MFM300 Multi Function Meter
User Manual

MFM300V2408

Contents

1. Product Brief introduction

1.1 Reference standards

GB/T 17883-1999 Class 0.2S and 0.5S Static AC Active Electric Meter - equivalent to IEC 60687:1992
GB/T 17882-1999 Class 2 and 3 Static AC Reactive Electric Meter DL/T 614 Multifunction Electric Power Meter (equivalent to IEC 61268-1995)
GB/T 13850 Ac Energy Transfer to Analog Quantity or Electric Measuring transmitter of Digital Signal (equivalent to IEC 60688-1992, AMD.1 - 1997).
Performance Standard: GB/T 22264.1- Panel Type Digital Display Electric Measuring Instrument, Part 1 Definition and General Requirement.
GB/T 22264.2- Panel Type Digital Display Electric Measuring Instrument, Pad 2 pedal Requirements for Current Meter and Voltage meter.
GB/T 22264.3- Panel Type Digital Display Electric Measuring Instrument, Part 3 Special requirements for power meter and reactive power meter.
GB/T 22264.4- Panel Type Digital Display Electric Measuring Instrument, Pad 4 Special requirements for frequency meter.
GB/T 22264.5- Panel Type Digital Display Electric Measuring Instrument, Pad 5 Special requirement for phase meter and power factor meter
GB/T 22264.7- Panel Type Digital Display Electric Measuring Instrument, Part 7 Define and General requirement.
GB/T 22264.8-Panel Type Digital Display Electric Measuring Instrument, Part 8 Commend test way.

1.2 Product Overview

The Three phase multi function meter MFM300 is provided with high ability and precision. It can measure all electrical parameters in a three-phase electric network, including three-phase voltage, three-phase current, four-quadrant power (active power, reactive power, apparent power), frequency, power factor, two-direction energy. It also has one RS485 communication interface with MODBUS RTU protocol in the standard version.
The product provides extended optional functions of 4 digital inputs and 2 inputs. These Digital Inputs and Outputs have many application strategies, such as alarm signal, controlling signal or can be communicated by RS485.
The MFM300 is very competitive and can substitute for a general VAF meter, power meter, electricity energy meter. It can widely apply to many fields, like energy management systems, power monitoring systems, industry and mining enterprises, public places and intelligent buildings. The product is provided with many advantages, such as simple installation, simple wiring, convenient maintenance, less engineering work. It has well-organized data addresses and can support PLC, HMI, BMS software, EMS software easily.

2. Function Introduction (See Table 1)

Table 1

DISPLAY

Quadrant power direction
Load %: 0,20,40,60,80,100,120%
3 Rows x 4 digits to show voltage,
current, power, power factor, frequency
1 signal + 8 digits to show energy

MEASUREMENT FUNCTIONS

Three phase voltage
Three phase current
Three phase power (kW, kVar, KVA)
Three phase power factor, frequency
Import and Export Energy: kWh, kVarh, kVAh
RS485 MODBUS-RTU communication

SPECIFICATIONS

Item	Description / Parameter
Auxiliary	180-265VAC, 50 or 60Hz
Voltage	Rated: AC 300VLN / 500VLL
Current Input range	rated 5A; range 30mA - 6A Continuous 1.2In (6A), instantaneous 10*In /

3. Technical parameter (See Table 2)

Table 2

Item	Description / Parameter
Frequency	45 to 65 Hz
Measurement Accuracy class	Voltage: Cl 1; Current: Cl0.5; Frequency: +-0.2Hz, Power: Cl1; Active energy: Cl1; reactive energy: CL2
Display	LCD display: - 3 rows x 4 digits for voltage, current, power, pf - Sign + 8 digits for energy import and export - Quadrant arrows for power direction - Graph level 20, 40, 50, 80, 100, 120% for current.
Communication	RS485 interface, MODBUS-RTU protocol. Speed; 1.2, 2.4, 4.8, 9.6, 19.2, 38.4Kbps, N81, E(Even)81, O(Odd)81
CT Ratio	1 to 9999 (100/5A then ratio = 20)
PT Ratio	1 to 9999
Protection	Front panel: IP52
Environment	Working: -10 - 45°C, Humidity <85%RH
Mounting	Panel mount, cut out 91x91mm

4. Installation and Wiring

4.1 Panel Size(mm): 96×96 Hole Size(mm): 91×91 Depth(mm): 60 (See Fig.1)

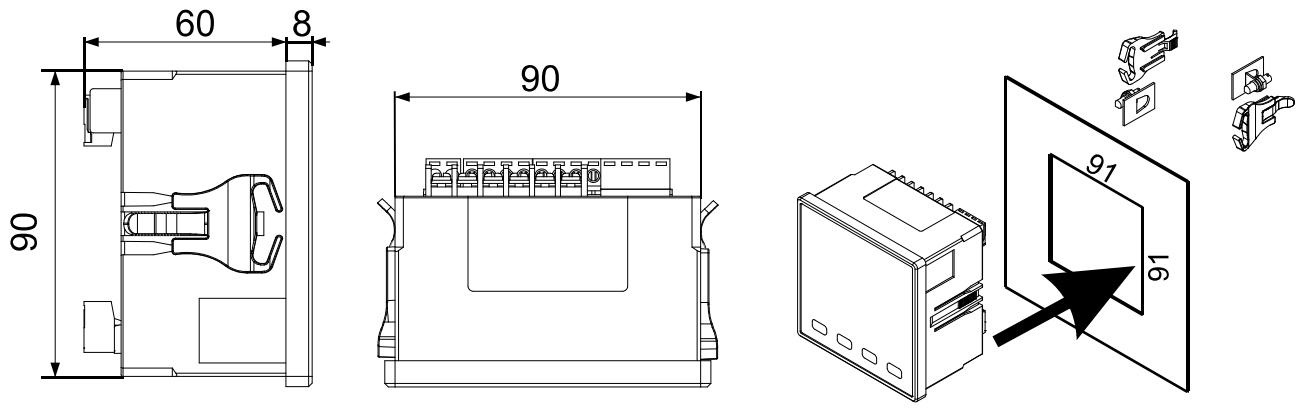
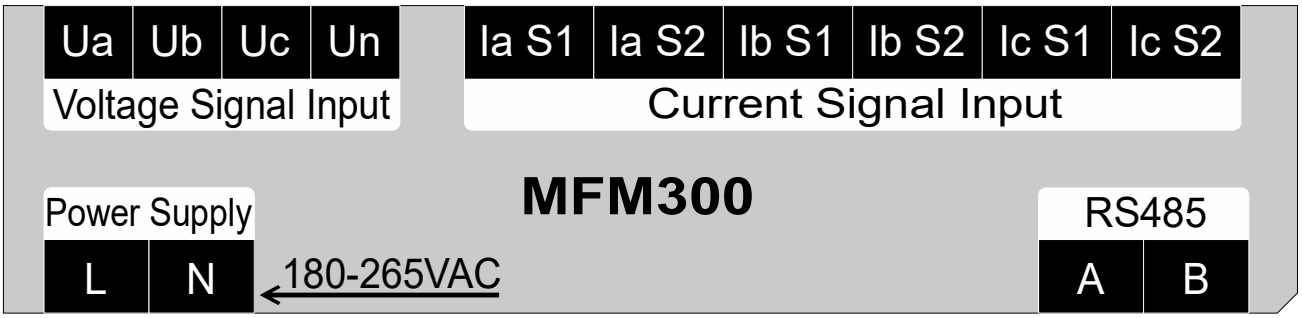


