m^3$.

2.1.2Reverse output permission

When the reverse output allowable parameter is set to the "allow" state, the converter outputs pulses and currents according to the flow value as long as the fluid flows. When the output allowable parameter is set to "disable", if the fluid flows in the opposite direction, the converter flow rate is displayed normally, the output pulse is "0", the current output signal is "0" (4mA), and the instantaneous flow rate is displayed as 0.

2.1.3 Meter range setting

The meter range setting refers to determining the upper flow value, and the lower limit flow value of the meter is automatically set to "0".

Therefore, the instrument range setting determines the range of the meter, which also determines the correspondence between flow and the percentage display, the frequency output, and the current output of the meter:

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

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

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

The pulse output value is not affected by the range setting of the meter.

2.1.4 Damping measuring time

Damping measuring time is also the filtering time. Long damping measuring time can improve the stability of both flow display and the output signal, which is suitable for total cumulative pulsation flow measurement.

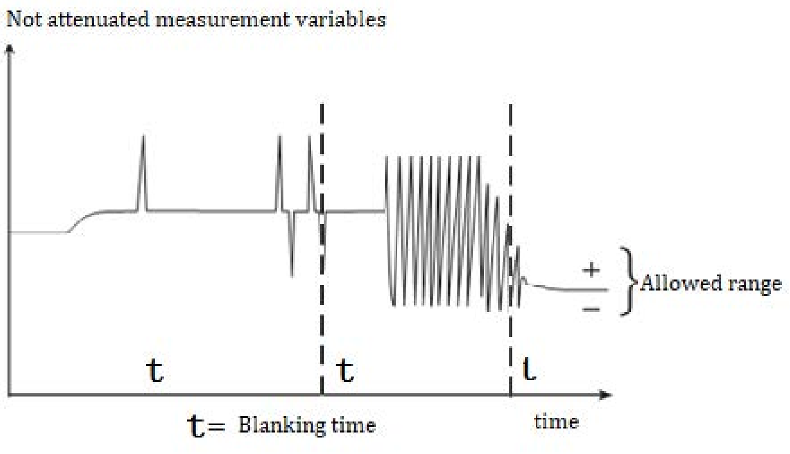
Short damping measuring time is characterized by fast measuring response, which is suitable for production process control. Damping measuring time can be 1S, 2S, 3S, 4S, 6S, 8S, 10S, 15S, 30S and 60S, and can be set according to needs.

2.1.5 Spike suppression range and spike suppression time

"Spike suppression range" and “spike rejection time" are used to eliminate some noises that cannot be removed by increased damping. It can distinguish the noises caused by the step signal and the slurry spike noise from the real flow. This discrimination is based on the range and duration of spike suppression. The figure shows the principle of removing coarse errors by using spike suppression range technique.

If the currently used flow data exceeds or falls below this limit value within the time of change above or below this limit value, then this change is believed to be caused by noise, so it would be eliminated by the system; while the currently used flow data is above or below this limit value and it’s not within the spike suppression time, the change is considered to be caused by a real change in flow, and the system recognizes that it is a flow measurement change.

Spike suppression range can be selected within 0~30%, and spike suppression time can be selected within 0~20s. This function would be turned off when either spike suppression range or spike suppression time is 0.



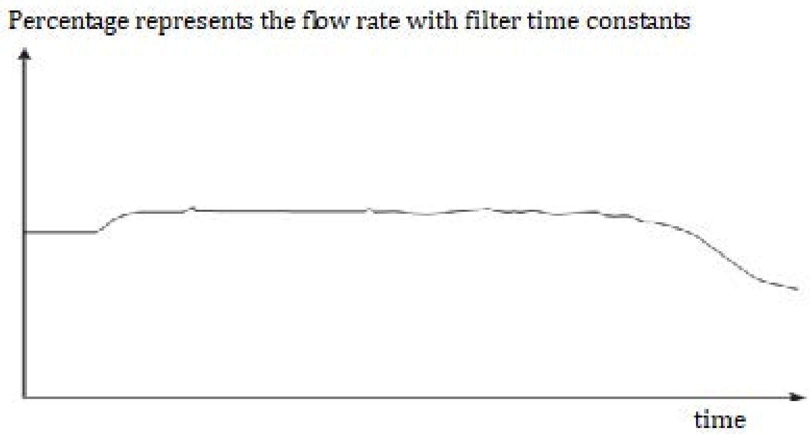


Fig. 2.1.6 Error coarse noise eliminated by using spike suppression range technique

2.1.6 Selecting flow direction

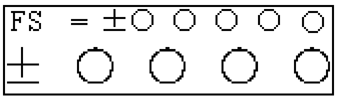
If the user thinks that the fluid direction during debugging is inconsistent with the design, there is no need to change the excitation wire or signal wire connection. The user can go to parameter setting to select the flow direction.

2.1.7 Small signal cutting point

During zero correction, the sensor tube should be filled with fluid and the fluid must be stationary.

2.1.8 Flow zero correction

The flow zero point is expressed in flow velocity in mm/s. Flow zero correction of the converter is shown as follows:



Upper line small print displays: FS stands for zero measurement value of the meter;

Lower line large print displays: flow rate zero point correction value.

When FS is not displayed as "0", the correction value should be adjusted to make FS be corrected as 0.

Note: If changing the lower line correction value, the FS value increases, then there is need to change the positive and negative signs of the lower line value so that FS can be corrected to zero.

The correction value of flow zero point is the matching constant value of the sensor, which should be recorded in the record sheet of the sensor and the sensor label. Sensor zero point is recorded as the flow rate value in mm/s and its sign is opposite to the sign of the modified value.

2.1.9 Factory calibration coefficient

This coefficient is a special coefficient for the converter manufacturer, which is used by the converter manufacturer to normalize the electromagnetic converter measurement circuit system to ensure that the interchangeability of all electromagnetic converters is 0.1%.

2.1.10 Total zeroing password

Users is able to set this password with a password above the third level, and then set the password for total zeroing.

2.2 Heat parameter setting

2.2.1 Working mode of meter

The electromagnetic flowmeter has two working modes: hot & cold meter mode and cold meter mode.

Hot & cold meter mode: only the heat is calculated, which is the default way of the meter. "H" stands for heat amount.

Cold meter mode: Only the cooling amount is calculated. "R" stands for cold amount.

2.2.2 Flowmeter location

If the flow sensor with hot & cold mode is installed at the inlet of the heating pipe, please select "Flow inlet"; If the flow sensor with heat & code mode is installed at the outlet of the heating pipe, please select "Flow outlet". Do not match this parameter with the actual installation, which will cause calculation errors.

2.2.3 Heat flow unit

The heat display units can be optional, including MJh, GJh, KWh, and MWh.

2.2.4 Total heat unit

The hot & cold meter display is an 8-digit counter with a maximum allowable count value of 99999999.

The total amount of heat units can be optional, including MJ, GJ, KW and MW.

The total heat equivalent is：

0.001MJ, 0.010MJ, 0.100MJ, 1.000MJ

0.001GJ, 0.010GJ, 0.100GJ, 1.000GJ

0.001 KW, 0.010 KW, 0.100 KW, 1.000 KW

0.001 MW, 0.010 MW, 0.100 MW, 1.000 MW

2.2.5 Heat range setting

Heat range setting refers to determining the upper heat value, and the lower heat value is automatically set to "0". T和function is the same as flow range setting.

