



POWER MONITORING UNIT

SAM3001 USER MANUAL

1. SAFETY PRECAUTIONS

The manufacturer is not responsible of the failure comply with the instructions in this manual.

CAUTION:

Ensure that only qualified technicians work on the installation and maintenance.

Never work alone.

The electrical parameters supplied should be within the nominal range

Before any work with or on the equipment, isolate the voltage inputs and auxiliary power supplies, cut the secondary of all CTs (current transformers), but never cut the secondary of the PT. (Power Transformers)

Always use an appropriate voltage sensing device to ensure that everything is switched off and that no voltage is present in any part of the equipment

Risk in the device

- ◆ The voltage of the auxiliary power supply is outside the nominal range
- ◆ The frequency of the power distribution system is outside the nominal range.
- ◆ The input polarity of the voltage or current is connected incorrectly.
- ◆ Remove or connect communication connections without switching off the device.
- ◆ Connect the cables to the terminal contrary to the instructions.

	"Danger" is used to warn workers that a danger exists; if the "Danger" is ignored, it will cause severe personal injury, death, equipment damage or property damage.
	"Warning" is used to indicate that death or serious personal injury may occur if proper precautions are not taken.

2. ABOUT THIS MANUAL

This manual deals with the characteristics of the analyser SAM3001 and shows the necessary instructions for its correct installation and start-up.

The equipment has its Modbus manual where you will find the ModBus register map necessary to communicate with the equipment. However, this manual describes the configuration and start-up of the equipment through the SACI software.

This software can be downloaded free from the SACI website (www.saci.es). To install it, you only need to download and run the file. Once executed, follow the installation instructions and you will have access to the application which you can communicate with the equipment.

This manual assumes that user has knowledge about the network measurement parameters and knows the measurement and power supply system's where the equipment will be installed.

If you have any questions about this user manual or the equipment, please contact your local SACI distributor.

INDEX

1. SAFETY PRECAUTIONS	1
2. ABOUT THIS MANUAL.....	2
3. GENERAL DESCRIPTION	7
4. Function	8
5. Models	10
5.1 Composition.....	10
5.2 Instruction for component.....	10
6. MEASURE	13
6.1 Measure parameters through the user interface.....	13
6.1.1 Network parameters	13
6.1.2 Energy.....	14
6.1.3 Device Status	14
7.INSTALLATION	15
7.1 Dimensions	15
7.1.1 SAM3001-03	15
7.1.2 SAM3001-02	15
7.1.3 SAM3001	15
7.1.4 SAM3001-04	16
7.1.5 Switching module	16
7.1.6 Closed type current transformer	17
7.1.7 Open type current transformer	18
7.1.8 Flexible coil current transformer	19
7.2 Connection.....	20
7.2.1 SAM3001-02 wiring diagram.....	20
7.2.2 SAM3001 wiring diagram	20
7.2.3 SAM3001-04 wiring diagram.....	21
7.3 Installation	21
7.3.1 SAM3001 installation method	21
7.3.2 SAM3001-03 installation	21
7.3.3 Closed type current transformer installation	22
7.3.4 Open type current transformer installation	25
7.3.5 Flexible coil current transformer installation	26

7.3.6 Connection between modules	27
8. CONFIGURATION SOFTWARE	28
8.1 Connect with the device.	28
8.2 Device configuration	28
8.3 Relay Configuration	29
9 Operation and display.....	31
9.1 Panel description.....	31
9.2 Instruction for SAM3001-D1 buttons	32
9.3 SAM3001-D1 display interfaces	33
9.3.1 Real-time measurement	34
9.3.2 Energy metering	35
9.3.3 Power quality	36
9.3.4 Demand record	38
9.3.5 Digital input and relay output	38
9.3.6 Event record	39
9.3.7 Extensible modules	39
10. Networking setup	41
10.1 Networking	41
10.1.1 Automatic networking	41
10.1.2 Manual networking	42
10.2 Menu	43
10.3 Setting item.....	43
10.3.1 Local setting	43
10.3.2 Time setting.....	44
10.3.3 Demand setting	44
10.3.4 Automatic meter reading setup.....	45
10.3.5 Monthly tariffs setup.....	45
10.3.6 Daily tariff setup	45
10.3.7 Synchronous clearing setup	45
10.3.8 Input signal setup	45
10.3.9 Communication setup	46
10.3.10 Relay output setup	46
10.3.11 Clear record	48

10.3.12 Limit value setup	48
10.4 Programming operation.....	50
11. Technical specification	51
11.1 SAM3001 measurement module.....	51
11.2 SAM3001-02 communication module	52
11.3 SAM3001-03 display module	53
11.4 SAM3001-04 power supply module	53
11.5 Current transformer	54
12. ModBus Map	57
12.1 Communication	57
12.1.1 Physical layer	57
12.1.2 Communication Protocol	57
12.1.3 Read the status of relay output (Function code 0x01)	58
12.1.4 Read the status of digital input (Function code 0x02)	59
12.1.5 Read data register value (function code 0x03/0x04)	59
12.1.6 Remotely-controlled single relay output (function code 0x05)	60
12.1.7 Remotely-controlled multi-relay output (function code 0x0F)	60
12.1.8 Write setup register (function code 0x10).....	61
12.1.9 Read event record and data (function code 0x14)	62
12.1.10 Read SOE event record:	62
12.1.11 Read alarm event record.....	64
12.2 Data format.....	66
12.2.1 32-bit floating format	66
12.2.2 16-bit Integer format.....	66
12.2.3 32-bit Integer format	66
Appendix 1 MODBUS-RTU Communication List.....	67
Primary data	67
Module information	68
Extreme value data	74
Tariff energy	75
Demand data	75
Grid quality parameters	76
Waveform data	78

SOE 79
Set register 79
Firmware version number 90

3. GENERAL DESCRIPTION

SAM3001 distributed multi-circuit power monitoring unit is a new generation of power monitoring products developed by SACI, which can realize real-time measurement of power parameters of low-voltage power distribution systems, power metering, power quality analysis, state monitoring, off-limit alarm, leakage monitoring, temperature monitoring and other functions.

Up to 32 three-phase circuits or 96 single-phase circuits can be measured. Equipped with a large color LCD screen and touch mode buttons. It is easy to use, compact in size and easy to install. It is an ideal solution for multi-circuit power monitoring in industrial occasions.

DEVICE

- ModBus-RTU communication protocol.
- The device is completely configurable through the software developed by Saci or through its Modbus map.
- DIN rail mounting, plug-in terminal block
- Multi-circuit measurement: can measure power parameters of up to 32 three-phase loops, in the same display / communication bus.
- Compact design: The ultra-narrow installation width is convenient for installation near the load monitoring point, reducing the use of cables

USER INTERFACE

- Multilanguage available.
- It allows the configuration of the devices in an easy and intuitive way.
- The measurement module can automatically assign communication addresses through the display module
- Color LCD centralized display: share a display module to display the information of multiple circuits, and the interface is beautiful.

COMMUNICATIONS

- ModBus-RTU communication protocol.
- RS485 communication port for reading and writing device parameters.

CT MODELS

- Closed current transformers available
- Open current transformers split core available
- Rogowski coil current transformers available

4. Function

The following list shows the parameters which are directly measured or acquired after calculation on the basis of basic parameters by SAM3001.

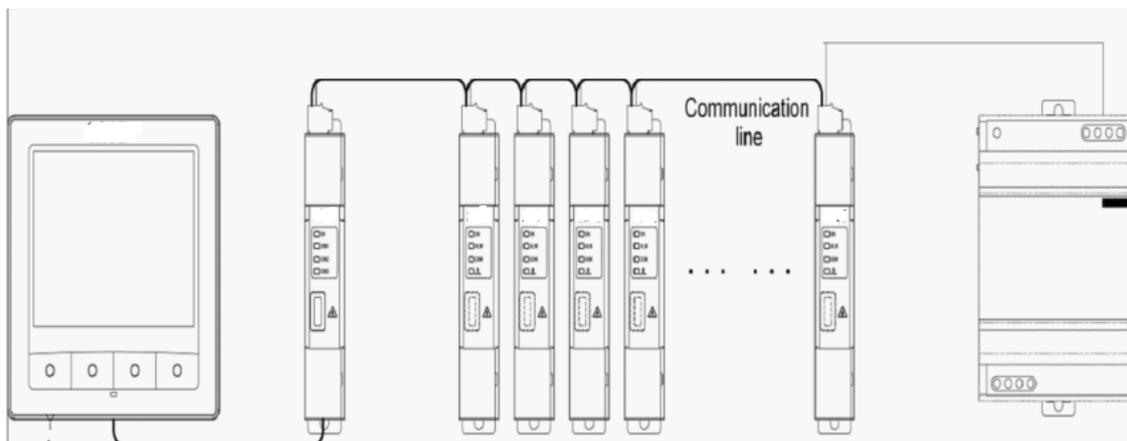
Measurement function	Accuracy	Real-time	Extreme value	Demand	Remark
Phase/line voltage	0.2	●	●	—	
Current	0.2	●	●	●	
Frequency	±0.01Hz	●	●	—	
Phase active power	0.5	●	—	—	
Total active power	0.5	●	●	●	
Phase reactive power	0.5	●	—	—	
Total reactive power	0.5	●	●	●	
Phase apparent power	0.5	●	—	—	
Total apparent power	0.5	●	●	●	
Phase power factor	0.5	●	—	—	
Total power factor	0.5	●	●	—	
Import/export active energy	0.5S	●	—	—	If split-core or Rogowski coil current transformer is adopted, the accuracy is Class 1.
Import/export reactive energy	2	●	—	—	
Four-quadrant reactive energy	2	●	—	—	
Apparent energy	0.5	●	—	—	
Voltage/current THD	Class A	●	—	—	31 st
Voltage/current harmonic content	Class A	●	—	—	31 st
Voltage/current unbalance	Class B	●	—	—	

Voltage/current sequence component	0.5	●	—	—	
Voltage/current phase angle	$\pm 0.1^\circ$	●	—	—	
Voltage crest factor	—	●	—	—	
Current K factor	—	●	—	—	
Tariffs	—	●	—	—	4 configurable tariffs

5. Models

5.1 Composition

SAM3001 is composed of one display module SAM3001-D1, one communication module SAM3001-C1, one power module SAM3001-P, 32 measurement modules SAM3001-M (extensible to module SAM3001-F1/F/F3) at most, current transformer, switching module and special connection wires.



Component		Quantity
Name	Model	
Display module	SAM3001-03	1
Communication module	SAM3001-02	1
Measurement module	SAM3001	1~32
Power supply module	SAM3001-04	1

5.2 Instruction for component

The following list shows the functions of SAM3001 series modules:

Name	Model	Function
Display module	SAM3001-03	To show measured data from measurement module, and be used to set parameter of measurement module
Communication module	SAM3001-02	Three digital communication interfaces available, adopting Modbus-RTU protocol. No.1 interface is connected to measurement module SAM3001; No.2 interface is connected to host computer; No.3 interface is connected to display module SAM3001-03. Details about communication are available in the communication map.
Measurement module	SAM3001	Measure voltage, current, power, frequency, energy, demand, extreme value and harmonics of three-phase grid. One RS485 communication interface, and external current transformers.

230 V auxiliary power supply	SAM3001-M1A	Measuring module with 230 V auxiliary power supply, with HRB connector for RS485 communications.
	SAM3001-M1B	Measuring module with 230 V auxiliary power supply, with fixed connector for RS485 communications.
Self-supplied	SAM3001-M21A	Self-powered measurement module with HRB connector for RS485 communications and one digital output.

Accessory

Name	Model	Description
Current transformer	TU__M3K	External closed type current transformer for measurement module
Current transformer	TA__M3K	External open type current transformer for measurement module
Current transformer	RC__F3K	External flexible coil transformer for measurement module
Connection line	RJ12-1	To connect display module and communication module; SAM3001 and Z1 and Z2, with length of 1m/0.5m
Connection line	RJ12-3	To connect measurement module to closed CT TU__M3K with length of 0.5m
Connection line	L2	To connect Z3, Z4 modules to SAM3001 and SAM3001-F1/F2/F3
Switching module	Z1	Connectors to be used when using split TA__M3K
Switching module	Z3	To connect between SAM3001 modules
Switching module	Z4	To connect SAM3001-02 module

Function

Function		
Parameter measurement	Three-phase voltage, current and frequency	•
	Phase and total power and power factor	•
	Demand, max. value, min. value, average value	•
Energy metering	Bi-direction energy, apparent energy	•
	Four-quadrant reactive energy	•
	Sub-phase energy	•
	Tariff energy	•
Power quality	THD	•
	Sub-harmonic	31 st
	Unbalance	•
	Crest factor, K factor	•
	Voltage deviation, frequency deviation	•

Data record	Demand record	•
	Max value, min value and average value record	•
	Off-limit alarm records	•
	SOE event record	•
Relay output		1*

***Only available in SAM3001-M21A**

6. MEASURE

SAM3001 devices can measure the following parameters. The sampling is made period by period, without rejecting any, so that the measurement responds exactly to the value in real time. Special attention has been paid to the accuracy of the sampling time, since it is the main cause of error.

- Voltage
- Current
- Power
- Power factor
- Frequency
- Energy

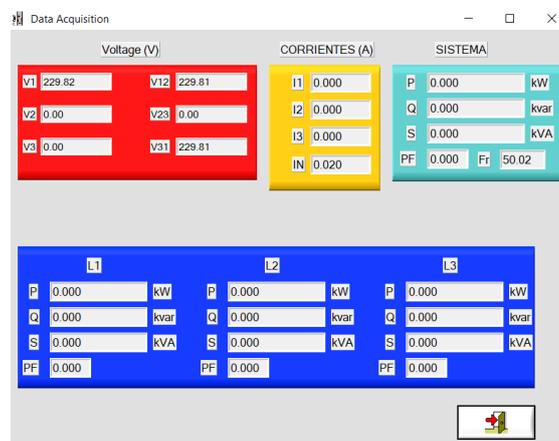
The following list shows the variables that can be measured including relative variables calculated from the basic electrical parameters:

Measuring variable	Instant	Total	Units
V1 V2 V3	✓		[V,kV]
V12 V23 V31	✓		[V,kV]
I1 I2 I3	✓		[A,kA]
F	✓		[Hz]
P1 P2 P3	✓	✓	[kW,MW,GW]
Q1 Q2 Q3	✓	✓	[kvar,Mvar,Gvar]
S1 S2 S3	✓	✓	[kVA,MVA,GVA]
PF1 PF2 PF3	✓	✓	-
EP+ EP-		✓	[kWh,MWh, GWh]
EQ1 EQ2 EQ3 EQ4		✓	[kvarh,MvarhGvarh]

6.1 Measure parameters through the user interface

6.1.1 Network parameters

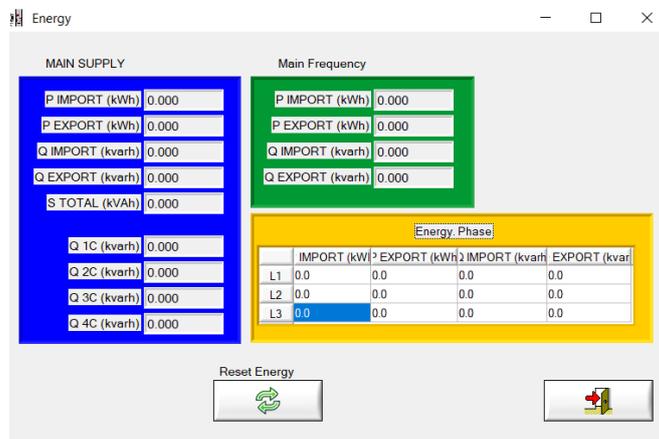
The device measures the voltage, current, frequency, power and power factor of each phase and of the system.



6.1.2 Energy

The equipment supports excellent energy measurement functions such as the following:

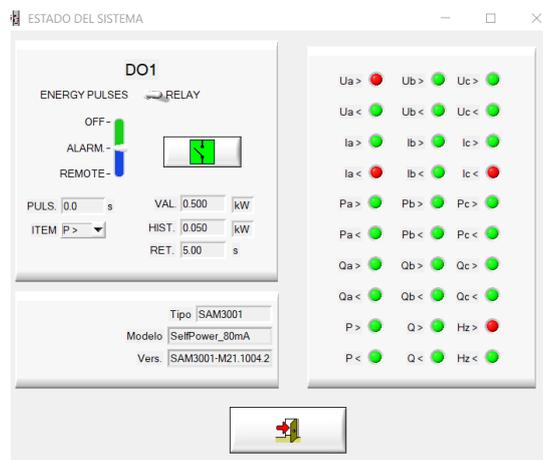
- Bi-directional energy measurement.
- Four quadrants of reactive energy measurement



Clicking on the icon  resets the energy meters.

6.1.3 Device Status

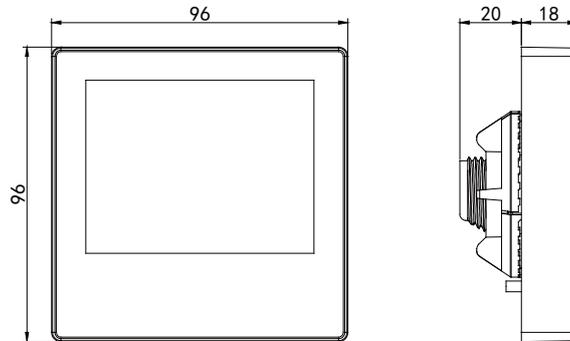
This part of the user interface shows the operating status of the relays and the alarm value, as well as the main configuration parameters of the device (identity, model, version, type of connection...)



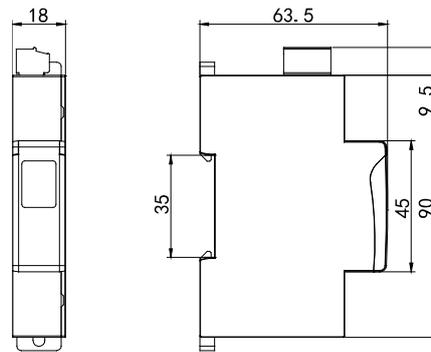
7.INSTALLATION

7.1 Dimensions

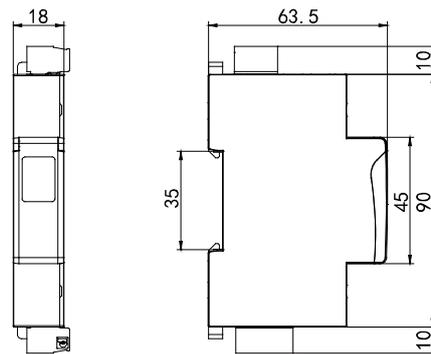
7.1.1 SAM3001-03



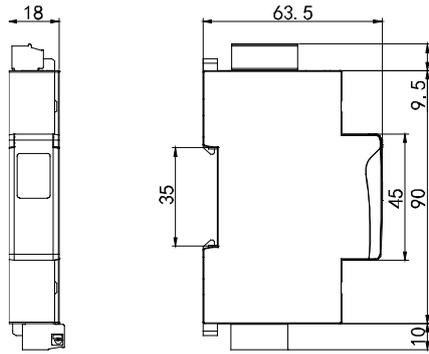
7.1.2 SAM3001-02



7.1.3 SAM3001

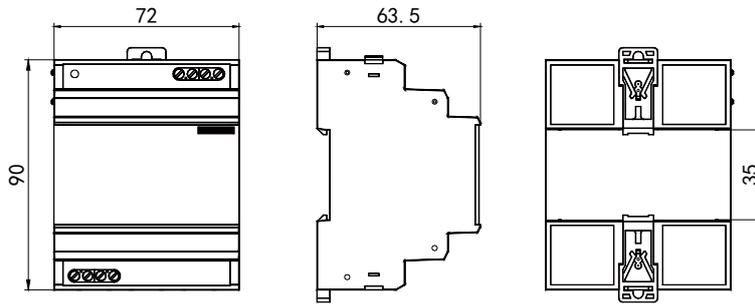


SAM3001-M1A (HRB connector)



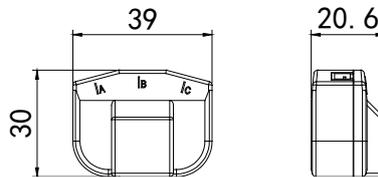
SAM3001-M1B (fixed connector)

7.1.4 SAM3001-04

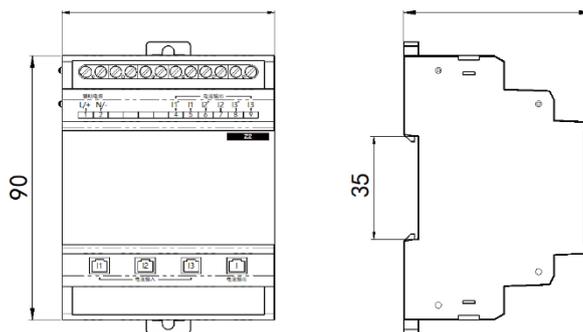


7.1.5 Switching module

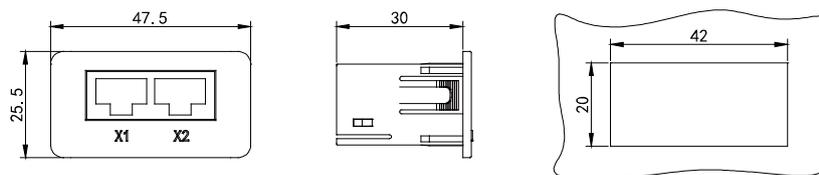
Module Z1 (equipped with open type current transformer TA__M3K)