Fig.1

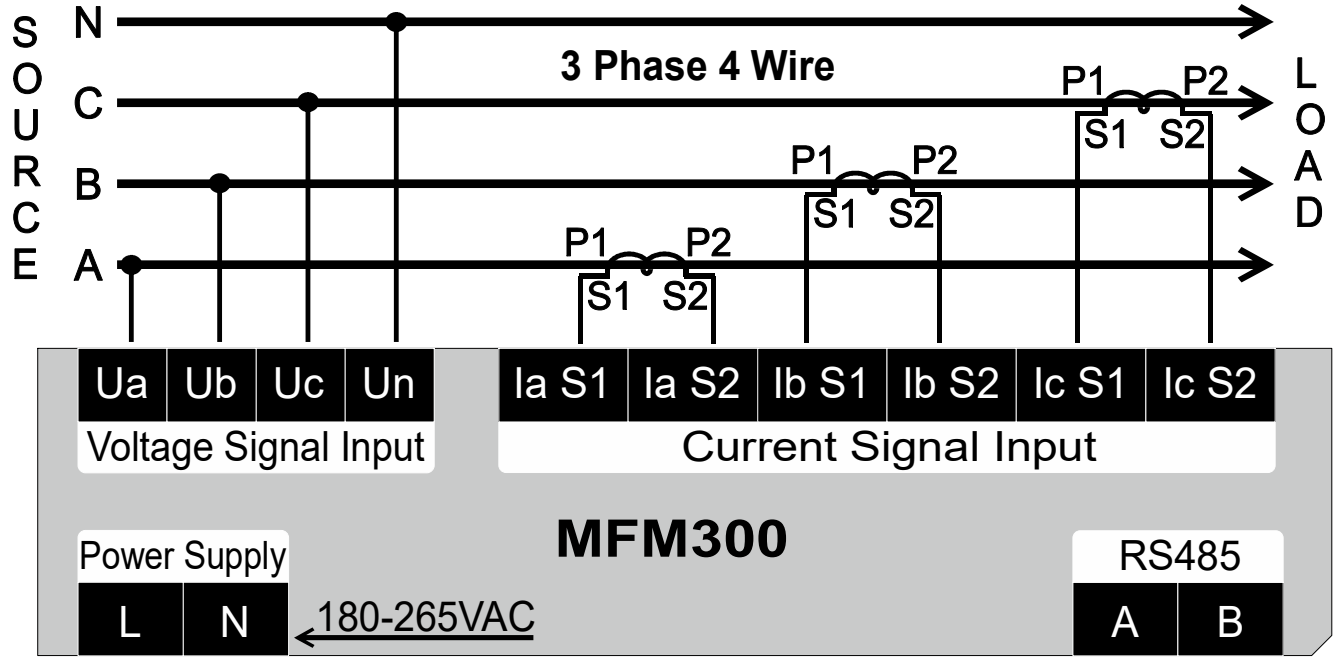
4.2 Wiring terminal and function (See table 3)