2.2.6 Starting measurement temperature

Starting measurement temperature refers to the temperature limit used by the meter to measure heat. When the temperature is less than the set temperature, the meter does not calculate the heat.

2.2.7 Pressure range selection

The electromagnetic hot & cold meter follows the urban construction industry standard CJ128—2007 of the People's Republic of China. Users can set two pressures of 0.6MP and 1.6MP for easy use.

2.2.8 Inlet and outlet temperature zero point, temperature range

Pt1000 thermal resistance three-wire bridge connection method is adopted for Electromagnetic hot & cold meter. Please refer to Appendix 4 for specific calibration method.

2.3 Alarm parameter setting

2.3.1 Maximum alarm allowed

The user selects Allow or Disallow.

2.3.2 Upper limit alarm value

The upper alarm value is calculated by the flow rate. The user sets an appropriate flow value in this parameter. When the instantaneous flow rate is higher than this value, the meter will display an alarm signal.

2.3.3 Lower limit alarm

The lower alarm value is calculated by the flow rate. The user sets an appropriate flow value in this parameter. When the instantaneous flow rate is lower than this value, the meter will display an alarm signal.

2.3.4 Excitation alarm

Select “Allow” to turn on excitation alarm function, select “Suppress” to turn off excitation alarm function.

2.3.5 Empty tube alarm allowed

It has an empty tube detection function and does not require additional electrodes. If user chooses to allow empty tube alarm, the meter can detect empty tube status when the fluid in the tube is lower than the measuring electrode. After detecting empty tube status, the analog output and digital output of the meter are set to signal zero, and the meter flow is displayed as zero.

2.3.6 Empty tube alarm threshold

In the case of a full tube of fluid (with or without flow rate), the upper line of the empty tube alarm threshold parameter shows the measured conductivity, the lower line sets the empty tube alarm threshold. The empty tube alarm threshold can be set according to the measured conductivity, which can be set to 3~5 times of the measured conductivity.

2.3.7 Empty tube zero point correction

When the full pipe value on site is large, user can correct the zero point of the empty tube. During the empty tube zero point correction, it should be ensured that the sensor tube is filled with fluid. The empty tube zero correction is displayed as follows:

```
MZ = 0 0 0 1 5
 + 0 0 0 0
```

Upper line display: MZ represents the zero point measurement of the empty tube;

Lower line display: empty tube zero point correction value;

First, according to the value of the measured conductivity MT, adjust the correction value so that MZ = about 5-10 (note: if the correction value in the lower line is increased, the MZ value will decrease).

2.3.8 Empty tube range correction

When the MT value of the empty tube conductivity measured is small, user can correct the empty tube range. During the empty tube range correction, it should be ensured that there is no fluid in the sensor tube. The empty tube range correction is displayed as follows:

```
MR = 0 0 1 0 7
 1 . 0 0 0 0
```

Upper line display: MR represents the range measurement of the empty tube;

Lower line display: empty tube range correction value;

When the lower correction value is increased, the MR value increases, the lower correction value and the MR value decrease. User can adjust MR to a suitable value according to actual needs (it is recommended to adjust to MR=500), then the conductivity value during empty tube measuring is basically the actual corrected MR value.

2.4 Output parameter setting

2.4.1 Pulse output mode

There are three optional pulse output modes: Flow Frequency (flow frequency), Heat Frequency (heat frequency), Pulse output (pulse output).

- Flow Frequency mode: The frequency output is a continuous square wave. The frequency value corresponds to the flow percentage.

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

- Heat Frequency mode: the frequency output is a continuous square wave. The frequency value corresponds to the heat percentage.

Frequency output value = (heat value measurement / heat range setting) * frequency full range value;

- Pulse output mode: pulse output is a rectangular wave pulse train. Each pulse represents a flow equivalent of the tube flow. The pulse equivalent is set by setting "pulse equivalent unit" and "pulse equivalent". The pulse output mode is mostly used for total accumulation, which is usually connected to accumulation instrument.

The frequency and pulse output are generally in the form of OC gate, so DC power supply and load should be connected externally. Please see section 5.14 for details.

Electromagnetic converter has 6 types of pulse equivalents: L, m3, MJ, GJ, KWh, MWh.

When the set pulse unit is L or m3, the converter outputs the pulse according to the instantaneous flow. When the set pulse unit is MJ, GJ, KWh or MWh, the converter outputs the pulse according to the instantaneous heat.

2.4.3 Pulse equivalent

Pulse equivalent refers to the flow value represented by a pulse. The pulse equivalent needs to be set by setting "pulse equivalent units" and "pulse equivalent”. The range is 00.001 ~ 59.999.

With the same flow rate, when the pulse equivalent is small, the output pulse frequency is high, and the cumulative flow error is small.

2.4.4 Pulse width

The pulse output is active low, pulse width: 1---9999ms

Pulse width—Maximum number of output pulses (Table 2)

No.	Pulse width (ms)	Maximum output pulses per hour (p/h)
1	1	1800000
2	5	360000
3	10	180000
4	50	36000
5	100	18000
6	200	9000
7	500	3600

2.4.5 Digital output upper limit

The frequency output range corresponds to the upper limit of the flow measurement, which is 100% of the flow percentage. The upper limit of frequency output can be set arbitrarily within the range of 1~5000Hz.

2.4.6 Current output mode

Flow: In 4~20mA mode, the meter outputs a 4~20 mA current according to the flow percentage.

Heat: In 4~20 mA mode, the meter outputs a 4~20 mA current according to the heat percentage.

2.4.7 Current zero point correction

It is the current output zero adjustment of the converter set by factory, which allows the current output to be 4mA.

2.4.8 Current full correction

It is the current output full-scale adjustment set by factory, which allows the current output to be 20mA.

2.4.9 Current output test

After adjusting the current output zero point and full-scale, user can use this parameter to test the output current linearity of the converter. The user can set 0, 0.2, 0.5, 0.7, and 1.0 respectively to check the output current linearity characteristics.

2.5 Sensor parameters

2.5.1 Diameter of the tube measured

The sensor that comes with the electromagnetic flowmeter can be 3 ~ 3000mm in diameter.

3、4、5、6、8、10、15、20、25、32、40、50、65、80、100、125、150、200、250、300、350、400、450、500、600、700、800、900、1000、1100、1200、1300、1400、1500、1600、1700、1800、1900、2000、2100、2200、2300、2400、2500、2600、2700、2800、2900、3000；

2.5.2 Excitation frequency selection

The electromagnetic converter provides 4 excitation frequency options: 3.125Hz, 4.167Hz, 6.25Hz and 12.5Hz (the default setting is 6.25Hz). The small-diameter sensor excitation system has a small inductance, and 6.25Hz should be selected. The large-diameter sensor excitation system has a large inductance, user can only choose between 3.12Hz and 4.16Hz. In use, low excitation frequency should be selected first, if the zero point of flow rate is too high, then lower the excitation frequency in turn. Note: The meter must work at the excitation frequency calibrated. If high-frequency excitation is used, user can choose 12.5Hz.

2.5.3 Sensor coefficient value

Sensor coefficient is the calibration coefficient of the electromagnetic flowmeter. This coefficient is obtained from the actual standard and stamped on the sensor label. User must include this coefficient in the converter parameter table.

2.5.4 Flow correction

Please see the appendix for details.

2.5.5 Sensor serial number

The sensor serial number can be used to mark the ex-factory time and serial number to match the setting of sensor coefficients.

