Electrometric Flowmeter Heat Meter and Cold Meter

User Manual

Standard:

JB/T9248-1999ElectrometricFlowmeter
CJ128-2007 Heat Meter

Content

1 Wiring

1.1 Signal and Exciting Line

1.1.1 Signal Line Dispose

When meter works with sensors and conductivity of measuring flow is larger than 50μS/cm, under this circumstance, PVVPB 2*0.12*280mm2 model cable (metal shielded signal line covered with PVC) can be used as communication cable for flow signals. The length of signal cable should be less than 100m. Signal lines have to be connected to sensors that were assembled by producers. The meter can output equivalent level of exciting shielded signal voltage so that interference on flow measurement signals can reduced by means of decreasing the distributed capacitance of communication cable. When conductivity of measuring flow is less than 50μS/cm or signals are transferred in remote distances, under this circumstance, double-conductor and double-shielded signal line at equivalent level of voltage can be used. For example, special STT3200 cable or BTS model signal cable (triple-shielded) can be used for signal communication.

1.1.2 Exciting Current Cable

Two conductor and insulating rubber- covered cables can be used as exciting current lines. Suggested model is RVVP 2*0.12*250mm^2.Length of exciting current line should be equal to the length of signal cable.
When the model STT3200 cables are used for exciting current, exciting current line and signal line can be put together as one line.

1.2 Meter Terminal Wiring

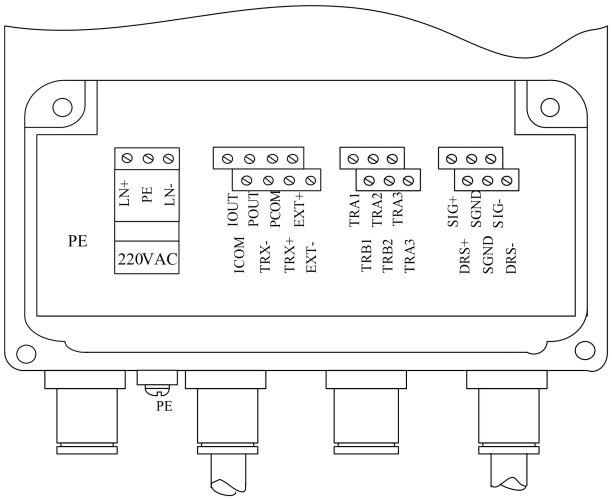


Fig.1.1 Terminal Drawing

Symbols and Description of Terminals:

Table 1.1

TRA1	Entry Temperature Input	TRA2	Entry Temperature Input
TRA3	Entry Temperature Input	TRB1	Outlet Temperature Input
TRB2	Outlet Temperature Input	TRB3	Outlet Temperature Input
SIG +	Signal 1	SGND	Signal Ground
SIG-	Signal 2	DRS +	Exciting Shielding 1
DRS-	Exciting Shielding 2	MTDR	Reserve
EXT +	Exciting Current +	EXT-	Exciting Current-
POUT	Frequency Output +	PCOM	Frequency Output Ground
IOUT	Current Output +	ICOM	Current Output Ground
TRX-	Communication Interface	TRX+	Communication Interface
LN-	220V (24V) Power Supply Input	LN+	220V (24V) Power Supply Input

1.3 Output and Power Supply Lines

All lines for signals transferring and power supply should be prepared by users. Take note that the lines should meet Load current requirement.

1.3.1 Frequency and Pulse Output Line

The figures below show frequency and pulse output connection with power supply and load. Diode should be added when using inductive load.

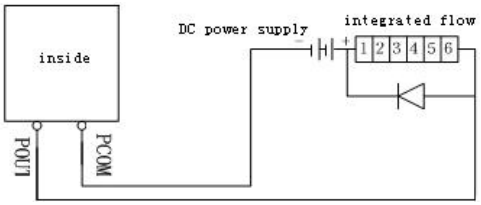


Fig.1.2 External power supply connecting with electronic counter

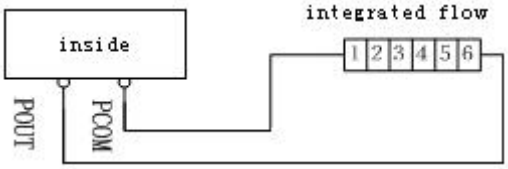


Fig.1.3 Internal power supply connecting with electronic counter

1.3.2 Current Output Wiring

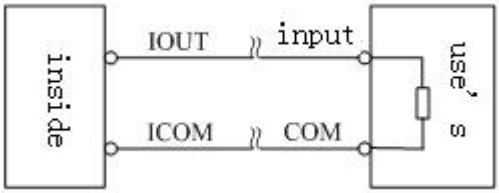


Fig.1.4 Current Output

1.3.3 OC Door Connection

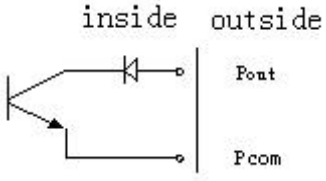


Fig1.5 OC Door Connection

1.3.4 Ground Line Connection

The ground terminal of heat meter shell should use larger than 1.6 mm^2 copper ground line. Contact resistance should be less than 1Ω.

2. Meter Parameters

2.1 Flow Parameters

2.1.1 Working Mode

SUP-LDGR Series have three working modes: Heat Meter working mode, Cold

Meter working mode and Heat & Cold Meter working mode.
Heat Meter working mode: default mode, measure on heat. “H” stands for heat.
Cold Meter working mode: measure on cold. “R” stands for cold.
Heat & Cold Meter working mode: measure on both heat and cold. Measuring results display separately.

2.1.2 Measuring Pipe Size

Cold and Heat meter sensor pipe size scope of SUP-LDGR Series is 10-2000mm.
10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1200，1400，1600,1800 and 2000.

2.1.3 Flow Unit

Flow units included m^3/h.

2.1.4 Heat Unit and Cold Unit

Displayed heat unit includes MJ/h、GJ/h、KWh/h、MWh/h

2.1.5 Measured Damping Time

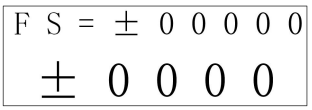
Measured damping time means filter time. Long measured damping time can enhance the stability of flow display and output signal and be applied for gross add up of pulse flow. Short measured damping time means quick respond to measurement and be applied in production control. Measured damping time setting is by choosing.

