User Manual
Revision 2.001
English

Smart energy meter

EM418 series

Shanghai fangqiu electric CO.,LTD.

Benefits and Main Features

- MID approved with appendix "B" and "D" certification
- Single phase metering 4 din modules
- Accuracy class B according to EN50470-3
  Accuracy class 1 according to IEC62053-21
- Instant Voltage,Ampere,kW,kvar,PF,Hz,+kWh,-kWh, Σ kWh,-kvarh,+kvarh
- Records MD and its occurent time for latest 12 months
- 1,2,3 and 4 tariff meter option, up to 12 time periods per day
- LCD display, 6 integer 2 decimal, meter display when power fails
- Large clear back light display
- Summer time switch
- Clock time verification function
- Date memory recording, including 1-12 month energy consumption, MD and MD's current time
- Isolate pulse output and IR (DIN43864)
- Direct metering up to 100A
- RS485 communication port, modbus protocol
- Program by button on the nameplate
- Memory back-up (EEprom)
- The meter is intended to be installed in a Mechanical Environment 'M1', with Shock and Vibrations of low significance, as per 2004/22/EC Directive and should be installed in Electromagnetic Environment 'E2', as per 2004/22/EC Directive.

Index:

1. Safety notice

The smart energy meter of EM418 series does not require special mechanical or electrical tools for its installation. Mounting position (with any angle of tilt) has no effect on the measurement functions of the meter.

Connecting of the meter must be made according to applicable wiring diagram. Incorrect connection of the meter to the electricity network causes major display problem and can also causes serious damage to the meter. Before starting meter operation, it must be ensured the local conditions of the energy system are consistent with data on the nameplate of the meter. Preferably use for the connection of shielded cables. Make sure that connecting cables are not damaged during installation of the meter are not energized and free of non-mechanical stress.

Repairs when removing the cover of the meter, which is also under tension can be made only by a qualified electrician who is familiar with the associated risks. Capacitors in the meter may still be charged even if the meter is disconnected from all energy sources.

2. Content of delivery

Single phase, electronic energy meter, instructions for assembly

ID setting

Baud rate setting

Password setting

3. Declaration of Conformity

Declaration of Conformity

We, Shanghai Fangqiu Electric Co., Ltd
Room1803, No1858 North Zhongshan RD
Putuo district Shanghai
China

Ensure and declare that apparatus:

EM418

With the measurement range

230V, 0.5-10(100)A, 50Hz, 1800imp/kWh

Are in conformity with the type as described in the

EC-type examination certificate 8G80182

And satisfy the appropriate requirements of the Directive 2004/22/EC with the following standards:

EN 50470-1: 2006, Electricity metering equipment (AC) Part 1: General requirements, tests and test conditions. Metering equipment (class indexes A, B and C)

And

EN 50470-3: 2006, Electricity metering equipment (AC) Part 3: Particular requirements - Static meters for active energy (class indexes A, B and C)