2.6 Communication parameter setting

2.6.1 Communication mode

The meter provides three communication modes for options: MODBUS, HART and PROFIBUS. Corresponding communication mode should be set when the meter is equipped with different communication methods.

2.6.2 Communication address

It refers to the communication address of this meter during data communication, with optional range: address 01 ~ 250. Address 0 is reserved.

2.6.3 Communication speed

Communication baud rate can be 300, 600, 1200, 2400, 4800, 9600, 19200 or 38400.

2.6.4 Calibration mode

The converter is equipped with standard MODBUS communication of 8-bit no parity mode. User can choose 8-bit odd parity and 8-bit even parity mode according to needs.

2.7 Modification record

2.7.1 User password 1~4

The user enters with a password of security level 5. The password can be modifiable.

2.7.2 Meter serial number 1, 2, 3

The serial number of the converter records the ex-factory time and serial number.

2.7.3 High and low of forward direction total volume

The high and low total volume of forward direction setting can change the cumulative total flow value, which is mainly used for maintenance and replacement of the meter.

User can enter with a password of security level 5 to modify the amount of flow accumulation. Generally, the cumulative amount set cannot exceed the maximum value ((99999 9999)) calculated by the counter.

2.7.4 High and low of total heat amount

User can enter with a password of security level 5 to modify the amount of heat accumulation. Generally, the cumulative amount set cannot exceed the maximum value (999999999) calculated by the counter.

2.7.5 Inlet and outlet temperature correction

This coefficient is used to correct the difference between the temperature of a certain temperature point and the standard temperature, and does not affect the overall temperature linearity after correction. It is mainly used when there is an error in the field thermocouple indication.

2.8 Time parameters

2.8.1 Year, month, day, hour, minute, second

It is used to set the year, month, day, hour, minute, and second to ensure the accuracy of the converter clock.

3. Display and operation

1-A high temperature display,
B low temperature display

2- Instantaneous flow rate,
empty tube ratio

3-Instantaneous energy,
instantaneous flow

4- Cumulative energy,
cumulative flow

5-R Select the manual operator to adjust parameters,
P Select the light sensitive touch screen to adjust parameters

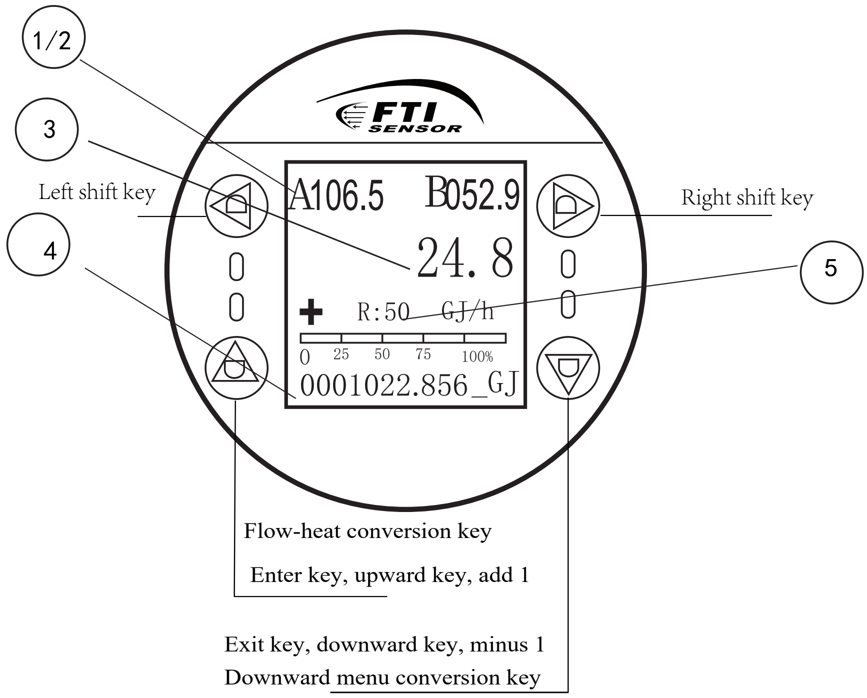


Figure 3: Square-table keyboard definition and LCD display

When powered on, the meter automatically enters measurement state. In automatic measurement state, the meter automatically completes each measurement and displays corresponding measurement data. To set or modify a parameter, the meter must enter parameter setting state. In parameter setting state, user uses the panel key to perform parameter setting.

3.1 Functions of keys

3. 1. 1 Functions of keys in automatic measurement status

Upward key: conversion between instantaneous heat and instantaneous flow;

Downward key: selecting display content on the lower part of the screen;

Confirm key: enter password state, input the password to enter the converter menu.

3. 1. 2 Key function in the parameter setting state

Downward key: the number at the cursor minus 1, turn the page forwards;

Upward key: add 1 to the number at the cursor, turn the page backwards.

Press the confirm key to move the cursor clockwise, press the composite key to move the cursor counterclockwise;

When the cursor moves below the upward key, press the upward key to enter the submenu.

When the cursor moves below the downward key, press the downward key to return to the upper level menu.

3.2 Function selection screen and parameter settings

3. 2. 1 **Parameter Settings**

Press "confirm key" to enter password input, "00000" displays, input corresponding password and move the cursor below the "enter key", press "enter key", "parameter settings" displays, then press “confirm key” to move the cursor below "enter key", press "enter key" to enter the main menu, and set the parameters.

Notes：The center of the Screen is P:XX，Touch screen，input：Left →Right→Left

The center of the Screen is R:XX，Hand operator，input：►Enter

Parameter No.	Function	Description
1	Parameter settings	Select this function to enter parameter settings
2	Total amount clearance	Select this function to perform the total meter clearance operation
3	Monthly heat record	Select this function to view 18-month forward direction accumulation and heat accumulation
4	Monty cold accumulation record	Select this function to view 18-month forward direction accumulation and cold accumulation
5	Error logging	Select this function to view 24 error records (error records during excitation or temperature alarm)

3. 2. 2 **Total amount clearance**

Press "confirm key", to enter password input, "00000" displays, enter the corresponding password and move the cursor below "enter key", press "enter key", "parameter setting" displays, then press "upward key" or "downward key" to turn the page to "total zero", enter the total amount clearance password (this password needs to be set by the user in the parameter menu "total zero password"), press "confirm key" to move the cursor below "enter key", press "enter key", When the total amount clearance password automatically becomes "00000", the zero clearance function is completed, and the total amount inside the meter is 0.