2.1.6 Flow Direction Choosing

When doing debugging, if the flow direction is not consistent, users don’t need to change connection of exciting and signals lines, just to reset the flow direction parameter.

2.1.7 Flow Zero-point Correction

Make sure the senior is full and the fluid is in stationary state when doing the flow zero-point correction. Flow zero-point is shown as velocity of flow, unit is mm/s. Zero-point correction displayed as below:



Upper small characters: FS means measured zero-point;
Lower large characters: corrected flow zero-point.
When FS display is not “0”, do correction to make FS display “0”. Note: if correct lower line character and FS increases, change the “+, -” in lower line to make sure FS display to be zero.

The corrected flow zero-point is the compound value of sensor, and should be recorded in sensor list and label. The unit is mm/s, and the sign is in opposite with corrected value.

2.1.8 Small Signal Elimination Point

Small signal elimination point setting is showed by flow. When small signal is eliminate, only the velocity of flow, elimination flow, percent display and signal output are displayed.

2.1.9 Temperature Gaps Signal Elimination

When the temperature gaps of the flow entry temperature and flow outlet temperature is less than the setting temperature, the meter will not calculate.

2.1.10 Flow Integrating Unit

9 bit calculator is applied and the upper limit is 999999999.
Unit is m^3 and flow equivalent is 0.001m^3, 0.010m^3, 0.100m^3, 1.000m^3.

2.1.11 Heat and Cold Integrating Unit

9 bit calculator is applied to Heat Meter and the upper limit is 999999999.
Heat integrating unit is MJ、GJ、KWh、MWh.

Heat Equivalent：0.001MJ、 0.010MJ、 0.100MJ、 1.000MJ
0.001GJ、 0.010GJ、 0.100GJ、 1.000GJ
0.001 KWh、 0.010 KWh、 0.100 KWh、 1.000 KWh
0.001 MWh、 0.010 MWh、 0.100 MWh、 1.000MWh

Note: Cold integrating has direction display and one bit less than heat integrating.

2.1.12 Reverse Measurement Forbidden

SUP-LDGR Series Heat Meter and Cold Meter has the function of reverse measurement forbidden. If the function is applied as “Forbidden”, no output for heat and cold measurement and only flow velocity is able to display. If the function is applied as “Allowed”, all other functions work as intended. As default, if the flow is reverse, heat and cold integrating will not be measured.

2.2 Output Parameters

2.2.1 Current Output Mode

There are five current output modes: flow output, heat output, cold output, heat & cold output and flow direction output.
Flow output: current is output as instant flow percent, the percent means the flow percent.
Heat output: current is output as instant heat percent, the percent means the heat

percent.
Cold output: current is output as instant cold percent, the percent means the cold percent.
Heat & cold status output: current is output as instant heat or cold status. When in heat status, current output is 20mA. When in cold status, current output is 4mA.
Flow direction output: current is output as the flow direction. When the direction is reverse, the current is 20mA. When in the positive direction, the current is 4mA.

2.2.2 Range setting of flow, heat and cold

Meter range setting is to set the flow upper limit, and the lower limit is set to “0” automatically.
The meter range setting decides the range of the meter, and also decides the meter percent display, meter current and correspondence between frequency output and flow, heat and cold.
Meter percent display value = (measured flow value / meter range) * 100%
Meter current output value = (measured flow value / meter range) * 20mA + 4mA
Meter frequency output value = (measured flow value / meter range) * frequency full range

2.2.3 Impulse mode

There are sixteen impulse modes: flow impulse Ltr, flow impulse m3, heat impulse MJ, GJ, KWh, MWh, cold output MJ,GJ, KWh, MWh,, cold & heat output MJ,GJ, KWh, MWh, old & heat status and flow direction output.
Frequency output mode: frequency output is continuous square wave, and frequency value corresponds with the percentage of flow. Detailed, refer to 2.4.
Impulse output mode: pulse output is a rectangular wave pulse train, and each pulse represents there is a flow equivalent in the pipe. The impulse equivalent is set by “impulse output type” parameter and “output impulse coefficient” parameter. Impulse output mode can be used in gross accumulation and generally, connected to the integrating meter.
Cold & heat status output: when impulse output stands for the cold & heat status, heat is low level and cold is high level.
Flow direction output: when impulse output stands for flow direction, forward is low level, and the reverse is high level.

2.2.4 Upper limit of frequency output

The meter output frequency corresponds to the flow percent output (do not corresponds to heat and cold), the range can be chosen for 1~5000. The formula is as below:
Meter frequency output = (measured flow value/ flow range) * frequency full range

2.2.5 Output impulse coefficient

Impulse coefficient is impulse equivalent, the range is 0.001~59.999. The unit is the same with the chosen impulse output type unit, and is used to measure impulse output.

2.2.6 Width of output impulse

Output impulse is effective when the output is low level, the impulse width is 0.3~499.9ms.

Impulse width and maximum output pulse number correspondence table

Table 2.1

No.	Impulse width (ms)	Maximum output pulse number 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

2.3 Sensor Parameter

2.3.1 Sensor Coefficient

Sensor coefficient is the calibration coefficient of the flow meter which is obtained by the factory and sealed to the sensor label. The coefficient should be set in SUP-LDGR parameter list.

2.3.2 Excitation Mode Choosing

There are two excitation modes: frequency 1/10 (mode 1) and frequency 1/12 (mode 2). Mode 1 is usually applied to small caliber and mode 2 is applied to big caliber. Select mode 1 first and if the meter velocity zero-point is too high, then select mode 2.

※Note: the chosen excitation mode should be determined by excitation calibration mode.

2.3.3 Sensor Code 1 and 2

Sensor code is used by the manufacturer to record the sensor.

2.3.4 Installation Place of Meter

If the sensor is installed in pipe entrance, choose “inlet”; if the sensor is installed in

pipe outlet, choose “export”, otherwise, there will be an error.

2.4 Temperature Parameter

2.4.1Inital temperature of heat meter and cold meter

If the temperature is lower than the initial setting temperature, the meter will not calculate the heat or cold.

2.4.2 Working pressure choosing

0.6 MP or 1.6 MP can be chosen according to CJ128—2007.

2.4.3 Entrance and outlet temperature zero and temperature calibration

Pt1000 RTD three-wire bridge connection method is applied, and detailed calibration methods refer to Appendix 4.

2.5 Alarming Parameter

2.5.1 Empty Pipe Alarming Allowance

Empty pipe alarming is applied to SUP-LDGR and no additional pole is needed. If the function is chosen, if the liquid is less than the pole, the empty pipe can be detected. Then the analog output, digital output and flow display become zero.