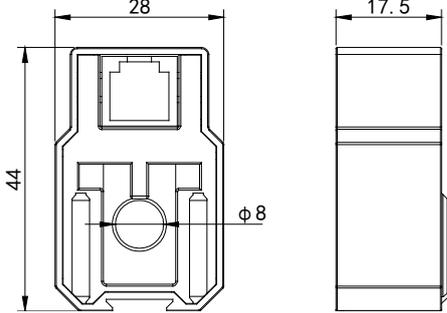
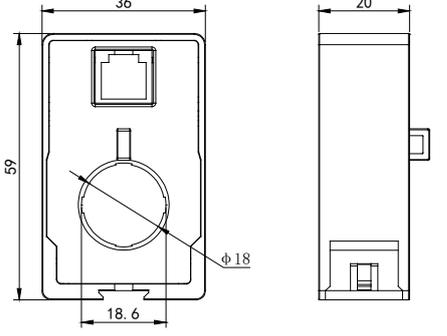
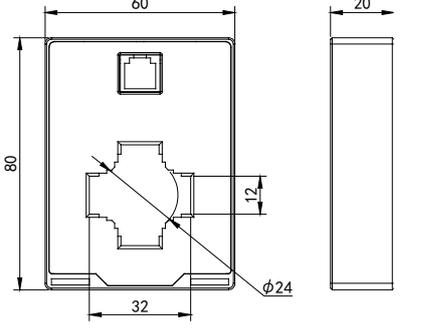
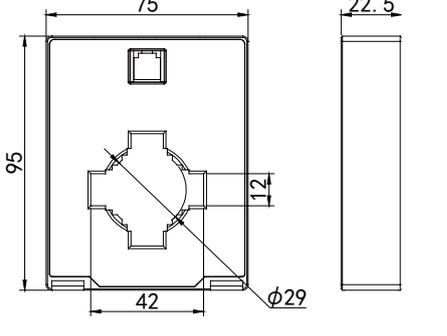
Module Z2 (equipped with flexible coil current transformer RC__F3K)

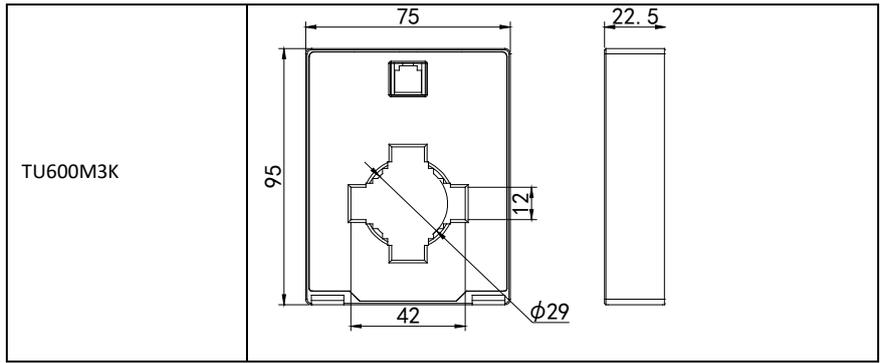


Module Z3/Z4



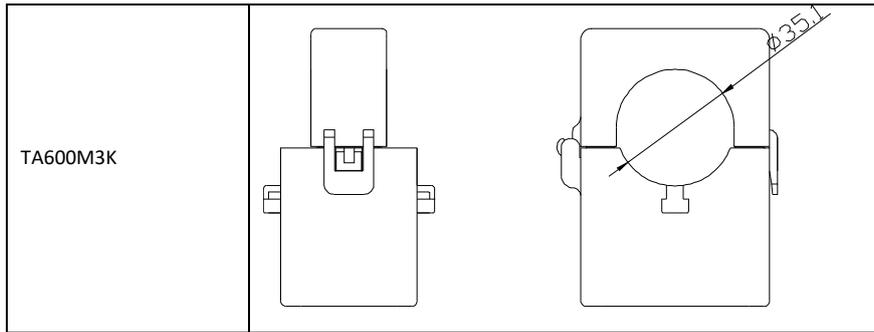
7.1.6 Closed type current transformer

Model	Dimension (mm)
TU5M3K	 <p>Technical drawing of the TU5M3K model. The front view shows a width of 28 mm and a height of 44 mm. The side view shows a thickness of 17.5 mm. A central hole has a diameter of $\phi 8$ mm.</p>
TU100M3K	 <p>Technical drawing of the TU100M3K model. The front view shows a width of 36 mm and a height of 59 mm. The bottom width is 18.6 mm. The side view shows a thickness of 20 mm. A central hole has a diameter of $\phi 18$ mm.</p>
TU200M3K	 <p>Technical drawing of the TU200M3K model. The front view shows a width of 60 mm and a height of 80 mm. The bottom width is 32 mm. The side view shows a thickness of 20 mm. A central hole has a diameter of $\phi 24$ mm. A dimension of 12 mm is shown from the bottom edge to the center of the hole.</p>
TU400M3K	 <p>Technical drawing of the TU400M3K model. The front view shows a width of 75 mm and a height of 95 mm. The bottom width is 42 mm. The side view shows a thickness of 22.5 mm. A central hole has a diameter of $\phi 29$ mm. A dimension of 12 mm is shown from the bottom edge to the center of the hole.</p>



7.1.7 Open type current transformer

Model	Dimension (mm)
TA05M3K	<p>Technical drawing of the TA05M3K transformer. The top view shows a rectangular shape with a central circular hole. The side view shows a circular hole with a diameter of $\phi 10.2$.</p>
TA100M3K	<p>Technical drawing of the TA100M3K transformer. The top view shows a rectangular shape with a central circular hole. The side view shows a circular hole with a diameter of $\phi 16.1$.</p>
TA200M3K	<p>Technical drawing of the TA200M3K transformer. The top view shows a rectangular shape with a central circular hole. The side view shows a circular hole with a diameter of $\phi 24.1$.</p>
TA400M3K	<p>Technical drawing of the TA400M3K transformer. The top view shows a rectangular shape with a central circular hole. The side view shows a circular hole with a diameter of $\phi 35.1$.</p>

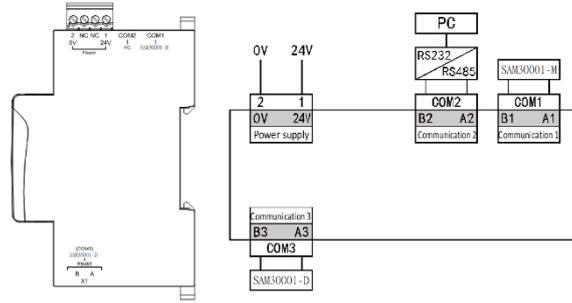


7.1.8 Flexible coil current transformer

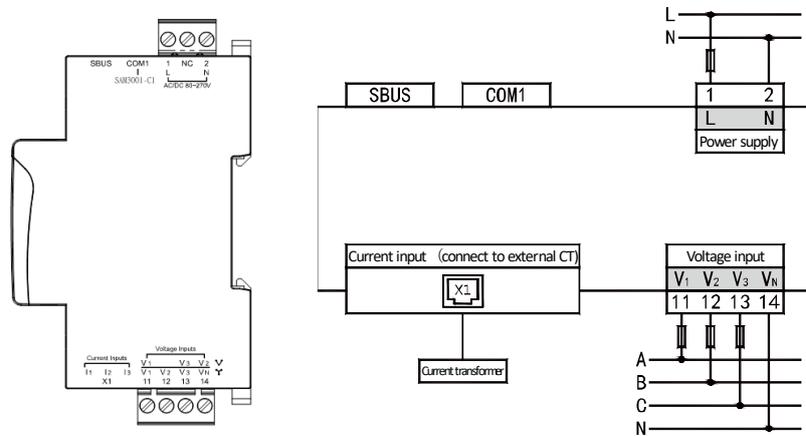
Model	Dimension (mm)	
RC600F3K		
RC1000F3K		
RC2000F3K		
RC3000F3K		

7.2 Connection

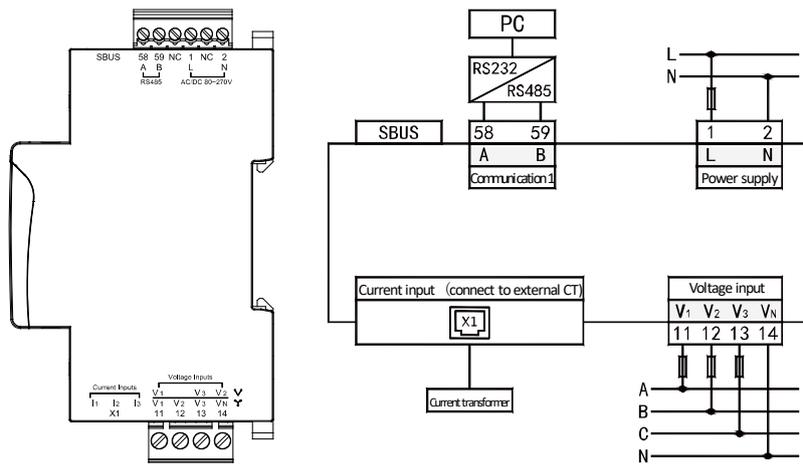
7.2.1 SAM3001-02 wiring diagram



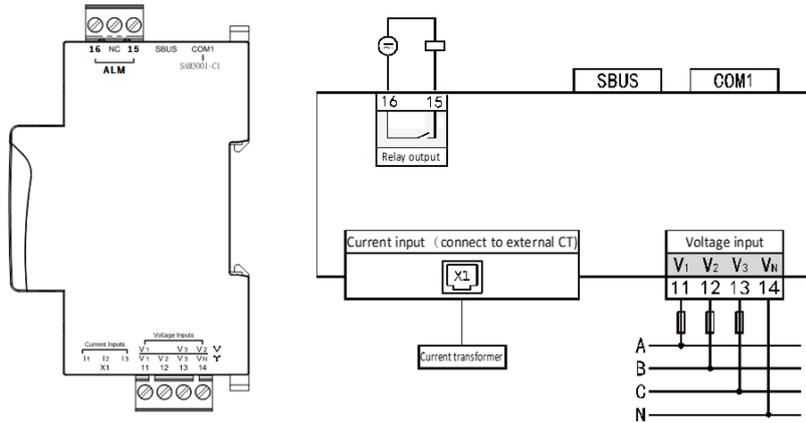
7.2.2 SAM3001 wiring diagram



SAM3001-M1A wiring diagram

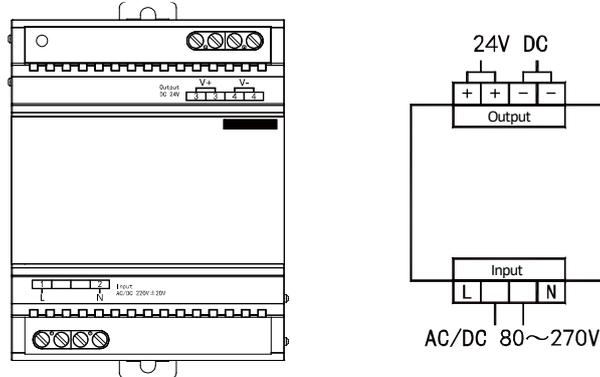


SAM3001-M1B wiring diagram



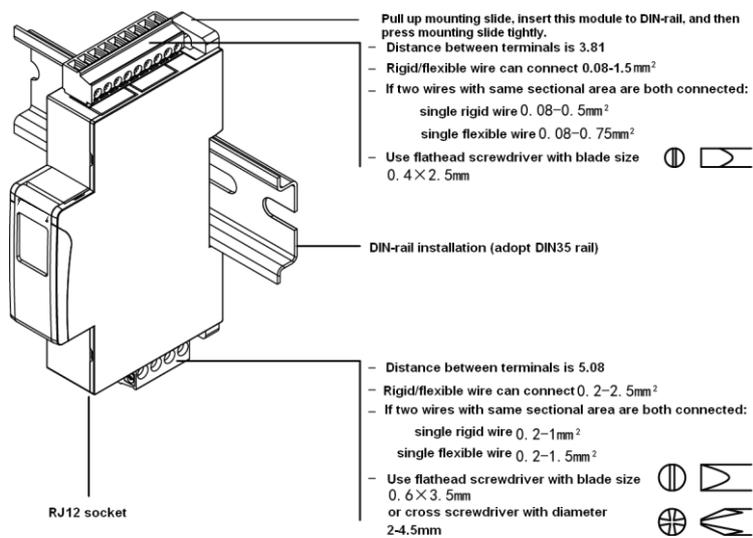
SAM3001-M21A wiring diagram

7.2.3 SAM3001-04 wiring diagram



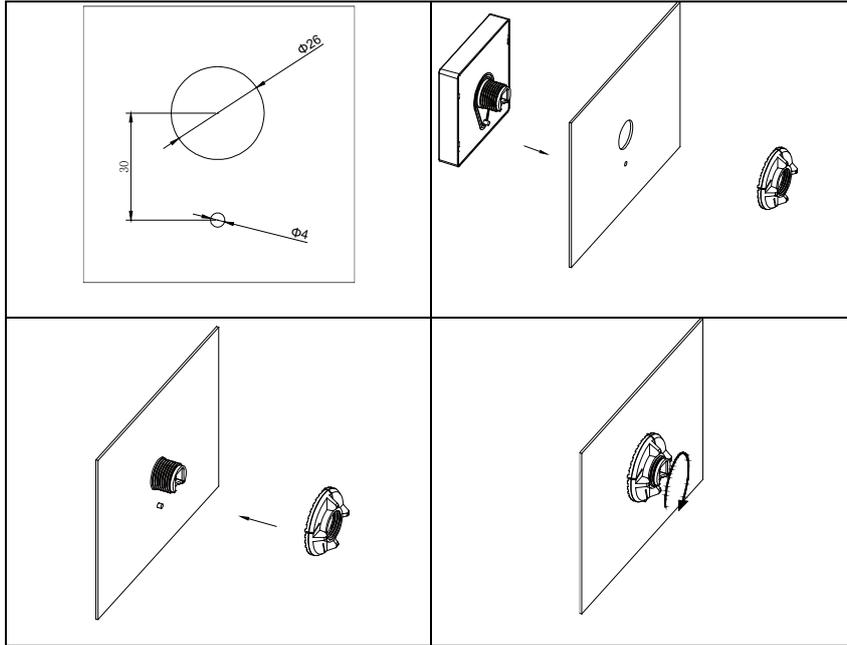
7.3 Installation

7.3.1 SAM3001 installation method

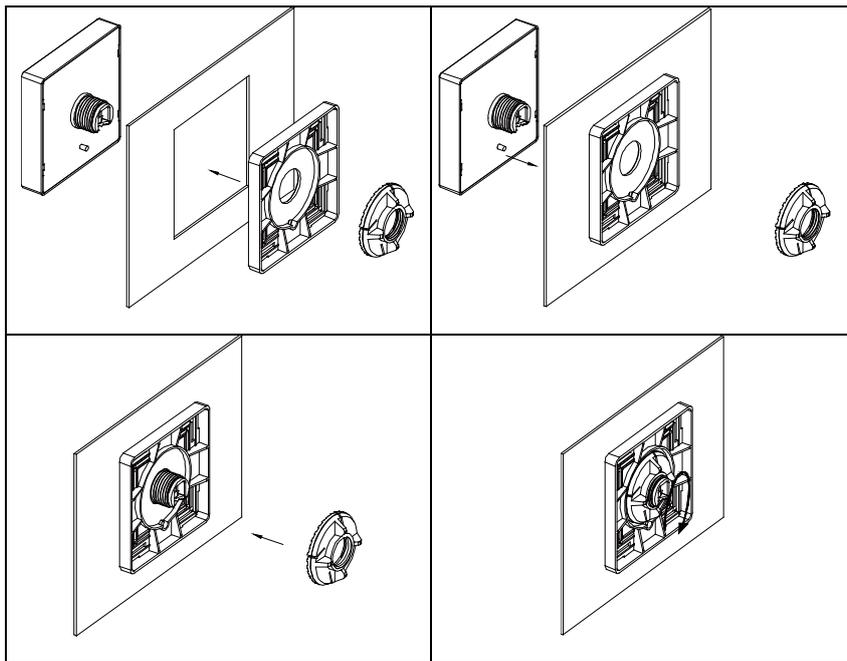


7.3.2 SAM3001-03 installation

Installation method 1

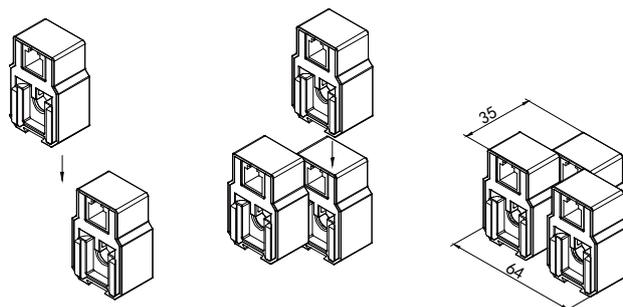


Installation method 2 (used for cut-out size 91×91mm,76×76mm,67×67mm)

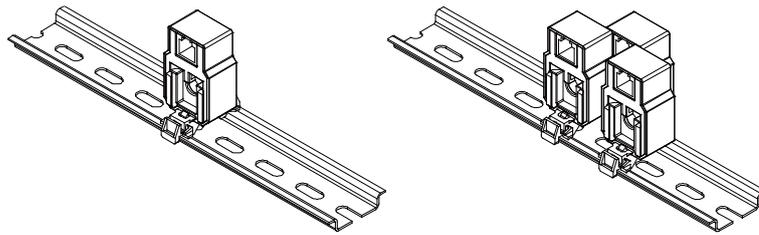


7.3.3 Closed type current transformer installation

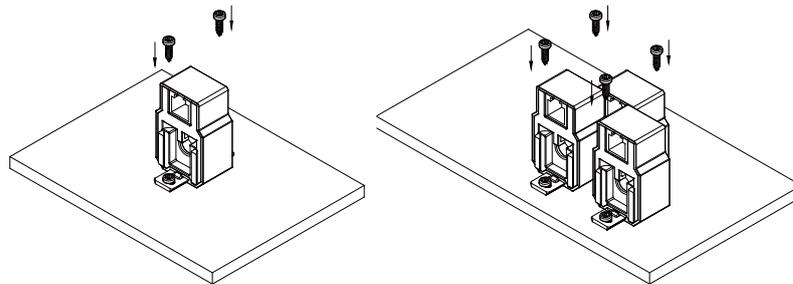
1) TU__M3K closed type current transformer assembly



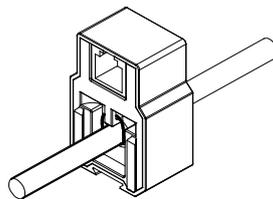
2) TU__M3K DIN-rail installation



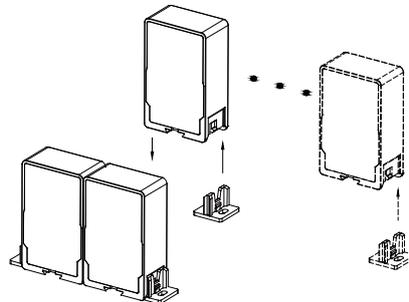
3) TU__M3K panel mounting



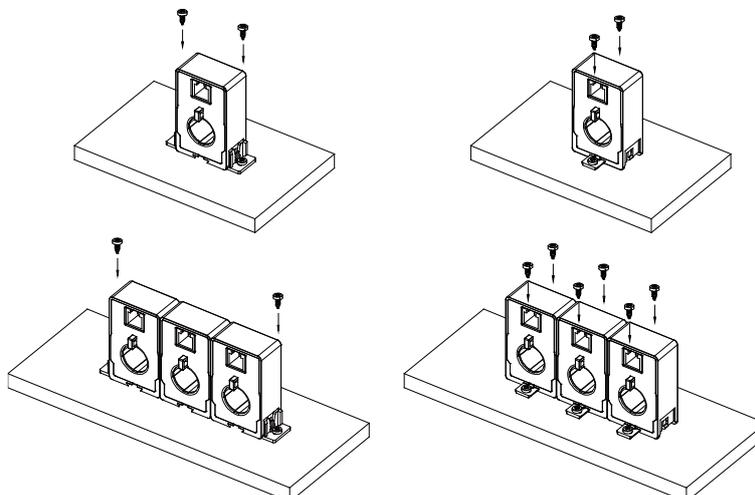
4) TU__M3K cable fixing with tie



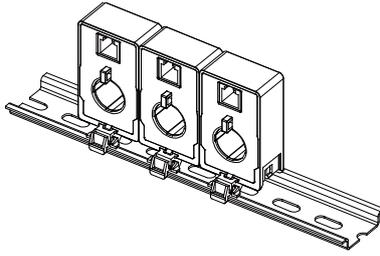
5) TU__M3K closed type transformer panel mounting



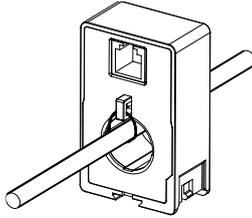
6) TU__M3K closed type transformer panel mounting



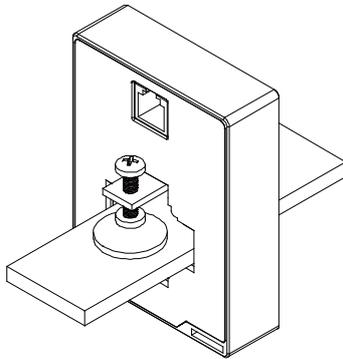
7) TU__M3K closed type transformer DIN-rail installation



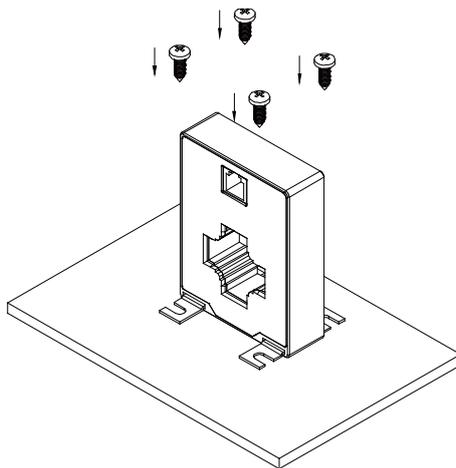
8) TU__M3K cable fixing with tie



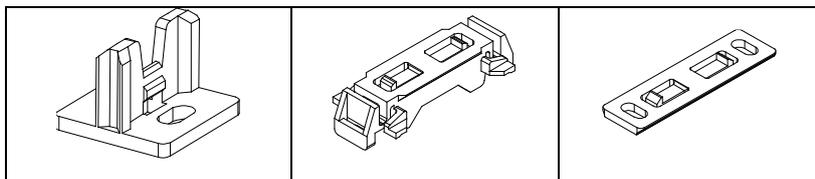
9) TU__M3K cable fixing



10) TU__M3K closed type transformer panel mounting



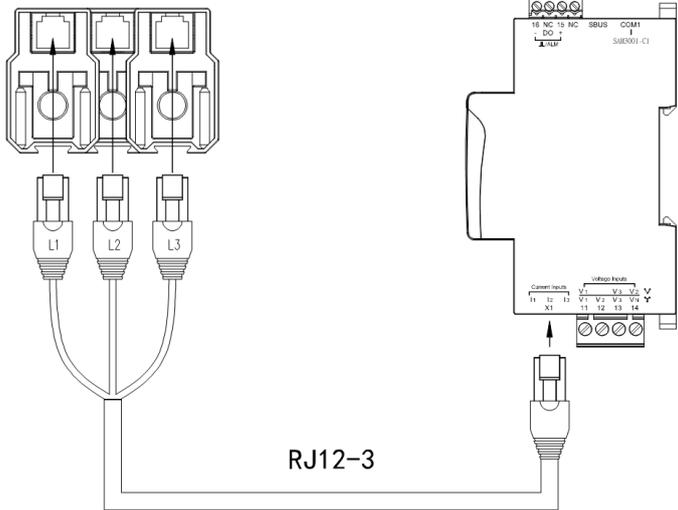
11) Installation accessory for closed type transformer



Expanding or fixing accessory for TU__M3K	DIN-rail installation accessory for TU__M3K	Fixing accessory for TU__M3K
---	---	------------------------------

12) If measurement current is larger than 160A, please connect TU__M3K to the secondary side of primary current transformer.