Note: "Total Amount Clearance Password" +1 can clear the cumulative value of the total amount of heat (cold) in the current mode;

"Total Amount Clearance Password" +2 can clear the accumulated working time;

"Total Amount Clearance Password" +3 can clear 24 months of monthly heat records;

"Total Amount Clearance Password" +4 can clear 24 months of cold monthly records;

"Total Amount Clearance Password" +5 can clear 24 months of error records;

"Total Amount Clearance Password" +6 can clear the residual accumulated amount of recorded monthly cumulative record in the current mode;

4. Meter picture

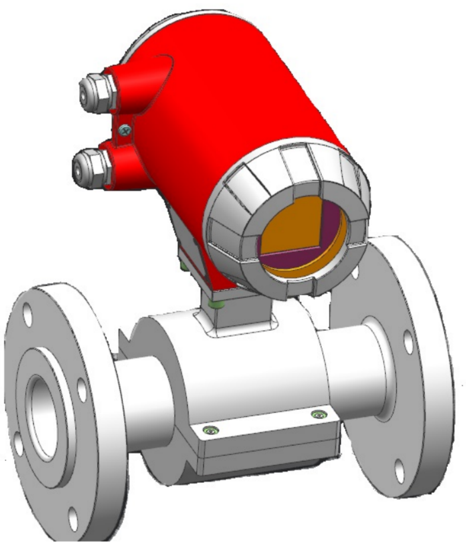


Fig. 4 Integrated thermal energy meter

5. Product features and indicators

5.1 Basic Functions

■ Low-frequency square wave excitation and high-frequency excitation for options: 3.12Hz, 4.16Hz, 6.25Hz, 12.5Hz;

■ Excitation current is 125mA (this current must be selected for high-frequency excitation), 187mA and 250mA;

■ Empty tube measurement function with no need of additional electrode, continuous measurement, fixed value alarm

■ Flow rate measurement range: 0.1 --- 15 m/s, flow rate resolution: 0.5 mm/s;

■ AC high-frequency switching power supply, applicable voltage range: 85VAC --- 250VAC;

■ DC 24V switching power supply, applicable voltage range: 20VDC --- 36VDC;

■ Network functions (optional): MODBUS, HART, MBUS;

■ Chinese and English display mode, (other languages can be customized);

■ Two internal totalizers for recording forward direction total and total heat separately.

5.2 Special Features

■ Infrared reading corresponding parameters of converter through the adapter.

5.3 Normal working conditions

Ambient temperature: split type –10~+60°C;

Relative humidity: 5%~90%;

Power supply: single-phase AC 85~250V, 45~63Hz;

Dissipated power: less than 20W (after connecting the sensor).

5.4 Connection type with sensor

- The square housing is split type: wall-mounted square housing. The converter is connected with the sensor cable;

5.5 Sensor matching requirements

Sensor signal sensitivity: at a flow rate of 1 m/s, the sensor output is 150μV ~ 200μV;

For electromagnetic flowmeter converter, 125 mA, 187mA and 250mA are used in the excitation circuit, which can adapt to the excitation coil resistance of 50Ω~110Ω sensors;

User can select different excitation currents by changing the resistance of the precision resistor of the excitation part. If 250mA is required, user should change to a 5Ω precision resistance. If 187mA is required, user should change to a 6.8 Ω precision resistance. If 125mA is required, user should change to a 10Ω precision resistance.

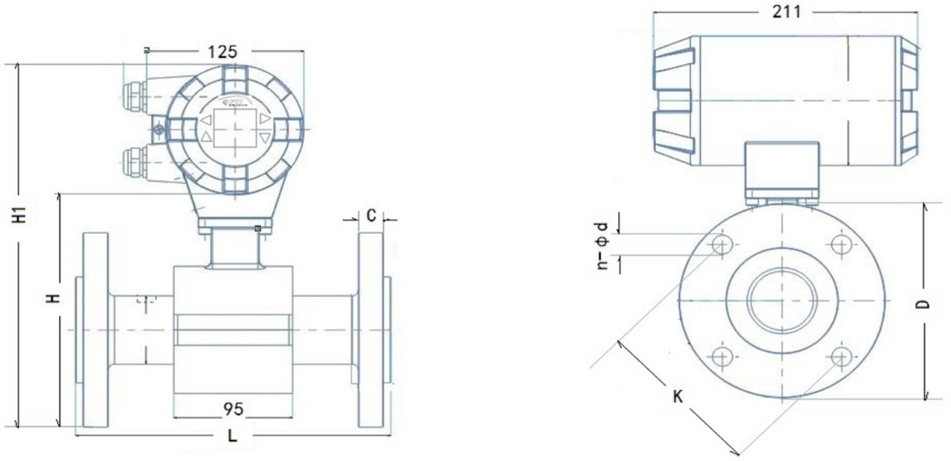
Sensor excitation coil resistance:

250mA excitation current: 50 ~ 60Ω;
187mA excitation current: 60 ~ 80Ω;
125mA excitation current: 100 ~ 110Ω;

5.6Installation and dimension drawing

Installation and dimension drawing

Integrated type



DN	L (mm)	H	H1	H2	D	K	n-Φd	C	压力（Mpa）	重量(kg)
10	160	120	260	202	90	60	4-Φ14	14	4.0	5.2
15	160	125	265	207	95	65	4-Φ14	14		5.5
20	160	135	275	217	105	75	4-Φ14	16		5.8
25	160	145	285	227	115	85	4-Φ14	16		6.2
32	160	165	305	247	140	100	4-Φ18	18		7.2
40	200	175	315	257	150	110	4-Φ18	18		8.3
50	200	190	330	272	165	125	4-Φ18	20		10
65	200	210	350	292	185	145	4-Φ18	20	1.6	10.5
80	200	225	365	307	200	160	8-Φ18	20		11.4
100	250	252	392	334	235	180	8-Φ18	22		14.5
125	250	275	415	357	250	210	8-Φ18	22		17.5
150	300	310	450	392	285	240	8-Φ22	24		23
200	350	362	502	444	340	295	12-Φ22	26		32
250	400	420	560	502	395	350	12-Φ22	26	1.0	44
300	500	470	610	552	445	400	12-Φ22	28		56
350	500	525	665	607	500	460	16-Φ22	30		71
400	600	590	730	672	565	515	16-Φ26	32		94
450	600	635	775	717	615	565	20-Φ26	35		106
500	600	690	830	772	670	620	20-Φ26	38		129
600	600	717	937	879	780	725	20-Φ30	42		203
700	700	912	962	994	895	840	24-Φ30	30		320
800	800	995	1045	1077	1010	950	24-Φ34	32		450
900	900	1125	1175	1207	1110	1050	28-Φ34	34		580
1000	1000	1135	1185	1217	1220	1160	28-Φ36	34		700
1200	1200	1417	1467	1499	1405	1340	32-Φ33	60	0.6	900
1400	1400	1640	1690	1722	1630	1560	36-Φ36	68		1150
1600	1600	1840	1890	1922	1830	1760	40-Φ36	76		1450
1800	1800	2055	2105	2137	2045	1970	44-Φ39	84		1780

Figure 5.6 Dimension drawing

5.7 Measurement accuracy of the whole machine

Diameter (mm)	Range (m/s)	Accuracy
3～20	＜0.3	±0.25%FS
	0.3～1	±1.0%R
	1～15	±0.5%R
25～600	0.1～0.3	±0.2５%FS
	0.3～1	±0.5%R
	1～15	±0.3%R
700～3000	0.3以下	±0.25%FS
	0.3～1	±1.0%R
	1～15	±0.5%R
%FS: relative range; %R: Relative measurement		

5.8 Analog current output

Load resistance: 0~750Ω.

Basic error: 0.1% ±10μA.

5.9 Digital frequency output

Frequency output range: 1~5000Hz;

Output galvanic isolation: optoelectronic isolation. Isolation voltage: > 1000VDC;

Frequency output drive: FET output,

Maximum withstand voltage: 36VDC,

Maximum load current: 250mA.

5.10 Digital pulse output

Output pulse equivalent: 0.001~59.999 m3 /cp,

Output pulse width: 1~9999ms adjustable;

Output galvanic isolation: photoelectric isolation, isolation voltage: > 1000VDC;

Pulse output drive: FET output,

Maximum withstand voltage: 36VDC,

Maximum load current: 250mA.