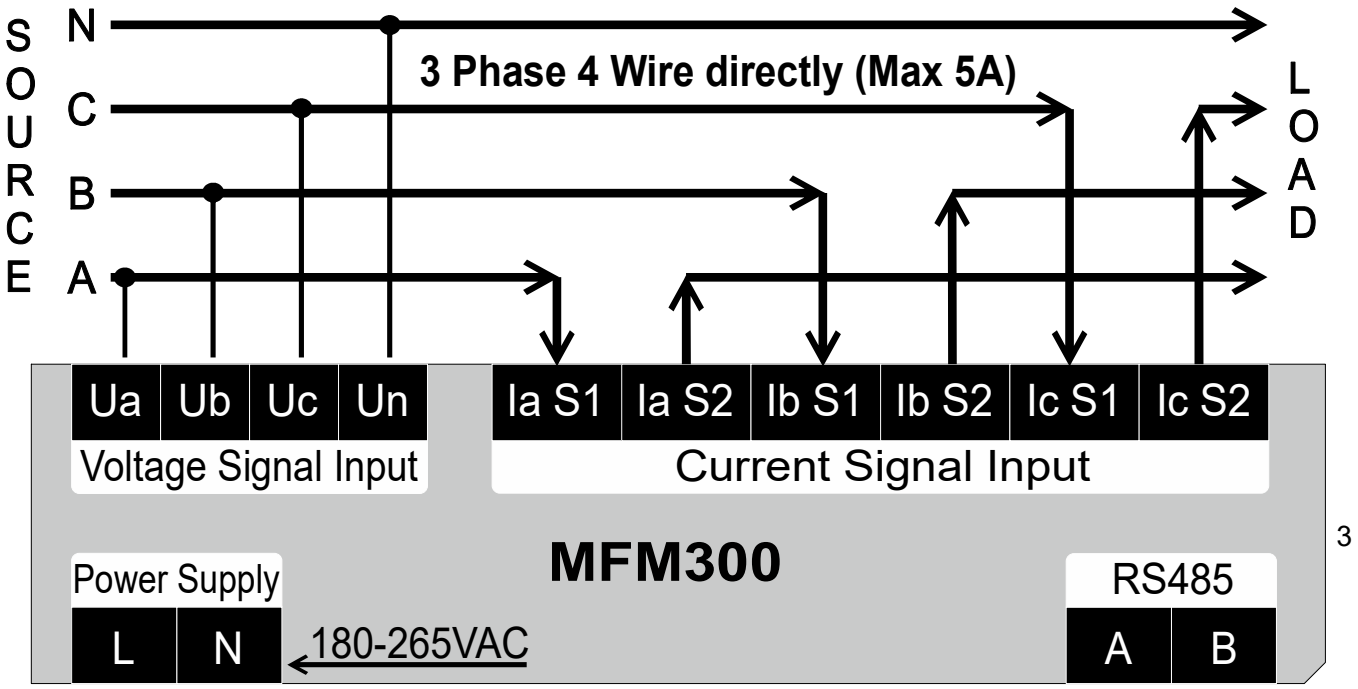
Table 3



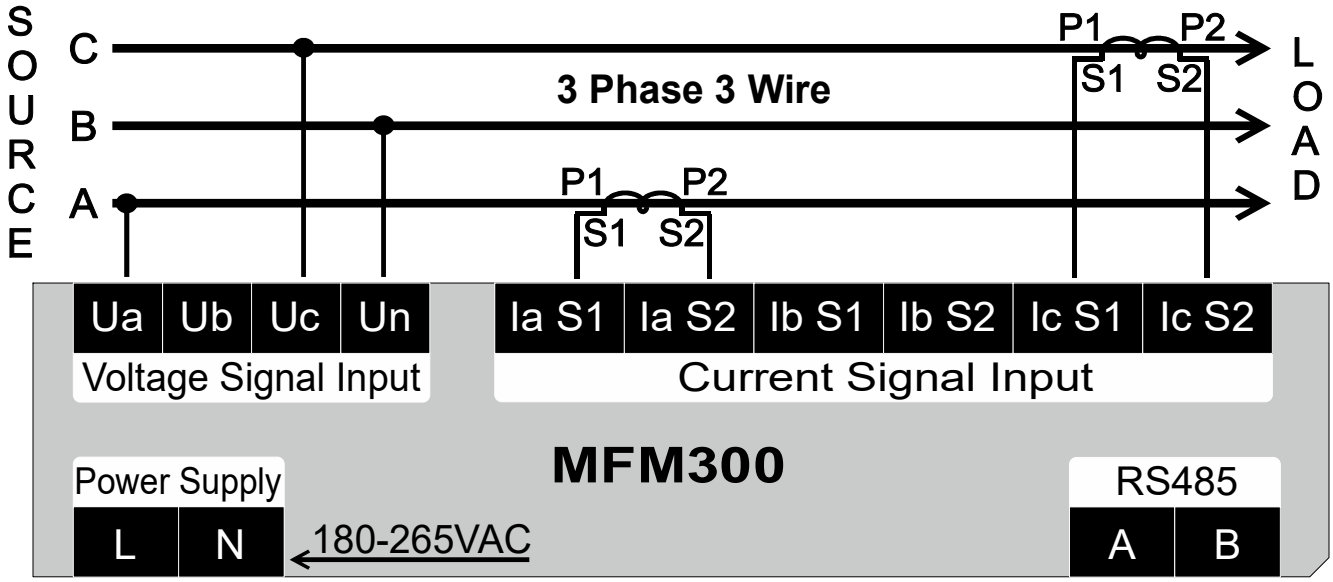
Pin	Description / Parameter
Power supply LN	auxiliary power supply for the LCD display and meter working. Make sure the power voltage is suitable for the for the meter.
Voltage signal input	Voltage signal to be measured. Following the correct connection diagram.
Current signal input	Signal from secondary side of CTs. Please connect the phase exactly
RS485 (AB)	communication signal

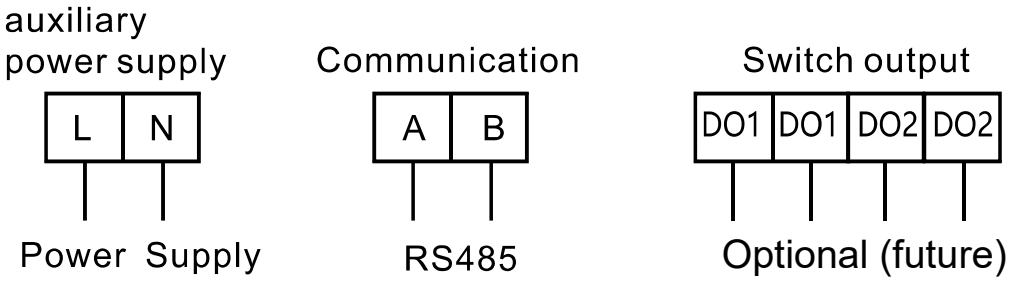
4.3 Wiring


SOURCE
N
C
B
A
3 Phase 4 Wire
P1
P2
S1
S2
LOAD
Ua
Ub
Uc
Un
Voltage Signal Input
Ia S1
Ia S2
Ib S1
Ib S2
Ic S1
Ic S2
Current Signal Input
MFM300
Power Supply
L
N
180-265VAC
RS485
A
B


SOURCE
N
C
B
A
3 Phase 4 Wire directly (Max 5A)
LOAD
Ua
Ub
Uc
Un
Voltage Signal Input
Ia S1
Ia S2
Ib S1
Ib S2
Ic S1
Ic S2
Current Signal Input
MFM300
Power Supply
L
N
180-265VAC
RS485
A
B

3





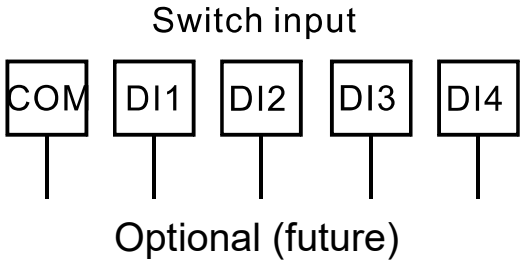


Fig.5

Note: The meter is provided with two kinds of wiring modes, please make sure the actual wiring is same to the set wiring in the meter.
The wiring diagram and technical parameter printed on the product shall be prevailed.

5. Programme operation

Under programming status, digital interface adopts layered structure menu type ,meter supply three lines digital display. (see Fig.6)
No.1 line is first layer menu information.
No.2 line is second layer menu information,
No.3 line is third layer menu information.
For example: as shown in Fig. 6, No.1 line: INPT means signal input.
No.2 line:CT current ratio No. 3 line: 5 means the CT value. CT value=25/5A=5.