2.5.2 Empty Pipe Alarming Threshold

When the liquid if full of the pipe, the empty pipe alarming function is applied. The upper line of the display shows the actual tested conductance, the lower line of the display shows the empty pipe alarming threshold. The empty pipe alarming threshold should be set based on tested conductance and 3-5 times of the tested conductance. The alarming, the “MT” is displayed.

2.5.3 Excitation Mode Alarming

The function is in effective when the parameter is set as “allowed” and when alarming, “SY” is displayed.

2.6 Linear Calibration Parameter

2.6.1 Allowance for Flow Calibration

The parameter is used to choose whether the nonlinear calibration is applied. “Allowance” means that calibration is applied, and “Forbidden” means that calibration is not applied.

2.6.2 Flow calibration point 1-4

Detailed, refer to Annex 2.

2.6.3 Flow calibration number 1-4

Detailed, refer to Annex 2.

2.7 Communication Parameter

2.7.1 Communication Address

The address range is from 01 to 99 and address 0 is reserved, when communication.

2.7.2 Communication Speed

Communication baud rate range is 300, 600, 1200, 2400, 4800, 9600, 19200 and 38400.

2.7.3 Communication Terminal Resistance

Fig.4.1 communication terminal resistance switch

Switch 1 or 2 means：

ON means RS485 communication terminal resistance (120Ω) is connected.

OFF means communication terminal resistance is not connected.

Note: communication terminal resistance is only used in long-way communication.

2.8 Time Parameter

The parameters are used to set the clocks (year, month, date, hour, minute and second) used in power-down timing function and monthly gross function.

2.9 Factory Calibration Parameter

2.9.1 Factory Calibration Coefficient

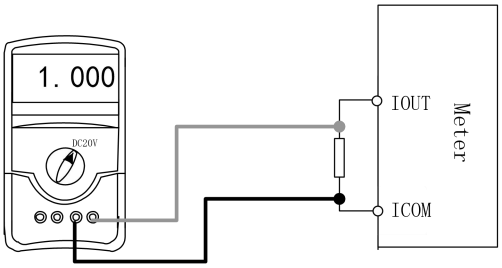
Factory calibration coefficient is the special coefficient of sensor-made-factory and the factory use this coefficient to unite SUP-LDGR electromagnetic flowmeter converters to make sure all the Meters can interchange by 0.1%.

2.9.2 Current zero point and full scale calibration

(1) Calibration reparation

Power on meter and run it for 15 minutes to make the meter heat stable. Prepare level 0.1% ammeter or 250Ω resistance and level 0.1% voltmeter and connect to

the meter as below:



(2) Current zero calibration:

Set converter to parameter setting state and choose “current zero calibration”. Turn the standard signal source to “0”, adjust calibration parameter and make sure the display on ammeter is 4mA (±0.004mA).

(3) Full scale current calibration

Choose “full scale current calibration” parameter and turn the standard signal source to full scale. Adjust convertor calibration parameter and make sure the display on ammeter is 20mA (±0.004mA).

When the current “0” and full scale is calibrated, the current function of convertor can meet the precision requirement. The linearity of the current output of convertor is within 0.1%.

2.9.3 Gross Zero Cleaning Password

The Password can be set in gross zero-point clearing function using level 2 password. Detailed, refer to 3.2.

2.9.4 Meter Code 1 and 2

Meter code is used to record the date when the meter leaves the factory and code.

2.9.5 Language

There are Chinese and English for users.

2.10 Integrating Gross Setting Parameter

2.10.1 Integrating Gross High/Low Level

High/low level setting can change the gross flow and is applied to meter maintenance and change. Users can use level 2 password to get in and change the value of total flow. The upper limit is 999999999.

2.10.2 Heat Gross High/Low Level

The setting method is the same with the setting of integrating gross high/low level. Note: 8 bit calculator is applied when KWh or MWh is chosen and upper limit is

99999999. If the upper limit is beyond, 99999999 is displayed.

3 Meter Display and Operation

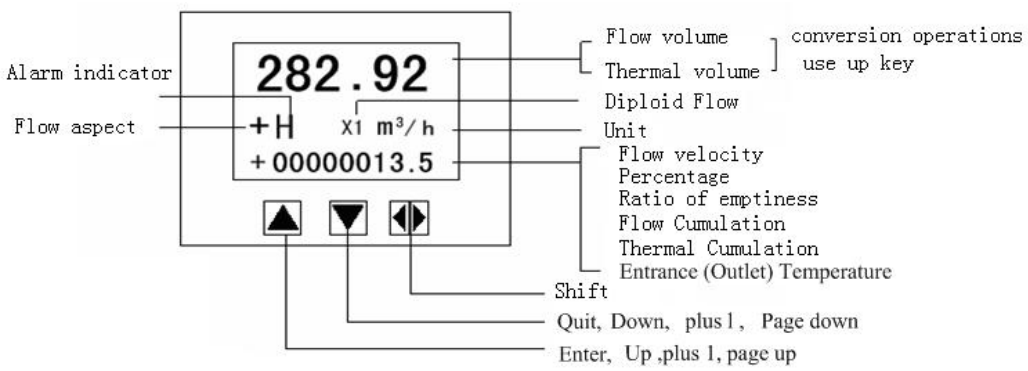


Fig. 3.1 Key and Liquid Crystal Display

When power on, the meter comes into test function to test all other functions and record the data automatically. Under the meter parameters setting mode, parameters can be set by the three keys.

3.1 Keyboard

a) Keyboard function under automatic testing function

Up: The instantaneous heat (cold) and flow transfer; Heat displays as “H” and cold displays as “R”.

Down: Circular selection screen display content in lower line; Heat accumulating displays as “H” and cold accumulating displays as “C”.

Shift: Press “Shift” key once, comes into function choosing display;

b) Keyboard function under parameter setting

Up: Subtract 1 from the number at cursor area, turn into the Front Page;

Down: Plus 1 from the number at cursor area, turn into the After Page;

Press “Shift” key to move the cursor to “Up” key, press “Up” key to the submenu;

Press “Shift” key to move the cursor to “Down” key, press “Down” key return to the father menu.

