Clamp-onUltrasonicFlowmeter/EnergyMeter

Instruction Manual

Model:F2/F3/E3

Update Record	Revision	3.02
	Date	08 . 2021

Content

Update information:

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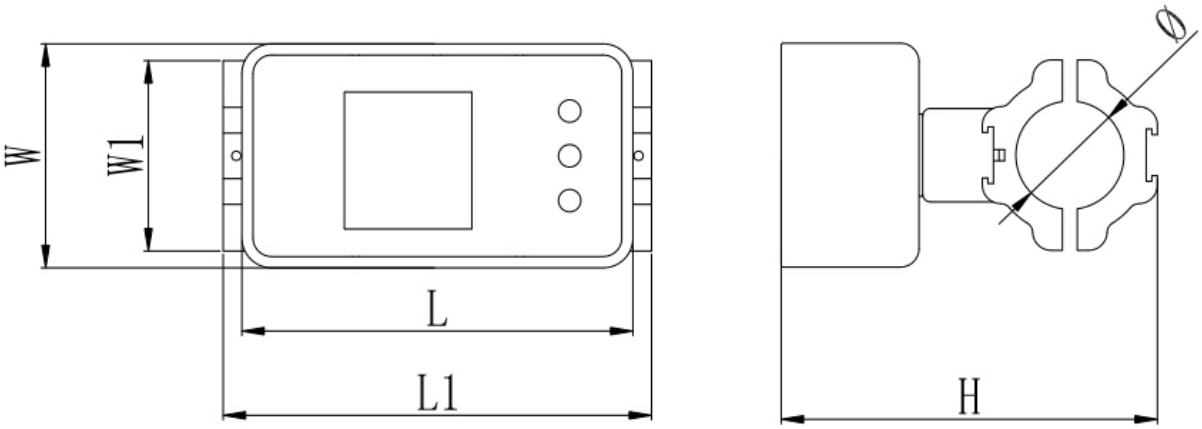
1 Technical Parameter

1.1 Host type

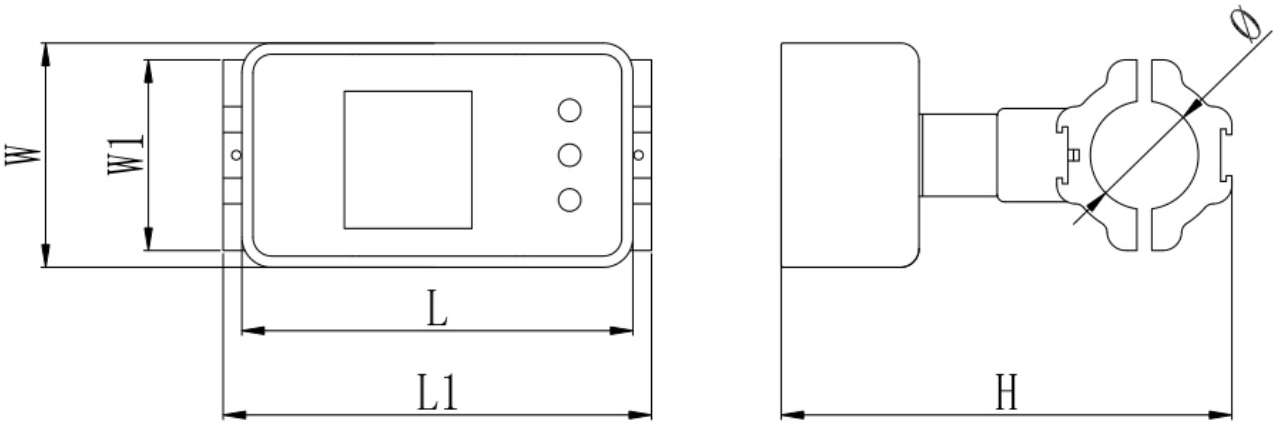
Model Name	Picture	Application
F2 clamp-on flowmeter		Suitable for flow measurement in cleaning industry
F3 clamp-on flowmeter		Suitable for flow measurement in air-conditioning industry
E3 clamp-on energy meter		Suitable for heating (cooling) measurement in air-conditioning industry

1.2 Overall Dimension

1.2.1 Overall dimension of main engine



F2 overall dimension drawing

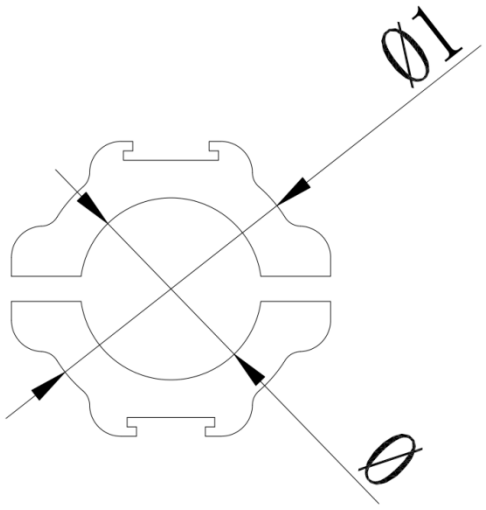


E3/F3 overall dimension drawing

Model	Nominal Diameter	Outer Diameter of Pipe(mm)		W	W1	L	L1	H	ϕ
		A Level	B Level						
F2	DN20	25～29	21～25	60	51	105	118	101	29
	DN80	87～91	83～87	60	113	105	153	163	91
E3/F3	DN20	25～29	21～25	60	51	105	118	121	29
	DN80	87～91	83～87	60	113	105	153	183	91

The overall dimensions of the minimum and maximum pipe diameters are listed in the table. Refer to Appendix 1 and Appendix 2 for the specification of clam on and the applicable range of pipe clamp

1.2.2 Pipe clamp size of temperature sensor



Range of Pipe Diameter	ϕ Inside Diameter of Pipe Clamp (mm)	ϕ 1 Outside Diameter of Pipe Clamp (mm)
DN20~DN80	23~91	43~105

See Appendix 3 for specific specifications and parameters

1.3 Technical Index—F2/F3 clamp on flowmeter

Performance Index	
Measurable range of velocity	（0.03～5.0）m/s
Accuracy	±2% of measured value , velocity＞0.3m/s
Repeatability	0.4%
Range of pipe diameter	DN20～DN80
Measured medium	water
Pipe material	carbon steel, stainless steel, copper, PVC
Function Index	
Communication interface	RS485 (standard)； Support FUJI protocol and MODBUS protocol
WIFI(optional)	Range of frequency：2.412~2.484GHz
	Transmitting power: 802.11b 16±2 dBm 802.11n 13±2 dBm 802.11g14±2 dBm
	Working temperature: -20~85℃
	Theoretically, the transmission distance can reach 40 meters in open environment
Output	4-20mA(optional)，OCT(optional)，Relay(optional)
Power supply	10～36VDC/500mA
Keyboard	3 touch keys
Display screen	1.44" LCD
Temperature range	Transmitter installation environment temperature: -10℃～50℃ Medium temperature measured by transducer: 0℃～60℃
Humidity	Relative humidity 0-99%, no condensation
IP	IP54
Physical Characteristics	
Transmitter	All-in-one
Transducer	Clamp on
Cable	Φ5 six core cable, standard length: 2m

- The accuracy obtained through Gentos's flow standard device may cause error due to the type of pipeline, the type of fluid, temperature, etc. used by customers.