13) Diagram for connection between measurement module and transformer



7.3.4 Open type current transformer installation

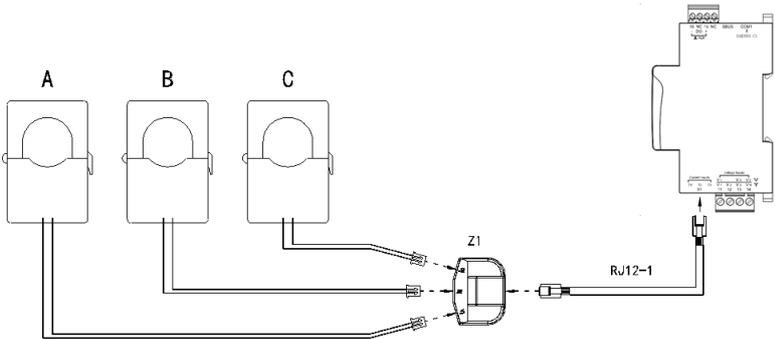
1) Connect with cable



2) TA__M3K05 can be connected to the secondary side of primary current transformer if it is equipped with primary current transformer.

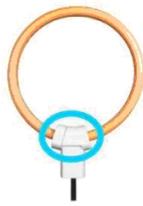


3) Diagram for connection between measurement module and transformer

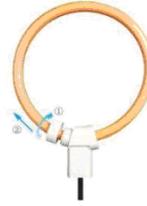


7.3.5 Flexible coil current transformer installation

1) Connect to cable



① catch connection part ;



② loosen plastic nut ;

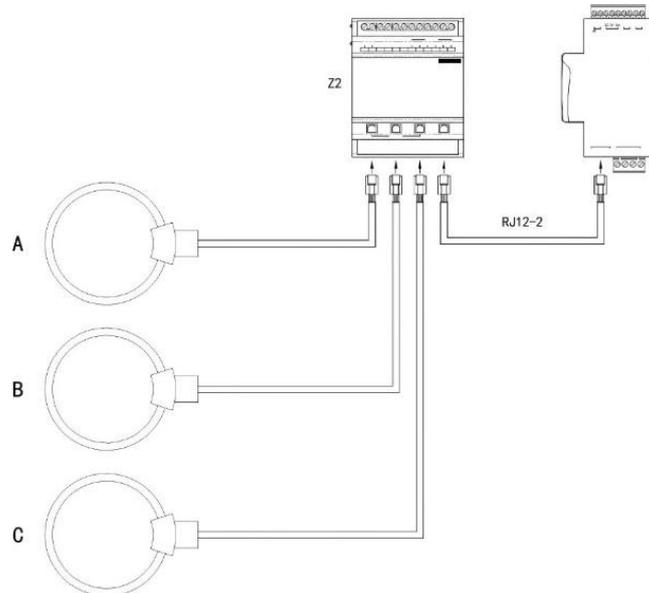


③ open connector and make it through cable ;

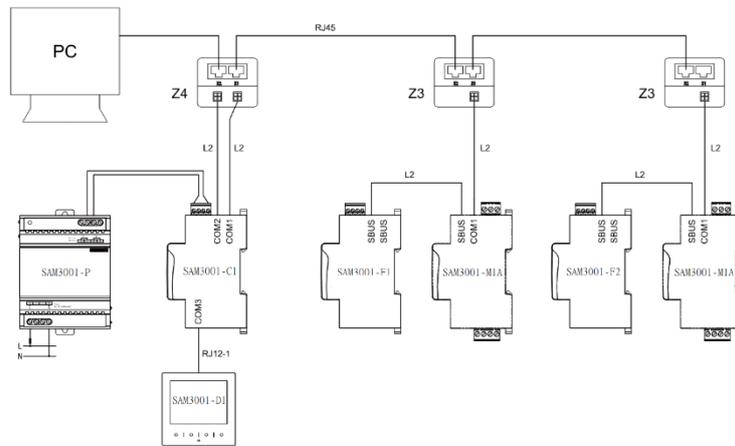


④ insert connector and screw the nut;

2) Diagram for connection between current transformer and measurement module

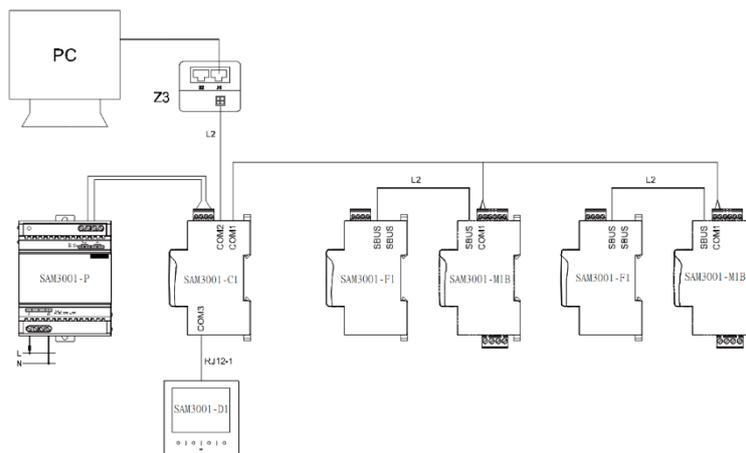


7.3.6 Connection between modules



SAM3001-M1A module wiring diagram

SAM3001-02 is connected to SAM3001-M1A through COM port and connected to each other through Z4/Z3; SAM3001-M1A is connected to any SBUS port of SAM3001-F1/F2/F3/F4 through SBUS port; The two SBUS ports of SAM3001-F1/F2 of /F3 are connected internally, just connect one interface.



SAM3001-M1B module wiring diagram

SAM3001-02 is connected to SAM3001-M1B through the COM interface; SAM3001-M1B is connected to any SBUS interface of SAM3001-F1/F2/F3 through SBUS interface, and the two SBUS interfaces of SAM3001-F1/F2/F3/F4 are connected internally, just connect one interface.

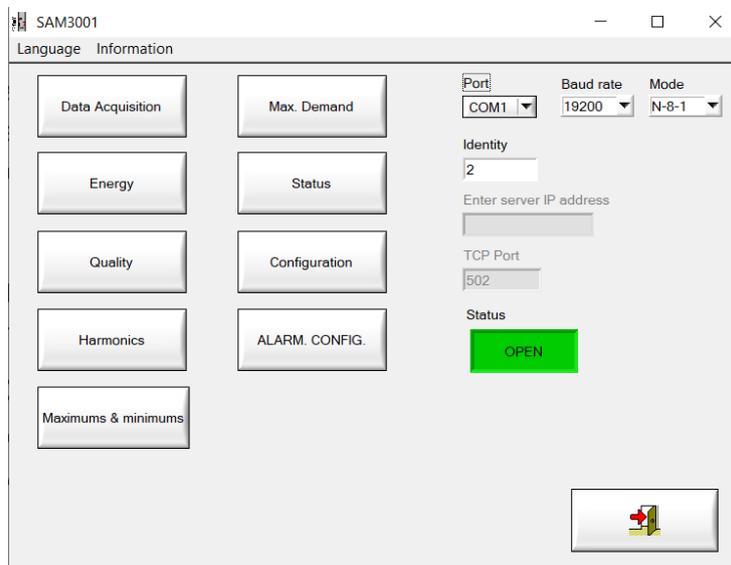
8. CONFIGURATION SOFTWARE

Once the device is installed, the application is downloaded and the communication is done, you have to configure the device according to your installation:

8.1 Connect with the device.

To communicate with the device through the ModBus protocol, the device must have an identity (by default all the devices have the identity 1)

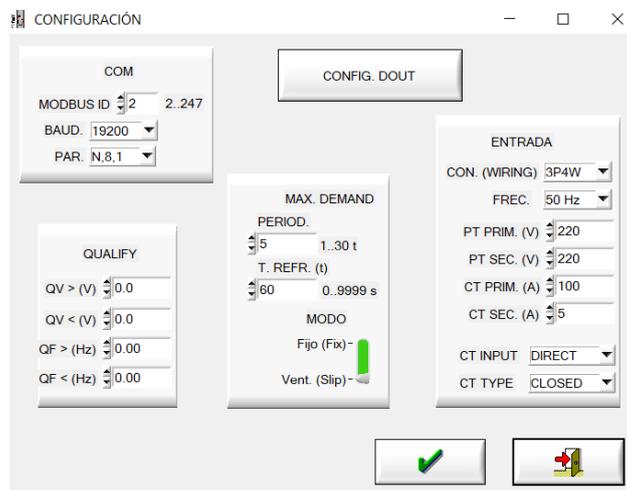
By connecting the instrument through the RS485 port, you can connect it through a COM port or through TCP/IP. In this case you must enter the IP address and port.



Once the connection parameters have been entered, simply press the "close" button and enter the configuration menu.

8.2 Device configuration

Once connected to the instrument, its configuration can be accessed. To do so, press the DEVICE CONFIGURATION button:



If you wish to configure the equipment via the serial line using Modbus commands with a software alternative to SACL, you must first write the password in the corresponding register.

In this part of the program you can configure the ModBus identity of the device, the baud rate and the connection mode.

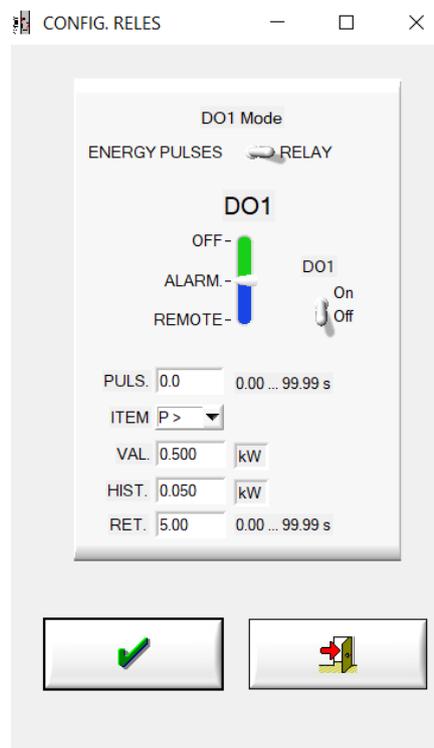
It is also possible to configure both the primary and secondary voltage input and the primary and secondary current input of the current transformer connected to the equipment, if necessary.

The working frequency and connection are also configured in this area of the user interface.

Once you have finished configuring the device, click on the button  to save the configuration.

8.3 Relay Configuration

Only available in SAM3001-M21A.



You can change the working mode, the relay status (open or closed), and the activation value.

The relay has three working modes:

- Off: the relay is switched off.
- Remote: allows the relay to be opened or closed manually.
- Alarm: the relay is in a protection function.

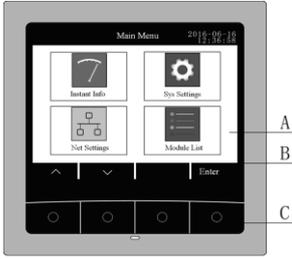
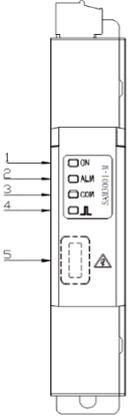
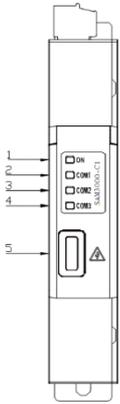
Depending on your needs you must select the protection function of your device (one for each relay)

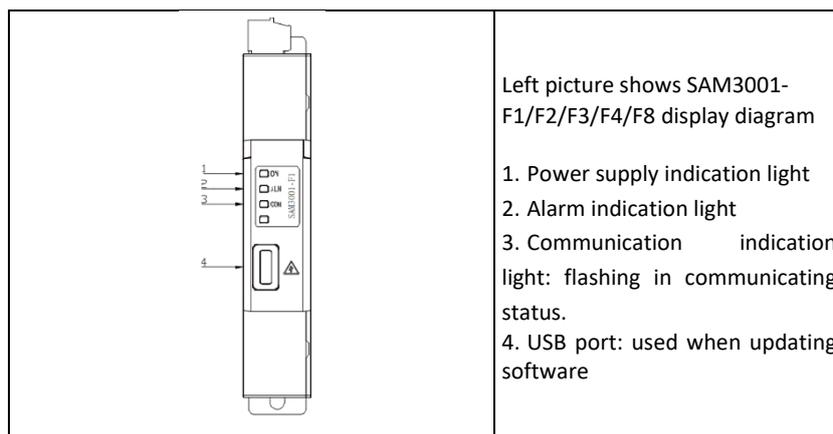
The alarm status of the relay is shown by an LED indicating whether it is on (red) or off (no color).

In the bottom, you can set the alarm value, the hysteresis value and the activation and deactivation times (the last one only for the follower function) of the relay. Once the configuration is finished, click on the button to save the changes in the device.

9 Operation and display

9.1 Panel description

Module	Instruction
	<p>Left picture shows SAM3001-03 main display interface</p> <p>A: display window</p> <p>B: Indication for function of buttons</p> <p>C: Touch buttons</p>
	<p>Left picture shows SAM3001 indication diagram.</p> <ol style="list-style-type: none"> 1. Power supply indication light 2. Alarm indication light 3. Communication indication light: flashing in communicating status. 4. Pulse output indication light 5. USB port: used when updating software
	<p>Left picture shows SAM3001-02 indication diagram</p> <ol style="list-style-type: none"> 1. Power supply indication light 2. Communication 1 indication light 3. Communication 2 indication light 4. Communication 3 indication light 5. USB port



9.2 Instruction for SAM3001-D1 buttons

User can check measured data and set parameter through buttons.

Sign for buttons	Description for buttons functions
	Move upward, switch to former page, change parameter, add number at selected bit
	Move downward, switch to following page, change parameter
	Move left to check or change data cyclically
	Move right to check or change data cyclically
	Enter selected item
	Return to upper level menu, cancel modified data
	Enter a specified measurement module
	Switch to another measurement module
	Switch to next page
	Edit and modify item
	Zooming
	Ineffective button

Method of changing numbers:

Press to select a bit; press to increase number in cyclic sequence at selected bit.

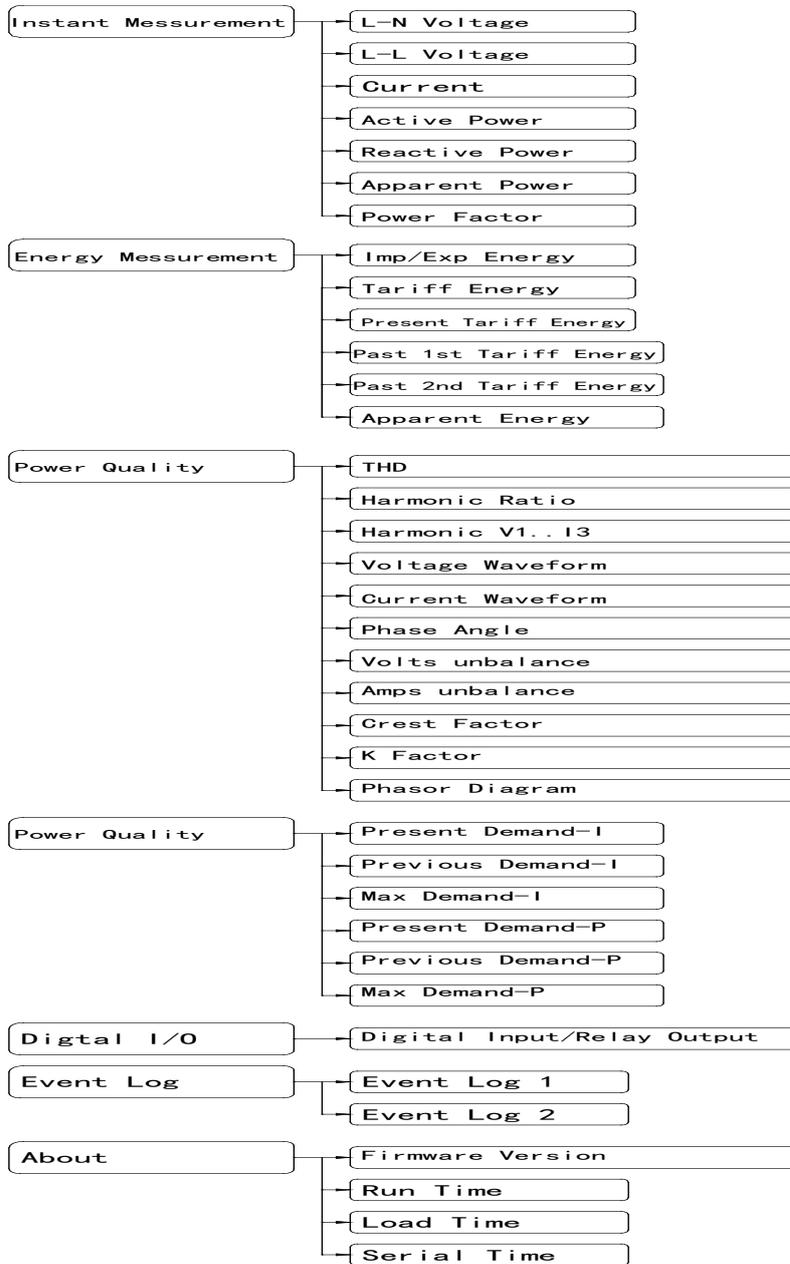
Enter and exit programming status:

Enter programming status: In main interface, press or to select “Sys settings” to enter system setting mode, or select “Instant Info—Instant Measurement” to enter parameter setting mode, and then input programming password to set parameters. (Defaulted password is 0001. User can change it.).