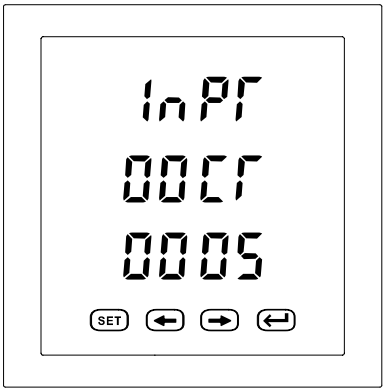


Fig.6

Parameter setting can be customized according to requirements.(See Table 4)

Table 4

No.1 layer	No.2 layer	No.3 layer	Description
System set "SET"	Display DISP	0000-0014	0000 means automatic cycling display(Displayed information see Table 5,6)
	DISL	0001-0003 or 0000-0120	0001-0003 is for LED brightness adjustment. 0000-0120 is keeping time of LCD back light(0000 means the backlight keeping ON)
	Energy clear CLr.E	1111	1111 means the energy clear, other values are invalid

Signal input INPT	Wiring mode NET	0000 or other values	0000 means 3 phase 4 line, other values means 3 phase 3 line
	Voltage transformation ratio PT	1~9999	PT value= PT primary value/ secondary value
	Current transformation ratio CT	1~9999	CT value= CT primary value/ secondary value
Communication set CONi (i is 1~2)	address SN	1~247	Meter address range: 1-247
	Communication speed BAUD	0000~0006	0001 means 1200; 0002 means 2400; 0003 means 4800; 0004 means 9600; 0005 means 19200; 0006 means 38400
	Data format DATA	0000~0002	0000:E,8,1; 0001:0,8,1; 0002:N,8,1
Switching output set D0-i (i is 1-4)	Choose alarm item or close alarm (refer to 8.2 switching output)	Set the specific threshold value of alarm item	Choose alarm item,and set relative threshold value(when alarm item is switching value, noneed set threshold value), once meet the alarm conditions, switch output ON.

Note: The above menu is applied to the product with complete function.If you find there is no such menu in the product or the menu is not working, It means the product not supporting the function.

Programming step(see Fig.7)

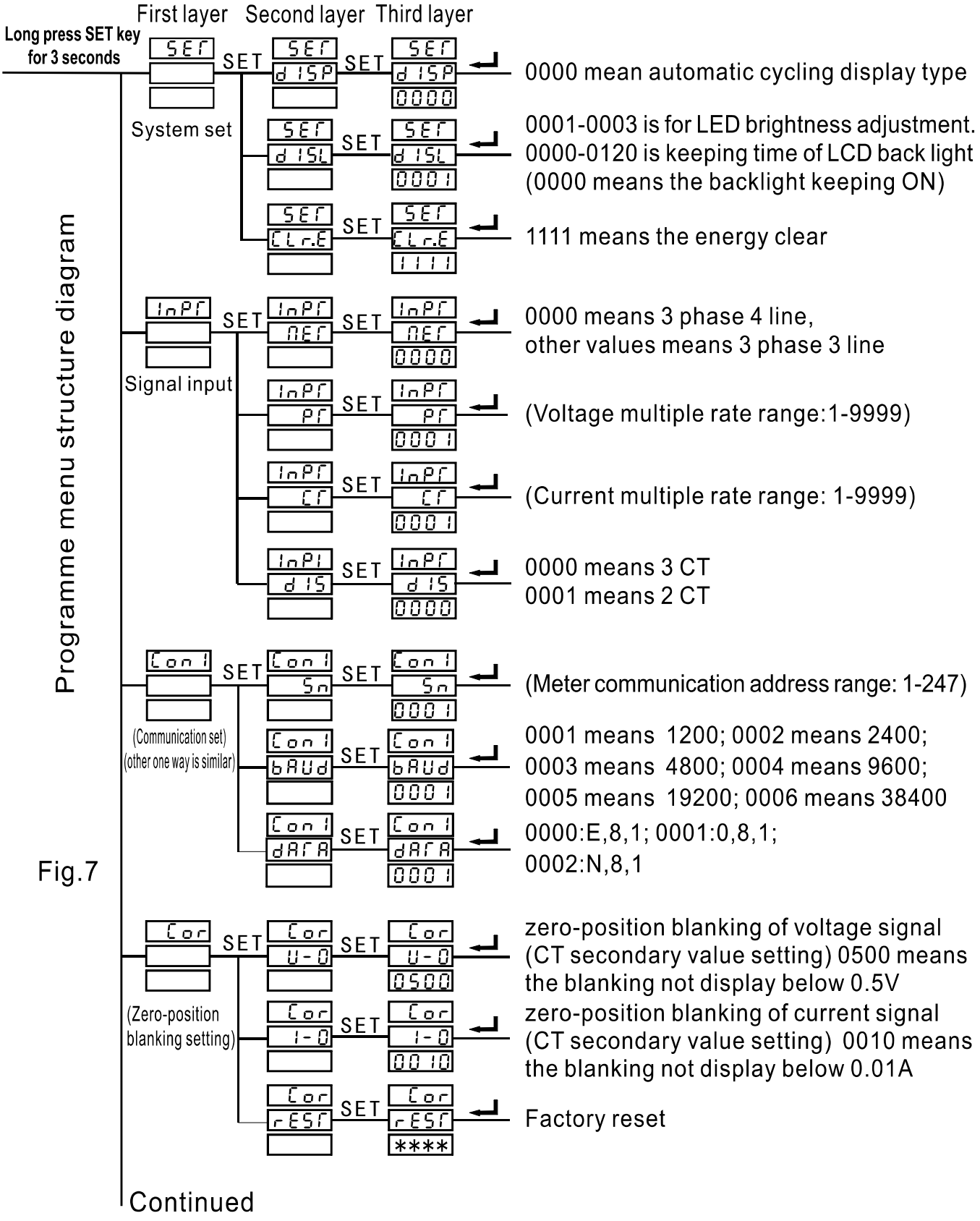
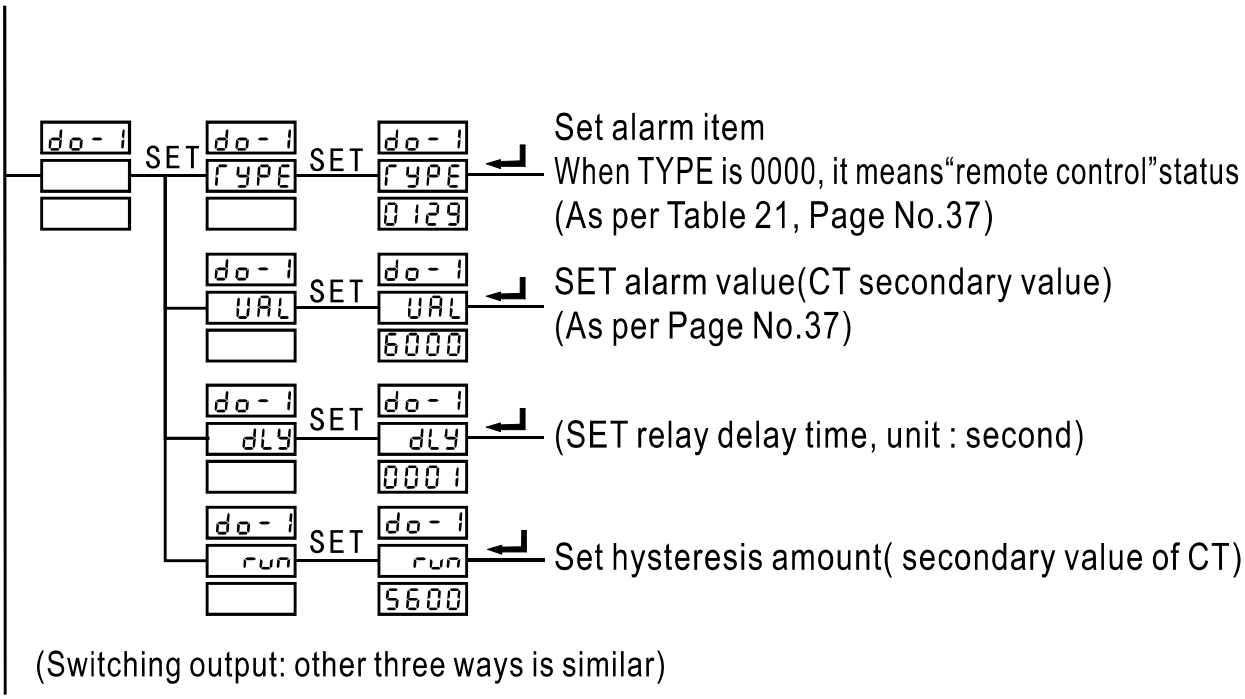