3.2 Parameter Setting and Functional Key Operation

If the meter parameter setting or changing is applied, come into the parameter setting function thought testing function. Press “Shift” key once and go into the parameter setting function, move the cursor above “Up” key. Press “Up” key to go into “00000” status and then type in password. Move the cursor above “Up” key to go into parameter setting function. The figure is as below:

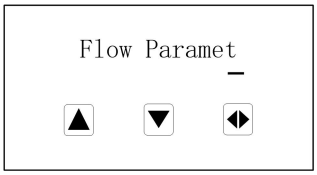


Fig. 3.2

If need to change the main menu, press “Up” key. If need to change the sub menu parameter, move the cursor below the “Up” key. The figure is as below:

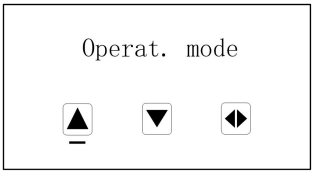


Fig. 3.3

If entered the sub menu, move the cursor below the “Up” key to set the parameters. According to the security level, the password can be changed accordingly. The function can be chosen by pressing “Shift” key.

There are 2 levels of passwords in meter design, level 1 user can set up passwords and level 2 password are fixed. The 2 passwords are of different security levels for different users.

3.3 Function Choosing Display

Press “Shift” key to go into function choosing and then, press “Enter” key. There are five functions for choosing:

Table 3.1

No.	Function	Remarks
1	Parameters Set	Parameter setting function is available by choosing this function
2	Clr total rec	Gross cleaning is available by choosing this function
3	Month total rec	32 months gross can be checked by choosing this function.
4	Power down rec	32 times power-down records can be checked by choosing this function.
5	Parameter changing record	Reserved

3.3.1 Parameter Setting

Press “Shift” key once and go into the parameter setting function and then, type in password. Press “Shift” key and move the cursor to “Enter” key to do parameter

setting.

3.3.2 Gross Cleaning

Press “Shift” key once and go into the parameter setting function and then, press “Up” key to “Gross Cleaning”, type in password. Press “Shift” key and move the cursor to “Enter” key, then press “Enter” key. When the password changes to “00000”, the gross cleaning is done and the gross in meter becomes 0.

3.3.3 Monthly Gross

The clock (powered by battery inside) in the meter can work more than five years continuously. If the Monthly Gross function or Power-down Timing function is applied, make sure that the clock in the meter can work as normal.
Adjust the clock year, month, day, hour, minute and second;
Make sure the battery inside works (change battery every five years).

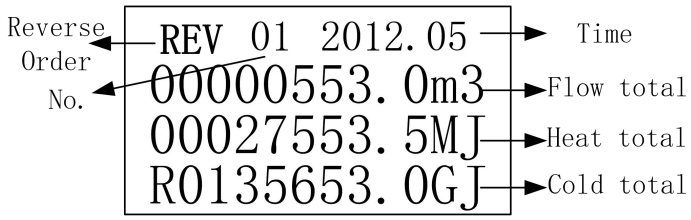


Fig. 3.4 Monthly Gross

Monthly gross can record 32 months data and when the time is longer than 32 months, the new record will cover the first month record.

3.3.4 Power-down Timing Display

32 times power-down records can be recorded and totally 9999 times of power-down records.

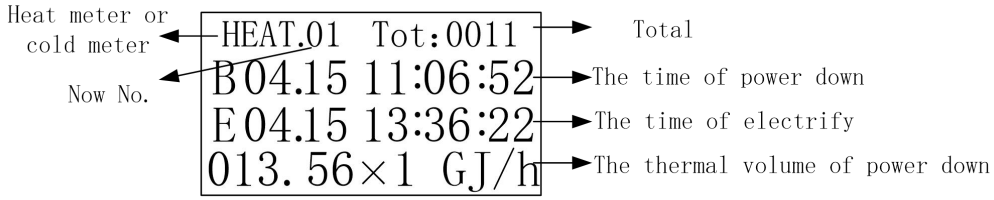


Fig. 3.5 Power-down Timing

4 Meter Performance and Index

4.1 Basic function

- Low frequency square wave excitation, excitation frequency: 1/10 Power frequency,1/12 Power frequency;
- Exciting Current: 125mA, 250 mA；
- Empty pipe measuring with no additional pole, continuously measuring, alarm by fixed value ;
- Flow velocity measuring range: 0.1 to15m/s, velocity resolution: 0.5mm/s；
- AC high-frequency switching power supply: 85VAC to 250VAC;
- 24V DC switching power supply: 20VDC to 36VDC;
- Network function: MODBUS(Standard), HART(Optional), GPRS(Optional), PROFIBUS(Optional);
- English and Chinese for choosing(Other language is optional);
- Two integrators insides to record flow and heat.

4.2 Normal Operating Conditions

Environmental Temperature: –10~+60℃；
Relative Humidity: 5%~90%；
Power Supply, Single-phase electric power: 85~250V, 45~63Hz；
Power Dissipation: less than 20W (with senior connected).

4.3 Sensors Connecting Type

Split squared shells: squared shells hang on the wall, converters connected with sensor cable.

4.4 Sensor Requirement

Sensitivity of sensor signal: under 1m/s, output 150μV~200μV;
For the meter, when using 125 mA current in excitation loop, 100Ω~110Ω resistance is applied. When using 250 mA current in excitation loop, 40Ω~60Ω resistance is applied.

4.5 Install Dimension Drawing and Meter Figure

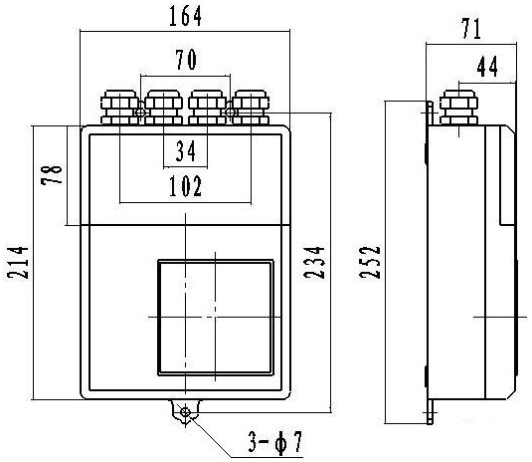


Fig. 4.1 Drawing of Split Squared Shells

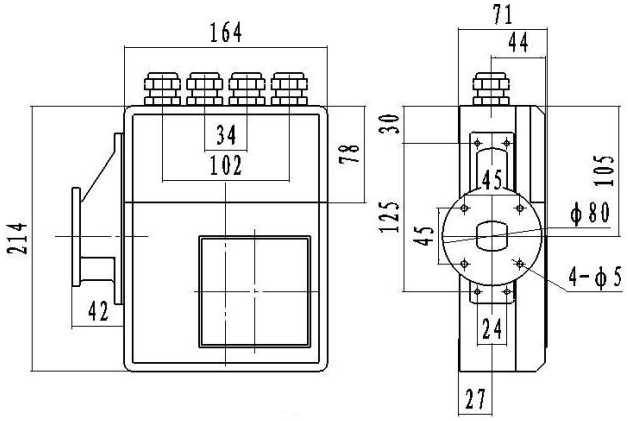


Fig. 4.2 Drawing of Split Squared Shells

Fig. 4.3 Meter image

4.6 Measurement Accuracy

Table 4.1 VS: Set Range (m/s)