5.11 Digital communication interface and communication protocol

MODBUS interface: RTU format, physical interface RS-485, galvanic isolation 1000V;

HART interface: supporting standard HART protocol, display measured values online and modify parameters by using handset operator.

5.12 Galvanic isolation

The insulation voltage between the analog input and the analog output is not less than 500V;

The insulation voltage between the analog input and the alarm power supply is not less than 500V;

The insulation voltage between the analog input and the AC power supply is not less than 500V;

The insulation voltage between the analog output and the AC power supply is not less than 500V;

The insulation voltage between the analog output and the ground is not less than 500V;

The insulation voltage between the pulse output and the AC power supply is not less than 500V;

The insulation voltage between the pulse output and the ground is not less than 500V;

The insulation voltage between the alarm output and the AC power supply is not less than 500V;

The insulation voltage between alarm output and the ground is not less than 500V.

5.13 Digital output and calculation

Digital output refers to frequency output and pulse output. The frequency output and the pulse output share the same output point on the wiring, so the user can select either frequency output or pulse output

5. 13. 1 **Frequency output:**

The frequency output range is 0~5000HZ, and the frequency output corresponds to the flow percentage.

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

The upper limit of the frequency output can be adjusted. The user can choose from 0~5000HZ, and can also choose a lower frequency, such as 0~1000HZ or 0~5000HZ. The frequency output method is generally used for control applications, because it reflects the percentage flow. While if it is used for metering applications, pulse output method should be selected.

5. 13. 2 **Pulse output mode:**

The pulse output mode is mainly used for metering mode. When outputting a pulse, it represents an equivalent fluid flowing through the tube, for instance, a pulse representing 1L or representing 1m3.

The pulse equivalent can be set to: 0.001L~59.999 m3. When selecting the pulse equivalent, the user should note that the flow range must match the pulse equivalent. For the volume flow, the calculation formula is as follows:

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

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

D-Pipe Diameter (mm)

V-Flow Rate (m/s)

If the pipeline flow rate is too large and the pulse equivalent is selected too small, the pulse output will exceed the upper limit, so the pulse output frequency should be limited to less than 500Hz (when the pulse width is 1ms). When the pipeline flow is small and the pulse equivalent selection is too large, it would take a long time to output a pulse. Please refer to the "Pulse Width – Corresponding Maximum Output Pulse Number Table" for details.

In addition, it must be noted that the pulse output is different from frequency output. A pulse is output when a pulse equivalent is accumulated, and the pulse output is not very uniform. Generally, user should choose a counter instrument instead of a frequency meter for measuring pulse output.

5. 13. 3 **Wiring of digital outputs**

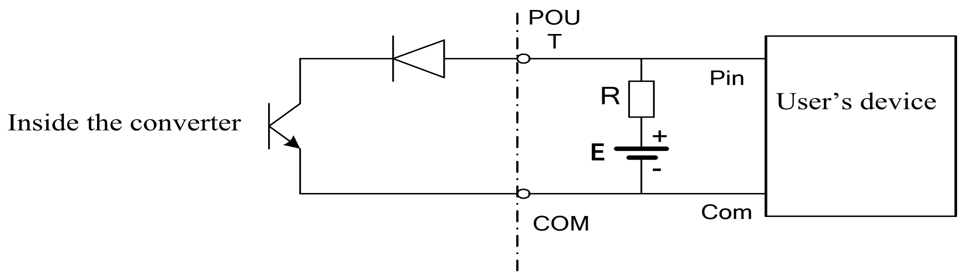
The digital output has two contacts: the digital output contact and the digital ground contact. Symbols are as follows:

POUT ———— digital output contact;

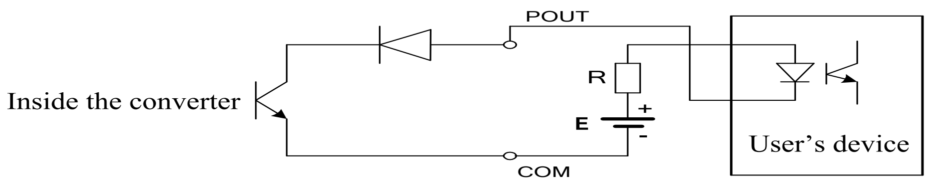
COM ———— digital ground contact;

POUT is an open-collector output. User can refer to the following circuit when wiring:

5. 13. 4 **Digital level output connection**

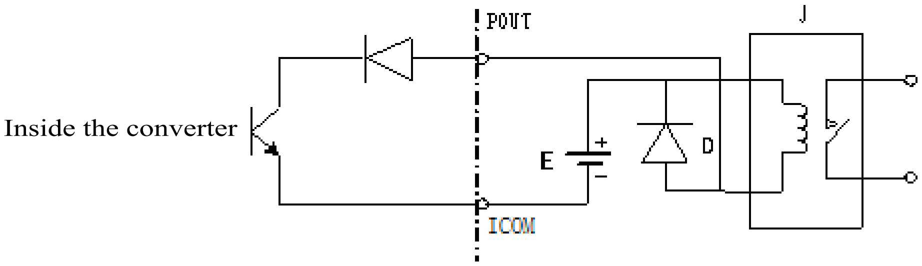


5. 13. 5 **Digital output connected to photoelectric coupler (for instance PLC, etc.)**



Generally, it requires a current of about 10mA for the photoelectric coupler, so E/R = about 10mA. E=5~24V.

5. 13. 6 **Digital output connected to relay**



Generally, intermediate relays require 12V or 24V. D is a freewheeling diode. Currently most intermediate relays have a diode. In case the intermediate relay itself does not contain a diode, user should connect one externally.

The table of digital output parameters is as follows:

POUT parameters

Parameters	Test conditions	Minimum value	Typical value	Maximum value	Unit
Operating voltage	IC=100 mA	5	24	36	V
Operating current	Vol≤1.4V	0	300	350	mA
Operating frequency	IC=100mA Vcc=24V	0	5000	7500	HZ
High electrical level	IC=100mA	Vcc	Vcc	Vcc	V
Low electrical level	IC=100mA	0.9	1.0	1.4	V

5.14 Analog output and calculation

5. 14. 1 Analog output

Analog output refers to a 4~20mA signal system.

The internal power supply of analog current output is 24V and can drive a load resistance of 750Ω.

The analog current output corresponds to the percentage flow rate, i.e.:

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

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

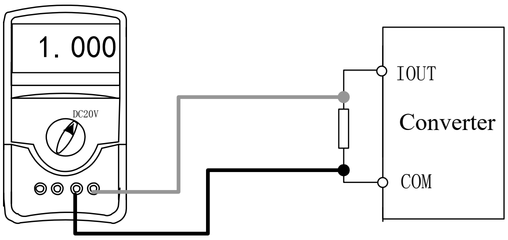
Therefore, in order to improve the resolution of the output analog current, user should properly select the range of the flowmeter.

The manufacturer has calibrated the parameters of the analog output before the meter leaves the factory. In general, the user requires no further adjustments. If there is an abnormal situation, when the user needs to calibrate the analog output, the following operating procedures can be followed.

5. 14. 2 Analog output adjustment

(1) Instrument adjustment preparation

Turn on the meter and let it run for 15 minutes to be stable. Prepare a 0.1% class ammeter, or a 250Ω resistor and a 0.1% voltmeter. Have them connected as shown below.



(2) Current "0" point correction:

Enter “parameter setting”, select "current zero point correction", shift the standard signal source to "0", adjust the correction coefficient; the ammeter will indicate 4mA (± 0.004mA).