Company stamp and signature

4. Technical description

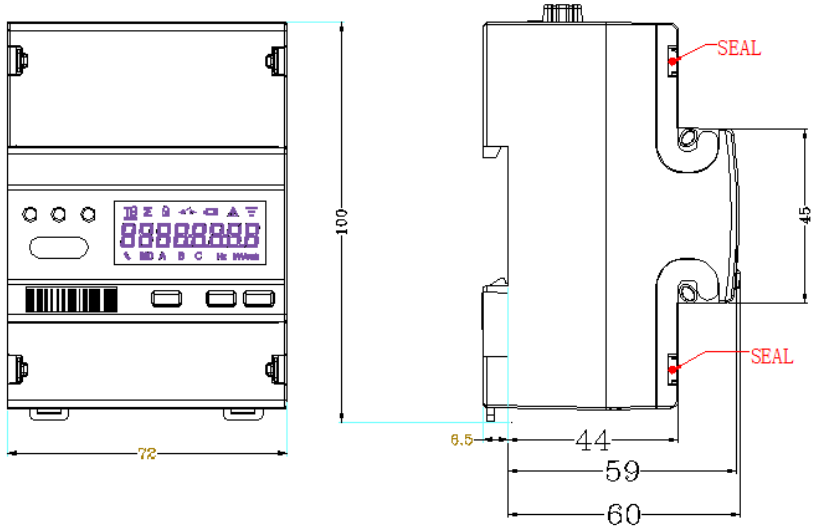
4.1 Performance criteria

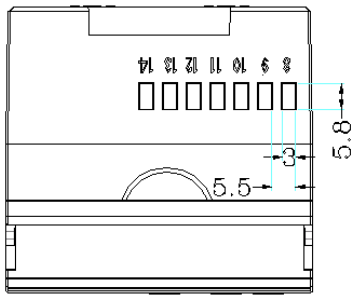
Type of measurement	Voltage,Ampere,kW,kvar,PF,Hz +kWh,-kWh,kWh,-kvarh,+kvarh
humidity	≤ 75%
Storage humidity	≤ 95%
Operating temperature	-25°C - +55°C
Storage temperature	-40°C - +70°C
Humanity	0 to 95%,non-condensing
International standard	EN50470-3 &IEC62053-21
Accuracy class	B
Protection against penetration of dust and water	IP51
Insulating encased meter protective class	Ⅱ
Install place	Indoor Meter
Connection area main terminals	
Current terminals flexible 1×mm^2	0-16mm^2
RS485 cable	AWG18
another terminal flexible 1×mm^2	0-2.5mm^2

4.2 Meter specification

Voltage(v)	230V
Operational voltage	70%～130%Un
- Iref	10A
-Itr	1A
-Imax	100A
-Imin	0.5A
-Ist	40mA
Power consumption of current circuits(VA)	< 0.01
Power consumption of voltage circuits(W)	< 1.3W
Frequency (Hz)	50
Memory back-up	EEprom
Environment resistance to heat and fire	Terminal 960℃ Cover 650℃
Rates	0～4
Separate Import & Export Registers	585
Time-keeping accuracy	<0.5s/day
Clock operating with battery	>15 years
Power off clock running time	>5 years
upper	ABS+PC
lower	ABS+PC
Pulse width(ms)	80
Pulse constant(imp/kWh)	1600
LED constant	1600
Width (mm)	76
Height (mm)	10
Depth (mm)	60

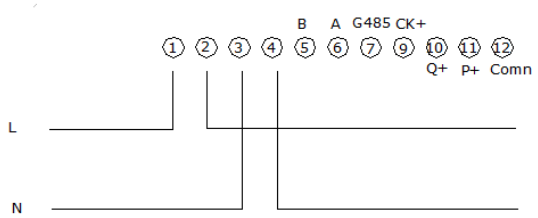
5. Dimensions and sealing points





6. Wiring diagrams

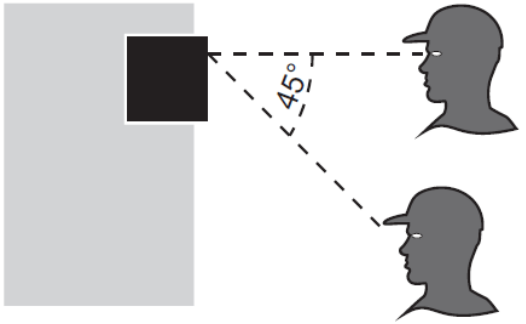
Note: the following types of wiring diagrams show the energy meter, include terminals for pulse output and the communication interface RS-485.However,depending on the ordering number of the energy meter only some terminals of the energy meters are involved.



1/2	L1 in &Out
3/4	Neutral
5/6 /7	RS485 Communication contact
	TX/RX(-) , Terminal 5
	TX/RX(+) Terminal 6
	G485 (⊥) Terminal7
11/12	Active test pulse output contact(12-,11+)
10/12	Reactive test pulse output contact(12-,10+)
9/12	Clock test pulse output contact(12-,9+)

7. Meter reading

the view angle Operator-meter should be up to 45^0



8. Main function

8.1 Measuring Function

On the EM418'S front panel, there are three LED, active/reactive energy pulse light, and current reverse indicator lights .