1.4 Technical Index—E3 clamp on energy meter

Performance Index							
Measurable range of velocity	（0.03～5.0）m/s						
Nominal diameter (DN)	20	25	32	40	50	65	80
Flow commonly used (m3/h)	2.5	3.5	6	10	15	25	40
Min flow (m3/h)	0.1	0.14	0.24	0.4	0.6	1	1.6
Max flow (m3/h)	5	7	12	20	30	50	80
Accuracy Class	Class 2						
Range of temperature	4~95℃ (Temperature measurement range of temperature sensor)						
Range of temperature difference	3~75K						
Temperature resolution	0.01℃						
Measured medium	water						
Pipe material	carbon steel, stainless steel, copper, PVC						
Installation mode	Horizontal or vertical						
Installation position	Influent or effluent						
Function Index							
Input interface	2*PT1000 clamp on or insertion temperature sensor 0~100℃（32～212℉）						
Communication interface	RS485 (standard)； Support FUJI protocol and MODBUS protocol						
WIFI(optional)	Range of frequency：2.412~2.484GHz						
	Transmitting power: 802.11b 16±2 dBm；802.11n 13±2 dBm； 802.11g 14±2 dBm						
	Working temperature: -20~85℃						
	Theoretically, the transmission distance can reach 40 meters in open environment						

Output	4-20mA(optional)，OCT(optional)，Relay(optional)
Power supply	10～36VDC/500mA
keyboard	3 touch keys
Display screen	1.44" LCD
Temperature range	Transmitter installation environment temperature: -10℃～50℃ Medium temperature measured by transducer: 0℃～60℃
humidity	Relative humidity 0-99%, no condensation
IP	IP54
Working Pressure	1.6MPa
Physical Characteristics	
Transmitter	All-in-one
Transducer	Clamp on
Cable	Φ5 six core cable, standard length: 2m

- The accuracy obtained through Gentos's flow standard device may cause error due to the type of pipeline, the type of fluid, temperature, etc. used by customers.

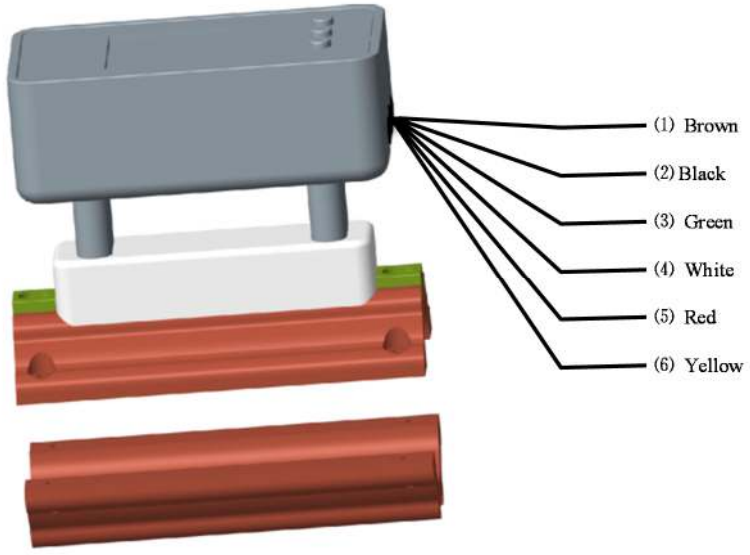
2 Installation and Wiring

2.1 Installation instructions

1. Read "section 4. Select measurement point" carefully. After the designated location is selected, the area outside the pipe to be installed shall be cleaned up, and the dense part of the pipe shall be selected for installation.。
2. The central part of the sensor is pasted with the company's special coupling pastes. During installation, the coupling pastes shall be extruded to ensure the close fitting between the sensor and the pipe wall without bubbles.。

2.2 Meter wiring

1. The flow direction identification shall be consistent with the flow direction in the pipeline. See the following chart for cable instruction



Function	Identification	Color
Power supply （10~36VDC）	+	brown
	-	black
RS485	A	green
	B	white
Optional （WIFI\4-20mA \OCT\Relay）	+	red
	-	yellow

2.3 Quick installation steps

Clamp-on energy meter adopts all-in-one, only requests simple several steps and simple setup parameters. The flow measurement can be realized by directly clamping it on the pipe section and connecting it to the power supply.

The first step Take out the clamp on product and then clamp the up and down pipe clamp to the selected position of the pipe.。	
The second step Tighten the screws	
The third step Install main engine part into the slot of the up pipe clamp and then tighten the screws	
The forth step Power on to start measurement The actual pipeline parameters can be set through M31, M37 and M38 to make the measurement more accurate.	

- If the clamp is still loose after locked, the black rubber pad (2mm thick) attached to the accessory bag can be pasted on both sides of the inner wall of the clamp.



2.4 E3The quick installation steps of the heat (cool) clamp on ultrasonic meter

First step Take out clamp-on energy flow meter	
Second step Snap the upper and lower pipe clamps to the selected position of the pipe.	
Third step Tighten the screws.	
Forth step Install the main body part into the slot of the upper pipe clamp and tighten the screws.	
Fifth step Start to power on to measure The actual pipeline parameters can be set through M31, M37 and M38 to make the measurement more accurate.	

Sixth step Add insulation cotton.	

- If the clamp is still loose after locking, the black rubber pad (2mm thick) attached to the accessory bag can be pasted on both sides of the inner wall of the clamp



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2.5 InstallationofE3temperaturesensor

2.5.1 Clamp-on temperature sensor

1. The temperature sensor pipe clamp consists of upper and lower two semi-circles. The clamp-on type temperature sensor is embedded in the groove of the inner wall of the ring. When E3 is installed, the pipe clamp equipped with temperature sensor is clamped on the pipe, and then locked with the inner hexagonal screw.

2. Before the clamp-on temperature sensor is installed, it is necessary to clean up the area where the pipeline is to be installed, and remove rust and paint, etc.
3. Temperature sensors with red and blue markings are installed in the influent and effluent pipe sections respectively.

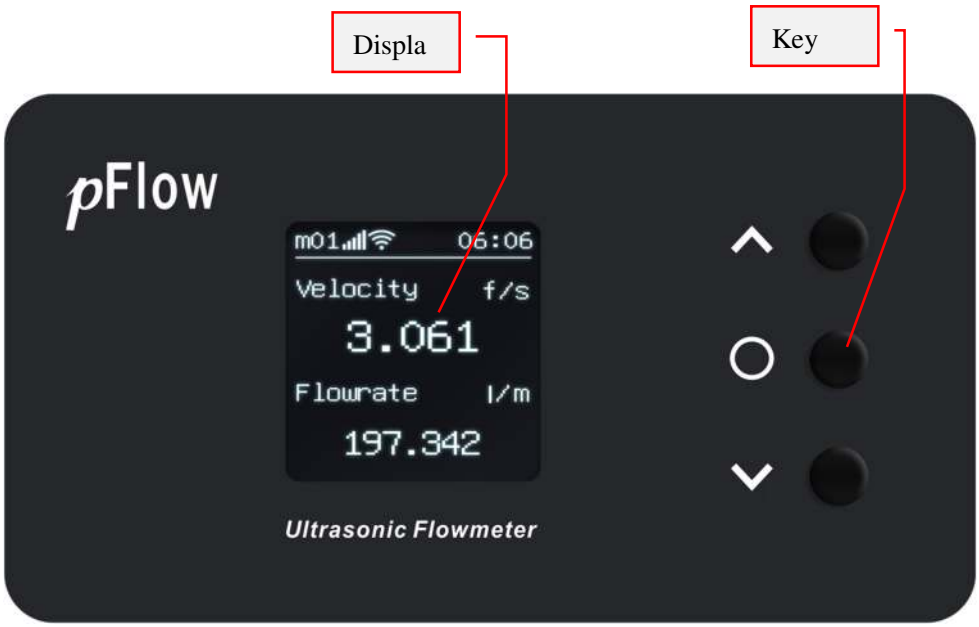
2.5.2 Insertion type temperature sensor

1. Insertion type and clamp-on type temperature sensor's pipe clamps are universal. Insertion type temperature sensors are installed in the holes of the semi-circle as shown in the figure.

2. The insertion type temperature sensor is provided with a sealing rubber ring inside and outside the hole, so as to ensure that the insertion type temperature sensor does not leak after installation.
3. Temperature sensors with red and blue markings are installed in the influent and effluent pipe sections respectively.