Pipe	Range	Accuracy
3-20	Below 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	Below 0.3	±0.25%FS
	0.3-1	±1.0%R
	1-15	±0.5%R
%FS: relative range; %R: relative testing		

4.7 Digital Frequency Output

Frequency output range: 2000;
Output Electrical Isolation: photoelectric isolation; isolation voltage> 1000V DC;
Frequency output drive: FET output, Withstand voltage< 36VDC, Load current<250mA

4.8 Analog Current Output

Load resistance: 0-750Ω
Basic error: 0.1%±10μA

4.9 Digital Communication Interface and Communication Protocol

RS485 Interface: Modbus protocol, RTU format, registers address refer to Annex 5, Electrical isolation 1000V;

4.10 Electric Isolation

- Analog input and analog output isolation voltage should not be lower than 500V;
- Analog input and alarming power isolation voltage should not be lower than 500V;
- Analog input and AC power isolation voltage should not be lower than 500V;

- Analog output and AC power isolation voltage should not be lower than 500V;
- Analog output and earth isolation voltage should not be lower than 500V;
- Pulse output and AC power isolation voltage should not be lower than 500V;
- Pulse output and earth isolation voltage should not be lower than 500V;
- Alarming output and AC power isolation voltage should not be lower than 500V;
- Alarming output and earth isolation voltage should not be lower than 500V;

4.11 Digital/Analog output and calculating

4.11.1 Frequency Output

Frequency output range is 1-5000Hz and frequency output is usually used in control since it shows the flow percent, which is used to demarcate the meter.

Frequency output=(Measure value / Meter range) * Full scale vale

4.11.2 Digital output wiring

Digital output has two connectors: digital output connector and digital earth connector. The symbols are as below:
POUT - digital output connector;
PCOM - digital earth connector;
POUT is open-collector output; the wiring is as follows:

4.11.3 Digital Level Output Wiring

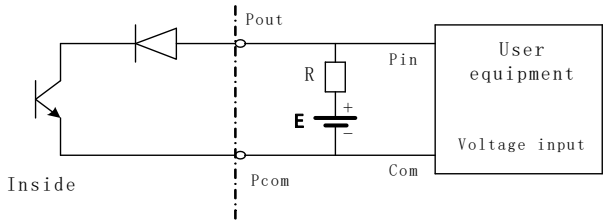


Fig.4.4

4.11.4 Digital Output is connected with Optocoupler (PLC etc.)

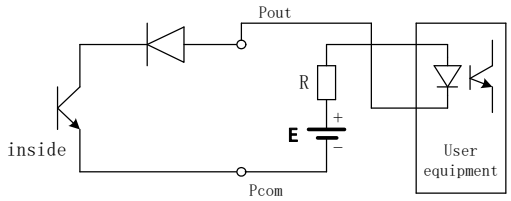


Fig.4.5

Generally, 10mA current is applied in optocoupler, E/R=10mA, E=5～24V.

4.11.5 Analog Output is connected with Relay

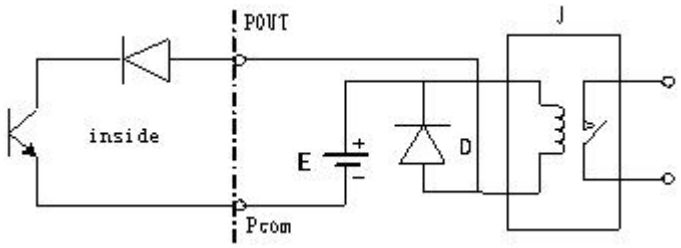


Fig.4.6

Generally, relay power supply is 12V or 24V.

D is free-wheeling diode and always exists inside middle relay. If the diode is not existed, the user should have one outside.

Digital output parameters are as follows:

Table 4.2 POUT Parameter

Parameter	Test Condition	Minimum	Typical Value	Maximum	Unit
Working Voltage	IC=100mA	5	24	36	V
Working Current	Vol≤1.4V	0	300	350	mA
Working Frequency	IC=100mA Vcc=24V	0	5000	7500	Hz
High level	IC=100mA	Vcc	Vcc	Vcc	V
Low Level	IC=100mA	0.9	1.0	1.4	V

4.11.6 Analog Output

Analog output means 4-20mA signal system.

Analog current output is powered by 24V supply and can drive 750Ω resistance.

Analog current output shows the flow percent:

$$I_0 = \frac{\text{Measure value}}{\text{Full scale value}} \bullet \text{the scale of current} + \text{the zero point of current}$$

When 4-20mA signal system is applied, current zero is 4mA.

In order to enhance analog current resolution, appropriate flow range should be chosen.

Generally, all analog output parameters are calibrated within the factory and no need to recalibrate by users. If error occurs, the calibration can be done according to the introduction of zero-current full range parameter setting.

※Remark: When SUP-LDGR heat meter and sensor are connected to the pipe, no matter to use it or do the calibration, the following steps should be taken first:

- Fix the pipe of front and rear of the sensor with copper wire to earth
- Connect the sensor to earth
- When doing the zero calibration, make sure the liquid in the pipe is in stillness

- Make sure sensor electrode oxidation film is generated stable(electrode and liquid continuously contact for 48 hours)

5 Error Dispositions

5.1 No Display

- Check whether the power is on
- Check whether the power fuse is in good condition
- Check whether the power voltage meets the requirement

5.2 Excitation Mode Alarming (SY)

- Check whether excitation wiring EX1and EX2 is open circuit
- Check whether the total sensor excitation coil resistance is less than 150Ω
- If the items above are in normal, then the meter is malfunctioned

5.3 Empty Pipe Alarming (MT)

- Check whether the fluid is full of the senior pipe
- Connect SIG1, SIG2 and SIGGND to short circuit, if the empty pipe alarming “T” disappeared, the meter is in normal condition; otherwise, the error may caused by low fluid conductance, wrong setting of empty pipe threshold or range.
- Check whether the signal wiring is correct
- Check whether the sensor pole is in normal condition

Make sure that flow is zero, and the displayed conductance ratio should be less than 100%

If there is liquid in pipe, the resistance between SIG, SIG2 and SIGGND should be less than 50kΩ. (If the medium is water, it is better to use pointer multimeter to do the test and there is charge and discharge during the testing.)