Meter can measure import active energy , export active energy , Bi-directional reactive measuring .

With time-division measurement function, user can store or calculate active and reactive energy according to the time interval of 4 tariffs (Sharp, peak, Even, valley).

8.2 Demand function

The meter can calculate the forward and reverse active/reactive demand and the demand occurrence time.

Max demand can be set by slip Frequency, demand interval and slip Frequency time can be setup . Factory default: demand interval is 15mins, slip Frequency is 1min.

It can store Max demand data of 12 account days.

8.3 Data store function

The meter can store total active energy, forward/reverse active total energy and time-sharing energy. Also include the reactive forward/reverse total energy and time-sharing energy, four-quadrant reactive total energy and time-sharing energy.

Data restore time is at 0'clock the end of a month or any day of a month from 1~28 on hour.

The meter can store current and previous 12months data.

When energy meter has no power, all settlement –related data should be save less than 10 years, other data preserve less than 3 years.

8.4 TOU function

The internal clock circuit of energy meter has time automatic switching function.

Calendar, clock and rate can be set and adjustment through RS485, infrared interface.

At least 4 tariffs and 12 time interval can be set within a natural day, min time interval is 15 minutes. Time interval can be set over Zero o'clock.

The Meters also provide automatic accounting of leap-years.

8.5 Electricity parameters measurement

Measure record and display voltage, current, active power, reactive power, apparent Power and power factors. error is not more than ±1. The resolution of frequency is 0.01Hz.

8.6 Display function

Smart meter have two status: cycle display status and button press display . When pressing the button, User can set according their request. Button press will Back light the LCD. Display cycle can be set within 5~20 seconds, The default is 5 seconds. The meter can be communicated by IR and RS485, users can setup the display items. The meter can display max 20 screens in cycle and 40 screens by button pressing. The display items as following:

Instantaneous values

No	Comments	Read	Write	Bytes	Starting address
1	Voltage	Y	N	4	0010
2	Frequency	Y	N	4	004E/0040
3	Current	Y	N	4	0052/0018
4	Active power	Y	N	4	0092/0022
5	Apparent power	Y	N	4	00D2/0032
6	Reactive power	Y	N	4	0112/002A
7	Power factor	Y	N	4	0152/003A

Total energy accumulator

No	Comments	Read	Write	Bytes	Starting address
8	Active energy net	Y	N	4	0700/0618
9	Active energy import	Y	N	4	0800/0160
10	Active energy export	Y	N	4	0900/0166
11	Reactive energy import	Y	N	4	0A00/0162
12	Reactive Energy export	Y	N	4	0B00/0168

Energy accumulators divided into tariffs

No	Comments	Read	Write	Bytes	Starting address
13	Active net total	Y	N	4	0700
14	Active net Tariff 1	Y	N	4	0702
15	Active net Tariff 2	Y	N	4	0704
16	Active net Tariff 3	Y	N	4	0706
17	Active net Tariff 4	Y	N	4	0708

18	Active import total	Y	N	4	0800
19	Active import Tariff 1	Y	N	4	0802
20	Active import Tariff 2	Y	N	4	0804
21	Active import Tariff 3	Y	N	4	0806
22	Active import Tariff 4	Y	N	4	0808
23	Active export total	Y	N	4	0900
24	Active export Tariff 1	Y	N	4	0902
25	Active export Tariff 2	Y	N	4	0904
26	Active export Tariff 3	Y	N	4	0906
27	Active export Tariff 4	Y	N	4	0908
28	Reactive import total	Y	N	4	0A00
29	Reactive import Tariff 1	Y	N	4	0A02
30	Reactive import Tariff 2	Y	N	4	0A04
31	Reactive import Tariff 3	Y	N	4	0A06
32	Reactive import Tariff 4	Y	N	4	0A08
33	Reactive export total	Y	N	4	0A00
34	Reactive export Tariff 1	Y	N	4	0A02
35	Reactive export Tariff 2	Y	N	4	0A04
36	Reactive export Tariff 3	Y	N	4	0A06
37	Reactive export Tariff 4	Y	N	4	0A08