3 Display and Settings

3.1 Display instructions



3.2 Key instructions

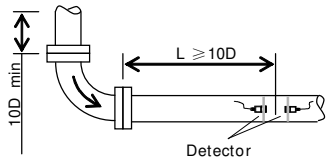
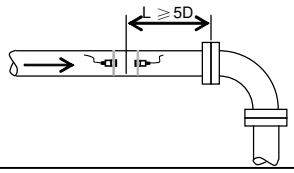
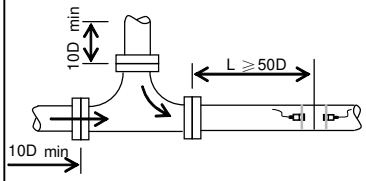
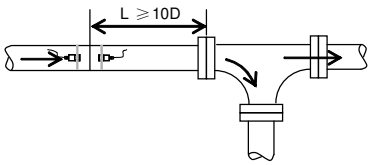
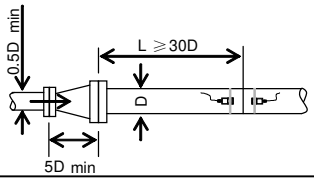
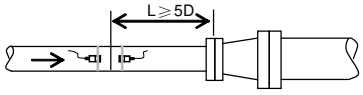
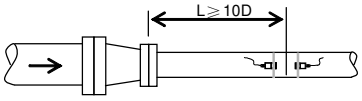
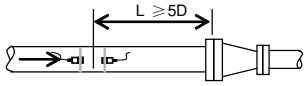
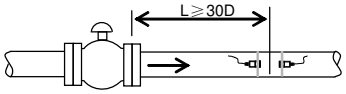
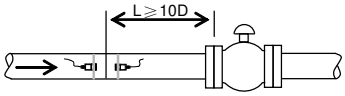
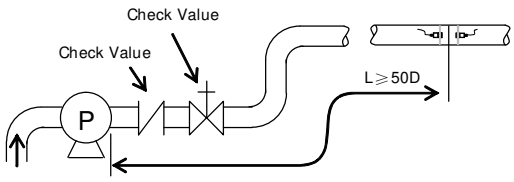
1. ∧key and ∨Key are used to select the menu up and down, and ○keyis used to determine.
2. Press ∧ for about 3 seconds and then release it for 4 times, which can make the display interface rotate counterclockwise 90 degrees display, 180 degrees display, 270 degrees display and 360 degrees restore display. That is to say, pressing ∧ once more can make the display interface rotate 90 degrees counter-clockwise, which is convenient to switch the display interface to the appropriate state in practical use.
3. Long press ∨ and then open, you can enter the WIFI connecting network mode(Suitable for meter with WiFi function). See Appendix 3 for details.
4. If you press ○ for 3 seconds or so, you can realize menu jump.∧means increase of value,∧means decrease of value, and ○means right shift of value. If there is a corresponding menu, you can jump to the corresponding menu. If there is no menu, you need to continue to input until you enter a correct menu.
5. Under the optional menu, press the ○for shortto make the corresponding selection.

4 Select Measurement Point

This flowmeter is the simplest and most convenient in the installation of all small caliber flowmeters. As long as a suitable measurement point is selected, it can measure by clamping the product pipe section area and the water supply end on the pipeline.

When selecting the measurement point, it is necessary to select the pipe section with uniform distribution of fluid flow field to ensure the measuring accuracy. When installing, the following principles should be followed:

- Select a section filled with fluid, such as the vertical part of the pipeline (fluid preferably flows upward) or the horizontal section filled with fluid.
- The measuring point should be a uniform straight pipe with 10 times diameter (10D) from upstream and 5 times diameter (5D) from downstream. There are no valves, elbows, diameter-changing devices in this range. The length of straight pipe section is recommended to use the values shown in the table below.
- It is necessary to ensure that the temperature at the measuring point is within the working range.
- Considering the scaling condition on the inner wall of the pipe, the non-scaling pipe section is selected to measure as far as possible, and the pipe section with uniform and dense material and easy to transmit ultrasonic wave is selected.

Name	Straight length of Upstream piping	Straight length of Downstream piping
90° bend		
Tee		
Diffuser		
Reducer		
Value	 Flow controlled upstream	 Flow controlled downstream
Pump		

5 Menu Window Instructions

Menu Type	Menu Window	Function Instructions	Remarks
Flow information	M01	Display instantaneous velocity and flow	
	M02	Display instantaneous flow and flow accumulation	
Energy information	M10	Display influent temperature and calibration status	suitable for heating (cooling) energy meter
	M11	Display effluent temperature and calibration status	
	M12	Display temperature difference and meter operation time	
	M13	Display instantaneous heating energy and accumulated heating energy	
	M14	Display instantaneous cooling energy and accumulated cooling energy	
Current loop information	M19	Display output current and calibration status	Suitable for supporting 4-20mA functional meter
Meter information	M20	Display date	Modify date by key
	M21	Display time	Modify time by key
	M22	Display serial number and version number	
Diagnostic information	M28	Display signal quality and measurement status	
Measurement settings	M31	Display instantaneous flow and pipe material	The pipe material includes carbon steel, stainless steel, copper pipe and PVC, one of which is selected by the manufacturer when leaving the factory
	M37	Set pipelineoutside diameter	
	M38	Set pipeline wall thickness	
	M39	Set flow offset	
Current loop setting	M45	Set the flow corresponding to 4mA	Suitable for supporting 4-20mA functional meter
	M46	Set the flow corresponding to 20mA	

Unit setting	M50	Display instantaneous flow and select flow unit	Optional unit: m3/h (default), l/m, gpm(UK), cfm, gpm(USA)
	M51	Display instantaneous velocity and select velocity unit	Optional unit: m/s (default), f/s, yd/s
	M52	Show pipe inside diameter and select length units	Optional: mm(default), in
	M53	Display instantaneous energy and select energy units	Suitable for heating (cooling) energy meter Optional unit： KG/h, MJ/h, GJ/h, Kcal/h, Mcal/h, KW(default), MW, Kbtu/h
OCT setting	M55	Configure OCT output trigger mode	General optional: off, frequency output (default), no signal, low flow alarm, high flow alarm, flow accumulation pulse, batch flow trigger Ultrasonic heating (cooling) can also be selected: energy accumulation pulse, batch cooling trigger, batch heating trigger
	M56	Set up OCT output minimum frequency	
	M57	Set up OCT output maximum frequency	
	M58	Set up OCT output minimum flow	
	M59	Set up OCT output maximum flow	
Other setting	M60	Display power-off flow and select baud rate	Optional baud rate: 4800, 9600, 14400, 19200, 38400, 50400, 57600, 76800, 115200
	M61	Display power off date and select Chinese-English switch	
	M62	Set temperature sensitivity	Suitable for heating (cooling) energy meter
	M63	Set network address code	
Relay setting	M65	Configure Relay output trigger mode	General optional: off, frequency output (default), no signal, low flow alarm, high flow alarm, flow accumulation pulse, batch flow trigger Ultrasonic heating (cooling) can also be selected: energy accumulation pulse, batch cooling trigger, batch heating trigger

Shared settings about OCT and Relay	M66	Set flow or heating/Cooling batch control value of OCT and Relay	See supplementary note 6. (10)
	M67	Sett the lower limit of instantaneous flow alarm from OCT and Relay	See supplementary note 6. (3)
	M68	Setting the upper limit of instantaneous flow alarm from OCT and Relay	See supplementary note 6. (3)
	M69	Set flow or cooling/heating pulse single quantity of OCT and Relay	See supplementary note 6. (10)
Switch setting	M71	Display flow accumulation and select switch flow accumulation	
	M72	Display flow accumulation and select clear accumulated flow	
	M73	Display energy accumulation and select switch energy accumulation	Suitable for heating (cooling) energy meter, and control heating energy and cooling energy at the same time
	M74	Display energy accumulation and select clear accumulated energy	Suitable for heating (cooling) energy meter, and control heating energy and cooling energy at the same time
	M75	Display machine running time and select to restore factory settings	

Instruction:

1. The above table contains the menus required for F2, F3 flow meters and E3 heating (cooling) energy meters.
2. For F2 and F3 flow meters, the energy menu in the above table is not displayed.。

6 Communication Protocol

6.1 FUJI protocol

The FUJI protocol of the meter adopts the mode of reply communication, and the upper system requests the meter to reply by issuing "commands". The baud rate of asynchronous communication (main workstation, computer system, secondary workstation, ultrasonic flowmeter) is usually 9600bps. Single byte data format (10 bits): 1 starting bits, 1 stop bits and 8 data bits. Check bit: NONE.