Fig.7

To be continued



Operation instruction:

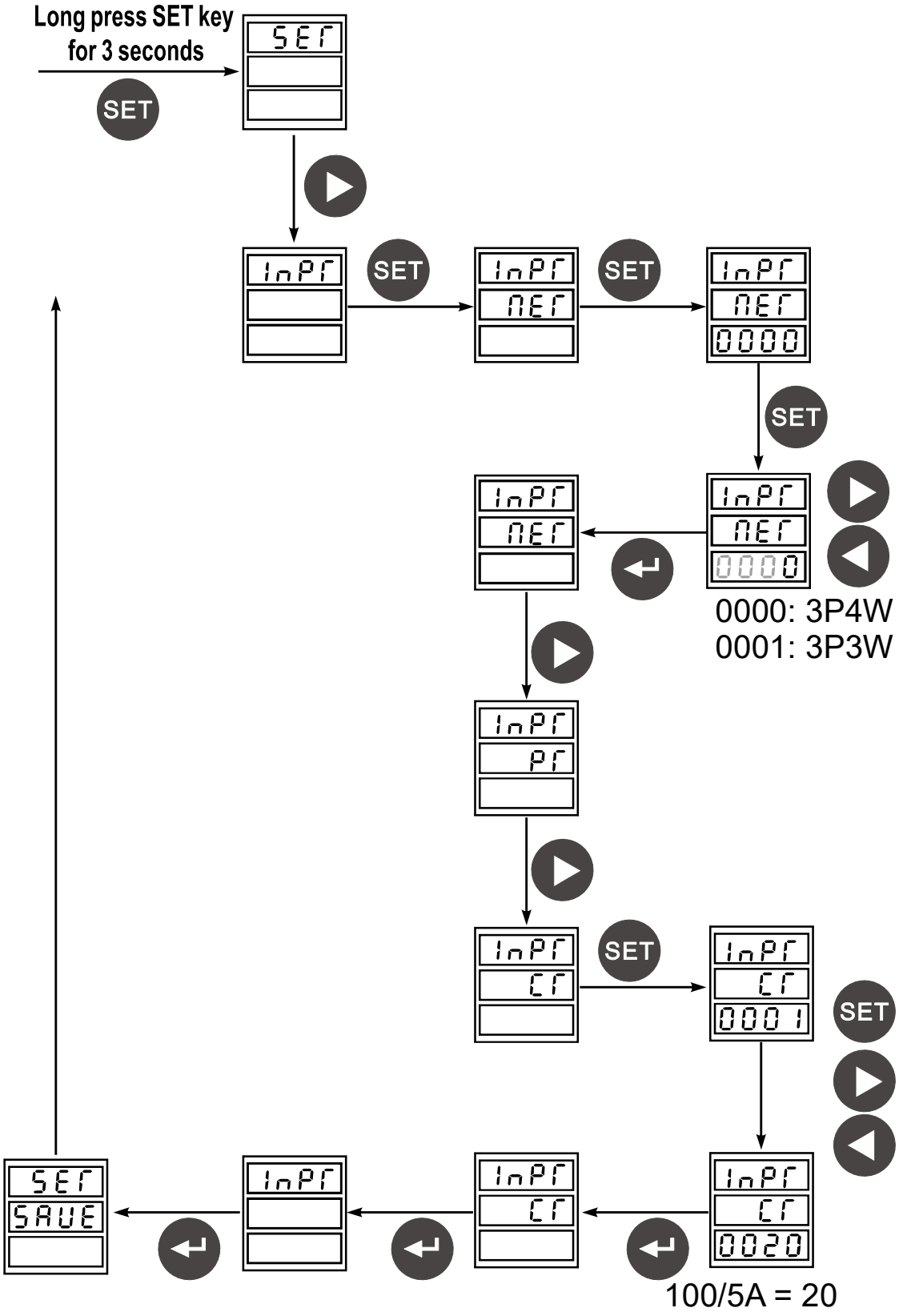
(a) After revised the data of third layer (or option), need press “↵” button to back the second menu then the setting take effect.

(b)The wiring method can be revised refer to the actual wiring mode.