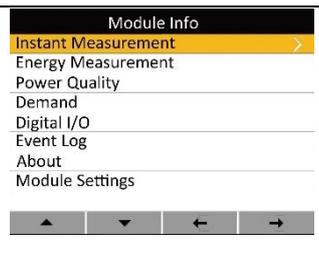
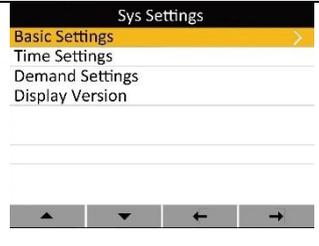
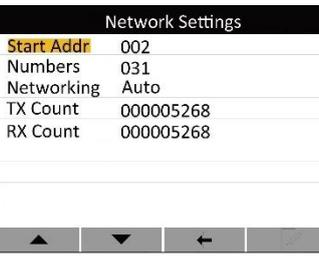
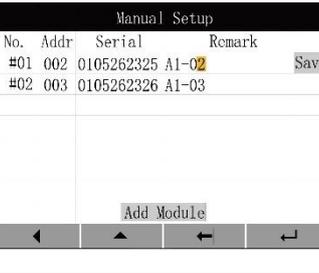
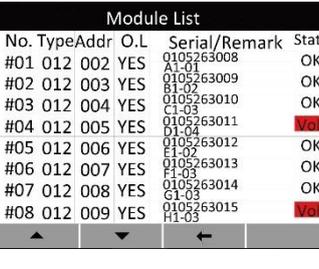
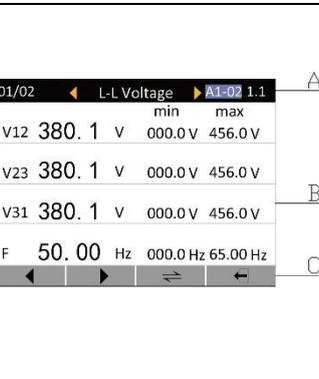
Exit programming status: return to first level of programming interface, and then press . The meter will show “Yes or No”. Select “Yes” to save modified data and return to upper level menu; select “No” to cancel modified data and return to upper level menu.

9.3 SAM3001-D1 display interfaces

Measured data can be checked through SAM3001-03. The measured data can be viewed on the SAM3000-03. The following diagram shows an overview of the display menu:



Display	Description
	<p>The left picture is the main interface. It is divided into "Module Information", "System Settings", "Network Configuration" and "Module List".</p>

 <p>Module Info Instant Measurement > Energy Measurement Power Quality Demand Digital I/O Event Log About Module Settings</p>	<p>The picture on the left is the module information interface. It contains measurement information, help, individual module parameter settings, etc.</p>																																																						
 <p>Sys Settings Basic Settings > Time Settings Demand Settings Display Version</p>	<p>The left picture is the system setting interface. Here are the broadcast settings for all module parameters.</p>																																																						
 <p>Network Settings Start Addr 002 Numbers 031 Networking Auto TX Count 000005268 RX Count 000005268</p>	<p>The figure on the left is the networking configuration interface.</p>																																																						
 <p>Manual Setup</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Addr</th> <th>Serial</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>#01</td> <td>002</td> <td>0105262325</td> <td>A1-02</td> </tr> <tr> <td>#02</td> <td>003</td> <td>0105262326</td> <td>A1-03</td> </tr> </tbody> </table> <p>Add Module</p>	No.	Addr	Serial	Remark	#01	002	0105262325	A1-02	#02	003	0105262326	A1-03	<p>The left picture shows the manual networking interface. The cabinet name of the measurement module is set in the remarks, A1 represents the cabinet number, the cabinet number consists of 1 letter and 1 number, the letter is selected from A to Z, and the number is selected from 1 to 9; 02 represents the serial number of the instrument in the cabinet, represented by two digits.</p>																																										
No.	Addr	Serial	Remark																																																				
#01	002	0105262325	A1-02																																																				
#02	003	0105262326	A1-03																																																				
 <p>Module List</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Type</th> <th>Addr</th> <th>O.L</th> <th>Serial/Remark</th> <th>State</th> </tr> </thead> <tbody> <tr> <td>#01</td> <td>012</td> <td>002</td> <td>YES</td> <td>0105263008 A1-01</td> <td>OK</td> </tr> <tr> <td>#02</td> <td>012</td> <td>003</td> <td>YES</td> <td>0105263009 B1-02</td> <td>OK</td> </tr> <tr> <td>#03</td> <td>012</td> <td>004</td> <td>YES</td> <td>0105263010 C1-03</td> <td>OK</td> </tr> <tr> <td>#04</td> <td>012</td> <td>005</td> <td>YES</td> <td>0105263011 D1-04</td> <td>Volt</td> </tr> <tr> <td>#05</td> <td>012</td> <td>006</td> <td>YES</td> <td>0105263012 E1-05</td> <td>OK</td> </tr> <tr> <td>#06</td> <td>012</td> <td>007</td> <td>YES</td> <td>0105263013 F1-06</td> <td>OK</td> </tr> <tr> <td>#07</td> <td>012</td> <td>008</td> <td>YES</td> <td>0105263014 G1-07</td> <td>OK</td> </tr> <tr> <td>#08</td> <td>012</td> <td>009</td> <td>YES</td> <td>0105263015 H1-08</td> <td>Volt</td> </tr> </tbody> </table>	No.	Type	Addr	O.L	Serial/Remark	State	#01	012	002	YES	0105263008 A1-01	OK	#02	012	003	YES	0105263009 B1-02	OK	#03	012	004	YES	0105263010 C1-03	OK	#04	012	005	YES	0105263011 D1-04	Volt	#05	012	006	YES	0105263012 E1-05	OK	#06	012	007	YES	0105263013 F1-06	OK	#07	012	008	YES	0105263014 G1-07	OK	#08	012	009	YES	0105263015 H1-08	Volt	<p>The left picture shows the information of online modules.</p>
No.	Type	Addr	O.L	Serial/Remark	State																																																		
#01	012	002	YES	0105263008 A1-01	OK																																																		
#02	012	003	YES	0105263009 B1-02	OK																																																		
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#04	012	005	YES	0105263011 D1-04	Volt																																																		
#05	012	006	YES	0105263012 E1-05	OK																																																		
#06	012	007	YES	0105263013 F1-06	OK																																																		
#07	012	008	YES	0105263014 G1-07	OK																																																		
#08	012	009	YES	0105263015 H1-08	Volt																																																		
 <p>01/02 ◀ L-L Voltage ▶ A1-02 1.1</p> <table border="1"> <thead> <tr> <th></th> <th>min</th> <th>max</th> </tr> </thead> <tbody> <tr> <td>V12 380.1 V</td> <td>000.0 V</td> <td>456.0 V</td> </tr> <tr> <td>V23 380.1 V</td> <td>000.0 V</td> <td>456.0 V</td> </tr> <tr> <td>V31 380.1 V</td> <td>000.0 V</td> <td>456.0 V</td> </tr> <tr> <td>F 50.00 Hz</td> <td>000.0 Hz</td> <td>65.00 Hz</td> </tr> </tbody> </table>		min	max	V12 380.1 V	000.0 V	456.0 V	V23 380.1 V	000.0 V	456.0 V	V31 380.1 V	000.0 V	456.0 V	F 50.00 Hz	000.0 Hz	65.00 Hz	<p>A: Content prompt, 01/02 means that there are 2 modules in total, the current module is the first; "phase voltage" in the middle shows the measurement type; A1-02 means the cabinet name of the measurement module; 1.1 means the first measurement information screen.</p> <p>B: Display various data or graphic information display content data window;</p> <p>C: Button function, there will be four button function prompt units at the bottom of each interface, indicating the current function of each physical button</p>																																							
	min	max																																																					
V12 380.1 V	000.0 V	456.0 V																																																					
V23 380.1 V	000.0 V	456.0 V																																																					
V31 380.1 V	000.0 V	456.0 V																																																					
F 50.00 Hz	000.0 Hz	65.00 Hz																																																					

9.3.1 Real-time measurement

Real-time measurement interfaces show phase voltage, line voltage, phase current, phase and total active power, reactive power, apparent power, power factor and extreme values.

Display interfaces	Instruction
	<p>Left picture shows instantaneous values of three phase voltages and frequency. First press “▲” or “▼” to select module, second press “↵” to enter the display interface of the selected module. If user needs to check other modules, please press “↔” at first, and then press “▲” or “▼” to switch to another module. Press “⏏” to exit real-time measured information display interface and return to instant measurement display interface.</p>

9.3.2 Energy metering

Detailed energy metering functions is as follows:

- Bi-direction active and reactive energy
- Four-quadrant reactive energy
- Apparent energy

The meter shows primary value. The primary value is equal to the secondary value multiplied by voltage or current transformer ratio. Secondary value is the reference to all of the energy. The smallest energy accumulation resolution ratio of secondary value is 1Wh or 1varh. The smallest energy display resolution is 0.001kWh or 0.001kvarh.

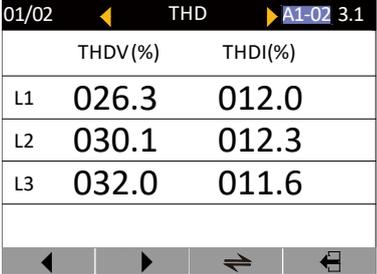
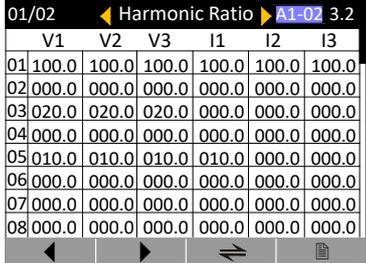
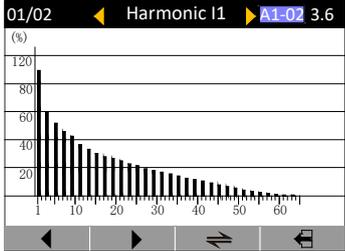
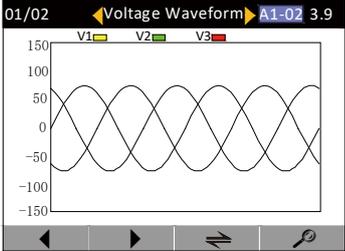
The maximum electric energy can maintain the secondary side electric energy 4294967295 Wh, the electric energy display range is the primary electric energy 9999999999 kWh (99.9 billion kWh), and will not overflow during the normal service life of the instrument. Users can manually reset the clean energy data according to their own needs (user password is required).

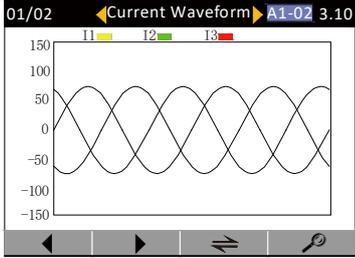
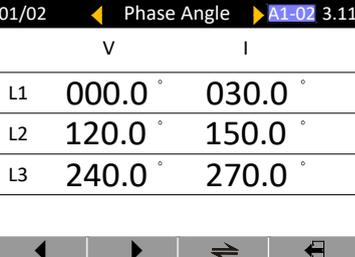
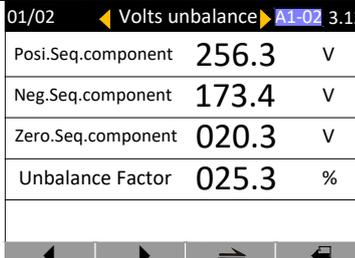
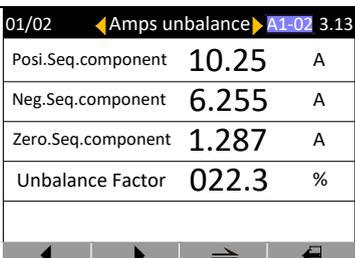
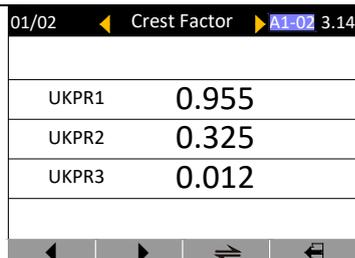
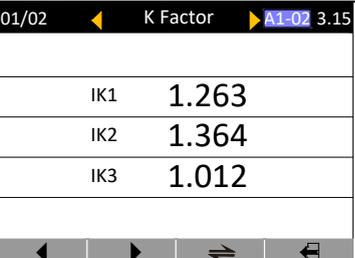
Display interfaces	Instruction
	<p>Left picture shows bi-direction active/reactive energy.</p> <p>EP+ = 9832.13kWh, EP- = 100.268, EQ+ = 25.01varh, EQ- = 40.28。</p>
	<p>Left picture shows active energy in different time zones</p> <p>Total active energy (Σ): 14525.012kWh Active energy of T1: 100.208kWh Active energy of T2: 3021.11kWh Active energy of T3: 123.022kWh Active energy of T4: 300.012kWh</p>

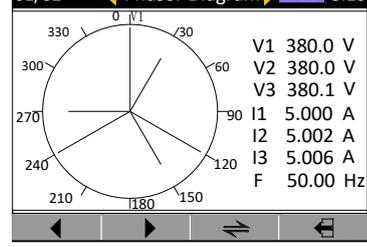
9.3.3 Power quality

Detailed functions of power quality are as follows:

- 2nd to 31st sub-harmonics measurement
- Voltage and current harmonics bar graph
- Voltage and current waveform
- Voltage and current phase angle
- Voltage and current sequence component
- Voltage crest factor
- Current K factor
- Voltage and current vector graph

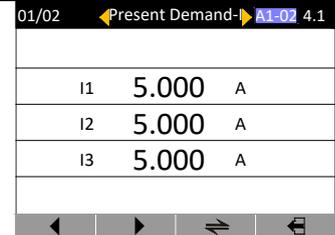
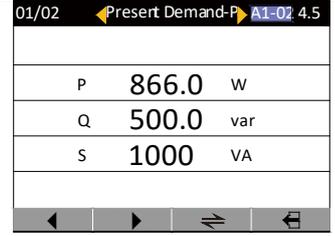
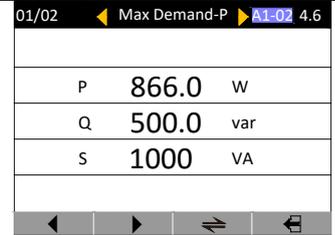
Display interfaces	Instruction																																																																					
 <table border="1" data-bbox="341 763 718 1037"> <thead> <tr> <th colspan="2">01/02</th> <th colspan="2">THD</th> <th colspan="2">A1-02 3.1</th> </tr> <tr> <th></th> <th>THDV(%)</th> <th></th> <th>THDI(%)</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>026.3</td> <td></td> <td>012.0</td> <td></td> <td></td> </tr> <tr> <td>L2</td> <td>030.1</td> <td></td> <td>012.3</td> <td></td> <td></td> </tr> <tr> <td>L3</td> <td>032.0</td> <td></td> <td>011.6</td> <td></td> <td></td> </tr> </tbody> </table>	01/02		THD		A1-02 3.1			THDV(%)		THDI(%)			L1	026.3		012.0			L2	030.1		012.3			L3	032.0		011.6			<p>Left picture shows three-phase voltage and current THD.</p>																																							
01/02		THD		A1-02 3.1																																																																		
	THDV(%)		THDI(%)																																																																			
L1	026.3		012.0																																																																			
L2	030.1		012.3																																																																			
L3	032.0		011.6																																																																			
 <table border="1" data-bbox="341 1072 707 1335"> <thead> <tr> <th colspan="2">01/02</th> <th colspan="2">Harmonic Ratio</th> <th colspan="2">A1-02 3.2</th> </tr> <tr> <th></th> <th>V1</th> <th>V2</th> <th>V3</th> <th>I1</th> <th>I2</th> <th>I3</th> </tr> </thead> <tbody> <tr><td>01</td><td>100.0</td><td>100.0</td><td>100.0</td><td>100.0</td><td>100.0</td><td>100.0</td></tr> <tr><td>02</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td></tr> <tr><td>03</td><td>020.0</td><td>020.0</td><td>020.0</td><td>000.0</td><td>000.0</td><td>000.0</td></tr> <tr><td>04</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td></tr> <tr><td>05</td><td>010.0</td><td>010.0</td><td>010.0</td><td>010.0</td><td>000.0</td><td>000.0</td></tr> <tr><td>06</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td></tr> <tr><td>07</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td></tr> <tr><td>08</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td><td>000.0</td></tr> </tbody> </table>	01/02		Harmonic Ratio		A1-02 3.2			V1	V2	V3	I1	I2	I3	01	100.0	100.0	100.0	100.0	100.0	100.0	02	000.0	000.0	000.0	000.0	000.0	000.0	03	020.0	020.0	020.0	000.0	000.0	000.0	04	000.0	000.0	000.0	000.0	000.0	000.0	05	010.0	010.0	010.0	010.0	000.0	000.0	06	000.0	000.0	000.0	000.0	000.0	000.0	07	000.0	000.0	000.0	000.0	000.0	000.0	08	000.0	000.0	000.0	000.0	000.0	000.0	<p>Left picture shows sub-harmonics content of three-phase voltage and current. Press “” to check other sub-harmonics content.</p>
01/02		Harmonic Ratio		A1-02 3.2																																																																		
	V1	V2	V3	I1	I2	I3																																																																
01	100.0	100.0	100.0	100.0	100.0	100.0																																																																
02	000.0	000.0	000.0	000.0	000.0	000.0																																																																
03	020.0	020.0	020.0	000.0	000.0	000.0																																																																
04	000.0	000.0	000.0	000.0	000.0	000.0																																																																
05	010.0	010.0	010.0	010.0	000.0	000.0																																																																
06	000.0	000.0	000.0	000.0	000.0	000.0																																																																
07	000.0	000.0	000.0	000.0	000.0	000.0																																																																
08	000.0	000.0	000.0	000.0	000.0	000.0																																																																
	<p>Left picture shows bar graph information for sub-harmonics of I1.</p>																																																																					
	<p>Left picture shows real-time waveform of three-phase voltage.</p>																																																																					

	<p>Left picture shows real-time waveform of three-phase current.</p>												
 <table border="1" data-bbox="352 519 707 683"> <thead> <tr> <th></th> <th>V</th> <th>I</th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>000.0 °</td> <td>030.0 °</td> </tr> <tr> <td>L2</td> <td>120.0 °</td> <td>150.0 °</td> </tr> <tr> <td>L3</td> <td>240.0 °</td> <td>270.0 °</td> </tr> </tbody> </table>		V	I	L1	000.0 °	030.0 °	L2	120.0 °	150.0 °	L3	240.0 °	270.0 °	<p>Left picture shows phase angle of three-phase voltage and current. Phase angle of Ua is defaulted as 0°. Phase angle of other parameters are the relative phase difference to Ua.</p>
	V	I											
L1	000.0 °	030.0 °											
L2	120.0 °	150.0 °											
L3	240.0 °	270.0 °											
 <table border="1" data-bbox="352 813 707 976"> <tbody> <tr> <td>Posi.Seq.component</td> <td>256.3</td> <td>V</td> </tr> <tr> <td>Neg.Seq.component</td> <td>173.4</td> <td>V</td> </tr> <tr> <td>Zero.Seq.component</td> <td>020.3</td> <td>V</td> </tr> <tr> <td>Unbalance Factor</td> <td>025.3</td> <td>%</td> </tr> </tbody> </table>	Posi.Seq.component	256.3	V	Neg.Seq.component	173.4	V	Zero.Seq.component	020.3	V	Unbalance Factor	025.3	%	<p>Left picture shows three-phase voltage sequence component and unbalance.</p>
Posi.Seq.component	256.3	V											
Neg.Seq.component	173.4	V											
Zero.Seq.component	020.3	V											
Unbalance Factor	025.3	%											
 <table border="1" data-bbox="352 1106 707 1270"> <tbody> <tr> <td>Posi.Seq.component</td> <td>10.25</td> <td>A</td> </tr> <tr> <td>Neg.Seq.component</td> <td>6.255</td> <td>A</td> </tr> <tr> <td>Zero.Seq.component</td> <td>1.287</td> <td>A</td> </tr> <tr> <td>Unbalance Factor</td> <td>022.3</td> <td>%</td> </tr> </tbody> </table>	Posi.Seq.component	10.25	A	Neg.Seq.component	6.255	A	Zero.Seq.component	1.287	A	Unbalance Factor	022.3	%	<p>Left picture shows three-phase current sequence component and unbalance.</p>
Posi.Seq.component	10.25	A											
Neg.Seq.component	6.255	A											
Zero.Seq.component	1.287	A											
Unbalance Factor	022.3	%											
 <table border="1" data-bbox="352 1400 707 1563"> <tbody> <tr> <td>UKPR1</td> <td>0.955</td> </tr> <tr> <td>UKPR2</td> <td>0.325</td> </tr> <tr> <td>UKPR3</td> <td>0.012</td> </tr> </tbody> </table>	UKPR1	0.955	UKPR2	0.325	UKPR3	0.012	<p>Left picture shows crest factor of voltage.</p>						
UKPR1	0.955												
UKPR2	0.325												
UKPR3	0.012												
 <table border="1" data-bbox="352 1693 707 1856"> <tbody> <tr> <td>IK1</td> <td>1.263</td> </tr> <tr> <td>IK2</td> <td>1.364</td> </tr> <tr> <td>IK3</td> <td>1.012</td> </tr> </tbody> </table>	IK1	1.263	IK2	1.364	IK3	1.012	<p>Left picture shows K factor of current.</p>						
IK1	1.263												
IK2	1.364												
IK3	1.012												

 <p>01/02 ◀ Phasor Diagram ▶ A1-02 3.16</p> <p>V1 380.0 V V2 380.0 V V3 380.1 V I1 5.000 A I2 5.002 A I3 5.006 A F 50.00 Hz</p>	<p>Left picture shows phase angle diagram of three-phase voltage and current.</p>
--	---

9.3.4 Demand record

There are six separate demand record channels for measuring max. demand, present demand and demand in last period of three-phase current, total active power, total reactive power and apparent power.