6.1.1 Communication command

The basic commands are represented by data strings and the end of the command is indicated by a carriage return line break.They are characterized by arbitrary data length. The commands commonly used are shown in the following table:

Command	Command Meaning	Remarks
CET	Clear energy accumulation	1. Write command without parameters; 2. This command will clear the heating energy accumulation and cooling energy accumulation; 3. The command is suitable for cooling and heating energy meter; 4. Error returns "memory error", and success returns "OK".
CFT	Clear flow accumulation	1. Write command without parameters; 2. This command will clear the flow accumulation; 3. Error returns "memory error", and success returns "OK".
CLM	Set current loop 4-20mA output mode	1. Write command with parameters; 2. For parameter 0, 4-20mA means set output according to flow; for parameter 1, 4-20mA means set output according to flow, and other values are not defined; 3. The settings will be saved;; 3. The command is suitable for supporting 4-20mAh functional meter; 4. Setting error returns "Set error"; Storage error returns"memory error"; and Success returns "OK".
DATE	Read date	1. Read command; 2. The return date format is yyyy-mm-dd(week).
DI+	Positive accumulation of flow	1. Read command; 2. When the value exceeds 10 ^ 8, the accuracy will be lost, whichever is displayed;
DID	Read network address	1. Read command; 2. The return value is in decimal.
DIE	Accumulated energy	1. Read command; 2. When the value exceeds 10 ^ 8, the accuracy will be lost,

		whichever is displayed; 3. This command is suitable for cooling and heating energy meter.
DIE+	Accumulated heating energy	1. Read command; 2. When the value exceeds 10 ^ 8, the accuracy will be lost, whichever is displayed; 3. This command is suitable for cooling and heating energy meter.
DIE-	Accumulated cooling energy	1. Read command; 2. When the value exceeds 10 ^ 8, the accuracy will be lost, whichever is displayed; 3. This command is suitable for cooling and heating energy meter.
DQD	Instantaneous flow per day	1. Read command, 2. This command reads the instantaneous flow in one day.
DQH	Instantaneous flow per hour	1. Read command, 2. This command reads the instantaneous flow in one hour.
DQM	Instantaneous flow per minute	1. Read command, 2. This command reads the instantaneous flow in one minute.
DQS	Instantaneous flow per second	1. Read command, 2. This command reads the instantaneous flow in one second.
DV	Read velocity	1. Read command; 2. The value changes according to the change of velocity unit.
E+	Instantaneous heating energy	1. Read command; 2. The command is suitable for cooling and heating energy meter
E-	Instantaneous cooling energy	1. Read command; 2. The command is suitable for cooling and heating energy meter
ESN	Read serial number	1. Read command; 2. If the serial number is wrong, return to "error". If it is successful, return to the corresponding serial number.
FLOOR	Set the floor of the meter	1. Write commands with parameters, for example: FLLOR12; 2. The default value is 12. It is recommended not to exceed 6 characters in the setting string; 3. The settings will be saved; 4. The command is suitable for supporting WIfFi functional meters; 5. Set error returns“Set error”, memory error returns“Memory

		error", and success returns"OK".
JH	Return vendor information	1. Read instructions; 2.The command always returns to the corresponding string correctly.
MENU	Display menu jump	1. Write command with parameters, for example: MENU2; 2. If the display menu does not exist, return to "error". If the display menu exists, jump to the corresponding menu.
MER	Storage error and attempt to repair	1. Write command without parameters; 2. If the repair fails, the corresponding prompt message will be returned. If the repair is successful, the "OK" will be returned.
MPAS	Set MODBUS register address to be compatible with our previous models	1. Write commands with parameters, for example: MPAS1; 2. Parameter 0 indicates incompatibility (default), and non-0 indicates compatibility; 3. It is compatible with the numerical data type in the Modbus protocol of the previous model, and the string data type is not compatible with the meter except the serial number; 4. The settings will be saved; 5. Set error returns"Set error", memory error returns"Memory error", and success returns"OK".
MPRO	Modbus reverse output switch	1. Write commands with parameters, for example: MPRO1; 2. Parameter 0 indicates no reverse output (default), and parameter non-0 indicates reverse output; 3. The standard Modbus protocol is that the low byte of output is in the front and the high byte is in the back. This command can output the high byte first and the low byte last (the check code is still the low 8 bits first and the high 8 bits last); 4. The settings will be saved; 5. Set error returns"Set error", memory error returns"Memory error", and success returns"OK".
README	Read storage error	1. Read commands; 2. Return the storage error prompt string.
READSE	Read error type of system	1. Read command; 2. Return error code and error prompt string. Error code 0 indicates no error, error code 1 indicates storage error, error code 2 indicates display error, error code 3 indicates RTC error, and error code 4 indicates network error.
ROOM	Set the room number of the number	1. Write commands with parameters, for example: ROOM12; 2. The default value is 12. It is recommended not to exceed 6 characters in the setting string; 3. The settings will be saved; 4. The command is suitable for supporting 4-20mA WIfFi functional meters;

		5. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
RUNIT	Set whether to return unit when reading data such as flow	1. Write commands with parameters, for example: RUNIT1; 2. parameter 0 is set to return data without unit, and parameter non 0 is set to return data with unit (default); 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SBCE	Set batch control value of cooling and heating	1. Write instructions with parameters, for example: SBCE300.5; 2. The setting value changes according to the change of the unit; 3. The settings will be saved; 4. The instruction is applicable to instruments supporting OCT or relay functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success; 6. Remarks: this value has effect on both heating and cooling and it has effect on relay and OCT at the same time. When the heating or cooling accumulates to this set value, Oct or relay outputs high electrical level and keeps high electrical level until triggering again: set OCT or relay batch heating or cooling control mode to complete triggering.
SBCF	Set flow batch control value	1. Write instructions with parameters, for example: SBCF300.5; 2. The setting value changes according to the change of the unit; 3. The settings will be saved; 4. The instruction is applicable to instruments supporting OCT or relay functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success; 6. Remark: this value works for OCT and relay at the same time. When the flow accumulates to this set value, Oct or relay outputs high electrical level and keeps high electrical level until triggering again: set OCT or relay batch flow control mode to complete triggering.
SCH	Set the corresponding flow value of 20mA	1. Write commands with parameters, for example: SCH100; 2. The setting value will be changed depending on change of the unit 3. The settings will be saved; 4. The command is suitable for supporting 4-20mA functional meters; 5. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”. 6. Note: when 4-20mA is configured to output according to flow, the upper limit of flow is set; when output according to

		velocity, the upper limit of velocity is set.
SCL	Set the corresponding flow value of 4mA	1. Write commands with parameters, for example: SCL0; 2. The setting value will be changed depending on change of the unit; The default is 0. 3. The settings will be saved; 4. The command is suitable for supporting 4-20mA functional meters; 5. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”. 6. Note: when 4-20mA is configured to output according to flow, the upper limit of flow is set; when output according to velocity, the upper limit of velocity is set.
SCM	Set the temporary communication mode of 485 to stand-alone mode	1. Write instructions without parameters; 2. The setting will not be saved and will be restored to the bus networking mode (default mode) after power failure. The function of this command is: when the communication address or command is wrong, there will be corresponding prompt information returned; 3. The command always returns "OK".
SDATE	Set date	1. Write commands with parameters, for example: SDATE2019-06-27; 2. If the meter has WiFi function and WiFi connecting network is successful, it will automatically update the meter time according to the server, and the setting is meaningless; 3. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SDID	Set network addresses	1. Write commands with parameters, for example: SDID88; 2. The settable value is 1-247, and the default value is 88; 3. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SDL	Set display language	1. Write commands with parameters, for example: SDL1; 2. Parameter 0 is set to English, parameter 1 is set to Chinese, and other values are not defined; 3. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SECS	Set energy accumulation switch	1. Write commands with parameters, for example: SECSI; 2. Parameter 0 means off, and parameter non-0 means on (default). 3. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SED	Setting outer diameter	1. Write commands with parameters; 2. The setting value is changed according to the change of

		length unit, which is set by default according to the initial setting; 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SEU	Set energy units	1. Write commands with parameters, for example: SEU0; 2. Parameter 0 - KJ/h, parameter 1 - MJ/h, parameter 2 - GJ/h, parameter 3 - Kcal/h, parameter 4 - Mcal/h, parameter 5 - KW (default), parameter 6 - MW, parameter 7 - Kbtu/h other values are undefined; 3. The settings will be saved; 4. The command is suitable for the cooling and heating energy meters; 5. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SFAL	Set the lower limit of flow alarm	1. Write instructions with parameters, for example: SFCS1.0; 2. The setting changes with the change of flow unit; 3. The settings will be saved; 4. The instruction is applicable to instruments supporting OCT or relay functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success. 6. Remarks: when the instantaneous flow is less than the lower limit of flow alarm or greater than the upper limit of flow alarm, Oct or relay outputs high electrical level until the instantaneous flow is between the upper and lower limits.
SFAH	Set the upper limit of flow alarm	1. Write instructions with parameters, for example: SFCS300.0; 2. The setting changes with the change of flow unit; 3. The settings will be saved; 4. The instruction is applicable to instruments supporting OCT or relay functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success. 6. Remarks: when the instantaneous flow is less than the lower limit of flow alarm or greater than the upper limit of flow alarm, Oct or relay outputs high electrical level until the instantaneous flow is between the upper and lower limits.
SFCS	Set flow accumulation switch	1. Write commands with parameters, for example: SFCSI; 2. Parameter 0 means off, and parameter non-0 means on (default). 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.