(3) Current full-range correction

Enter " Current full-range correction ", shift the standard signal source to the full-range, adjust the correction coefficient; the ammeter will indicate 4mA (± 0.004mA).

After adjusting the "0" point of the current and the full-range value, the converter will be accurate in current function. The linearity of current output is within 0.1%.

(4) Current linearity check:

Shift the standard signal source to 75%, 50% and 25% in turn, and check the linearity of the output current.

※Note: After the electromagnetic flowmeter converter and sensor are connected to the fluid pipeline (whether for calibration or use), the following should be done first:

- Connect the pipes at both ends of the sensor firmly with copper wires.
- Ground the sensor properly.
- Ensure the fluid in the pipeline is stationary when adjusting the zero point.
- Ensure stable formation of the sensor electrode oxide film (48 hours of continuous contact between the electrode and the fluid).

6. Alarm information

The printed circuit board of the electromagnetic flow converter is made by surface soldering technology, which is not maintainable for the user. Therefore, the user should not open the housing of the converter.

The intelligent converter can be self-diagnostic. Except for power supply and hardware circuit failures, the converter can correctly give alarm information about failures in general application. The information is indicated on the left side of the screen as follows:

SYS ---- system excitation alarm；	MTP ---- Fluid empty tube alarm；
CUT ---- Small signal cut-off alarm；	REV ---- Reverse flow cut-off alarm；
HIG ---- Flow upper limit alarm；	LOW---- Flow lower limit alarm；
TAE ---- Inlet temperature Alarm；	TBE ---- Outlet temperature alarm

7. Troubleshooting

7.1 No display of the meter

* Check whether the power supply is on;

* Check whether the power fuse is intact;

* Check whether the power supply voltage meets the requirements;

7.2 Excitation alarm

* Whether the excitation wiring EXT+ and EXT- are open;

* Whether the total resistance of the sensor excitation coil is less than 150Ω;

* If both A and B are normal, the converter is faulty.

*Short-circuit the converter signal lines (white core wire, red core wire, shielded wire), if the "empty tube" prompt is withdrawn, the converter is normal. It may be that the conductivity of the measured fluid is low or the empty tube threshold and empty tube range are set incorrectly.

7.3 Empty tube alarm

* Check whether the fluid fills up the sensor measuring tube;

*Short-circuit the converter signal lines (white core wire, red core wire, shielded wire), if the "empty tube" prompt is withdrawn, the converter is normal. It may be that the conductivity of the measured fluid is low or the empty tube threshold and empty tube range are set incorrectly.

* Check whether the signal connection is correct;

* Check whether the sensor electrodes are normal:

Set the flow rate to be zero, the conductivity ratio should be less than 100%;

When there is flow, the resistance of the white core wire or the red core to the shielded wire should be less than 50kΩ respectively (If the measured medium is water, it is best to measure with a pointer multi-meter, and there should be charge and discharge during the measuring).

7.4 Inaccurate flow measurement

* Check whether the fluid fills up the sensor measuring tube;

* Check whether the signal cable connection is normal;

* Check whether the sensor coefficient and sensor zero point are set according to the sensor label or factory verification sheet;

8. Packing and storage

8.1Packing

The electromagnetic converter is vacuum packed and is moisture-proof. The vacuum package bag is a special sealing bag. If the vacuum sealing bag is opened, then the converter inside is not the original product.

Documents packed with converter include: an installation and instruction manual, a product certificate and a packing list.

8.2 Transportation and storage

In order to prevent damage to the meter during transportation, please keep the packaging in the condition of shipment from the manufacturer before arriving at the installation site. The storage site should be rainproof and moisture-proof, with small mechanical vibration and no impact. Make sure the temperature range is -20~+60°C and the humidity is not more than 80%.

Appendix 1 Excitation Frequency Selection (Reference)

Ordinary excitation converter provides three excitation frequency options: 3.125Hz, 4.167Hz and 6.25Hz. The default setting is 6.25Hz.

The high-frequency excitation converter offers only one excitation frequency, which is 12.5Hz. To select the excitation frequency of ordinary excitation converter, user can refer to the following rules: the inductance of the sensor excitation system with a small diameter is small, and 6.25Hz should be selected. The large-diameter sensor excitation system has a large inductance, and the user can only choose between 3.12Hz and 4.16Hz. During operation, user should select a low excitation frequency first, and if the zero point of the flow rate is too high, then lower the excitation frequency in turn. Note: It must operate at the excitation frequency calibrated.

During matching of electromagnetic converter and the sensor, the sensor excitation coil resistance may not meet the requirements of the electromagnetic converter. At this time, user can do as follows based on specific situation:

（1） The excitation coil resistance is small

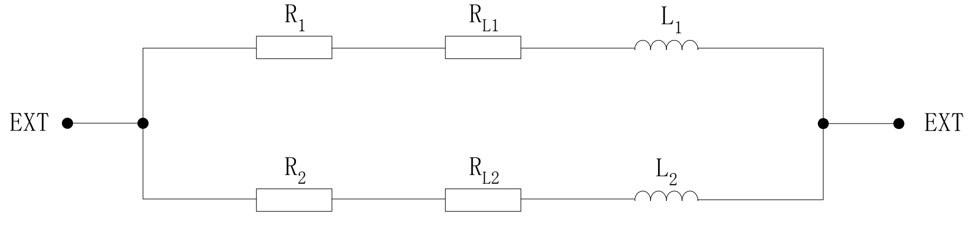
If the resistance of the excitation coil is less than the resistance required by the converter, it is feasible to connect series resistors in the excitation coil loop to make the total resistance meet the requirements of the converter. The power of the series resistors should be greater than twice the actual power consumption.

（2） The excitation coil resistance is large

If the excitation coil resistance is greater than the resistance required by the converter, it is feasible to change the coil connection method, for example, the total resistance of the excitation coil is 200Ω, then the resistance of each excitation coil is 100Ω, connect the upper and lower excitation coils in parallel to make the resistance of coils meet the requirements. If the resistance of parallel connection is too small, user can solve the problem by connecting resistors in series.

According to the above analysis, change the excitation coil wiring method of the sensor, measure from both ends of the excitation coil, so that the total resistance = (R1 + RL1) parallel (R2 + RL2) ≤ 120Ω;

(As shown in the figure: R1, R2 - applied resistance; RL1, RL2 - excitation coil resistance)



（3） The stability time of the sensor excitation current is too long (the inductance is too large)

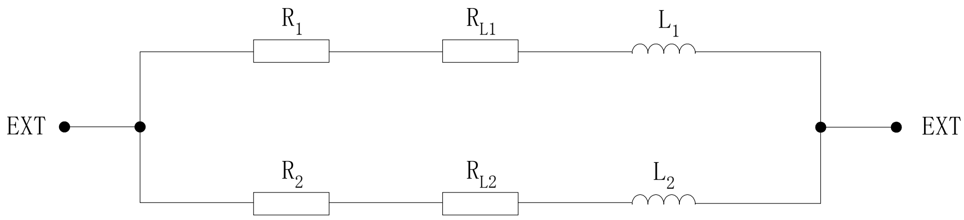
For the problem that the excitation current stability time is too long, first change the excitation mode, select 1/10 power frequency to 1/16 power frequency. If it does not solve the problem, then change coils connection method.

Excitation current crossing time $\tau = L/R$

L - excitation coil inductor; R – excitation coil resistance.