Display interfaces	Instruction
 <p>01/02 ◀ Present Demand ▶ A1-02 4.1</p> <p>I1 5.000 A I2 5.000 A I3 5.000 A</p>	<p>Left picture shows three-phase current demand at present.</p>
 <p>01/02 ◀ Present Demand-P ▶ A1-02 4.5</p> <p>P 866.0 W Q 500.0 var S 1000 VA</p>	<p>Left picture shows the previous demand values of the three-phase total active, reactive, and apparent power.</p>
 <p>01/02 ◀ Max Demand-P ▶ A1-02 4.6</p> <p>P 866.0 W Q 500.0 var S 1000 VA</p>	<p>Left picture shows the maximum demand value of three-phase total active, reactive and apparent power.</p>

9.3.5 Digital input and relay output

Digital input adopts dry contact mode which is powered by power supply inside meter and is not in need for external power supply.

Digital inputs monitor the status of external switches. Meter receives status changes of contacts and shows it on screen immediately.

Meter has one relay output. There are three working modes for relay output which are energy pulse output, remote control and alarm linkage

Display interfaces	Instruction
--------------------	-------------

01/02 ◀ Digital I/O ▶ A1-02 5.1		
Digital Input		
No.	Mode	State
01	On-Off	—/—
02	On-Off	—/—
Relay output		
No.	Mode	State
01	Off	—/—
◀ ▶ ⇌ ⏪		

Left picture shows two digital input status of No. 2 module. Second digital input is closed; work mode of relay output is off.

9.3.6 Event record

Event records include power on record, parameter modification record, over current record and etc. It also includes total number of times and the latest occurrence time.

Display interfaces			Instruction		
01/02 ◀ Event Log 1 ▶ A1-02 6.1					
Type	Number	Last Record Time			
Power On	0005	2016-06-04-14-33-10			
Power Off	0005	2016-06-03-18-25-20			
Setting	0007	2016-06-04-11-02-26			
Clr Demand	0001	2016-06-04-14-52-35			
Clr Energy	0001	2016-05-23-11-03-25			
Ovr Volts	0002				
Loss Volts	0000				
Ovr Amps	0000				
◀ ▶ ⇌ ⏪					

Left picture shows event record information.

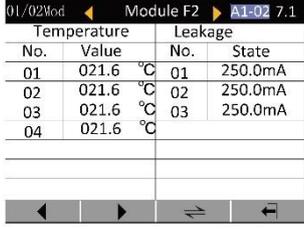
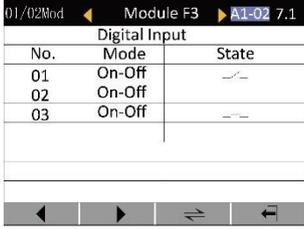
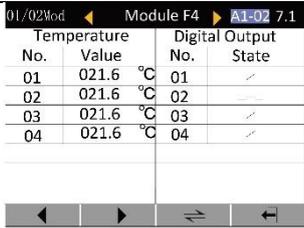
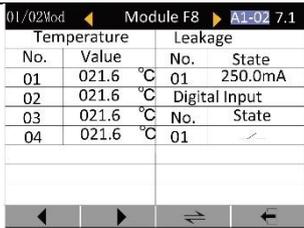
9.3.7 Extensible modules

SAM3001 can be equipped with SAM3001-F0 or SAM3001-F1 or SAM3001-F2 or SAM3001-F3 or SAM3001-F4 or SAM3001-F8 expansion modules. The digital input of the expansion module SAM3001-F1 adopts the dry node input mode. The instrument is equipped with a power supply inside, and no external power supply is required. The switch input monitors the external switch state: at this time, the instrument will accept the node state of the port and display it on the screen, and it will change immediately after the node state changes.

Display interfaces			Instruction		
01/02Mod ◀ Module F0 ▶ A1-02 7.1					
Temperature					
No.	Value				
01	021.6 °C				
02	021.6 °C				
03	021.6 °C				
04	021.6 °C				
◀ ▶ ⇌ ⏪					
01/02Mod ◀ Module F1 ▶ A1-02 7.1					
Temperature		Digital Input			
No.	Value	No.	State		
01	021.6 °C	01	✓		
02	021.6 °C	02	✓		
03	021.6 °C	03	✓		
04	021.6 °C				
◀ ▶ ⇌ ⏪					

The left picture shows the SAM3001-F0 data information, including 4-way temperature.

The left picture shows the data information of SAM3001-F1, including 4-way temperature and 3-way DI input status.

 <table border="1"> <thead> <tr> <th colspan="2">Temperature</th> <th colspan="2">Leakage</th> </tr> <tr> <th>No.</th> <th>Value</th> <th>No.</th> <th>State</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>021.6 °C</td> <td>01</td> <td>250.0mA</td> </tr> <tr> <td>02</td> <td>021.6 °C</td> <td>02</td> <td>250.0mA</td> </tr> <tr> <td>03</td> <td>021.6 °C</td> <td>03</td> <td>250.0mA</td> </tr> <tr> <td>04</td> <td>021.6 °C</td> <td></td> <td></td> </tr> </tbody> </table>	Temperature		Leakage		No.	Value	No.	State	01	021.6 °C	01	250.0mA	02	021.6 °C	02	250.0mA	03	021.6 °C	03	250.0mA	04	021.6 °C			<p>The left picture shows the data information of SAM3001-F2, including 4-way temperature and 3-way leakage input.</p>
Temperature		Leakage																							
No.	Value	No.	State																						
01	021.6 °C	01	250.0mA																						
02	021.6 °C	02	250.0mA																						
03	021.6 °C	03	250.0mA																						
04	021.6 °C																								
 <table border="1"> <thead> <tr> <th colspan="3">Digital Input</th> </tr> <tr> <th>No.</th> <th>Mode</th> <th>State</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>On-Off</td> <td>—</td> </tr> <tr> <td>02</td> <td>On-Off</td> <td>—</td> </tr> <tr> <td>03</td> <td>On-Off</td> <td>—</td> </tr> </tbody> </table>	Digital Input			No.	Mode	State	01	On-Off	—	02	On-Off	—	03	On-Off	—	<p>The left picture shows the data information of SAM3001-F3, including 3-way DI input status.</p>									
Digital Input																									
No.	Mode	State																							
01	On-Off	—																							
02	On-Off	—																							
03	On-Off	—																							
 <table border="1"> <thead> <tr> <th colspan="2">Temperature</th> <th colspan="2">Digital Output</th> </tr> <tr> <th>No.</th> <th>Value</th> <th>No.</th> <th>State</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>021.6 °C</td> <td>01</td> <td>✓</td> </tr> <tr> <td>02</td> <td>021.6 °C</td> <td>02</td> <td>✓</td> </tr> <tr> <td>03</td> <td>021.6 °C</td> <td>03</td> <td>✓</td> </tr> <tr> <td>04</td> <td>021.6 °C</td> <td>04</td> <td>✓</td> </tr> </tbody> </table>	Temperature		Digital Output		No.	Value	No.	State	01	021.6 °C	01	✓	02	021.6 °C	02	✓	03	021.6 °C	03	✓	04	021.6 °C	04	✓	<p>The left picture shows the data information of SAM3001-F4, including 4-way temperature and DO output status.</p>
Temperature		Digital Output																							
No.	Value	No.	State																						
01	021.6 °C	01	✓																						
02	021.6 °C	02	✓																						
03	021.6 °C	03	✓																						
04	021.6 °C	04	✓																						
 <table border="1"> <thead> <tr> <th colspan="2">Temperature</th> <th colspan="2">Leakage</th> </tr> <tr> <th>No.</th> <th>Value</th> <th>No.</th> <th>State</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>021.6 °C</td> <td>01</td> <td>250.0mA</td> </tr> <tr> <td>02</td> <td>021.6 °C</td> <td colspan="2">Digital Input</td> </tr> <tr> <td>03</td> <td>021.6 °C</td> <th>No.</th> <th>State</th> </tr> <tr> <td>04</td> <td>021.6 °C</td> <td>01</td> <td>✓</td> </tr> </tbody> </table>	Temperature		Leakage		No.	Value	No.	State	01	021.6 °C	01	250.0mA	02	021.6 °C	Digital Input		03	021.6 °C	No.	State	04	021.6 °C	01	✓	<p>The left picture shows the data information of SAM3001-F8, including 4-way temperature, DI input status and 1-way leakage input.</p>
Temperature		Leakage																							
No.	Value	No.	State																						
01	021.6 °C	01	250.0mA																						
02	021.6 °C	Digital Input																							
03	021.6 °C	No.	State																						
04	021.6 °C	01	✓																						

10. Networking setup

10.1 Networking

Networking means to set communication connection between communication module SAM3001-02 and measurement module SAM3001, so as to read measured data and set parameter through communication. There are two methods of networking which are automatic networking and manual networking. These two methods can be realized through display module SAM3001-04 or “SAM3001 Debugging Software”.

10.1.1 Automatic networking

Automatic networking means to set communication connection between SAM3001-02 and SAM3001 automatically.

1) Automatic networking through display module SAM3001-03.

Enter networking interface of SAM3001-03.

	<p>Select networking sign in main display interface and enter “Network”.</p>																								
	<p>Input password. The initial password is 0001.</p>																								
	<p>Input slave address of communication module SAM3001-02 in “C1 Addr”. This address must be the same with that of communication module. The total number of the modules and the slave address should not be larger than 247. Module quantity should not be larger than 32.</p>																								
	<p>After setting “Start Addr”, select and confirm “Auto” to start networking. Re-networking should be done after adding or reducing measurement module SAM3001-M.</p>																								
<table border="1"> <thead> <tr> <th>序号</th> <th>型号</th> <th>地址</th> <th>在线</th> <th>序列号/备注</th> <th>状态</th> </tr> </thead> <tbody> <tr> <td>#01</td> <td>M1</td> <td>002</td> <td>是</td> <td>0105263008 A1-01</td> <td>正常</td> </tr> <tr> <td>#02</td> <td>M1</td> <td>003</td> <td>是</td> <td>0103263009 A1-02</td> <td>正常</td> </tr> <tr> <td>#03</td> <td>M1</td> <td>004</td> <td>是</td> <td>0105263010 A1-03</td> <td>正常</td> </tr> </tbody> </table>	序号	型号	地址	在线	序列号/备注	状态	#01	M1	002	是	0105263008 A1-01	正常	#02	M1	003	是	0103263009 A1-02	正常	#03	M1	004	是	0105263010 A1-03	正常	<p>When automatic networking is finished, on-line module information can be checked in “Module List” interface. In “State” column, “OK” indicates measured information is normal; if it shows letters with red backlight, it means corresponding</p>
序号	型号	地址	在线	序列号/备注	状态																				
#01	M1	002	是	0105263008 A1-01	正常																				
#02	M1	003	是	0103263009 A1-02	正常																				
#03	M1	004	是	0105263010 A1-03	正常																				

Module List					
No.	Type	Addr	O.L	Serial/Remark	State
#01	012	002	YES	0105263008 A1-01	OK
#02	012	003	YES	0105263009 A1-02	OK
#03	012	004	YES	0105263010 A1-03	OK
#04	012	005	YES	0105263011 A1-04	Volt
#05	012	006	YES	0105263012 A1-05	OK
#06	012	007	YES	0105263013 A1-06	OK
#07	012	008	YES	0105263014 A1-07	OK
#08	012	009	YES	0105263015 A1-08	Volt

measured information is abnormal.
The letters are as follows:

“Volt” indicates abnormal voltage;

“Phas” indicates abnormal phase angle;

“Freq” indicates abnormal frequency.

10.1.2 Manual networking

Manual networking means to set communication connection between SAM3001-02 and SAM3001 by manual.

1) Manual networking through display module SAM3001-03.

Connect SAM3001-M and SAM3001-02 with communication line. Enter networking interface of SAM3001-03.

	<p>Select networking sign in main display interface and enter “Network”.</p>
	<p>Input slave address of communication module SAM3001-02 in “Start Addr”. This address must be the same with that of communication module. The total number of the modules and the slave address should not be larger than 247. Module quantity should not be larger than 32.</p>
	<p>First press “▲” or “▼” to select an available module; second press “←”; third select and modify address, serial number or remark; fourth save modified parameter. In “Remark” column, “A1” indicates cabinet No., “02” indicates the No. of meter in that cabinet. Information in “Remark” column can be changed by manual after automatic networking.</p>
	<p>Move cursor to “Add module” and confirm it, and then a new module will be shown. Input serial No. and remark information for that module, and then select “Save” to add the new module.</p>

10.3.2 Time setting

Time Settings	
2016 - 4 - 15	To set date and time
09 : 39 :28	

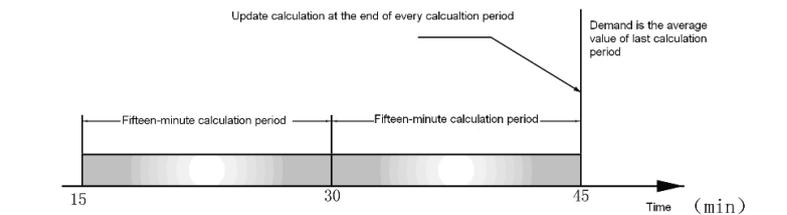
10.3.3 Demand setting

Demand Settings					Channel	1-6
Chan	Item	Mode	t	T	Item	I1,I2,I3,P,Q,S
1-6	IPQS	Slip	0008 s	0006t	Mode	slip/fixed
					Calculation updating time	t
					Time zone	$T=n*t$, n:

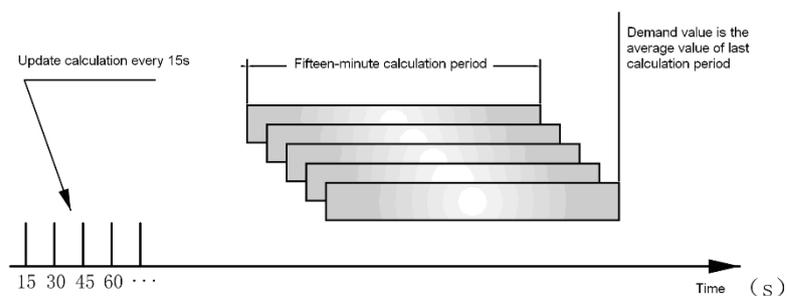
There are two demand measurement modes which are slip and fixed. The relative time parameters are set as t (slipping time; unit min) and T (slipping period/time zone; unit min).

Slip: meter calculates average demand during latest T minutes every t minutes, tests and records the value, automatically reads the demand every month ;

Fixed: meter calculates average demand during latest T minutes every T minutes, tests and records the value, automatically reads the demand every month.



Fixed mode



Slip mode

Note: calculation method is upper pictures takes 15min as example.

10.3.9 Communication setup

	Slave address	1~247
	Baud rate	19200
	Data format	N81
	Communication protocol	Modbus-RTU

10.3.10 Relay output setup

	<p>Relay output has three kinds of working modes:</p> <ol style="list-style-type: none"> 1. OFF; 2. Remotely control open and closed actions of relay through communication; 3. Alarm linkage, relay acts when the measured value is beyond a certain threshold value
	<p>Alarm linkage</p> <p>If pulse width is "00.00", it works in electrical level mode; otherwise, it works in pulse output mode.</p> <p>Please refer to alarm item list table for more information.</p>
	<p>Remote control through communication</p> <p>If pulse width is "00.00", it works in electrical level mode; otherwise, it works in pulse output mode.</p>

Alarm item list table

Item	Format	Instruction	Item	Format	Instruction
D12-0	0	Linkage when No. 2 digital input is 0	Q <	xxxx var	Low total reactive power alarm
D12-1	1	Linkage when No. 2 digital input is 1	Q >		High total reactive power alarm

DI1-0	0	Linkage when No. 1 digital input is 0	P <	xxxx W	Low total active power alarm
DI1-1	1	Linkage when No. 1 digital input is 1	P >		High total active power alarm
THDi <	xx.xx%	Low current THD alarm	F <	xx.xx Hz	Low grid frequency alarm
THDi >		High current THD alarm	F >		High grid frequency alarm
THDu <	xx.xx%	Low voltage THD alarm	I <	x.xxx A	Low phase current alarm (any phase current)
THDu >		High voltage THD alarm	I >		High phase current alarm (any phase current)
PF <	x.xxx	Low total power factor alarm	UIl <	xxx.x V	Low line voltage alarm (any line voltage)
PF >		High total power factor alarm	UIl >		High line voltage alarm (any line voltage)
S <	xxxx VA	Low total apparent power alarm	Uln <	xxx.x V	Low phase voltage alarm (any phase voltage)
S >		High total apparent power alarm	Uln >		High phase voltage alarm (any phase voltage)

Note: Off-limit alarm value of voltage, current or power is based on primary value.

Item	Format	Instruction	Item	Format	Instruction
DI1-1	1	Linkage when No. 1 digital input is 1	Q <	xxxx var	Total reactive power low alarm
DI2-1	1	Linkage when No. 2 digital input is 1	Q >		Total reactive power high alarm
DI3-1	1	Linkage when No.3 digital input is 1	P <	xxxx W	Total active power low alarm
Status	1	System alarm	P >		Total active power high alarm
THDi <	xx.xx%	THDi low alarm	F <	xx.xx Hz	Grid frequency low alarm
THDi >		THDi high alarm	F >		Grid frequency high alarm
THDu <	xx.xx%	THDu low alarm	I <	x.xxx A	Any phase current low alarm
THDu >		THDu high alarm	I >		Any phase current high alarm
PF <	x.xxx	Total PF low alarm	UIl <	xxx.x V	Any line voltage low alarm

PF >		Total PF high alarm	Ull >		Any line voltage high alarm
S <	xxxx VA	Total apparent power low alarm	Vln <	xxx.x V	Any phase voltage low alarm
S >		Total apparent power high alarm	Vln >		Any phase voltage high alarm

Note: The off-limit alarm values of voltage, current and power are subject to the primary value.

10.3.11 Clear record

Reset	
Reset Energy	<input type="checkbox"/>
Reset Demand	<input type="checkbox"/>
Reset Max/Min	<input type="checkbox"/>
Reset SystemEvent	<input type="checkbox"/>
Reset SoE	<input type="checkbox"/>
Reset Alarm	<input type="checkbox"/>

Select an item, and then press **Enter** to clear corresponding record.

10.3.12 Limit value setup

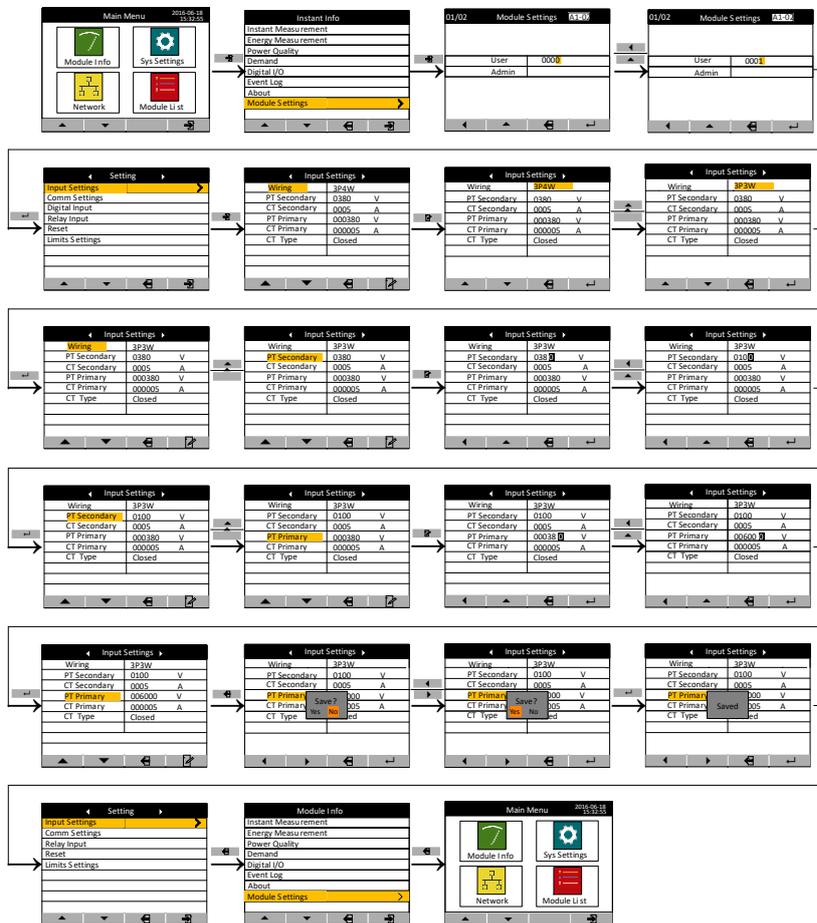
<table border="1"> <thead> <tr> <th colspan="4">Limits Mode 1</th> </tr> <tr> <th>Item</th> <th>Mode</th> <th>Item</th> <th>Mode</th> </tr> </thead> <tbody> <tr> <td>L1 Over Volts</td> <td>OFF</td> <td>L3 Over Amps</td> <td>OFF</td> </tr> <tr> <td>L2 Over Volts</td> <td>OFF</td> <td>L1 Under Amps</td> <td>OFF</td> </tr> <tr> <td>L3 Over Volts</td> <td>OFF</td> <td>L2 Under Amps</td> <td>OFF</td> </tr> <tr> <td>L1 Under Volts</td> <td>OFF</td> <td>L3 Under Amps</td> <td>OFF</td> </tr> <tr> <td>L2 Under Volts</td> <td>OFF</td> <td>L1 Over Act. P</td> <td>OFF</td> </tr> <tr> <td>L3 Under Volts</td> <td>OFF</td> <td>L2 Over Act. P</td> <td>OFF</td> </tr> <tr> <td>L1 Over Amps</td> <td>OFF</td> <td>L3 Over Act. P</td> <td>OFF</td> </tr> <tr> <td>L2 Over Amps</td> <td>OFF</td> <td>L1 Under Act. P</td> <td>OFF</td> </tr> </tbody> </table>	Limits Mode 1				Item	Mode	Item	Mode	L1 Over Volts	OFF	L3 Over Amps	OFF	L2 Over Volts	OFF	L1 Under Amps	OFF	L3 Over Volts	OFF	L2 Under Amps	OFF	L1 Under Volts	OFF	L3 Under Amps	OFF	L2 Under Volts	OFF	L1 Over Act. P	OFF	L3 Under Volts	OFF	L2 Over Act. P	OFF	L1 Over Amps	OFF	L3 Over Act. P	OFF	L2 Over Amps	OFF	L1 Under Act. P	OFF	Used for voltage, current, active power off-limit enable setting.
Limits Mode 1																																									
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Limits Mode 2																																									
Item	Mode	Item	Mode																																						
L2 Under Act. P	OFF	T1 Over Temp.	OFF																																						
L3 Under Act. P	OFF	T2 Over Temp.	OFF																																						
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Limits Mode 3																																									
Item	Mode	Item	Mode																																						
No.1 Leak.Over	OFF																																								
No.2 Leak.Over	OFF																																								
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No.2 Leak.Under	OFF																																								
No.3 Leak.Under	OFF																																								
Over Frequency	OFF																																								
Under Frequency	OFF																																								

Frequency Limits		
Item	Value(Hz)	Hys(Hz)
Over Freq.	00.00	00.00
Under Freq.	00.00	00.00

Used for frequency off-limit enable setting.