SFU	Set flow unit	1. Write commands with parameters, for example: SFU0; 2. Parameter 0 - m3/h (default), parameter 1 - 1/m, parameter 2 - gpm (UK), parameter 3 - cfm, parameter 4 - gpm (USA), other values are undefined; 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SOFL	Set the flow lower limit of OCT	1. Write instructions with parameters, for example: SOFL0; 2. The setting changes with the change of flow unit; 3. The settings will be saved; 4. The instruction is applicable to instruments supporting OCT functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SOFH	Set the flow upper limit of OCT	1. Write instructions with parameters, for example: SOFL300.0; 2. The setting changes with the change of flow unit; 3. The settings will be saved; 4. The instruction is applicable to instruments supporting OCT functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SOFRL	Set the frequency lower limit of OCT	1. Write instruction with parameter, unit: Hz, for example: SOFRL0.5; 2. The instruction is applicable to instruments supporting OCT function; 3. The settings will be saved; 4. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SOFRH	Set the frequency upper limit of OCT	1. Write instruction with parameter, unit: Hz, for example: SOFRH5000; 2. The instruction is applicable to instruments supporting OCT function; 3. The settings will be saved; 4. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SOM	Set output mode of OCT	1. Write instructions with parameters, such as SOM9; 2. Parameter 0 is off, parameter 1 has no signal trigger output, parameter 2 has low flow alarm output, parameter 3 has high flow alarm output, parameter 4 has flow accumulation pulse output, parameter 5 has batch flow trigger output, parameter 6 has cooling/heating accumulation pulse output, parameter 7 has

		batch heating trigger output, parameter 8 has batch cooling trigger output, and other values are undefined; 3. The settings will be saved; 4. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SRM	Set output mode of relay	1. Write instructions with parameters, such as SRM0; 2. Parameter 0 is off, parameter 1 has no signal trigger output, parameter 2 has low flow alarm output, parameter 3 has high flow alarm output, parameter 4 has flow accumulation pulse output, parameter 5 has batch flow trigger output, parameter 6 has cooling/heating accumulation pulse output, parameter 7 has batch heating trigger output, parameter 8 has batch cooling trigger output, and other values are undefined; 3. The settings will be saved; 4. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SRST	Restore factory settings	1. Write commands without parameters; 2. The setting will be restored to the default value.
SSPE	Set cooling/heating value of single pulse	1. Write instructions with parameters, such as SSPE3.0; 2. The setting value changes with the change of energy unit; 3. The settings will be saved; 4. This instruction is applicable to instruments supporting OCT or relay functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success. 6. Remarks: the setting value works on the cooling and heating at the same time, and works on OCT and relay at the same time. When the output mode of OCT or relay is selected as energy accumulation pulse, the value takes effect. A rising edge of OCT or relay output represents a set value.
SSPF	Set flow value of single pulse	1. Write instructions with parameters, such as SSPF3.0; 2. The setting value changes with the change of energy unit; 3. The settings will be saved; 4. This instruction is applicable to instruments supporting OCT or relay functions; 5. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success. 6. Remark: this value work on OCT and relay at the same time. When the output mode of OCT or relay is flow accumulation pulse, the value will work. A rising edge of OCT or relay output indicates a set value.
SSU	Set length unit	1. Write commands with parameters, for example: SSU0;

		2. Parameter 0 - mm (default), parameter 1 - in, other values are undefined; 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
STIME	Set time	1. Write commands with parameters, such as STIME15:20:46; 2. If the WiFi connecting network is successful, the settings will be meaningless and update time automatically according to the server; 3. Set error returns“Set error”, and success returns“OK”.
STS	Set temperature sensitivity	1. Write commands with parameters, for example: STS0.2; 2. Parameter requirements > = 0.1, default 0.1; 3. The settings will be saved; 4. The command is suitable for the cooling and heating energy meters; 5. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SWT	Set wall thickness	1. Write instructions with parameters; 2. The setting value changes according to the length unit, and the initial wall thickness is used by default; 3. The settings will be saved; 4. Return "set error" when setting error, return "memory error" when storage error, and return "OK" when success.
SUB	Set communication baud rate	1. Write commands with parameters, for example: SUB0; 2. Parameter 0 - 4800, parameter 1 - 9600 (default), parameter 2 - 14400, parameter 3 - 19200, parameter 4 - 38400, parameter 5 - 50400, parameter 6 - 57600, parameter 7 - 76800, parameter 8 - 115200, other values are undefined; 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SVU	Set velocity unit	1. Write commands with parameters, such as SVU0; 2. Parameter 0 - m / s (default), parameter 1 - f / s, parameter 2 - yd/ s, other values are undefined; 3. The settings will be saved; 4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
SZS	Set zero offset	1. Write commands with parameters, for example: SZS2000; 2. The setting value varies with the change of flow unit. The default value is 0; 3. The settings will be saved;

		4. Set error returns“Set error”, memory error returns“Memory error”, and success returns“OK”.
TIME	Read time	1. Read commands; 2. The return time format: hh-mm-ss.
P	Return Data with 8-bit and verification	Such as PDQD PDQH...
W	Request a piece of data with address (i.e. address set through SDID)	Such as W88DQD
Wand & use together	Used to connect multiple instructions when requesting multiple data (at least 1 instruction and at most 5 instructions)	Such as:W88&DQD; W88DQD&DQH&DQM or W88&DQD&DQH&DQM

Note:

1. If there are multiple flow meters in the data network at the same time, the basic command cannot be used alone. It must be prefixed with W before use. Otherwise, multiple flow meters will respond at the same time, resulting in system confusion.

(1) P prefix

Character P can be added before each basic command to indicate that the returned data has CRC verification.The check sum is obtained by binary addition. For example: If the return data of the command DI+ (CR) (LF) (The corresponding binary data are 44H, 49H, 2BH, 0DH, 0AH) is+1234567E+0m3 (CR) (LF) (The corresponding binary data are 2BH, 31H, 32H, 33H, 34H, 35H, 36H, 37H, 45H, 2BH, 30H, 6DH, 33H, 20H, 0DH, 0AH), the return data of the command PDI+ (CR) is +1234567E+0m3 !F7 (CR). "!" indicates that it is the sum character in the front, and the checksum of two bytes is in the back (2BH+31H+32H+33H+34H+35H+36H+37H+45H+2BH+30H+6DH+33H+20H= (2) F7H). Please note that there is a space symbol before "!" .

(2) W prefix

The usage of W prefix: W + string address code + basic command. The value range of digital string is 0 ~ 247. If visit the instantaneous velocity of flow meter No.88, please issue command W88DV (CR) (LF), and the corresponding binary code is 57H, 58H, 44H, 56H, 0AH, 0DH.

(3) & Functional symbols

& the function symbol can add up to five basic commands (prefixed with P) to form a composite command and transmit it to the flowmeter, which responds at the same time. For example, it is required to send back 1. Instantaneous flow; 2. Instantaneous velocity; 3. Positive accumulative energy; 4. Instantaneous cooling energy; 5. Accumulative cooling energy, with verification, and send the command as follows:

W88PDQD&PDV&PDI+&E-&DIE-（CR）（LF）

The data returned at the same time may be as follows:

+0.000000E+00m3/d! AC（CR）（LF）

+0.000000E+00m/s! 88（CR）（LF）

+1234567E+0m3! F7（CR）（LF）

+0.000000E+0m3! DA（CR）（LF）

+0.000000E+0 m3! DA（CR）（LF）

(4) Note: the usage of W prefix and P prefix is not recommended for setting command, otherwise unexpected results may occur.