Therefore, either decreasing L or increasing R will decrease τ.

According to the above analysis, change the sensor excitation coil wiring method, as shown in the following figure:



R_1、R_2—— Applied resistance; ; R_{L1}、R_{L2}——Excitation coil resistance.

By connecting resistors R1 and R2 in series, the total resistance (R1 + RL1) is connected in parallel

(R2 + RL2) ≤ 120Ω;

Appendix 2 Nonlinear Correction Function Description

The electromagnetic converter has updated the nonlinear correction calculation method. The new calculation method is convenient to set with clear definition and accurate correction results.

Parameter definition:

Qpn --selecting the actual standard flow rate value at the correction point (correction point: Qp1--Qp5)

Qcn – Expected flow rate value at the point after correction (correction number: Qc1 -- Qc5)

The electromagnetic converter is designed with 5 flow rate correction points, 4 flow rate correction numbers, and the 5th flow rate correction point is also the 5th flow rate correction number. The corresponding relationship is as follows:

Flow rate correction point 1------ flow rate correction number 1

Flow rate correction point 2------ flow rate correction number 2

Flow rate correction point 3------ flow rate correction number 3

Flow rate correction point 4------ flow rate correction number 4

Flow rate correction point 5------ flow rate correction number 5

The user must follow the principle of setting the correction point from small flow rate to large flow rate:

Correction Point 5 〉 Correction Point 4 〉 Correction Point 3 〉 Correction Point 2〉 Correction Point 1〉 0.

Flow rate correction formula:

$$K = \frac{Q_{c1}}{Q_{p1}} + \frac{Q_X - Q_{P1}}{Q_{p2} - Q_{P1}} \times \left(\frac{Q_{c2}}{Q_{p2}} - \frac{Q_{c1}}{Q_{p1}} \right)$$

$$Qcx = K \times Qx$$

Qcx --Flow rate after correction

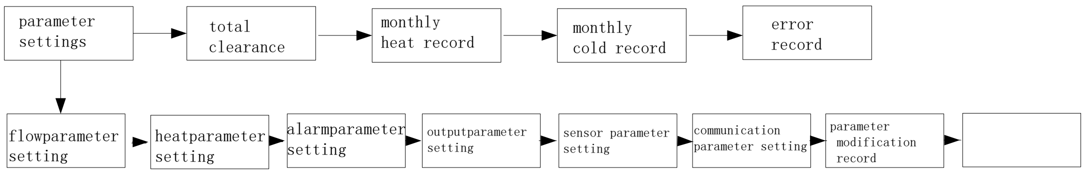
Qx -----Flow rate before correction

K-----Intermediate variable

Note: If the user only needs part of the correction points, the remaining correction points and the number of corrections can be set to the maximum point flow rate. Example: The user only needs to correct point 1 to correction point 3, then set according to

Correction point 4 = Correction number 4 = Correction point 5.

Appendix 3: List of meter menus



List of meter menus

No.	Parameter	Setting mode	Content	Pass-word level
	Flow parameter setting			
1	Flow accumulation unit	choose	0. 001m³ ~ 1m³	2
2	Reverse output permission	choose	Allow ，disallow	2
3	Meter range setting	input number	0 ~ 99999	2
4	Measurement damping time	choose	1 ~ 60S	2
5	Spike suppression range	input number	0% ~ 30%	3
6	Spike suppression time	input number	0s ~ 20s	3
5	Flow direction selection	choose	Forward direction, reverse direction	2
6	Small signal cut-off point	input number	Set by flow	2
7	Fluid density	input number	0 ~ 19.999T/m3	2
8	Flow zero correction	input number	0 ~ ±9999	2
9	Factory calibration coefficient	input number	0.0000 ~ 5.9999	5
10	Total clearance password	Changeable by user	0 ~ 99999	2
	Heat parameter setting			
1	Meter operation mode		Hot & cold mode, cold mode	2
2	Flowmeter location	choose	Flow inlet / Flow outlet	2
3	Heat flow unit	choose	MJh、GJh、KWh、MWh	2
4	Total heat unit	choose	0. 001MJ ~ 1MJ 、0. 001GJ ~ 1GJ、0. 001KW ~ 1KW	2

			、0. 001MW ~ 1MW	
5	Heat range setting	input number	0 ~ 99999	2
6	Starting measuring temperature	input number	0 ~ 199.9	2
7	Pressure range selection	choose	0.6MP/1.6MP	2
8	Inlet temperature zero point	input number	0 ~ 59999	5
9	Inlet temperature range	input number	0 ~ 5.9999	5
10	Outlet temperature zero point	input number	0 ~ 59999	5
11	Outlet temperature range	input number	0 ~ 5.9999	5
12	Heat test selection	input number	Allow， disallow	2
13	Inlet temperature setting	input number	0 ~ 199.9	5
14	Outlet temperature setting	input number	0 ~ 199.9	5
15	Test flow rate setting	input number	0 ~ 19.999	5
	Alarm parameter setting	**choose**		
1	Upper limit alarm permission	choose	Allow， disallow	2
2	Upper limit alarm parameter	input number	Set by flow	2
3	Lower limit alarm permission	choose	Allow， disallow	2
4	Lower limit alarm value	input number	Set by flow	2
5	Excitation alarm permission	choose	Allow， disallow	2
6	Empty tube alarm permission	choose	Allow， disallow	2
7	Empty tube alarm threshold value	input number	0 ~ 59999	2
8	Empty tube zero correction	input number	0 ~ 59999	5
9	Empty tube range correction	input number	0 ~ 5.9999	5

	Output parameter setting			
1	Pulse output mode	choose	Flow Frequency、Heat Frequency 、Pulse output	2
2	Pulse unit	choose	L、 m^3 、MJ、GJ、KWh、MWh	2
3	Pulse equivalent	input number	00. 001 ~ 59. 999	2
4	Pulse width	choose	1 ~ 9999ms	2
5	Upper limit of digital output	input number	1 ~ 5000 Hz	2
6	Current output mode	choose	Flow:4-20mA Heat:4-20mA	2
7	Current zero correction	input number	0. 0000 ~ 0. 9999	5
8	Current full correction	input number	0. 0000 ~ 0. 9999	5
9	Current output test	input number	0. 0000 ~ 0. 9999	2
	Sensor parameter setting			
1	Diameter of measured tube	choose	3 ~ 3000	2
2	Excitation frequency selection	choose	3. 125Hz ~ 12. 5Hz	4
3	Sensor parameter value	input number	0. 0000 ~ 5. 9999	4
4	Flow rate correction permission	choose	Allow， disallow	2
5	Flow rate correction point1	Set by user	Set by flow rate	4
6	Flow rate correction1	Set by user	Set by flow rate	4
7	Flow rate correction point2	Set by user	Set by flow rate	4
8	Flow rate correction2	Set by user	Set by flow rate	4
9	Flow rate correction point3	Set by user	Set by flow rate	4
10	Flow rate correction3	Set by user	Set by flow rate	4