10.4 Programming operation

Suppose the wiring mode of meter is three phase four wire, input voltage range is 380V, direct voltage input, primary voltage is 380V. To change the wiring mode to be three phase three wire, set input voltage range as 100V, set primary voltage as 6000V, the operation process is as follows,



11. Technical specification

11.1 SAM3001 measurement module

Working environment	
Working temperature	-20°C-70°C
Storage temperature	-40°C-85°C
Relative humidity	≤95%RH, no condensation
Working altitude	≤2000m
Protection	IP20
Insulation	Signal, power supply and output terminal to case resistance>100MΩ
Withstand voltage	≥2kV
EMC	
Immunity to electrostatic discharge	IEC 61000-4-2-Level III
Immunity to radio-frequency field	IEC 61000-4-3- Level III
Immunity to electrical fast transients/bursts	IEC 61000-4-4- Level IV
Immunity to impulse waves	IEC 61000-4-5- Level IV
Immunity to conducted disturbances	IEC 61000-4-6- Level III
Immunity to power frequency magnetic fields	IEC 61000-4-8- Level III
Immunity to voltage dips and short interruptions	IEC 61000-4-11- Level III
Working power supply	
Rated range	AC/DC:80~270V (SAM3001-M1A/M1B)
Power consumption	≤0.5W
Voltage input	
Range	3×220V/380V
Resolution	0.1 V
Impedance	≥1.7 MΩ/phase
Power consumption	≤0.1 VA /phase
Over voltage	Continuous 1.2Un, instantaneous: 2Un/10s
Frequency	45-65 Hz
Current input	
Range	External current transformer, please refer to 7.5 current transformer
Relay output (SAM3001-M21A)	

Type	Solid state relay
Capacity	AC: 0.12A/280V; DC:0.12A/400V
Isolation voltage	5000 V AC
Action time	2ms max
Release time	1ms max
Pulse output width	80ms±20%
Energy pulse frequency	≤10Hz
Communication interface port COM	
Physical interface	RS485
Communication speed	19200bps at most
Communication protocol	Modbus-RTU
Isolation voltage	4000 V AC
Communication interface port SBUS	
Physical interface	RS485
Communication port	Used to connect to SAM3001-F1/F2/F3/F4
Communication baud rate	38400bps
Communication protocol	Modbus-RTU
Insulation voltage	4000 V AC

11.2 SAM3001-02 communication module

Working environment	
Working temperature	-20°C~70°C
Storage temperature	-40°C-85°C
Relative humidity	≤95%RH, no condensation
Working altitude	≤2000m
Protection	IP20
Insulation	Signal, power supply and output terminal to case resistance>100MΩ
Working power supply	
Rated range	(24±20%) V DC
Power consumption	≤ 1W

Communication interface	
Communication port1 (SBUS port)	This interface uses wire L2 and goes through the transfer module Z4 to connect to COM1port of SAM3001-M
Communication port2 (SBUS port)	This interface uses wire L2 and goes through the transfer module Z4 to connect to the port of host software
Communication port3	This interface uses wire RJ12-1 to connect to SAM3001-D1
Physical interface	RS485
Communication baud rate	Up to 9600bps
Communication protocol	Modbus-RTU
Isolation voltage	2500 V AC
Real-time clock	
Error	≤0.5s/day

11.3 SAM3001-03 display module

Parameter	Specification
Connection	RJ12-1 cable, connect to SAM3001-02
Display	3.5" TFT LCD, resolution 320×240, 167 million colors
Button	4 capacitive touch buttons with backlight
Breathing light	When the LCD backlight is off, the working frequency is 1Hz, and the working frequency is 2Hz when it alarms.
Protection	Front panel IP67
Working temperature	-20~70°C
Storage temperature	-30~80°C
Relative humidity	≤95%RH (no condensation)
Working range	(24±20%)VDC
Consumption	≤2W

11.4 SAM3001-04 power supply module

Parameter	Specification
Input voltage	AC/DC : 80V~270V
Output voltage	DC : 24V
Output power	<15W
Accuracy	±1%

Efficiency	≥75%
Withstand voltage	2000V AC

11.5 Current transformer

Closed type current transformer

Model	Dimension	Remark
TU__M3K		<p>Rated value : 5A</p> <p>Maximum : 10A</p> <p>Accuracy : 0.1%</p> <p>Isolation voltage : 4000V AC</p> <p>Working temperature : -40~70°C</p> <p>Storage temperature : -40~70°C</p> <p>Accessory : RJ12-3</p>
TU__M3K		<p>Rated value : 100A</p> <p>Maximum : 120A</p> <p>Accuracy : 0.1%</p> <p>Isolation voltage : 4000V AC</p> <p>Working temperature : -40~70°C</p> <p>Storage temperature : -40~70°C</p> <p>Accessory : RJ12-3</p>
TU__M3K200		<p>Rated value : 200A</p> <p>Maximum : 240A</p> <p>Accuracy : 0.1%</p> <p>Isolation voltage : 4000V AC</p> <p>Working temperature : -40~70°C</p> <p>Storage temperature : -40~70°C</p> <p>Accessory : RJ12-3</p>

<p>TU_M3K40 0</p>		<p>Rated value : 400A Maximum : 480A Accuracy : 0.1% Isolation voltage : 4000V AC Working temperature : -40~70°C Storage temperature : -40~70°C Accessory : RJ12-3</p>
<p>TU_M3K60 0</p>		<p>Rated value : 600A Maximum : 720A Accuracy : 0.1% Isolation voltage : 4000V AC Working temperature : -40~70°C Storage temperature : -40~70°C Accessory : RJ12-3</p>

Split type current transformer

Model	Dimension	Remark
<p>TA_M3K05</p>		<p>Rated value : 5A Maximum : 6A Accuracy : 1% Isolation voltage: 4000V AC Working temperature : -10°C~50°C Storage temperature : -20°C~70°C Accessory : Z1+RJ12-1</p>
<p>TA_M3K10 0</p>		<p>Rated value : 100A Maximum : 120A Accuracy : 0.5% Isolation voltage : 4000V AC</p>

		<p>Working temperature : - 10°C~50°C</p> <p>Storage temperature : - 20°C~70°C</p> <p>Accessory : Z1+RJ12-1</p>
TA_M3K20 0		<p>Rated value : 200A</p> <p>Maximum : 240A</p> <p>Accuracy : 0.5%</p> <p>Isolation voltage : 4000V AC</p> <p>Working temperature : - 10°C~50°C</p> <p>Storage temperature : - 20°C~70°C</p> <p>Accessory : Z1+RJ12-1</p>
TA_M3K40 0		<p>Rated value : 400A</p> <p>Maximum : 480A</p> <p>Accuracy : 0.5%</p> <p>Isolation voltage : 4000V AC</p> <p>Working temperature : - 10°C~50°C</p> <p>Storage temperature : - 20°C~70°C</p> <p>Accessory : Z1+RJ12-1</p>
TA_M3K60 0		<p>Rated value : 600A</p> <p>Maximum : 720A</p> <p>Accuracy : 0.5%</p> <p>Isolation voltage : 4000V AC</p> <p>Working temperature : - 10°C~50°C</p> <p>Storage temperature : - 20°C~70°C</p> <p>Accessory : Z1+RJ12-1</p>

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12. ModBus Map

SAM3001 includes a display module SAM3001-03, a communication module SAM3001-02, a power module SAM3001-04, and supports up to 32 monitoring modules SAM3001 (can be used for matching SAM3001-F0/F1/F2/F3/F4 expansion modules (only one of the modules is supported), as well as matching current transformers, transfer modules and special connecting cables, etc.

Components		Quantity
Name	Model	
Display module	SAM3001-03	1
Communication module	SAM3001-02	1
Measurement module	SAM3001	1~32
Temperature module	SAM3001-F0	1~32
Temperature & DI module	SAM3001-F1	1~32
DI module	SAM3001-F3	1~32
Temperature&DI module	SAM3001-F4	1~32
Power supply module	SAM3001-04	1

12.1 Communication

12.1.1 Physical layer

The communication interface of SAM3001 should be connected by shielded twisted pair. A bus can connect 32 devices at most and terminal resistance should be connected at both ends of the bus. Communication speed range is 1200~19200bps, defaulted as 19200bps; Byte format is 1 start bit, 8 data bits, no check bit or 1 odd/even check bit, and 1/2 stop bit.

12.1.2 Communication Protocol

Data format

Address code	Function code	Data code	CRC check code
one byte	one byte	N bytes	two bytes

Address code: slave address; address range 1-247, other addresses are reserved. When the module address is not known, the address information of the M module can be read by the address 255 broadcast.

Function code: It tells the addressed terminal device to perform a function. The following list shows the function codes supported by the device as well as corresponding meaning and functions.

Function code	Meaning
0x01	Read the status of relay output
0x02	Read the status of digital input
0x03/0x04	Read the value of data register
0x05	Remote control the action of relay
0x0F	Remote control the action of multiple relays
0x10	Write register instruction
0x14	Read event recording

Data code: It includes the data which is needed by a terminal device to perform a function or the data collected from a terminal device when it responds to an inquiry. These data may be numbers, referenced address or setting value. For example, when the data code tells a terminal device to read a register, the data field should indicate the terminal device that which register it should begin from and how much data it should read. The data code sent back from a terminal device includes data length and corresponding data.

Check code: Cyclical Redundancy Check (CRC16) field occupies two bytes including a 16-bit binary value. CRC value will be calculated by transmission equipment and be added to a data frame. When the receiving equipment receives the data, it will calculate CRC value again, then it compare the two CRC value. If the two value are not equal to each other, an error will be detected.

12.1.3 Read the status of relay output (Function code 0x01)

Host request	Frame structure	Address code	Function code	data code		CRC check code
				initial relay address	Number of relay	
	Byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Data range	1~247	0x01	0x0000 (fixed)	0x0001~0x0002	CRC16
	Message example	<u>0x01</u>	<u>0x01</u>	<u>0x00 0x00</u>	<u>0x00 0x02</u>	<u>0xBD 0xCB</u>
slave response	frame structure	address code	function code	data code		CRC check code
				byte of register	register value	

	Byte	1 byte	1 byte	1 byte	1 byte	2 bytes
	Message example	<u>0x01</u>	<u>0x01</u>	<u>0x01</u>	<u>0x03</u>	<u>0x11 0x89</u>

Remark: the register value in the slave response indicates the status of the relay. Beginning from the lowest bit of the byte, each number corresponds to the status of a loop of relay output. "1" indicates the relay is closed, while "0" indicates the relay is cut off. In the upper list, the register value "0x03" corresponds to "0000 0011" in binary system which means the first and second loop of relays are closed.

12.1.4 Read the status of digital input (Function code 0x02)

Host request	Frame structure	address code	function code	data code		CRC check code
				initial switch address	number of switches	
	Byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Data range	1~247	0x02	0x0000	0x0001~0x000C	CRC16
	Message example	<u>0x01</u>	<u>0x02</u>	<u>0x00 0x00</u>	<u>0x00 0x04</u>	<u>0x79 0xC9</u>
Slave response	Frame structure	address data	function code	data code		CRC check code
				byte of register	register value	
	Byte	1 byte	1 byte	1 byte	1 byte	2 bytes
	Message example	<u>0x01</u>	<u>0x02</u>	<u>0x01</u>	<u>0x02</u>	<u>0x20 0x49</u>

Remark: the register value in the slave response indicates the status of digital input. Beginning from the lowest bit of the byte, each number corresponds to the status of a loop of digital input. "1" indicates the switch is closed, while "0" indicates the switch is cut off. In the upper list the register value "0x02" is "0000 0010" in binary system which means second loop of digital input is closed.

12.1.5 Read data register value (function code 0x03/0x04)

Host request	Frame structure	Address code	Function code	Data code		CRC check code
				initial register address	number of register	
	Byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Data range	1~247	0x03/ 0x04		Max 100	CRC16

	Message example	<u>0x01</u>	<u>0x03</u>	<u>0x00 0x06</u>	<u>0x00 0x06</u>	<u>0XE4 0x36</u>
slave response	Frame structure	address code	function code	data code		CRC check code
				byte of register	register value	
	Byte	1 byte	1 byte	1 byte	12 bytes	2 bytes
	Message example	<u>0x01</u>	<u>0x03</u>	<u>0x0C</u>	<u>(12-byte data)</u>	<u>(CRC16)</u>

Remark: the initial register address in host inquiry is the initial address of the data collected from primary grid or secondary grid. The number of register indicates the length of the data. In the upper list the register address “0x00 0x06” indicates the initial address of phase voltage float data of three phases, and the number of register “0x00 0x06” indicates the length of the data is six (three float data occupy six registers).

12.1.6 Remotely-controlled single relay output (function code 0x05)

host request	frame structure	address code	function code	data code		CRC check code
				initial relay address	relay action value	
	byte	1byte	1byte	2 bytes	2 bytes	2 bytes
	data range	1~247	0x05	0x0000~0x0003	0xFF00/0x0000	CRC16
	message example	<u>0x01</u>	<u>0x05</u>	<u>0x00 0x00</u>	<u>0xFF 0x00</u>	<u>0x8C</u> <u>0x3A</u>
slave response	frame structure	address code	function code	data code		CRC check code
				initial relay address	relay action value	
	byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	message example	<u>0x01</u>	<u>0x05</u>	<u>0x00 0x00</u>	<u>0xFF 0x00</u>	<u>0x8C</u> <u>0x3A</u>

Remark: in host request, the relay action value “0xFF00” indicates the relay is closed, while “0x0000” indicates the relay is cut off. If you want to perform remotely control, please make sure the relay is working in “remote control” mode.

12.1.7 Remotely-controlled multi-relay output (function code 0x0F)

host request	frame structure	address code	function code	data code				CRC check code
				initial relay address	number of relay	number of data byte	relay action value	

	byte	1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte	2 bytes
	data range	1~247	0x0F	0x0000	0x0001 ~ 0x0004	0x01		CRC16
	message example	<u>0x01</u>	<u>0x0F</u>	<u>0x00</u> <u>0x00</u>	<u>0x00</u> <u>0x02</u>	<u>0x01</u>	<u>0x03</u>	<u>0x9E</u> <u>0x96</u>
slave response	frame structure	address code	function code	data code				CRC check code
				initial relay address		number of relay		
	byte	1 byte	1byte	2bytes		2bytes	2 bytes	
	message example	<u>0x01</u>	<u>0x0F</u>	<u>0x00 0x00</u>		<u>0x00 0x02</u>		<u>0xD4</u> <u>0x0A</u>

Remark: in the host inquiry, beginning from the lowest bit of relay action value, each bit corresponds to a loop of relay output. "1" indicates the relay is closed, while "0" indicates the relay is cut off. In the upper list, relay action value "0x03" is "0000 0011" in binary system, which means the first and second loops of relay are closed.

12.1.8 Write setup register (function code 0x10)

Host request	Frame structure	Address code	Function code	Data code				Check code
				initial register address	Length of register	number of register byte	Write value	
	Bytes	1 byte	1 byte	2 bytes	2 bytes	1 byte	2N bytes	2 bytes
	Data range	1~247	0x10	0x080A	0x0001	N		CRC16
	Message example	<u>0x01</u>	<u>0x10</u>	<u>0x08</u> <u>0x0A</u>	<u>0x00</u> <u>0x01</u>	<u>0x02</u>	<u>0x006</u> <u>4</u>	<u>0x2ED</u> <u>1</u>
Slave response	Frame structure	Address code	Function code	Data code				Check code
				Register initial address	Register length			
	Bytes	1 byte	1 byte	2 bytes	2 bytes			2 bytes
	Message example	<u>0x01</u>	<u>0x10</u>	<u>0x08</u> <u>0x0A</u>	<u>0x00 0x01</u>			<u>0x2ED</u> <u>1</u>

Remark: Please follow strictly the address list of instrument setting information in the annex of instrument when the setup register is written. Do not try to modify the areas which are kept used and the write data shall not exceed the setting range. Wrong writing of setup register may lead to abnormal instrument operation. Please be careful with the operation.

12.1.9 Read event record and data (function code 0x14)

The event records and data include SOE event records and alarm event records.

Request

Function code	1 byte	0x14
Byte counting	1 byte	0x07
Sub-request x, parameter type	1 byte	0x06
Sub-request x, document No.	2 bytes	0x0000-0x0008
Sub-request x, recording No.	2 bytes	0x0000-0x0020
Sub-request x, recording length	2 bytes	N

Response

Function code	1 byte	0x14
Response data length	1 byte	0x07~0xF5
Sub-request x, relevant document length.	1 byte	0x07~0xF5
Sub-request x, reference type	1 byte	6
Sub-request x, recording data	N×2 bytes	...

Event record	Document No.	Record No.	Record length
SOE event	0x0000	0x0000~0x001F 0x0000:the latest SOE event record 0x0001:the SOE event record before the latest SOE event record ...	8
Alarm event	0x0008	0x0000-0x001D: 0x0000: the latest alarm event record 0x0001: the alarm event record before the latest alarm event record ...	8

12.1.10 Read SOE event record:

				Data code	
--	--	--	--	-----------	--

Host request	Frame structure	Address code	Function code	Byte counting	Parameter type	Document No.	Recording No.	Recording length	Check code
	Bytes	1 byte	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes
	Data range	1~247	0x14	0x07	0x06	0x0000	0~31	8	CRC16
	Message example	<u>0x01</u>	<u>0x14</u>	0x07	<u>0x06</u>	<u>0x0000</u>	<u>0x0000</u>	<u>0x0008</u>	<u>0xF8E2</u>
Slave response	Frame structure	Address code	Function code	Data code				Check code	
				Response data length	Document response length	Parameter type	Recording data		
	Bytes	1 byte	1 byte	1 byte	1 byte	1 byte	16 bytes	2 bytes	
Message example	<u>0x01</u>	<u>0x14</u>	<u>0x12</u>	<u>0x11</u>	<u>0x06</u>	SOE recording data	CRC16		

SOE event recording data format description:

The instrument have 32 pieces of SOE event record, recording the time and status of the digital input and relay output action. The resolution is 1ms.

Format description of SOE event recording data:

Year, month, day, hour, minute, second, millisecond(8byte) + DI change status bits (2byte) + DI present status bits (2byte) + DO change status bits (2byte) + DO present status bits (2byte).

Year, month, day, hour, minute, second, millisecond : time when SOE event occurs.

DI change status bit: status bit which is changed corresponding to each channel of digital input starting from the lowest bit of the byte. 1 means action and 0 means no action.

DI present status bit: status value corresponding to each channel of digital input starting from the lowest bit of the byte. 1 means action status and 0 means reset status.

DO change status bit: status bit which is changed corresponding to each channel of relay output starting from the lowest bit of the byte. 1 means action and 0 means no action.

DO present status bit: status value corresponding to each channel of relay output starting from the lowest bit of the byte. 1 means action status and 0 means reset status.

For example: 0x0E 0x03 0x05 0x08 0x14 0x01 0x01 0x00 0x00 0x02 0x00 0x03 0x00 x02 0x00 0x00

0x0E 0x03 0x05 0x08 0x14 0x01 0x01 0x00 : means the time of 2014, March, 5th, 8 o'clock, 20 minute, 1 second, 256 millisecond.

0x00 0x02 0x00 x03 : 0x00 0x02 means that the digital input status of the second channel is changed while other channels remain unchanged; 0x00 x03 means the first channel and the second channel of digital input are in action status. Thereby, it can be concluded that the second channel switch input is displaced, and changes from the reset state to the action state; the first channel switch input is in the switch action holding state, and the other channel switch inputs are in the reset holding state.

0x00 x02 0x00 0x00 :

0x00 x02: means the status of second channel relay is changed;

0x00 0x00: means the current relay is in reset status. Thereby, it can be concluded that the second relay is displaced and changed from the action state to the reset state; the other relays are in the reset holding state.