6.2 MODBUS Protocol

6.2.1 Use of function code 0x03

The man engine sent read register information frame format:

Slave address	Function code	Register first address	Request number of registers	Check code
0x01 - 0xF7	0x03	0x0000 - 0x007F	0x0000 - 0x007F	CRC-16/MODBUS
1 bytes	1 bytes	2 bytes	2 bytes	2 bytes

Slave engine returns data frame format:

Slave address	Function code	Return bytes	Return data	Check code
0x01 - 0xF7	0x03	2 * N	2 * N data	CRC-16/MODBUS
1 bytes	1 bytes	1 bytes	2 * N bytes	2 bytes

Note: N indicates request number of registers

6.2.2 Use of function code 0x06

Send data error, return corresponding error data;Send data correct, no any return (This function is not open yet)

6.2.3 Error solution

①0x03When reading data, if there is an error, the following response is returned

Slave address	Error code	Error type	Check code
0x01 - 0xF7	0x83	1(register address error)	CRC-16/MODBUS
0x01 - 0xF7	0x83	2(register length error)	CRC-16/MODBUS
0x01 - 0xF7	0x83	3(check code error)	CRC-16/MODBUS
1 bytes	1 bytes	1 bytes	2 bytes

②0x06When writing a register, if there is an error, the following response is returned

Slave address	Error code	Error type	Check code
0x01 - 0xF7	0x86	1(register address error)	CRC-16/MODBUS
0x01 - 0xF7	0x86	2(register length error)	CRC-16/MODBUS
0x01 - 0xF7	0x86	3(check code)	CRC-16/MODBUS
0x01 - 0xF7	0x86	4(The function is not supported temporarily)	CRC-16/MODBUS
1 bytes	1 bytes	1 bytes	2 bytes

Example 1. In RTU mode, read the instantaneous flow (m3 / h) in hours of the meter with address 1 (0x01), that is, read the data of registers 40007 and 40008. The read command is as follows:

0x01 0x03 0x00 0x06 0x00 0x020x24 0x0A

meter addressfunction coderegister first addressnumber of registerCRC check code

The data returned by the meter is (assuming the current flow = 1.234567m3 / h):

0x01 0x03 0x04 0x51 0x06 0x9E 0x3F0x3B 0x32

meter addressfunction code Data bytes data (1.2345678) CRC check code

The four bytes of 3F 9E 06 51 are IEEE754 single precision floating-point format of 1.2345678.

Please pay attention to the data storage order in the above example. The standard is that the low byte of all data is in the front and the high byte is in the back. If you want to change the data transmission order to 3F 9E 06 51, you need to set it by FUJIcommand. After configuration, it will be saved permanently. After configuration, the low half byte in table 6.3.4 will actually become the high half byte and the high half byte will actually become the low half byte.

6.2.4 Register address list (readable only, not writable)

Cooling and Heating energy meter address	Register address	Flowmeter address	Register address	Data description	Data type	Remarks
$0000	40001	$0000	40001	Velocity(low half word)	32-bit floating point number	This value changes according to the change of velocity unit
$0001	40002	$0001	40002	Velocity(high half word)		
$0002	40003	$0002	40003	Flow -unit in seconds (low half word)	32-bit floating point number	This value changes according to the change of flow unit
$0003	40004	$0003	40004	Flow-unit in seconds (high half word)		
$0004	40005	$0004	40005	Flow -unit in minute (low half word)	32-bit floating point number	
$0005	40006	$0005	40006	Flow-unit in minute (high half word)		
$0006	40007	$0006	40007	Flow -unit in hour (low half word)	32-bit floating point number	
$0007	40008	$0007	40008	Flow-unit in hour (high half word)		
$0008	40009	$0008	40009	Flow -unit in day (low half word)	32-bit floating point number	
$0009	40010	$0009	40010	Flow-unit in day (high half word)		
$000A	40011	$000A	40011	Flow accumulation integer part (low half	32-bit signed	

				word)	integer	
$000B	40012	$000B	40012	Integer part of flow accumulation (high half word)		
$000C	40013	$000C	40013	Fractional part of flow accumulation	16-bit signed integer	This value changes according to the change of flow unit. And the number is increased by 10000 times before output, thus, the real value needs to be reduced by the same times
$000D	40014	xxxx	xxxx	Inlet water temperature (low half word)	32-bit floating point number	
$000E	40015	xxxx	xxxx	Inlet water temperature (high half word)		
$000F	40016	xxxx	xxxx	Outlet water temperature (low half word)	32-bit floating point number	
$0010	40017	xxxx	xxxx	Outlet water temperature (high half word)		
$0011	40018	xxxx	xxxx	Temperature difference (low half word)	32-bit floating point number	
$0012	40019	xxxx	xxxx	Temperature difference (high half word)		
$0013	40020	xxxx	xxxx	Instantaneous heating energy (low half word)	32-bit floating point number	This value changes according to the change of energy unit
$0014	40021	xxxx	xxxx	Instantaneous heating energy (high half word)		
$0015	40022	xxxx	xxxx	Instantaneous cooling energy (low half word)	32-bit floating point number	
$0016	40023	xxxx	xxxx	Instantaneous cooling energy (high half word)		
$0017	40024	xxxx	xxxx	Instantaneous energy (low half word)	32-bit floating point number	

$0018	40025	xxxx	xxxx	Instantaneous energy (high half word)		
$0019	40026	xxxx	xxxx	Integral part of accumulated heating energy (low half word)	32-bit signed integer	
$001A	40027	xxxx	xxxx	Integral part of accumulated heating energy (high half word)		
$001B	40028	xxxx	xxxx	Fractional part of heating energy accumulation	16-bit signed integer	This value changes according to the change of energy unit. And the number is increased by 10000 times before output, thus, the real value needs to be reduced by the same times
$001C	40029	xxxx	xxxx	Integral part of accumulated cooling energy (low half word)	32-bit signed integer	This value changes according to the change of energy unit
$001D	40030	xxxx	xxxx	Integral part of accumulated cooling energy (high half word)		
$001E	40031	xxxx	xxxx	Fractional part of cooling energy accumulation	16-bit signed integer	This value changes according to the change of energy unit. And the number is increased by 10000 times before output, thus, the real value needs to be reduced by the same times
$001F	40032	xxxx	xxxx	Integral part of accumulated energy (low half word)	32-bit signed integer	This value changes according to the change of energy unit
$0020	40033	xxxx	xxxx	Integral part of accumulated energy (high half word)		
$0021	40034	xxxx	xxxx	Fractional part of energy accumulation	16-bit signed integer	This value changes according to the change of energy unit. And the number is increased by 10000 times before output,

						thus, the real value needs to be reduced by the same times
$0022	40035	$000D	40014	Network address code	16-bit signed integer	
$0023	40036	$000E	40015	Flow accumulation switch	16-bit signed integer	1 on (default) 0 off
$0024	40037	xxxx	xxxx	Energy accumulation switch	16-bit signed integer	1 on (default) 0 off
$0025	40038	$000F	40016	Flow unit No.	16-bit signed integer	0 - m^3 /h (default) 1 - L/m 2 - gpm(UK) 3 - cfm 4 - gpm(USA)
$0026	40039	xxxx	xxxx	Energy unit No.	16-bit signed integer	0 - KJ/h 1 - MJ/h 2 - GJ/h 3 - Kcal/h 4 - Mcal/h 5 - KW (default) 6 - MW 7 - Kbtu
$0027	40040	$0010	40017	Baud rate No.	16-bit signed integer	0 - 4800 1 - 9600 (default) 2 - 14400 3 - 19200 4 - 38400 5 - 50400 6 - 57600 7 - 76800 8 - 115200
$0028	40041	$0011	40018	Serial number - characters 1,2	string	Count from left to right, for example, a in "abc" is left
$0029	40042	$0012	40019	Serial number - characters 3, 4		
$002A	40043	$0013	40020	Serial number - characters 5, 6		
$002B	40044	$0014	40021	Serial number - characters 7, 8		