11	Flow rate correction point4	Set by user	Set by flow rate	4
12	Flow rate correction4	Set by user	Set by flow rate	4
13	Flow rate correction point5	Set by user	Set by flow rate	4
14	Sensor serial number1	Set by user	Ex-factory year, month（0–99999）	4
15	Sensor serial number2	Set by user	Product serial number（0–99999）	4
	Communication parameter setting			
1	Meter communication mode	choose	MODBUS、HART、PROFIBUS	2
2	Meter communication address	input number	0～255	2
3	Meter communication speed	choose	300～38400	2
4	Meter validation mode	choose	8 bit no parity check, 8-bit odd parity check , 8-bit even parity check	2
	Parameter modification record			
1	Secret code1	Changeable by user	0～59999	5
2	Secret code2	Changeable by user	0～59999	5
3	Secret code3	Changeable by user	0～59999	5
4	Secret code4	Changeable by user	0～59999	5
5	Meter serial number1	Set by manufacturer	Ex-factory year, month（0–99999）	5
6	Meter serial number2	Set by manufacturer	Ex-factory year, month（0–99999）	5
7	Meter serial number3	Set by manufacturer	Ex-factory year, month（0–99999）	5
8	Total low in forward direction	Changeable by user	0～99999	5
9	Total high in forward direction	Changeable by user	0～999	5
10	Low total heat	Changeable by user	0～99999	5
11	High total heat	Changeable by user	0～999	5

12	Inlet temperature correction	Set by manufacturer	0. 0000 ~ 1. 9999	5
13	Outlet temperature correction	Set by manufacturer	0. 0000 ~ 1. 9999	5
	Time setting			
1	Month/Date/Year	Set by manufacturer	0 ~ 99	2
2	Hour/Minute/Second	Set by manufacturer	0 ~ 99	2

The meter parameters determine the operating status, calculation method, output mode and status of the meter. Correct selection and parameter settings allow the meter run in the best state and obtain high measurement display accuracy and measurement output accuracy.

The parameter settings include a 5-level password. Level 1~4 is the user password, and level 5 is set by the manufacturer. User can use the 5th level password to reset the 1~4th level password.

User can view the meter parameters with any level of password. However, if the user should use a different level of password if there is need to change the meter parameters.

Level 1 password (ex-factory set: 00522): only to view the parameters,

Level 2 password (ex-factory set: 03210),

Level 3 password (ex-factory set: 06108),

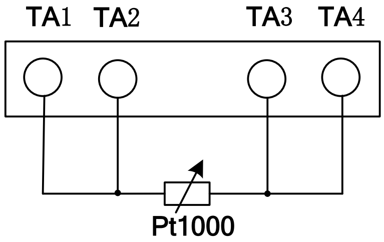
Level 4 password (ex-factory set: 07206),

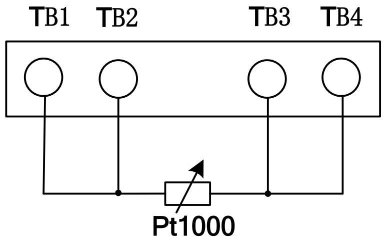
Level 5 password (fixed value):

Please refer to password level details in the above table.

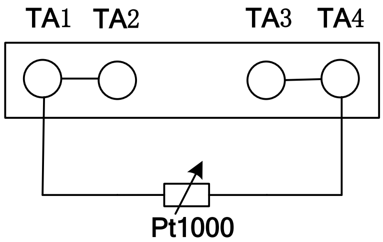
Appendix 4: Heat measurement, use and wiring methods

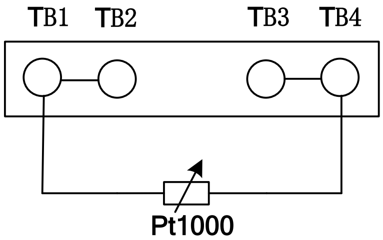
1.Temperature measurement calibration method:
The temperature measurement part of the hot & cold meter adopts a four-wire bridge connection with a Pt1000 thermal resistance by default, and the wiring is shown in the following figure:



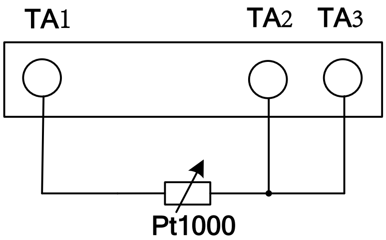


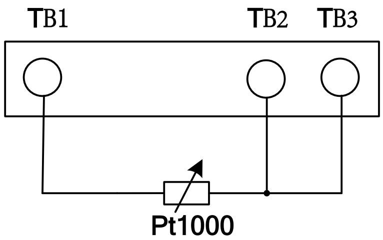
If the user needs to use a two-wire bridge connection with a Pt1000 thermal resistance, the wiring is shown in the following figure:





If the user needs to use a three-wire bridge connection with a Pt1000 thermal resistance, the wiring is shown in the following figure:





The thermal resistance measurement circuit needs to be "zero" calibrated in the parameter settings, and the converter has been calibrated with a resistance box before leaving the factory. If further calibration is required, the operation is as follows:

A. Use a resistance box (connected by a three-wire system)

Step 1: Adjust the standard resistance box to 1000 Ω, and adjust the zero correction value (generally about 34800) in the inlet (outlet) temperature zero parameter until the display shows 0.

Step 2: Adjust the standard resistance box to 1535.8 Ω, adjust the zero correction value (generally about 0.7500) in the inlet (outlet) temperature calibration parameter until the display shows 1400.

B. Use a blackbody furnace (connected by a three-wire system)

Step 1: immerse the thermal resistor in an ice water tank, and adjust the zero point correction value (generally 34800) in the temperature zero correction coefficient of the inlet (outlet) until the upper line displays ±0.

Step 2: Adjust the blackbody furnace to 140°C, and place the thermal resistor in the blackbody furnace, then adjust the correction coefficient in the inlet (outlet) range correction parameter until the upper line displays 1400.

2、Heat calculation method:

This electromagnetic hot & cold meter follows the urban construction industry standard CJ128-2007 of the People's Republic of China.

Heat measurement:

When water flows through an integrated heat meter or a combined heat meter installed in a heat exchange system, the meter can calculate and display the thermal energy released or absorbed by the system according to the flow given by the flow sensor, water supply and return signal given by the paired temperature sensor and the time of water flow. The calculation formula is as follows:

$$Q=\int_{\tau 0}^{\tau 1} q_m \times \Delta h \times d\tau = \int_{\tau 0}^{\tau 1} \rho \times q_v \times \Delta h \times d\tau$$

式中：

Q—the heat released or absorbed by the system (in J);

qm—the mass flow rate of water flowing through the heat meter(in kg/h); qv—the volumetric flow rate of water flowing through the heat meter (in m3/h);

ρ—the density of water flowing through the heat meter,(in kg/m3);

Δh—the difference in enthalpy of water at the inlet and outlet temperatures of the heat exchange system, (in J/kg);

τ—Time(in h).

The density and enthalpy value in the formula should comply with the provisions in Annex A of the CJ128-2007 standard. When the temperature is non-integer, interpolation correction should be performed.

Note: The heat measurement is calculated by multiplying the hot melt values of the inlet and outlet by the flow rate, so the calculated value is related to the second increment of the cumulative flow. That is, the heat flow is calculated for each increment generated by the cumulative flow. Therefore the units of the cumulative flow should not be adjusted too large, which would make it too long to produce a cumulative flow increment. The cumulative flow rate is a 9-digital decimal number (which is 999999999). There are 4 optional flow units: 0.001 m3, 0.01m3, 0.1 m3 and 1 m3. The flow unit selection should meet 2-3 years without overflow.

FTI Inc.
1013 Centre Road, Suite 403S
Wilmington, DE 19805 USA
Tel: +1 302 300 1919
Fax: +1 302 300 1619
Mail: sales@ftisensors.com
www.ftisensors.com