12.1.11 Read alarm event record

	Frame structure	Address code	Function code	Data code					Check code
				Byte counting	Parameter type	Document No.	Recording No.	Recording length	
Host request	Bytes	1 byte	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes
	Data range	1~247	0x14	0x07	0x06	0x0008	0~29	8	CRC16
	Message example	<u>0x01</u>	<u>0x14</u>	0x07	<u>0x06</u>	<u>0x0008</u>	<u>0x0000</u>	<u>0x0008</u>	<u>0x1923</u>
Slave response	Frame structure	Address code	Function code	Data code				Check code	
				Response data length	Document response length	Parameter type	Recording data		
	Bytes	1 byte	1 byte	1 byte	1 byte	1 byte	16 bytes	2 bytes	
Message example	<u>0x01</u>	<u>0x14</u>	<u>0x12</u>	<u>0x11</u>	<u>0x06</u>	<u>Alarm record data</u>	CRC16		

The meter has 30 alarm event records, and judges and processes voltage, current, power, etc. every 1s. Record the time and type of the event. Thresholds and hysteresis for voltage, current, power, etc. are set through communication.

Alarm event record data format description:

Year, month, day, hour, minute, second (6byte) + spare byte (2byte) + alarm type (2byte) + spare byte (6byte)

Year, month, day, hour, minute, second: the time when the alarm event occurred.

Alarm Type: Alarm event type.

For example : 0x0E 0x03 0x05 0x08 0x14 0x01 0x00 0x00 0x00 0x02 0x00 0x00 0x00 0x00 0x00 0x00

0x0E 0x03 0x05 0x08 0x14 0x01 : Indicates the time at 8:20:1 on March 5, 2014.

0x00 0x00 : spare byte

0x00 0x02 : A phase current high alarm

0x00 0x00 0x00 0x00 0x00 0x00 : spare byte

Alarm event number (part)

0. High frequency
1. Low frequency
2. High phase A current
3. A phase current is low
4. High phase B current
5. Low phase B current
6. High phase C current
7. C-phase current ground
8. A-phase active power is high
9. A-phase active power is low
10. B-phase active power is high
11. B-phase active power is low
12. High phase C active power
13. C-phase active power ground
14. A-phase reactive power is high
15. Low reactive power of phase A
16. High reactive power of B phase
17. Low reactive power of phase B
18. High reactive power of C-phase
19. C-phase reactive power ground
30. High total active power
31. Low total active power
38. A-phase voltage is high
39. A phase voltage is low

- 40. High phase B voltage
- 41. Low phase B voltage
- 42. C-phase voltage is high
- 43. Low phase C voltage
- 44. High total reactive power
- 45. Low total reactive power

12.2 Data format

12.2.1 32-bit floating format

32-bit floating format conforms to IEEE-754 format. The byte order of the data is in the form of a large end sequence, the high byte is preceded, and the low byte is in the post.

The following table shows the Float data for three-phase voltage:

Address(Hex)	Data(Hex)	Description
0006-0007	435C-8000	V1 = 0x435C8000 = 220.5V
0008-0009	4360-4CCD	V2 = 0x43604CCD = 224.3V
000A-000B	435E-B333	V3 = 0x435EB333 = 222.7V

12.2.2 16-bit Integer format

16-bit Integral format data adopts complementary code storage. The byte order of the data is in the form of a large end sequence, the high byte is preceded, and the low byte is in the post.

The following table shows the Int data for three-phase voltage:

Address(Hex)	Data(Hex)	Description
0210	0230	THDv1 = 0x0230 = 5.6%
0211	0172	THDv2 = 0x0172 = 3.7%
0212	0096	THDv3 = 0x0096 = 1.5%

12.2.3 32-bit Integer format

32-bit Integral format data adopts complementary code storage. The byte order of the data is in the form of a large end sequence, the high byte is preceded, and the low byte is in the post.

The following table shows the Long data for three-phase voltage:

Address(Hex)	Data(Hex)	Description
0210	0230	THDv1 = 0x0230 = 5.6%
0211	0172	THDv2 = 0x0172 = 3.7%
0212	0096	THDv3 = 0x0096 = 1.5%

Appendix 1 MODBUS-RTU Communication List

0x03/0x04 command data register address:

Primary data

Address	Form at	Data description	Unit	R/W
0000-0005	reserv ed			
0006-0007	Float	Phase A voltage	V	R
0008-0009	Float	Phase B voltage	V	R
0010-0011	Float	Phase C voltage	V	R
0012-0013	Float	Line AB voltage	V	R
0014-0015	Float	Line BC voltage	V	R
0016-0017	Float	Line CA voltage	V	R
0018-0019	Float	Phase A current	A	R
0020-0021	Float	Phase B current	A	R
0022-0023	Float	Phase C current	A	R
0024-0025	Float	In current(reserved)	A	R
0026-0027	Float	Phase A active power	kW	R
0028-0029	Float	Phase B active power	kW	R
0030-0031	Float	Phase C active power	kW	R
0032-0033	Float	Total active power	kW	R
0034-0035	Float	Phase A reactive power	kvar	R
0036-0037	Float	Phase B reactive power	kvar	R
0038-0039	Float	Phase C reactive power	kvar	R
0040-0041	Float	Total reactive power	kvar	R
0042-0043	Float	Phase A apparent power	kVA	R
0044-0045	Float	Phase B apparent power	kVA	R
0046-0047	Float	Phase C apparent power	kVA	R
0048-0049	Float	Total apparent power	kVA	R
0050-0051	Float	Phase A power factor		R
0052-0053	Float	Phase B power factor		R
0054-0055	Float	Phase C power factor		R
0056-0057	Float	Total power factor		R
0058-0059	Float	Grid frequency	Hz	R
0060-0061	Float	Import active energy EP+	kWh	R
0062-0063	Float	Export active energy EP-	kWh	R
0064-0065	Float	Import reactive energy EQ+	kvarh	R
0066-0067	Float	Export reactive energy EQ-	kvarh	R
0068-0069	Float	Apparent energy	kVAh	R

0070-0071	Float	First quadrant reactive energy	kvarh	R
0072-0073	Float	Second quadrant reactive energy	kvarh	R
0074-0075	Float	Third quadrant reactive energy	kvarh	R
0076-0077	Float	Fourth quadrant reactive energy	kvarh	R
0078-0079	Float	Import fundamental wave active energy	kWh	R
0080-0081	Float	Export fundamental wave active energy	kWh	R
0082-0083	Float	Import fundamental wave reactive energy	kvarh	R
0084-0085	Float	Export fundamental wave reactive energy	kvarh	R
0086-0087	Float	Phase AImport active energy	kWh	R
0088-0089	Float	Phase BImport active energy	kWh	R
0090-0091	Float	Phase CImport active energy	kWh	R
0092-0093	Float	Phase AExport active energy	kWh	R
0094-0095	Float	Phase BExport active energy	kWh	R
0096-0097	Float	Phase CExport active energy	kWh	R
0098-0099	Float	Phase AImport reactive energy	kvarh	R
0100-0101	Float	Phase BImport reactive energy	kvarh	R
0102-0103	Float	Phase CImport reactive energy	kvarh	R
0104-0105	Float	Phase AExport reactive energy	kvarh	R
0106-0107	Float	Phase BExport reactive energy	kvarh	R
0108-0109	Float	Phase CExport reactive energy	kvarh	R
0110-0125	reserved			

Module information

Address	Format	Data description	Unit	R/W
0126	Int	The first temperature value	0.1°C	R
0127	Int	The second temperature value	0.1°C	R
0128	Int	The third temperature value	0.1°C	R
0129	Int	The fourth temperature value	0.1°C	R
0130	Int	The first temperature value	0.1°C	R
0131	Int	The second temperature value	0.1°C	R
0132	Int	The third temperature value	0.1°C	R
0133	Int	The fourth temperature value	0.1°C	R
0134	Int	DI information: Bit0 : The first DI status Bit1 : The second DI status Bit2 : The third DI status	0 : disconnection 1 : closed	R

0135	Int	The first temperature value	0.1°C	R
0136	Int	The second temperature value	0.1°C	R
0137	Int	The third temperature value	0.1°C	R
0138	Int	The fourth temperature value	0.1°C	R
0139	Int	The first circuit leakage	0.1mA	R
0140	Int	The second circuit leakage	0.1mA	R
0141	Int	The third circuit leakage	0.1mA	R
0142	Int	DI information: Bit0 : The first DI status Bit1 : The second DI status Bit2 : The third DI status	0 : disconnection 1 : closed	R
0143	Int	The first temperature value	0.1°C	R
0144	Int	The second temperature value	0.1°C	R
0145	Int	The third temperature value	0.1°C	R
0146	Int	The fourth temperature value	0.1°C	R
0147	Int	RO information : Bit0 : The first RO status Bit1 : The second RO status Bit2 : The third RO status Bit3 : The fourth RO status	0 : disconnection 1 : closed	R
0148	Int	The first temperature value	0.1°C	R
0149	Int	The second temperature value	0.1°C	R
0150	Int	The third temperature value	0.1°C	R
0151	Int	The fourth temperature value	0.1°C	R
0152	Int	Leakage	0.1mA	R
0153	Int	DI information	0 : disconnection 1 : closed	R
0154	Int	The first temperature value	0.1°C	R
0155	Int	The second temperature value	0.1°C	R
0156	Int	The third temperature value	0.1°C	R
0157	Int	The fourth temperature value	0.1°C	R
0158	Int	Leakage	0.1mA	R
0159	Int	DI information	0 : disconnection 1 : closed	R
0160	Int	RO information	0 : disconnection 1 : closed	R

0161	Int	Extension module types : Bit00: SAM3001-F0 Bit01: SAM3001-F1 Bit02: SAM3001-F2 Bit03: SAM3001-F3 Bit04: SAM3001-F4 Bit05: reserved Bit06: reserved Bit07: reserved Bit08: SAM3001-F8 Bit09: SAM3001-F9	0 : null 1 : yes	R
0162	char	high byte : year ; low byte : month	From SAM3001-02	R/W
0163	char	high byte : day ; low byte : hour	From SAM3001-02	R/W
0164	char	high byte : minute ; low byte : second	From SAM3001-02	R/W
0165	char	high byte : week ; low byte : reserved	From SAM3001-02	R/W
0166-0229	reserved			
0230	Int	The first circuit leakage	0.1mA	R
0231	Int	The second circuit leakage	0.1mA	R
0232	Int	The third circuit leakage	0.1mA	R
0233	Int	The first temperature	0.1°C	R
0234	Int	The second temperature	0.1°C	R
0235	Int	The third temperature	0.1°C	R
0236	Int	The fourth temperature	0.1°C	R
0237	Int	Extension module types	01: SAM3001-F0 02: SAM3001-F1 03: SAM3001-F2 04: SAM3001-F3 05: SAM3001-F4 06: reserved 07: SAM3001-F6 08: reserved 09: SAM3001-F8	R

			10: SAM3001-F9	
0238	char	high byte : year ; low byte : month		R/W
0239	char	high byte : day ; low byte : hour		R/W
0240	char	high byte : minute ; low byte : second		R/W
0241	char	high byte : week ; low byte : reserved		R/W
0242	Int	RO information : Bit0 : The first RO status(F4) Bit1 : The second RO status(F4) Bit2 : The third RO status(F4) Bit3 : The fourth RO status(F4) Bit4 : The fifth RO status(M2x) Bit5 : The sixth RO status(F9)	0 : disconnection 1 : closed	R
0243	Int	DI information: Bit0 : The first DI status Bit1 : The second DI status Bit2 : The third DI status	0 : disconnection 1 : closed	R
0244	Int	System status Bit00: frequency high alarm Bit01:frequency low alarm Bit02: Phase A current high alarm Bit03: Phase A current low alarm Bit04: Phase B current high alarm Bit05: Phase B current low alarm Bit06: Phase C current high alarm Bit07: Phase C current low alarm Bit08: Phase A active power high alarm Bit09: Phase A active power low alarm Bit10: Phase B active power high alarm Bit11: Phase B active power low alarm Bit12: Phase C active power high alarm Bit13: Phase C active power low alarm	0 : normal 1 : abnormal	R

		Bit14: phase sequence alarm Bit15: reserved		
0245	Int	System status Bit00: Phase A reactive power high alarm Bit01: Phase A reactive power low alarm Bit02: Phase B reactive power high alarm Bit03: Phase B reactive power low alarm Bit04: Phase C reactive power high alarm Bit05: Phase C reactive power low alarm Bit06: The first temperature high alarm Bit07: The first temperature low alarm Bit08: The second temperature high alarm Bit09: The second temperature low alarm Bit10: The third temperature high alarm Bit11: The third temperature low alarm Bit12: The fourth temperature high alarm Bit13: The fourth temperature low alarm Bit14: Total active power high alarm Bit15: Total active power low alarm	0 : normal 1 : abnormal	R
0246	Int	System status Bit00: The first circuit leakage high alarm Bit01: The first circuit leakage low alarm Bit02: The second circuit leakage high alarm Bit03: The second circuit leakage low alarm Bit04: The third circuit leakage high alarm Bit05: The third circuit leakage low alarm Bit06: Phase A voltage high alarm	0 : normal 1 : abnormal	R

		<p>Bit07: Phase A voltage low alarm</p> <p>Bit08: Phase B voltage high alarm</p> <p>Bit09: Phase B voltage low alarm</p> <p>Bit10: Phase C voltage high alarm</p> <p>Bit11: Phase C voltage low alarm</p> <p>Bit12: Total reactive power high alarm</p> <p>Bit13: Total reactive power low alarm</p> <p>Bit14-Bit15: reserved</p>		
247	Int	<p>Voltage opening and closing status information :</p> <p>Bit0 : the first switch opening and closing status</p> <p>Bit1 : the second switch opening and closing status</p> <p>Bit2 : the third switch opening and closing status</p>	<p>0 : opening</p> <p>1 : closing</p>	R
248	Int	<p>Bit00: the fifth temperature high alarm</p> <p>Bit01: the fifth temperature low alarm</p> <p>Bit02: the sixth temperature high alarm</p> <p>Bit03: the sixth temperature low alarm</p> <p>Bit04: the seventh temperature high alarm</p> <p>Bit05: the seventh temperature low alarm</p> <p>Bit06: the eighth temperature high alarm</p> <p>Bit07: the eighth temperature low alarm</p> <p>Bit08: the fourth leakage high alarm</p> <p>Bit09: the fourth leakage low alarm</p> <p>Bit10: the fifth leakage high alarm</p> <p>Bit11: the fifth leakage low alarm</p> <p>Bit12: the sixth leakage high alarm</p> <p>Bit13: the sixth leakage low alarm</p> <p>Bit14-Bit15: reserved</p>		
249-255	reserved			

Extreme value data

Address	Format	Data description	Unit	R/W
0256-0257	Float	Phase A voltage historical maximum	V	R
0258-0259	Float	Phase B voltage historical maximum	V	R
0260-0261	Float	Phase C voltage historical maximum	V	R
0262-0263	Float	Line AB voltage historical maximum	V	R
0264-0265	Float	Line BC voltage historical maximum	V	R
0266-0267	Float	Line CA voltage historical maximum	V	R
0268-0269	Float	Phase A current historical maximum	A	R
0270-0271	Float	Phase B current historical maximum	A	R
0272-0273	Float	Phase C current historical maximum	A	R
0274-0275	Float	In(3P4W) historical maximum	A	R
0276-0277	Float	Total active power historical maximum	kW	R
0278-0279	Float	Total reactive power historical maximum	Kvar	R
0280-0281	Float	Total apparent power historical maximum	kVA	R
0282-0283	Float	Total power factor historical maximum		R
0284-0285	Float	Frequency historical maximum	Hz	R
0286-0287	Float	Phase A voltage historical minimum	V	R
0288-0289	Float	Phase B voltage historical minimum	V	R
0290-0291	Float	Phase C voltage historical minimum	V	R
0292-0293	Float	Line AB voltage historical minimum	V	R
0294-0295	Float	Line BC voltage historical minimum	V	R
0296-0297	Float	Line CA voltage historical minimum	V	R
0298-0299	Float	Phase A current historical minimum	A	R
0300-0301	Float	Phase B current historical minimum	A	R
0302-0303	Float	Phase C current historical minimum	A	R
0304-0305	Float	In(3P4W) historical minimum	A	R

0306-0307	Float	Total active powerhistorical minimum	kW	R
0308-0309	Float	Total reactive powerhistorical minimum	kvar	R
0310-0311	Float	Total apparent powerhistorical minimum	kVA	R
0312-0313	Float	Total power factorhistorical minimum		R
0314-0315	Float	Frequencyhistorical minimum	Hz	R
0316-0375	Float	Historical extreme value of this month		R
0376-0435	Float	Historical extreme value of last month		R
0436-0495	Float	Historical extreme value of the month before last month		R
0496-499	reserved			

Tariff energy

Address	Format	Data description	Unit	R/W
0500-0501	Float	Total tariff energy (total)	kWh	R
0502-0503	Float	Total tariff energy (tip)	kWh	R
0504-0505	Float	Total tariff energy (peak)	kWh	R
0506-0507	Float	Total tariff energy (flat)	kWh	R
0508-0509	Float	Total tariff energy (valley)	kWh	R
0510-0629	Float	Tariff energy of thismonth to last 12months	kWh	R
0630-1023	reserved			

Demand data

Address	Format	Data description	Unit	R/W
1024-1025	Float	Phase A current present demand	A	R
1026-1027	Float	Phase B current present demand	A	R
1028-1029	Float	Phase C current present demand	A	R
1030-1031	Float	Total active power present demand	kW	R
1032-1033	Float	Total reactive power present demand	kvar	R
1034-1035	Float	Total apparent power present demand	kVA	R
1036-1037	Float	Phase A current demand last cycle	A	R
1038-1039	Float	Phase B current demand last cycle	A	R
1040-1041	Float	Phase C current demand last cycle	A	R
1042-1043	Float	Total active power demand last cycle	kW	R

1044-1045	Float	Total reactive power demand last cycle	kvar	R
1046-1047	Float	Total apparent power demand last cycle	kVA	R
1048-1059	Float	Historical demand maximum		R
1060-1071	Float	Demand maximum this month		R
1072-1083	Float	Demand maximum last month		R
1084-1095	Float	Demand maximum the month before last month		R
1096-1279	reserved			

Grid quality parameters

Address	Format	Data description	Unit	R/W
1280-1281	Float	Voltage positive sequence component	V	R
1282-1283	Float	Voltage negative sequence component	V	R
1284-1285	Float	Voltage zero sequence component	V	R
1286-1287	Float	Unbalanced voltage		R
1288-1289	Float	Current positive sequence component	A	R
1290-1291	Float	Current negative sequence component	A	R
1292-1293	Float	Current zero sequence component	A	R
1294-1295	Float	Unbalanced current		R
1296-1297	Float	Phase voltage average value	A	R
1298-1299	Float	Line voltage average value	A	R
1300-1301	Float	Current average value	A	R
1302-1303	Float	Active power average value	kW	R
1304-1305	Float	Reactive power average value	kvar	R
1306-1307	Float	Apparent power average value	kVA	R
1308-1309	Float	Phase A voltage deviation	V	R
1310-1311	Float	Phase B voltage deviation	V	R
1312-1313	Float	Phase C voltage deviation	V	R
1314-1315	Float	Line AB voltage deviation	V	R
1316-1317	Float	Line BC voltage deviation	V	R
1318-1319	Float	Line CA voltage deviation	V	R
1320-1321	Float	Frequency deviation	Hz	R
1322-1323	Float	Phase A voltage fundamental wave value	V	R
1324-1325	Float	Phase B voltage fundamental wave value	V	R

1326-1327	Float	Phase C voltage fundamental wave value	V	R
1328-1329	Float	Phase A current fundamental wave value	A	R
1330-1331	Float	Phase B current fundamental wave value	A	R
1332-1333	Float	Phase C current fundamental wave value	A	R
1334-1335	Float	Phase A voltage harmonic content	V	R
1336-1337	Float	Phase B voltage harmonic content	V	R
1338-1339	Float	Phase C voltage harmonic content	V	R
1340-1341	Float	Phase A current harmonic content	A	R
1342-1343	Float	Phase B current harmonic content	A	R
1344-1345	Float	Phase C current harmonic content	A	R
1346-1347	Float	Phase A fundamental wave active power	kW	R
1348-1349	Float	Phase B fundamental wave active power	kW	R
1350-1351	Float	Phase C fundamental wave active power	kW	R
1352-1353	Float	Total fundamental wave active power	kW	R
1354-1387	reserved			
1388	Int	Phase A voltage phase angle	0.1°	R
1389	Int	Phase B voltage phase angle	0.1°	R
1390	Int	Phase C voltage phase angle	0.1°	R
1391	Int	Phase A current phase angle	0.1°	R
1392	Int	Phase B current phase angle	0.1°	R
1393	Int	Phase C current phase angle	0.1°	R
1394	Int	Phase A voltage crest factor	0.001	R
1395	Int	Phase B voltage crest factor	0.001	R
1396	Int	Phase C voltage crest factor	0.001	R
1397	Int	Phase A current K coefficient	0.001	R
1398	Int	Phase B current K coefficient	0.001	R
1399	Int	Phase C current K coefficient	0.001	R
1400-1402	reserved			
1403	Int	Transformer derating coefficient	0.1	R
1404	Int	Phase A current percentage	0.1	R
1405	Int	Phase B current percentage	0.1	R
0406	Int	Phase C current percentage	0.1	R