$002C	40045	$0015	40022	Zero offset value (low half word)	32-bit floating point number	This value changes according to the change of flow unit
$002D	40046	$0016	40023	Zero offset value (high half word)		
$002E	40047	$0017	40024	Outer diameter of pipe material (low half word)	32-bit floating point number	This value changes according to the change of length unit
$002F	40048	$0018	40025	Outer diameter of pipe material (high half word)		
$0030	40049	$0019	40026	Wall thickness of pipe material (low half word)	32-bit floating point number	This value changes according to the change of length unit
$0031	40050	$001A	40027	Wall thickness of pipe material (high half word)		
$0032	40051	$001B	40028	Set flow value corresponding to 4mA (low half word)	32-bit floating point number	This value changes according to the change of flow unit
$0033	40052	$001C	40029	Set flow value corresponding to 4mA (high half bytes)		
$0034	40053	$001D	40030	Set flow value corresponding to 20mA (low half word)	32-bit floating point number	This value changes according to the change of flow unit
$0035	40054	$001E	40031	Set flow value corresponding to 20mA (high half word)		
$0036	40055	$001F	40032	Theoretical output current value of current loop (low half word)	32-bit floating point number	
$0037	40056	$0020	40033	Theoretical output current value of current loop (high half word)		
$0038 To $004F	40057 To 40080	$0021 To $004F	40034 To 40080	Reserve space, add when necessary		

$0050 To $007E	40081 To 40127	$0050 To $007E	40081 To 40127	Manufactureruses Useless to users		

Note: half word takes up 2 bytes. Conversion of hexadecimal number to floating-point number shall be based on IEEE754 standard. When hexadecimal number is converted to 16 bit signed integer or 32-bit signed integer, it can be combined according to high and low.

7 Supplementary notes:

1. Conversion of instantaneous flow unit of the system (taking m^3 /h as the basic unit, base as the value when the unit is m^3 /h, and result as the calculation result)

（1）When l / min unit is selected:result = base * 16.66667；

（2）When gpm(UK) unit is selected: result = base * 3.666167；

（3）When cfm unit is selected: result = base * 0.588578；

（4）When gpm(USA) unit is selected: result = base * 4.402833；

Note: gpm (UK) represents British GPM and gpm (USA) represents American gpm.

2. Conversion of instantaneous energy unit of the system (taking MJ/h as the basic unit, base as the value when the unit is MJ/h, and result as the calculation result)

（1）When KJ/h unit is selected:result = base * 1000；

（2）When GJ/h unit is selected:result = base / 10^3；

（3）When Kcal/h unit is selected:result = base * 238.9；

（4）When Mcal/h unit is selected:result = base * 0.2389；

（5）When KW unit is selected:result = base * 0.277778；

（6）When MW unit is selected:result = base * 0.277778 / 10^3；

（7）When Kbtu unit is selected:result = base * 0.9478；

3. Conversion of instantaneous velocity unit of the system (taking m/s as the basic unit, base as the value when the unit is m/s, and result as the calculation result)）

（1）When f/s unit is selected:result = base * 3.28084；

（2）When yd/s unit is selected:result = base * 1.093613；

4. Network signal description:：

（1）"X" is displayed for network disconnection;

（2）The network module successfully resets and displays 2 network signals;

（3）Press the down key for 3 seconds and release it to enter the connecting network. The interface displays "...", and the waiting time of the connecting network is 10 minutes. If the WiFi password is wrong or the waiting timeout, it will display "!";

（4）If The network is connected successfully, it displays 3 network signals, and the mobile terminal displays "configuration completed";

（5）After connecting with the server, it will display 4 network signals;

（6）1 network signal is displayed in case of network error during transmission

5. Measurement signal description:

（1）The measurement’svibration is large when the network signal is 2 or below, and it is not suitable for long time measurement;

（2）The measurement effect is the best when the network signal is 4 to 5;

6. Description of OCT or relay options:

(1) When "frequency output" is selected in OCT option, OCT will output according to menu 56, 57, 58 and 59;

(2) When the option "no signal" is selected, it means that OCT outputs high level when there is no signal, otherwise it outputs low level, and the output electrical level of relay is opposite to OCT;

(3) When the option "low flow alarm" or "high flow alarm" is selected, it means that OCT outputs high electrical level when the measured flow is lower than the flow set in menu 67 or higher than the flow set in menu 68, otherwise it outputs low electrical level, and the output electrical level of relay is opposite to OCT;

(4) When the option "flow accumulation pulse" is selected, it means that OCT outputs a rising edge pulse when the flow accumulation reaches the single pulse set in menu 69, and the relay outputs a falling edge pulse;

(5) When the option "batch flow triggering" is selected, it means that OCT maintains high electrical level when the flow accumulation increases the batch control value set in menu 66, until the OCT option is reconfigured to "batch flow triggering" to start new metering; the output electrical level of relay is opposite to that of Oct;

(6) When the option "off" is selected, it means that OCT will always output low electrical level and relay will always output high electrical level.

(7) When "energy accumulation pulse" is selected, it means that OCT outputs a rising edge pulse and relay outputs a falling edge pulse when the cooling and heating accumulation reaches the single pulse set in menu 69;

(8) When the option "batch heating trigger" is selected, it means that OCT maintains high electrical level when the heating accumulation increases the batch control value set in menu 66, until the OCT option is reconfigured to "batch heating trigger" to start new metering; the output electrical level of relay is opposite to that of OCT;

(9) When the option "batch cooling triggering" is selected, it means that OCT will maintain the high electrical level when the accumulated cooling increases the batch control value set in menu 66 until the OCT option is reconfigured to "batch cooling triggering" to start a new metering; the output electrical level of relay is opposite to that of OCT.

(10) When OCT and relay work effectively at the same time, the values indicated by the contents set in menu 66 and menu 69.

OCT option	Relay option	Set value in Menu 66	Set value in Menu 69
Batch flow trigger	Batch flow trigger	Flow batch control value	Unusable
Batch flow trigger	Batch heating(cooling) trigger	Flow batch control value	Unusable
Batch heating(cooling) trigger	Batch flow trigger	Flow batch control value	Unusable
Batch heating(cooling) trigger	Batch heating(cooling) trigger	Batch heating(cooling)control value	Unusable
Other	Batch flow trigger	Flow batch control value	Unusable
Other	Batch heating(cooling) trigger	Batch heating(cooling)control value	Unusable

Batch flow trigger	Other	Flow batch control value	Unusable
Batch heating(cooling) trigger	Other	Batch heating(cooling)control value	Unusable

OCT option	Relay option	Set value in Menu 66	Set value in Menu 69
Flow accumulation pulse	Flow accumulation pulse	Unusable	Single accumulation of flow pulse
Flow accumulation pulse	Energy accumulation pulse	Unusable	Single accumulation of flow pulse
Energy accumulation pulse	Flow accumulation pulse	Unusable	Single accumulation of flow pulse
Energy accumulation pulse	Energy accumulation pulse	Unusable	Single accumulation of cooling/heating pulse
Other	Flow accumulation pulse	Unusable	Single accumulation of flow pulse
Other	Energy accumulation pulse	Unusable	Single accumulation of cooling/heating pulse
Flow accumulation pulse	Other	Unusable	Single accumulation of flow pulse
Energy accumulation pulse	Other	Unusable	Single accumulation of cooling/heating pulse

8 Appendix 1—Contrastive table of clamp on specification

Contrastive table of specification Unit: mm

Model	Nominal inner diameter of pipe	W	W1	L	L1	H
F2	DN20	60	51	105	118	101
	DN25	60	56	105	118	108
	DN32	60	63	105	118	115
	DN40	60	74	105	118	126
	DN50	60	89	105	153	139
	DN65	60	102	105	153	152
	DN80	60	113	105	153	163
E3/F3	DN20	60	51	105	118	121
	DN25	60	56	105	118	128
	DN32	60	63	105	118	135
	DN40	60	74	105	118	146
	DN50	60	89	105	153	159
	DN65	60	102	105	153	172
	DN80	60	113	105	153	183

9 Appendix 2—Statistical table of applicable range of pipe clamp for clamp on

Model	Pipe material	Nominal inner diameter of pipe	Range of applicablepipe outside diameter（mm）		Flow Range（0.03~5m/s）（m3/h）
			A Level	B Level	
F2/F3/E3	PVC Stainless Steel Carbon Steel	DN20	25~29	21~25	0.04~6
		DN25	32~36	28~32	0.05~9
		DN32	39~43	35~39	0.09~15
		DN40	50~54	46~50	0.13~23
		DN50	63~67	59~63	0.20~35
		DN65	76~80	72~76	0.35~60
		DN80	87~91	83~87	0.55~90
Note: B Level needs to be realized by pasting the attached rubber pad on both sides of the inner wall of the pipe clamp					