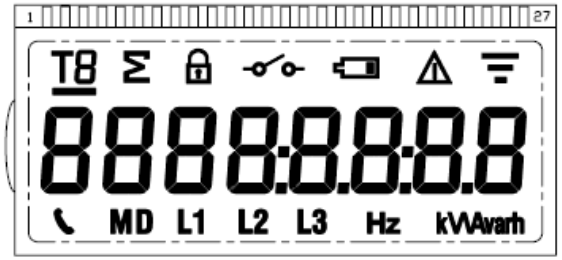
Production data and identification

No	Comments	Read	Write	Bytes	Starting address
38	Serial number	Y	Y	4	FF00
39	Manufacture code	Y	Y	4	FF02
40	Type code	Y	Y	2	FF04
41	Hardware version	Y	Y	2	FF05
42	Software version	Y	Y	2	FF06

Settings

No	Comments	Read	Write	Bytes	Starting address
43	Date	Y	Y	4	FC00
44	Time	Y	Y	2	FC02
45	Modbus id	Y	Y	2	0524
46	Baud rate	Y	Y	2	0525

Lcd content



Description of LCD symbols displayed

Symbol	Description
kVVArh	kWh—active energy kW—active power kvarh—reactive energy kvar—reactive power kVA—apparent power
Σ	Total
	Unpermitted programming
	Battery status:3.6V When the battery voltage is low, flashes show (<3V)

	LCD alarm indicator
	Communication symbols
MD	Max demand
T8	Tariff: T1,T2,T3,T4
T8	Tariff of current time
	 Last1 month Last2 month last 3 month

8.7 Switching off display

When the power is off, user can read the meter by pressing button on the panel.

The meter can display the readings which was displayed before the power off.

8.8 Summer/winter time switch permit/prohibition

Smart meter provide automatic summer/winter time switch accomplished at 02.00 on the last Sunday of March(forward 1 hours) and at 03:00 on the last Sunday of October(back 1 Hours).

Summer/winter time switch can permit or prohibition by RS485 or IR port.

8.9 **Communication Function**

With an infrared COM and a RS485 COM. Its physical layers are independent with each other. One communication channel will not be affected by the other one.The meter can realize data acquisition, broadcast time setting, read, program and manage through hand-held terminals, data acquisition terminal, test equipments and computers. Communication protocols fit Modbus RTU standard.

RS485 circuit and energy meter internal circuit can realize electrical isolation and failure protection of circuit.

RS485 communications transfer rates allow selected at 1200bps, 2400bps, 4800 bps and 9600bps, default is 9600bps,8,1,EVEN.The max quantity of meters on one RS485 main bus is 64 Units, the longest communication distance is 1.2Km.

8.10 Alarm function

When the meter connect wire wrong example: current reverse, the meter will display  , the ALARM led will be on.

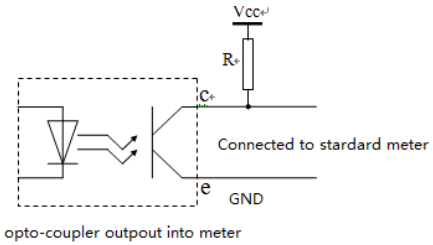
8.11 Pulse output function

8.11.1 Active/reactive pulse output

Smart meter is equipped with a pulse output which is fully separated from the inside circuit. That generates pulses in proportion to the measured energy .include the testing pulse output of active energy and reactive energy. 11/ 12 Test pulse output contact (P+/P-)，10/ 12 Test pulse output contact (Q+/Q-)

The test pulse output is a polarity dependant, passive transistor output requiring an external voltage source for correct operation. For this external voltage source, the voltage (Ui) should be 5-27V DC, and the maximum input current (Imax) should be 27mA DC. To connect the impulse output, connect 5-27V DC to connector 10&11 (anode), and the signal