- The DC voltage between DS1and DS2 should be less than 1V, otherwise, it means the sensor pole is polluted and cleaning is needed.

5.4 Flow Inaccurate

- Check whether the liquid is full of sensor pipe
- Check whether the signal line is in normal condition
- Check the sensor parameter and zero-point is set by sensor label or factory calibration

6 SUP-LDGR Packing and Storage

6.1 SUP-LDGR Packing

SUP-LDGR packing is vacuum encapsulation and is moisture proof. Vacuum encapsulation is special used by SUP-LDGR and if the packing is broken, the meter is not original.

Documentations along with the meter include installation manual, product quality certificate and packing list.

6.2 Transportation and Storage

In case the meter is broken during the transportation, before installing the meter, keep the factory packing. The storage should meet the following conditions: rain proof, moisture proof, small mechanical libration, no impact; temperature: -20 - +60℃; humidity less than 80%.

Annex 1: Selection of Exciting Mode (re.)

SUP-LDGR affords two exciting frequency types, the small-caliber one should use 1/10 and large-caliber one should use 1/12. When using, please select 1/10 first, if the zero of velocity is too high, select the other one.

Note: Demarcate on which exciting type, working on it only.

When user's sensor connects to SUP-LDGR meter, the sensor exciting loop resistance is often not fit for the SUP-LDGR meter's requirement, at this time users can do like this:

(1) Small exciting loop resistance

If the exciting loop resistance is smaller than the meter's request, can series resistance to get the total value. The series resistance's power should be more than one time of fact, for example, series 10Ω on 250mA current, the power will be 3W.

(2) Large exciting loop resistance (change exciting current)

If the exciting loop resistance is larger than the sensor's request, can change the exciting current, for example, if exciting loop resistance is 70Ω, for 250mA this is larger, so can change the current to 187mA.

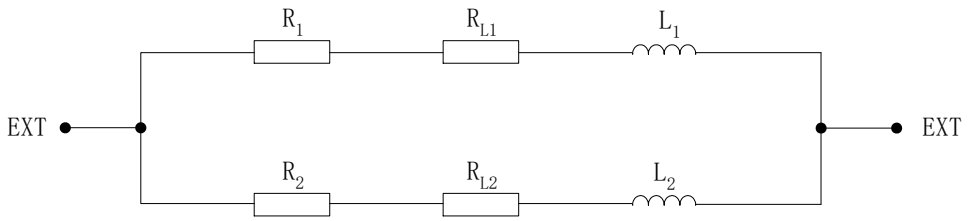
(3) Large exciting loop resistance (change loop connect)

If the exciting loop resistance is larger than the sensor's request, can change the connect of loop, for example, if exciting loop resistance is 200Ω, every exciting loop resistance is 100Ω, parallel connection the upper and lower loop is OK.

According the analysis, change the connect of exciting loop, measure from either head of exciting loop,

Total resistance = (R1 + RL1) parallel connection (R2 + RL2) ≤ 120Ω;

(As the Fig. R1, R2----addition resistances; RL1, RL2----exciting resistances)



Total resistance = (R1 + RL1) parallel connection (R2 + RL2) ≤ 120Ω;

(As the Fig. R1, R2----addition resistances; RL1, RL2----exciting resistances)

(4) Sensor exciting current steady time so long (inductance is too large)

For this question, firstly changing exciting type, select 1/16 or 1/25 frequency.

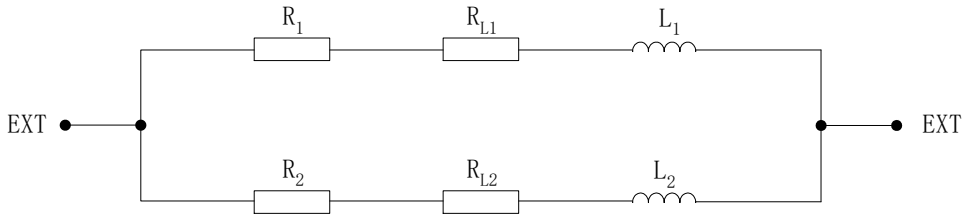
If cannot content, change connect of exciting loop.

Exciting current transition time τ = L / R

L ---- Exciting loop inductance; R ---- exciting loop resistance.

So decrease L and increase R both can decrease τ.

According the analysis, change the connect of exciting loop, measure from either head of exciting loop,



Total resistance = (R1 + RL1) parallel connection (R2 + RL2) ≤ 120Ω;
(As the Fig. R1, R2----addition resistances; RL1, RL2----exciting resistances)

Annex 2 Function of Nonlinear Calibration

Nonlinear calibration function is applied when the flow is below 0.5m/s. The function has 4 calibration phases, which contain 4 calibration points and 4 calibration parameters. The calibration point should meet the following requirements:
calibration point1> calibration point2> calibration point3> calibration point4>0
Calibration is done based on the sensor flow parameter curve. Sensor flow parameter should be obtained before doing the calibration, and then set the calibration parameter to do the calibration for different phase.
In the formats below, the Original Flow means the actual flow and the Calibration Flow means flow after calibration:

- If Calibration point 1> Original Flow ≥Calibration point 2;
  Calibration Flow = Calibration Parameter 1 ×Original Flow；
- If Calibration point 2 > Original Flow ≥Calibration point 3;
  Calibration Flow = Calibration Parameter 2 ×Original Flow；
- If Calibration point 3 > Original Flow ≥Calibration point 4;
  Calibration Flow = Calibration Parameter 3 ×Original Flow；
- If Calibration point 4 > Original Flow ≥0;
  Calibration Flow = Calibration Parameter 4 ×Original Flow；

Note: When setting the calibration point, make sure
calibration point1> calibration point2> calibration point3> calibration point4>0
The middle of calibration parameter is 1.0000, if the parameter in larger than 1, the calibration flow will be higher than the original flow; otherwise, the calibration flow will be lower than the original flow