1407	Int	Load percentage	0.1	R
1408	Int	Voltage pass rate	0.1	R
1409	Int	Frequency pass rate	0.1	R
1410	Int	Phase A voltage total harmonic distortion	0.01	R
1411	Int	Phase B voltage total harmonic distortion	0.01	R
1412	Int	Phase C voltage total harmonic distortion	0.01	R
1413	Int	Phase A current total harmonic distortion	0.01	R
1414	Int	Phase B current total harmonic distortion	0.01	R
1415	Int	Phase C current total harmonic distortion	0.01	R
1416	Int	Phase A voltage 2 nd harmonic content rate	0.01	R
1417	Int	Phase B voltage 2 nd harmonic content rate	0.01	R
1418	Int	Phase C voltage 2 nd harmonic content rate	0.01	R
1419	Int	Phase A current 2 nd harmonic content rate	0.01	R
1420	Int	Phase B current 2 nd harmonic content rate	0.0	R
1421	Int	Phase C current 2 nd harmonic content rate	0.01	R
1422-1595	Int	03 rd -31 st harmonic content rate	0.01	R
1596-1787	Int	32 nd -63 rd harmonic content rate	0.01	R
1788-1823	reserved			

Waveform data

Address	Format	Data content	Data description	R/W
1824-1855	Int	Uareal-time waveform data (32 points)		R
1856-1887	Int	Ubreal-time waveform data (32 points)		R
1888-1919	Int	Ucreal-time waveform data (32 points)		R
1920-1951	Int	Iareal-time waveform data (32 points)		R
1952-1983	Int	Ibreal-time waveform data (32 points)		R
1984-2015	Int	Icreal-time waveform data (32 points)		R

SOE

Address	Form at	Data content	Data description	R/W
2016	Int	high byte : year, low byte : month	Meter power-on record	R
2017	Int	high byte : day, low byte : hour		R
2018	Int	high byte : minute, low byte : second		R
2019	Int	Meter power-on times		R
2020	Int	high byte : year, low byte : month	Meter power-off record	R
2021	Int	high byte : day, low byte : hour		R
2022	Int	high byte : minute, low byte : second		R
2023	Int	Meter power-off times		R
2024	Int	high byte : year, low byte : month	Parameter modification record	R
2025	Int	high byte : day, low byte : hour		R
2026	Int	high byte : minute, low byte : second		R
2027	Int	Parameter modification times		R
2028	Int	high byte : year, low byte : month	Demand reset reocrd	R
2029	Int	high byte : day, low byte : hour		R
2030	Int	high byte : minute, low byte : second		R
2031	Int	Demand reset times		R
2032	Int	high byte : year, low byte : month	Energy clear record	R
2033	Int	high byte : day, low byte : hour		R
2034	Int	high byte : minute, low byte : second		R
2035	Int	Energy clear times		R
2036	Int	N° Alarms		R
2037	Int	N° SOE events		R
2038-2047	reserv ed			

Set register

Address	Form at	Data content	Data description	R/W
2048	Int	high byte : meter model	0 : auxiliary power supply 1 : self-supplied##	R/W
		low byte : module number	0 : single module	

			1 : double modules	
2049	Int	high byte : current size	0 : less than 100.0A 1 : 100A and above	R/W
		low byte : CT type	0 : 80mA output 1 : 0.333Voutput 2 : 10/2.5mA	
2050	Int	Meter address	1-247	R/W
2051	Int	Baud rate	0 : 1200bps 1 : 2400bps 2 : 4800bps 3 : 9600bps 4 : 19200bps 5 : 38400bps	R/W
2052	Int	Check mode	0 : N,8,1 1 : E,8,1 2 : O,8,1 3 : N,8,2	R/W
2053	Int	Pulse /DO selection	0 : pulse output## 1 : relay output	R/W
2054	Int	high byte : connection method	0 : 3P4W 1 : 3P3W 2 : 1P2W	R/W
		low byte : Grid frequency	0 : 50Hz 1 : 60Hz	R/W
2055	Int	Extension module types : Bit00: SAM3001-F0 Bit01: SAM3001-F1 Bit02: SAM3001-F2 Bit03: SAM3001-F3 Bit04: SAM3001-F4 Bit05: reserved Bit06: reserved Bit07: reserved Bit08: SAM3001-F8 Bit09: SAM3001-F9	0 : Null 1 : yes	R/W
2056	Int	Secondary voltage	1~690V	R/W
2057	Int	Secondary current	1~6A	R/W
2058-2059	Long	Primary voltage	1~999999V	R/W

2060-2061	Long	Primary current	1~999999A	R/W
2062	Int	Demand item	Default la/lb/lc/P/Q/S	R
2063	Int	Demand working mode	0 : Slip block 1 : Fixed block	R/W
2064	Int	Demand slip time (t)	1~9999s	R/W
2065	Int	Demand calculation period (T)	1~30T	R/W
2066	Int	Voltage pass rate upper limit	0.01V	R/W
2067	Int	Voltage pass rate lower limit	0.01V	R/W
2068	Int	Frequency pass rate upper limit	0.01Hz	R/W
2069	Int	Frequency pass rate lower limit	0.01Hz	R/W
2070	Int	DO1 working mode (F4)	0 : OFF 1 : Alarm 2 : Remote control	R/W
2071	Int	DO1 Pulse width	Pulse width : 0.10~ 99.99s Level : 0.00	R/W
2072	Int	DO1 alarm item	0 : Phase voltage overvoltage 1 : Phase voltage undervoltage 2 : Line voltage overvoltage 3 : Line voltage undervoltage 4 : current overcurrent 5 : current undercurrent 6 : Frequency exceeds over limit 7 : Frequency exceeds lower limit 8 : Total active power overload 9 : Total active power underload 10 : Total reactive power overload 11 : Total reactive power underload 12 : Total apparent power overload	R/W

			<p>13 : Total apparent power underload</p> <p>14 : high power factor</p> <p>15 : low power factor</p> <p>16 : high voltage total harmonic distortion</p> <p>17 : low voltage total harmonic distortion</p> <p>18 : high current total harmonic distortion</p> <p>19 : low current total harmonic distortion</p> <p>20 : system alarm</p> <p>21 : The first switch input is linked, the switch input is closed, and the relay output operates;</p> <p>22 : The second switch input is linked, the switch input is closed, and the relay output operates;</p> <p>23 : The third switch input is linked, the switch input is closed, and the relay output operates;</p>	
2073	Int	DO1 alarm delay time	0.00~99.99s	R/W
2074-2075	Float	DO1 alarm value	<p>numerical scale coefficient:</p> <p>voltage : V current : A</p> <p>power : kW</p> <p>Frequency : Hz</p> <p>PF harmonic : 0.01%</p>	R/W
2076-2077	Float	DO1 Hysteresis	same as the alarm value	R/W
2078-2085		DO2 setting (F4)		R/W
2086-2093		DO3 setting (F4)		R/W
2094-2101		DO4 setting (F4)		R/W
2102-2109		DO setting (SAM3001-M21A)		R/W
2110-2127		DO setting (F9)		R/W
2128-2129	Float	Total active power off-limit upper limit value	V	R/W
2130-2131	Float	Total active power off-limit upper limit hysteresis	V	R/W

2132-2133	Float	Total active poweroff-limit lower limit value	V	R/W
2134-2135	Float	Total active poweroff-limit lower limit hysteresis	V	R/W
2136-2137	Float	Total reactive power off-limit upper limit value	V	R/W
2138-2139	Float	Total reactive power off-limit upper limit hysteresis	V	R/W
2140-2141	Float	Total reactive poweroff-limit lower limit value	V	R/W
2142-2143	Float	Total reactive poweroff-limit lower limit hysteresis	V	R/W
2144-2145	Float	Phase A voltage off-limit upper limit value	V	R/W
2146-2147	Float	Phase A voltage off-limit upper limit hysteresis	V	R/W
2148-2149	Float	Phase B voltage off-limit upper limit value	V	R/W
2150-2151	Float	Phase B voltage off-limit upper limit hysteresis	V	R/W
2152-2153	Float	Phase C voltage off-limit upper limit value	V	R/W
2154-2155	Float	Phase C voltage off-limit upper limit hysteresis	V	R/W
2156-2157	Float	Phase A voltageoff-limit lower limit value	V	R/W
2158-2159	Float	Phase A voltageoff-limit lower limit hysteresis	V	R/W
2160-2161	Float	Phase B voltageoff-limit lower limit value	V	R/W
2162-2163	Float	Phase B voltageoff-limit lower limit hysteresis	V	R/W
2164-2165	Float	Phase C voltageoff-limit lower limit value	V	R/W
2166-2167	Float	Phase C voltageoff-limit lower limit hysteresis	V	R/W
2168-2169	Float	Phase A current off-limit upper limit value	A	R/W
2170-2171	Float	Phase A current off-limit upper limit hysteresis	A	R/W
2172-2173	Float	Phase B current off-limit upper limit value	A	R/W
2174-2175	Float	Phase B current off-limit upper limit hysteresis	A	R/W
2176-2177	Float	Phase C current off-limit upper limit value	A	R/W
2178-2179	Float	Phase C current off-limit upper limit hysteresis	A	R/W
2180-2181	Float	Phase A currentoff-limit lower limit value	A	R/W

2182-2183	Float	Phase A currentoff-limit lower limit hysteresis	A	R/W
2184-2185	Float	Phase B currentoff-limit lower limit value	A	R/W
2186-2187	Float	Phase B currentoff-limit lower limit hysteresis	A	R/W
2188-2189	Float	Phase C currentoff-limit lower limit value	A	R/W
2190-2191	Float	Phase C currentoff-limit lower limit hysteresis	A	R/W
2192-2193	Float	Phase A active power off-limit upper limit value	kW	R/W
2194-2195	Float	Phase A active power off-limit upper limit hysteresis	kW	R/W
2196-2197	Float	Phase B active power off-limit upper limit value	kW	R/W
2198-2199	Float	Phase B active power off-limit upper limit hysteresis	kW	R/W
2200-2201	Float	Phase C active power off-limit upper limit value	kW	R/W
2202-2203	Float	Phase C active power off-limit upper limit hysteresis	kW	R/W
2204-2205	Float	Phase A active poweroff-limit lower limit value	kW	R/W
2206-2207	Float	Phase A active poweroff-limit lower limit hysteresis	kW	R/W
2208-2209	Float	Phase B active poweroff-limit lower limit value	kW	R/W
2210-2211	Float	Phase B active poweroff-limit lower limit hysteresis	kW	R/W
2212-2213	Float	Phase C active poweroff-limit lower limit value	kW	R/W
2214-2215	Float	Phase C active poweroff-limit lower limit hysteresis	kW	R/W
2216-2217	Float	Phase A reactive power off-limit upper limit value	kW	R/W
2218-2219	Float	Phase A reactive power off-limit upper limit hysteresis	kW	R/W
2220-2221	Float	Phase B reactive power off-limit upper limit value	kW	R/W
2222-2223	Float	Phase B reactive power off-limit upper limit hysteresis	kW	R/W
2224-2225	Float	Phase C reactive power off-limit upper limit value	kW	R/W
2226-2227	Float	Phase C reactive power off-limit upper limit hysteresis	kW	R/W
2228-2229	Float	Phase A reactive poweroff-limit lower limit value	kW	R/W
2230-2231	Float	Phase A reactive poweroff-limit lower limit hysteresis	kW	R/W

2232-2233	Float	Phase B reactive poweroff-limit lower limit value	kW	R/W
2234-2235	Float	Phase B reactive poweroff-limit lower limit hysteresis	kW	R/W
2236-2237	Float	Phase C reactive poweroff-limit lower limit value	kW	R/W
2238-2239	Float	Phase C reactive poweroff-limit lower limit hysteresis	kW	R/W
2240	Int	The first temperature off-limit upper limit value	0.1°C	R/W
2241	Int	The first temperature off-limit upper limit hysteresis	0.1°C	R/W
2242	Int	The second temperature off-limit upper limit value	0.1°C	R/W
2243	Int	The second temperature off-limit upper limit hysteresis	0.1°C	R/W
2244	Int	The third temperature off-limit upper limit value	0.1°C	R/W
2245	Int	The third temperature off-limit upper limit hysteresis	0.1°C	R/W
2246	Int	The fourth temperature off-limit upper limit value	0.1°C	R/W
2247	Int	The fourth temperature off-limit upper limit hysteresis	0.1°C	R/W
2248	Int	The first temperatureoff-limit lower limit value	0.1°C	R/W
2249	Int	The first temperatureoff-limit lower limit hysteresis	0.1°C	R/W
2250	Int	The second temperatureoff-limit lower limit value	0.1°C	R/W
2251	Int	The second temperatureoff-limit lower limit hysteresis	0.1°C	R/W
2252	Int	The third temperatureoff-limit lower limit value	0.1°C	R/W
2253	Int	The third temperatureoff-limit lower limit hysteresis	0.1°C	R/W
2254	Int	The fourth temperatureoff-limit lower limit value	0.1°C	R/W
2255	Int	The fourth temperatureoff-limit lower limit hysteresis	0.1°C	R/W
2256	Int	The first circuit leakage off-limit upper limit value	0.1mA	R/W
2257	Int	The first circuit leakage off-limit upper limit hysteresis	0.1mA	R/W
2258	Int	The second circuit leakage off-limit upper limit value	0.1mA	R/W
2259	Int	The second circuit leakage off-limit upper limit hysteresis	0.1mA	R/W

2260	Int	The third circuit leakage off-limit upper limit value	0.1mA	R/W
2261	Int	The third circuit leakage off-limit upper limit hysteresis	0.1mA	R/W
2262	Int	The first circuit leakage off-limit lower limit value	0.1mA	R/W
2263	Int	The first circuit leakage off-limit lower limit hysteresis	0.1mA	R/W
2264	Int	The second circuit leakage off-limit lower limit value	0.1mA	R/W
2265	Int	The second circuit leakage off-limit lower limit hysteresis	0.1mA	R/W
2266	Int	The third circuit leakage off-limit lower limit value	0.1mA	R/W
2267	Int	The third circuit leakage off-limit lower limit hysteresis	0.1mA	R/W
2268	Int	Frequency off-limit upper limit value		R/W
2269	Int	Frequency off-limit upper limit hysteresis		R/W
2270	Int	Frequency off-limit lower limit value		R/W
2271	Int	Frequency off-limit lower limit hysteresis		R/W
2172-2275	reserved			
2276	Int	Phase A voltage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2277	Int	Phase B voltage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2278	Int	Phase C voltage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2279	Int	Phase A voltage lower limit alarm enable	0 : OFF 1 : Enable	R/W
2280	Int	Phase B voltage lower limit alarm enable	0 : OFF 1 : Enable	R/W
2281	Int	Phase C voltage lower limit alarm enable	0 : OFF 1 : Enable	R/W
2282	Int	Phase A current upper limit alarm enable	0 : OFF 1 : Enable	R/W
2283	Int	Phase B current upper limit alarm enable	0 : OFF 1 : Enable	R/W
2284	Int	Phase C current upper limit alarm enable	0 : OFF 1 : Enable	R/W
2285	Int	Phase A current lower limit alarm enable	0 : OFF 1 : Enable	R/W
2286	Int	Phase B current lower limit alarm enable	0 : OFF 1 : Enable	R/W
2287	Int	Phase C current lower limit alarm enable	0 : OFF 1 : Enable	R/W

2288	Int	Phase A active power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2289	Int	Phase B active power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2290	Int	Phase C active power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2291	Int	Phase A active power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2292	Int	Phase B active power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2293	Int	Phase C active power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2294	Int	Phase A reactive power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2295	Int	Phase B reactive power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2296	Int	Phase C reactive power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2297	Int	Phase A reactive power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2298	Int	Phase B reactive power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2299	Int	Phase C reactive power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2300	Int	The first temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2301	Int	The second temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2302	Int	The third temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2303	Int	The fourth temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2304	Int	The first temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2305	Int	The second temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2306	Int	The third temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2307	Int	The fourth temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2308	Int	The first circuit leakage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2309	Int	The second circuit leakage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2310	Int	The third circuit leakage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2311	Int	The first circuit leakage lower limit alarm enable	0 : OFF 1 : Enable	R/W

2312	Int	The second circuit leakage lower limit alarm enable	0 : OFF 1 : Enable	R/W
2313	Int	The third circuit leakage lower limit alarm enable	0 : OFF 1 : Enable	R/W
2314	Int	Frequency upper limit alarm enable	0 : OFF 1 : Enable	R/W
2315	Int	Frequency lower limit alarm enable	0 : OFF 1 : Enable	R/W
2316	Int	Phase sequence alarm enable	0 : OFF 1 : Enable	R/W
2317	Int	Total active power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2318	Int	Total active power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2319	Int	Total reactive power upper limit alarm enable	0 : OFF 1 : Enable	R/W
2320	Int	Total reactive power lower limit alarm enable	0 : OFF 1 : Enable	R/W
2321	Int	the fifth temperature off-limit upper limit value	0.1°C	R/W
2322	Int	the fifth temperature off-limit upper limit hysteresis	0.1°C	R/W
2323	Int	the sixth temperature off-limit upper limit value	0.1°C	R/W
2324	Int	the sixth temperature off-limit upper limit hysteresis	0.1°C	R/W
2325	Int	the seventh temperature off-limit upper limit value	0.1°C	R/W
2326	Int	the seventh temperature off-limit upper limit hysteresis	0.1°C	R/W
2327	Int	the eighth temperature off-limit upper limit value	0.1°C	R/W
2328	Int	the eighth temperature off-limit upper limit hysteresis	0.1°C	R/W
2329	Int	the fifth temperature off-limit lower limit value	0.1°C	R/W
2330	Int	the fifth temperature off-limit lower limit hysteresis	0.1°C	R/W
2331	Int	the sixth temperature off-limit lower limit value	0.1°C	R/W
2332	Int	the sixth temperature off-limit lower limit hysteresis	0.1°C	R/W
2333	Int	the seventh temperature off-limit lower limit value	0.1°C	R/W
2334	Int	the seventh temperature off-limit lower limit hysteresis	0.1°C	R/W
2335	Int	the eighth temperature off-limit lower limit value	0.1°C	R/W
2336	Int	the eighth temperature off-limit lower limit hysteresis	0.1°C	R/W

2337	Int	the fourth leakage off-limit upper limit value	0.1mA	R/W
2338	Int	the fourth leakage off-limit upper limit hysteresis	0.1mA	R/W
2339	Int	the fifth leakage off-limit upper limit value	0.1mA	R/W
2340	Int	the fifth leakage off-limit upper limit hysteresis	0.1mA	R/W
2341	Int	the sixth leakage off-limit upper limit value	0.1mA	R/W
2342	Int	the sixth leakage off-limit upper limit hysteresis	0.1mA	R/W
2343	Int	the fourth leakage off-limit lower limit value	0.1mA	R/W
2344	Int	the fourth leakage off-limit lower limit hysteresis	0.1mA	R/W
2345	Int	the fifth leakage off-limit lower limit value	0.1mA	R/W
2346	Int	the fifth leakage off-limit lower limit hysteresis	0.1mA	R/W
2347	Int	the sixth leakage off-limit lower limit value	0.1mA	R/W
2348	Int	the sixth leakage off-limit lower limit hysteresis	0.1mA	R/W
2349	Int	the fifth temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2350	Int	the sixth temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2351	Int	the seventh temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2352	Int	the eighth temperature upper limit alarm enable	0 : OFF 1 : Enable	R/W
2353	Int	the fifth temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2354	Int	the sixth temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2355	Int	the seventh temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2356	Int	the eighth temperature lower limit alarm enable	0 : OFF 1 : Enable	R/W
2357	Int	the fourth Leakage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2358	Int	the fifth Leakage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2359	Int	the sixth Leakage upper limit alarm enable	0 : OFF 1 : Enable	R/W
2360	Int	the fourth Leakage lower limit alarm enable	0 : OFF 1 : Enable	R/W

2361	Int	the fifth Leakagelower limit alarm enable	0 : OFF 1 : Enable	R/W
2362	Int	the sixth Leakagelower limit alarm enable	0 : OFF 1 : Enable	R/W
2363-2374	Char	Time period setting of the first set of tariff	For the minutes and hours of 12 time periods, the first time period is fixed at 00:00	R/W
2375-2386	Char	Time period setting of the second set of tariff setting	For the minutes and hours of 12 time periods, the first time period is fixed at 00:00	R/W
2387-2392	Char	Tariff setting of the first tariff	Rate types corresponding to the first set of rate periods: 0-peak, 1-peak, 2-flat, 3-valley	R/W
2393-2398	Char	Tariff setting of the second tariff	Rate types corresponding to the second set of rate periods: 0-peak, 1-peak, 2-flat, 3-valley	R/W
2399-2404	Char	Choice of monthly rates	0 : the first set 1 : the second set	R/W
2405	Char	Meter reading day setting	Automatic reading : hour, day	R/W
2406-2555	reserved			
2556-3031	For LCD			
3032-65279	reserved			

Firmware version number

Address	Format	Data content	Data description	R/W
65280-65295	Int	The software version number of the main module		R
65296-65311	Int	The software version number of the extensible module 1		R
65312-65327	Int	The software version number of the extensible module 2		R
65328-65503	reserved			
65504-65519	Int	Meter model		R