(c)Under normal condition, the label of product have remarked the model parameter and factory setting parameter. The user can reset the parameters according to the requirements.

(d) After revise the value , through “←” button and “→” button to increase or decrease , through“ **SET** ” button to move.

SETTING NETWORK 3P4W AND CT 100/5A

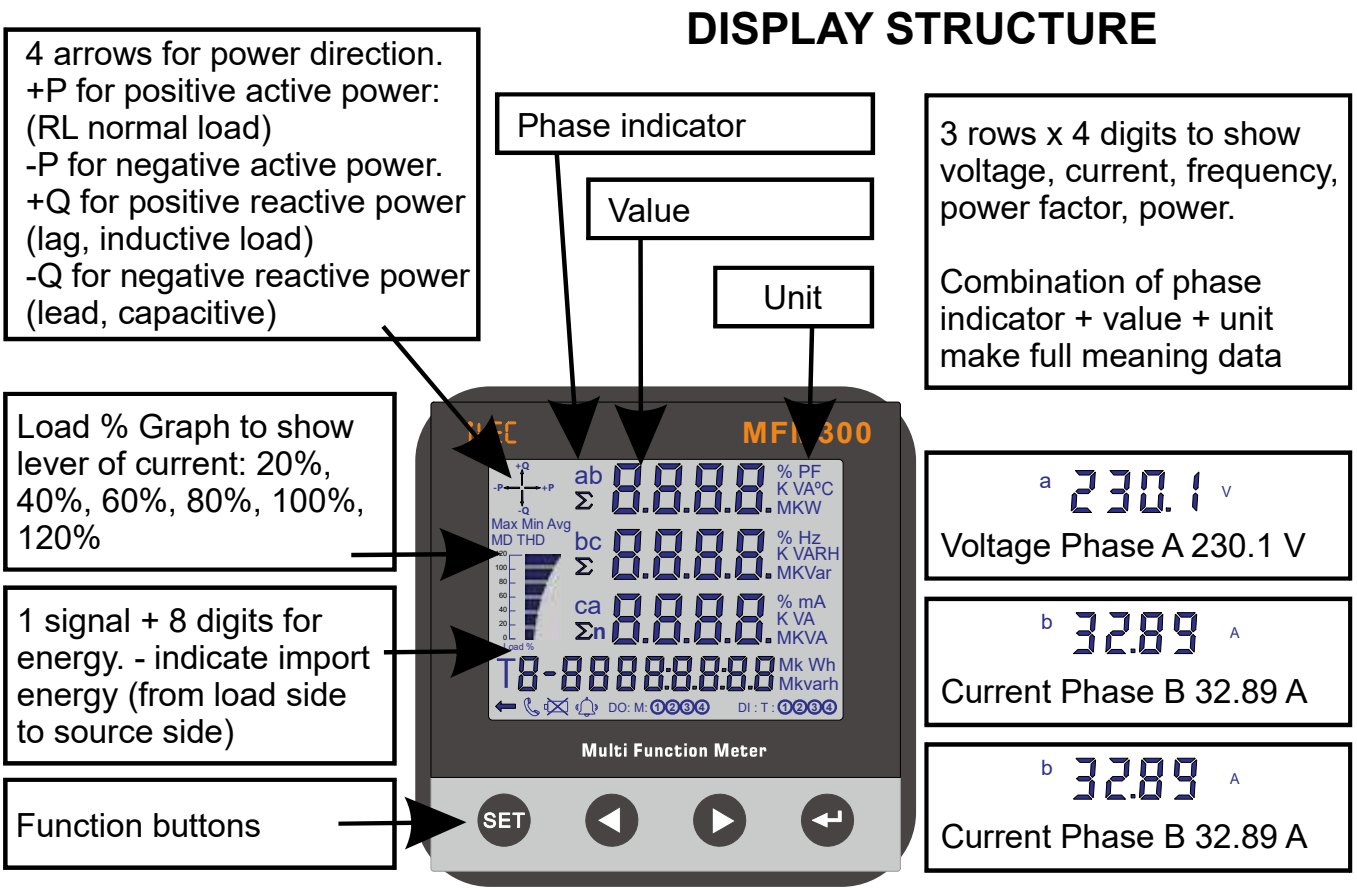


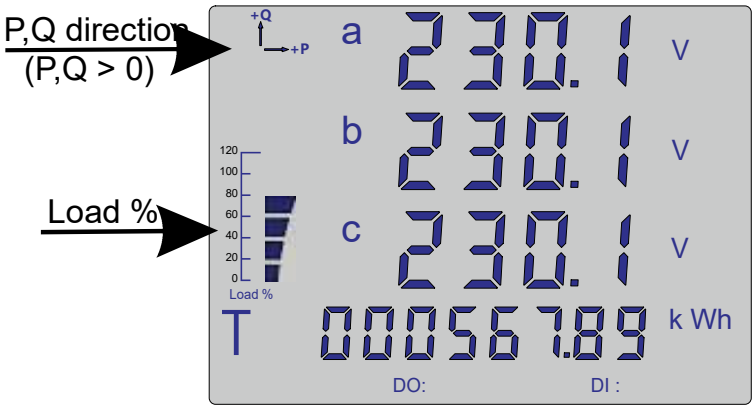
6. Display explanation and measurement information

(1) Panel instructions

If there is no relative symbol display (or the set data not working), It means the product is without the relative function.