Annex 3 Meter Menu

Parameter No.	Meaning	Range	Range
1	Flow Paramet		
1	Operat. mode	Heat meter mode Cold meter mode Cold——Heat mode	Choose
2	Snsr Size	10～2000	Choose
3	Heat Unit	GJ/h、MJ/h、KWh/h、MWh/h	Choose
4	Cold Unit	GJ/h、MJ/h、KWh/h、MWh/h	Choose
5	Flow Rspns	1～60S	Choose
6	Flow Direct	FORWARD、REVERSE	Choose
7	Flow Zero	0～±9999	Number set
8	Flow Cutoff	Based on flow setting	Number set
9	Tempe.Cutoff	0～199.9	Number set
10	Total Unit	0.001m^3～1m^3	Choose
11	HeatTotUnit	MJ、GJ、KWh、MWh	Choose
12	ColdTotUnit	MJ、GJ、KWh、MWh	Choose
2	Output Param		
2.1	Current Mode	Flow output Heat output Cold output Heat Cold output Status output	Choose
2.2	Flow Range	0～59999	Number set
2.3	Heat Range	0～59999	Number set
2.4	Cold Range	0～59999	Number set
2.5	Data Output	Flow Frequency Flow Pulse Lt Flow Pulse m3 Heat Pulse MJ Heat Pulse GJ Heat Pulse KWh Heat Pulse MWh Cold Pulse MJ Cold Pulse GJ Cold Pulse KWh Cold Pulse MWh Cold Heat P MJ Cold Heat P GJ Cold Heat P KWh Cold Heat P MWh	Choose

		WorkStatus Mark Flow direction	
2.6	FrequencyMax	0～59999	Number set
2.7	Pulse Factor	0.001～59.999	Number set
2.8	Pulse Width	0.3ms～499.9ms	Number set
3	Sensor Param		
3.1	Sensor Fact	0.0000～5.9999	Number set
3.2	Field Type	Type1/Type2	Choose
3.3	Snsr Code1	0～99999	User set
3.4	Snsr Code2	0～99999	User set
3.5	Sensor Post.	Flow Inlet Flow export	Choose
4	Temperature		
4.1	Heat Start T	0～199.9	Number set
4.2	Cold Start T	0～199.9	Number set
4.3	Pres. Range	0.6MP/6MP	Choose
4.4	TempA Zero	0～59999	Number set
4.5	TempA Range	0～5.999	Number set
4.6	TempB Zero	0～59999	Number set
4.7	TempB Range	0～5.999	Number set
5	Alarm Param		
5.1	Mtsnsr Ena	ENABLE/DISABLE	Choose
5.2	MtsnsrTrip	59999	Number set
5.3	Sys Alm Ena	ENABLE/DISABLE	Choose
6	Linearizati		
6.1	Line Crc Ena	ENABLE/DISABLE	Choose
6.2	Lineary CRC1	Based on flow setting	User set
6.3	Lineary Fact 1	0.0000～9999	User set
6.4	Lineary CRC2	Based on flow setting	User set
6.5	Lineary Fact 2	0.0000～9999	User set
6.6	Lineary CRC3	Based on flow setting	User set
6.7	Lineary Fact 3	0.0000～9999	User set
6.8	Lineary CRC4	Based on flow setting	User set
6.9	Lineary Fact 4	0.0000～9999	User set
7	Communicati		
7.1	Comm Addres	0～99	Number set
7.2	Baud Rate	300～38400	Choose
8	Date paramet		
8.1	YEAR	0～99	Number set
8.2	MONTH	0～99	Number set
8.3	DAY	0～99	Number set
8.4	HOUR	0～99	Number set

8.5	MINUTE	0～99	Number set
8.6	SECOND	0～99	Number set
9	Factory Adj		
9.1	Meter Fact	0.0000～5.9999	Number set
9.2	AnalogZero	0.0000～9999	Number set
9.3	Anlg Range	0.0000～3.9999	Number set
9.4	Clr Sum Key	0～99999	Modify available
9.5	MeterCode1	0～99999	Factor set
9.6	MeterCode2	0～99999	Factor set
9.7	Password 1	0～59999	Modify available
9.8	Language	Chinese/English	Choose
10	Test paramet		
10.1	Heat Test	ENABLE/DISABLE	Choose
10.2	TempA value	0～199.9	Number set
10.3	TempB value	0～199.9	Number set
10.4	Speed value	0～19.999	Number set
11	Total parame		
11.1	TotalWordLo	0～99999	Modify available
11.2	TotalWordHi	0～9999	Modify available
11.3	HeatTotalLo	0～99999	Modify available
11.4	HeatTotalHi	0～9999	Modify available
11.5	ColdTotalLo	0～99999	Modify available
11.6	ColdTotalHi	0～9999	Modify available

Meter parameters determine the operational status, calculation method, output method and status. Proper selection and set the meter parameters can make sure the meter works in the best state, and has higher measurement accuracy and measurement precision of output display.

Meter parameters setting function has 2 level password. Level 1 password is user password and level 2 password is factory password. The user can use the level 2 password to set the level 1 password.

If the user needs to change the meter parameter, different level password is needed.

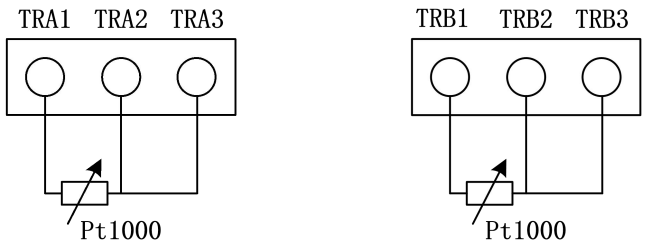
Level 1 password (factory set 00521): read only

Level 2 password (set 19818): user can change the parameter

Annex 4 Heat Measurement Instruction Manual

Temperature calibration method:

Pt1000 thermal resistance three-wire bridge connection method is applied in temperature measurement, wiring is as below:



Current zero-point calibration and range calibration should be applied in thermal resistance measurement circuit. The convertor has be calibrated in the factory and if calibration is still needed, follow the below steps:

A, use resistance box (connect according to three-wire bridge)

Step 1: Choose 1000Ω resistance and adjust zero-point value (generally, 32768) in the entrance (outlet) temperature zero-point parameter until the upper line of the LCD shows “0”.