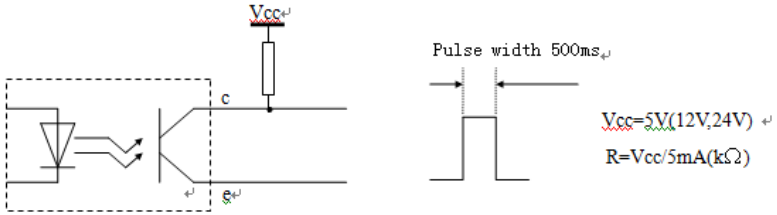
wire (S) to connector 12 (cathode). The meter pulses is indicated on the front panel.



opto-coupler outpout into meter

8.11.2 Multi-functions signal output

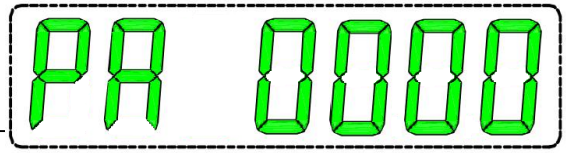
Terminal 9 and 12 are the Multi-functions signal output ports. The common status is 1Hz time output port for meter's clock accuracy testing. Testing diagram as below：



The terminals can be setup to switch to demand circle signal output and time output by RS485 and Infrared. When the meter is power off it will switch to 1Hz clock pulse output.

9 Programming

By holding the keys "SET" pressed for at last 3 sec., starts menu programming mode.LCD will show:



9.1 password verify

On the smart meter display will appear : PA followed by the currently memorized value . "PA" means "Password","0000"means the 4 digits of the Password. we can use press "Page Down" button to decrease the input value, and press "Page Up" to increase the input value ,press the "SET" button to switch the input Password digits, when the Password is correct, the meter will enter "program status" and display the "ID" program interface.

Remarks:

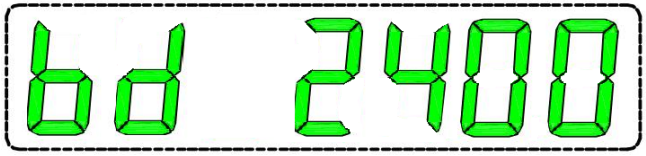
Please remember well the Password, Password to default (0000).

9.2 ID setting

After the Password authentication , the meter will display the "ID XX" setup interface. As the following picture "Id 00" it means the current ID address is 00 (the ID address is hex code)

Press "Page Down" button to decrease the digits. press "Page Up" to increase the digits， press "SET" button to save the setup, the interface will switch to Baud rate setup interface automatically. Press "SET" button to enter next interface if you do not need to change the baud rate.

9.3 Baud rate setting

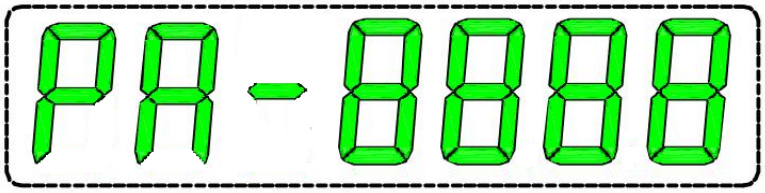


we can use press “Page Down” button to decrease the input value, and press “Page Up” to increase the input value ,press the “SET” button to switch the input digits, when the baud rate is correct, the meter will enter “program status” and display the password setting.

Remarks：

1. default baud rate will be 9600bps
2. 1200/2400bps /4800bps/9600bps can be set

9.4 Password setting：



The meter will display the current password after enter the password setup interface, press the “SET” to change the password. Use “page dow” and “page up” button to input password as you want. After 30 seconds the meter will save the password you changed.

Remarks:

1 Do not forget the password you setup.

2 Please press the button to check if every setup is correct after the program.

3 Password setup interface “-“ symbol will blink.

10.Battery replacement.

When the battery symbol”  ” blink on the LCD, it means the battery volume is not enough.

User can replace the battery as following instruction:

★ Open the meter terminal cover.

★ Open the battery cover.

★ Put new battery inside(connect positive pole with“+”，connect negative pole with“-”，tight the terminal screws)

★ close both battery cover and meter terminal cover.