Fig.8

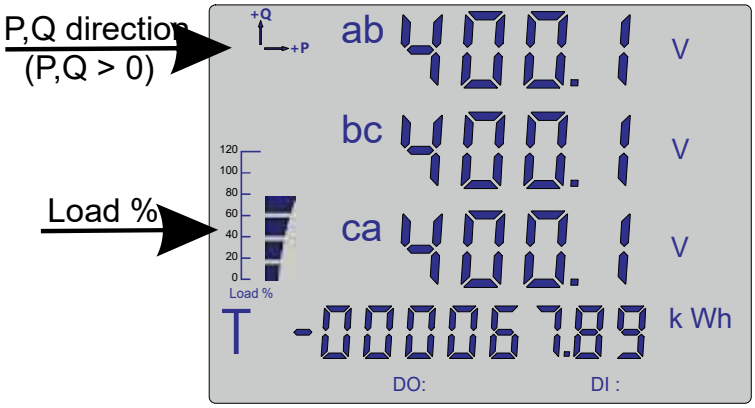




DISP=1: Voltage U_{LN}

Uan = 230.1V
Ubn = 230.1V
Ucn = 230.1V

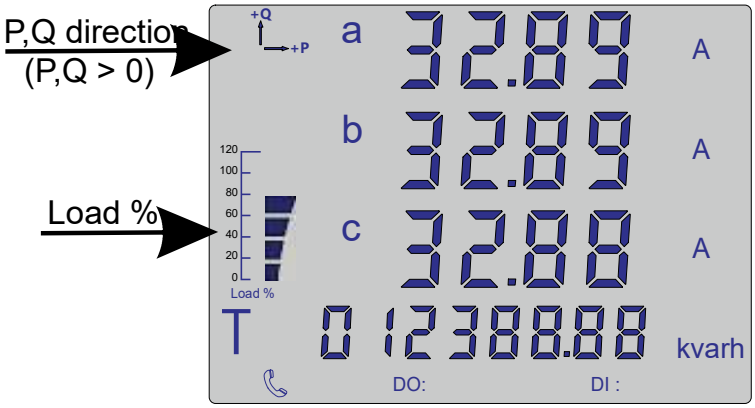
Positive active energy
(from source to load (Export))
=567.89 kWh



DISP=2: Voltage U_{LL}

Uab = 400.1V
Ubc = 400.1V
Uca = 400.1V

Negative active energy
(from load to source (Import))
=67.89 kWh

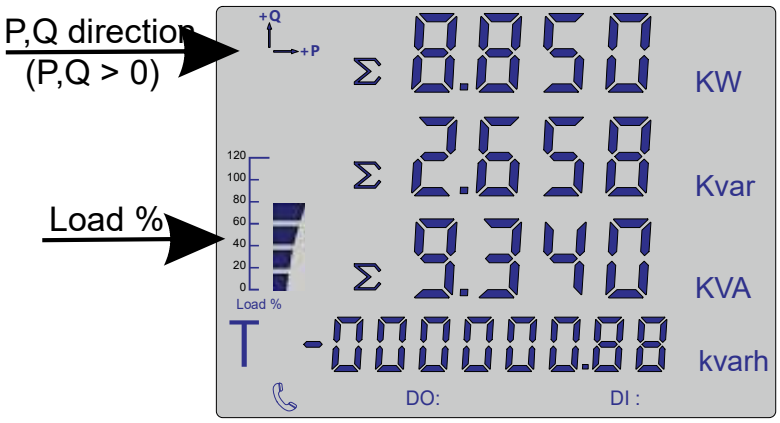


DISP=3: Three phase current

Ia = 32.89A
Ib = 32.89V
Ic = 32.88V

Positive reactive energy
(from source to load (Export))
=12388.88 kVarh

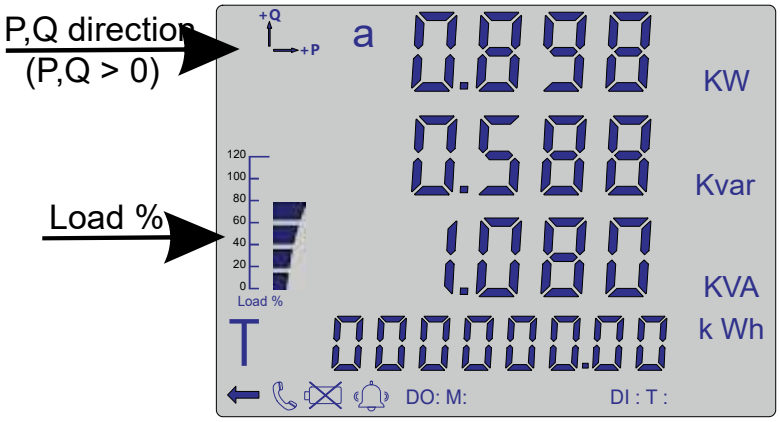
To change screen using arrow button



DISP=4: Total power

Total active power = 8.850kW
Total reactive power = 2.658kvar
Total apparent power = 9.340kVA

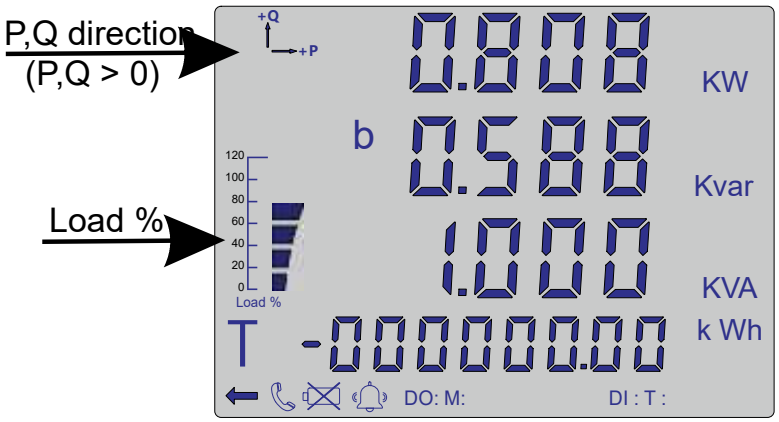
Negative reactive energy
(from load to source (import))
=0.89 kvarh