Step 2: Choose 1535.8Ωresistance and adjust zero-point value (generally, 1.2) in the entrance (outlet) temperature zero-point parameter until the upper line of the LCD shows “1400”.

B、use blackbody furnace (connect according to three-wire bridge)

Step 1: Put thermal resistance ice water immersion, adjust zero-point value (generally, 32768) in the entrance (outlet) temperature zero-point parameter until the upper line of the LCD shows “±0”.

Step 2: Choose temperature 140 ℃ of blackbody furnace, put the thermal resistance into blackbody furnace, adjust zero-point value in the entrance (outlet) temperature zero-point parameter until the upper line of the LCD shows “1400”.

2 Heat calculation method

The heat calculation is done according to CJ128—2007.

Heat calculation:

When the water flows through the installed integrated heat meter or combined meter, the water signal is obtained based on the water flow and temperature from the sensor. The calculation is done based on the water signal and flow time to show the heat released or absorbed.

The format is:

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

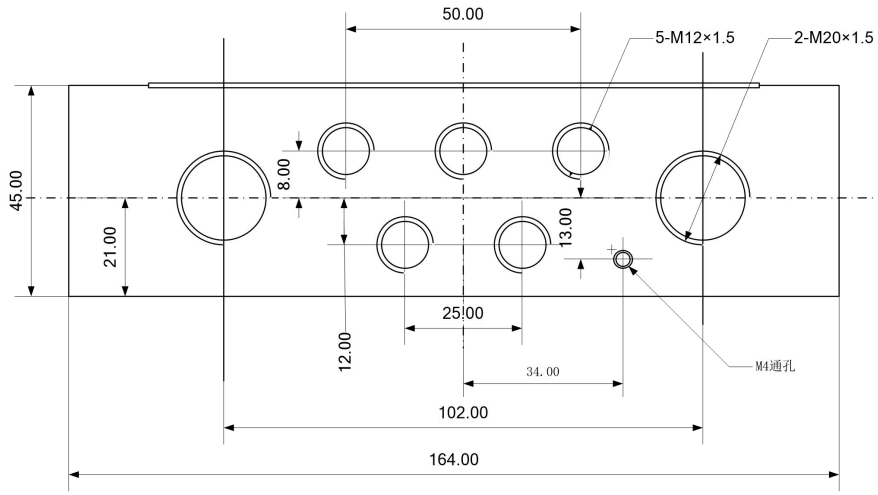
Q - Heat released or absorbed (J);
qm – Water flow (kg/h);
qv - Water volume flow (m3/h);
ρ – Water density (kg/m^3);
Δh - Enthalpy difference between entrance water temperature and outlet water temperature(J/kg);
T – Time (h).
In the format, the destiny and enthalpy is in compliance with the Annex A requirement of CJ128-2007. If the temperature is not integer, the calibration is needed.
Remark: The measurement of the quantity of heat is calculated by using hot melting value of entrance and exit multiplying flow. So the calculated value relates to increment of one second of accumulative flow. That is to say, every time accumulative flow generates one increment, the quantity of heat should be calculated. So unit of accumulative flow should not be adjusted too much, avoiding that it takes long time to generate one accumulative flow increment. Accumulative flow is represented by 9 bits decimal numbers (999999999). Flow unit is 0.001 m^3, 0.01m^3, 0.1 m^3, 1 m^3. The choice of flow unit should meet the demand that it won't overflow in 2-3 years.

Annex 5 Modbus Register Address Definitions

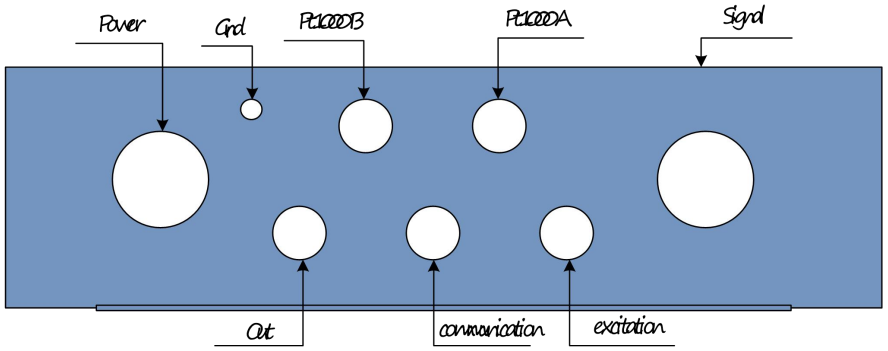
Protocol Addresses（Decimal）	Protocol Addresses（HEX）	Data Format	Register Definition
4112	0x1010	Float Inverse	Instantaneous flow floating-point (M3/h)
4114	0x1012	Float Inverse	Instantaneous flow velocity floating-point
4116	0x1014	Float Inverse	Reserved
4118	0x1016	Float Inverse	Flow conductance ratio floating-point
4120	0x1018	Long Inverse	Gross integer part
4122	0x101A	Float Inverse	Gross decimal value
4124	0x101C	Unsigned short	Instant cold unit 0： MJ/h; 1： GJ/h 2： KWh/h; 3 MWh/h
4125	0x101D	Unsigned short	Cold gross unit 0： MJ； 1： GJ 2： KWh; 3 MWh
4128	0x1020	Unsigned short	Instantaneous heat unit 0： MJ/h; 1： GJ/h 2： KWh/h; 3 MWh/h
4129	0x1021	Unsigned short	Flow gross unit (m3)
4130	0x1022	Unsigned short	Pressure range 0: 0.6MPa 1: 1.6MPa
4131	0x1023	Unsigned short	Gross heat unit 0: MJ 1: GJ; 2: KWh 3: MWh
4132	0x1024	Unsigned short	Empty pipe alarming 0: Normal 1: Alarming
4133	0x1025	Unsigned short	System alarming 0: Normal 1: Alarming
4134	0x1026	Float Inverse	Instantaneous heat flow
4136	0x1028	Long Inverse	Heat gross
4138	0x102A	Float Inverse	Heat gross decimal value
4140	0x102C	Unsigned short	Entrance temperature(℃)
4141	0x102D	Unsigned short	Outlet temperature(℃)
4142	0x102E	Long Inverse	Cold gross accumulating value
4144	0x1030	Float Inverse	Cold gross accumulating small amount
4146	0x1032	Float Inverse	Instant cold value

Annex 6 Definition of Wiring In and Out Line Hole

1 Bolt Size



2 Hole Definition



3 Bolt Definition