Model	Pipe material	Nominal inner diameter of pipe	Range of applicablepipe outside diameter（mm）		Flow Range（0.03~5m/s）（m3/h）
			A Level	B Level	
F2/F3/E3	Copper	DN20 DN25	25~29	21~25	0.04~6 0.05~9
		DN32	32~36	28~32	0.09~15
		DN40	39~43	35~39	0.13~23
		DN50	50~54	46~50	0.20~35
		DN65	63~67	59~63	0.35~60
		DN80	76~80	72~76	0.55~90
Note: B Level needs to be realized by pasting the attached rubber pad on both sides of the inner wall of the pipe clamp					

10 Appendix 3—Pipe clamp size of temperature sensor

Specification of pipe diameter	ϕ Inner diameter of pipe clamp (mm)	ϕ 1 Diameter of pipe clamp (mm)
DN20	29	43
DN25	36	48
DN32	43	55
DN40	54	66
DN50	67	81
DN65	80	94
DN80	91	105

11 Appendix 4—WiFi operation manual

11.1 Flowmeter connecting network

User uses mobile phone to search SMART METERS, clicking to followSMART METERS, and enters into Config (Device Configuration). According to the prompt operation, the flowmeter is in the state of interconnection when the connecting network is successful, and uploads data to icloud server.

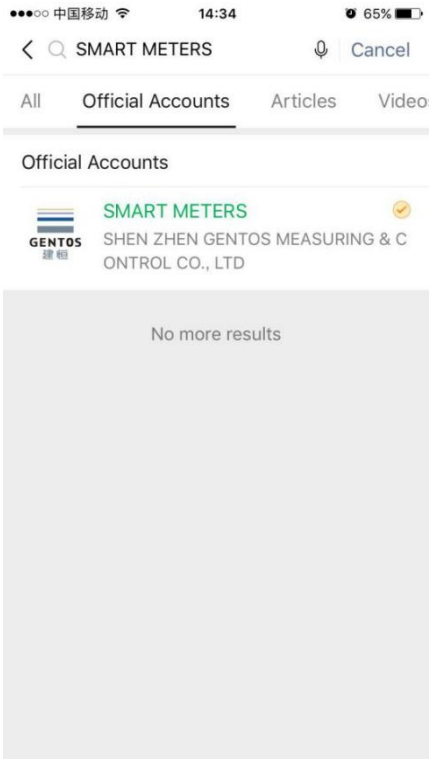
11.1.1 Flowmeter connecting network

Press ∨ key for 3 seconds and then release it to enter WiFi connecting network status.。

11.1.2 Download WeChat

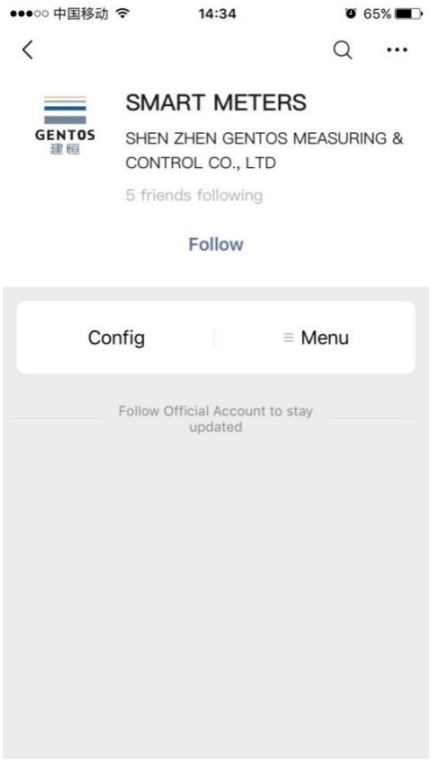
11.1.3 Search SMART METERS public cloud number

Enter WeChat and search public number.
“SMART METERS”



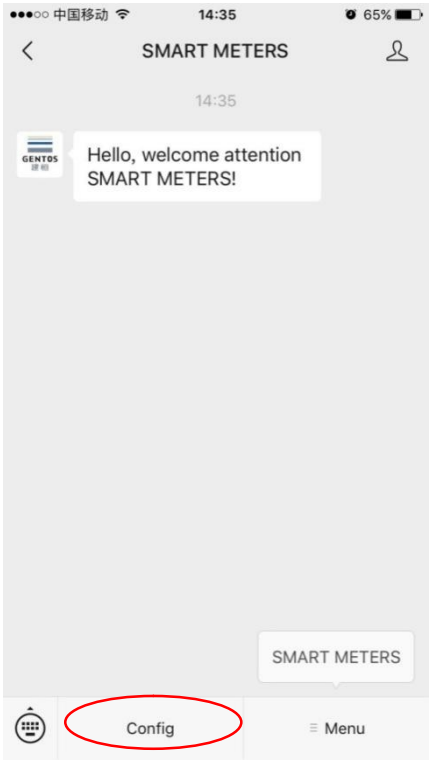
11.1.4 Click on following button

Follow Gentos' public cloud number



11.1.5 Instrument Distribution Network

Enter SMART METERS public number, click the below "Config" menu, and automatically enter "configuration device online" interface.

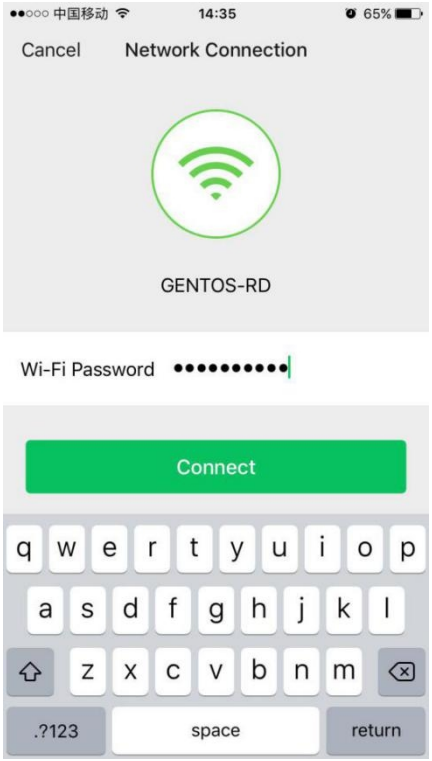


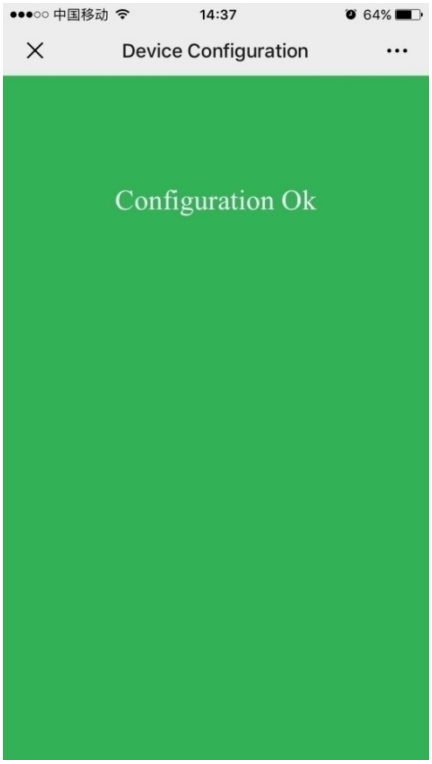
11.1.6 Configuration of equipment for Internet access

Enter the WiFi password, click on the connection, and wait for the distribution network. This process takes about tens of seconds to about a minute. After the distribution network is successful, the display configuration of the mobile phone is completed. Display that the distribution network is unsuccessful if the time-out occurs and need to be reconnected.

Note:

1. The device distributes network, and the mobile phone must be connected to WiFi. It is recommended to keep the distance between the instrument and mobile phone within 5m.
2. If connected successfully, the configuration information has been saved in the WiFi module, and the WiFi signal of this connection will be connected automatically as long as it is detected during the next power on.





11.1.7 Visit the central air conditioning billing system of Gentos

Refer to the relevant chapters of The Operation Manual of Central Air Conditioning Billing System Mobile Terminal.