DISP=5: A Phase power

Active power = 0.898kW
Reactive power = 0.588Kvar
Apparent power = 1.080KVA

Positive active energy
(from source to load (Export))
=00.00 kWh

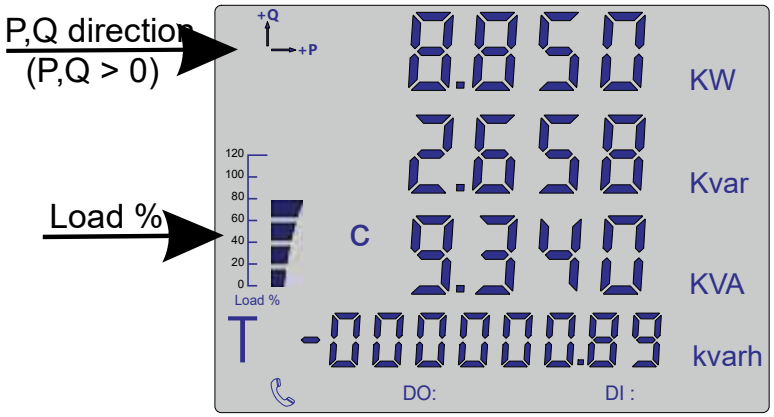


DISP=6: B Phase power

Active power = 0.808kW
Reactive power = 0.588Kvar
Apparent power = 1.000KVA

Negative active energy
(from load to source (Import))
=00.00 kWh

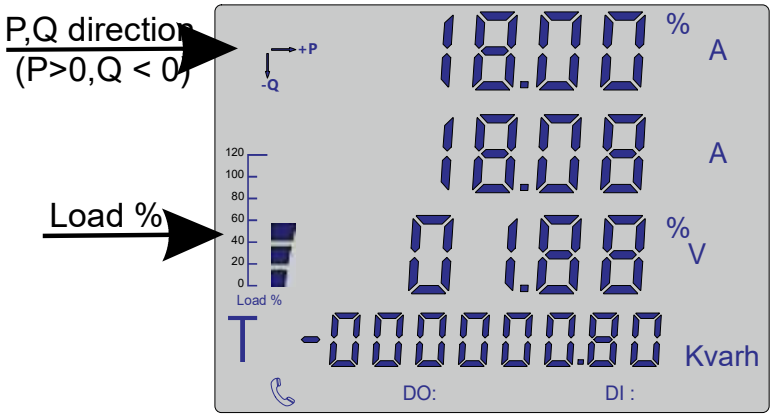
To change screen using arrow button



DISP=7: C Phase power

Total active power = 8.850kW
Total reactive power = 2.658kvar
Total apparent power = 9.340kVA

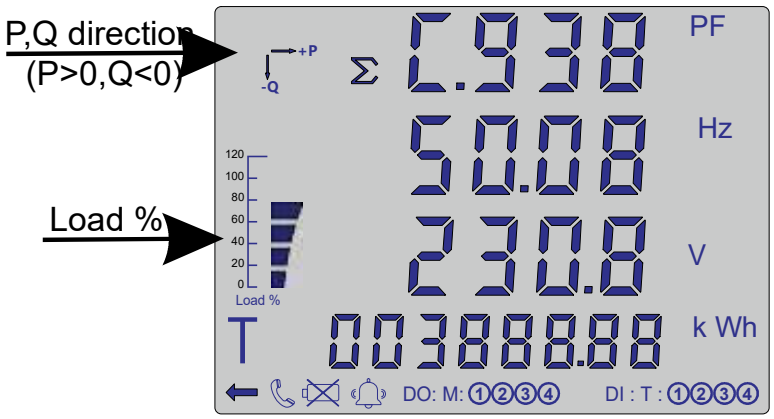
Negative reactive energy
(from load to source (import))
=0.89 kvarh



DISP=8: Unbalance

Current Unbalance = 18.00%
Average Current = 18.08A
Voltage Unbalance = 01.88%

Negative reactive energy
(from load to source (Import))
=00.80 kvarh

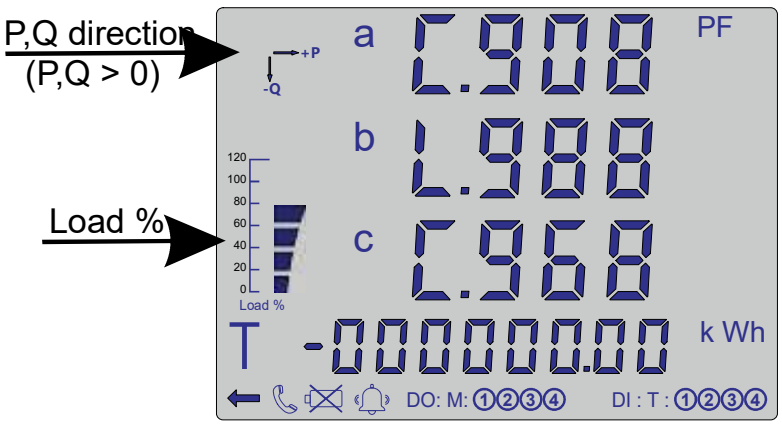


DISP=9: Total PF, Hz, Voltage

Total PF = C.938 (Capacitive)
Frequency = 50.08Hz
Average Voltage = 230.08V

Positive active energy
(from source to load (Export))
=3888.88 kWh

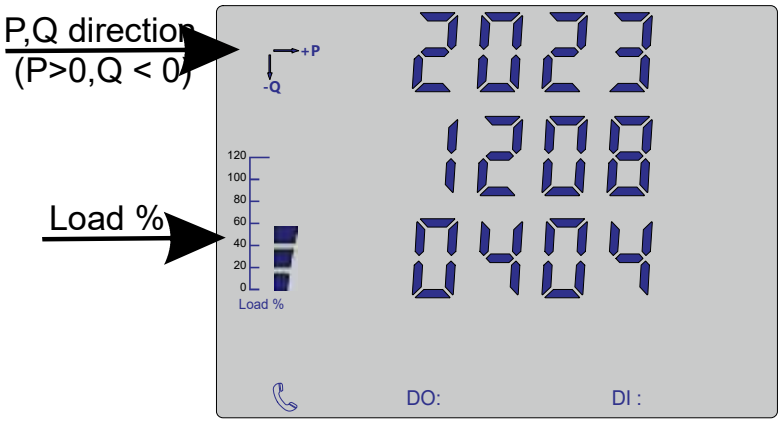
To change screen using arrow button



DISP=10: Three Phase PF

A phase PF = C.0.908
B phase PF = L.0.988
C phase PF = C.0.968

Negative active energy
(from load to source (import))
=0.00 kWh



DISP=11: Year and ID

Year = 2023
Id=12084004

Number of DISPLAYS maybe difference for new firmware

To change screen using arrow button

Table 6

7. Communication Protocol

7.1 physical layer

7.1.1 RS485 communication port, asynchronous half-duplex mode;

7.1.2 Communication speed 1200-38400bps can be set, factory default 9600dps;

7.1.3 Byte transfer format: 1 bit for initial bit, 8 bit for data bits, odd-even check (N81, E81, 081 can be selected), factory default N81.

7.2 Digital communication protocol

The meter is provided with serial asynchronism half-duplex RS485 communication port, adopt MODBUS-RTU protocol, various data can be transferred through communication line. One line can connect 32pcs meter at the same time, each meter can set different communication address. The communication terminal number of different series meters is different. communication should be connected by the shielded twisted-pair cable with copper network, and the diameter not less than 0.5mm^2.When wiring, keep the communication wire away from strong electric cables or other strong electric field, T type network Wiring is recommended (see Fig.10),Star-type or other wring is not recommended.

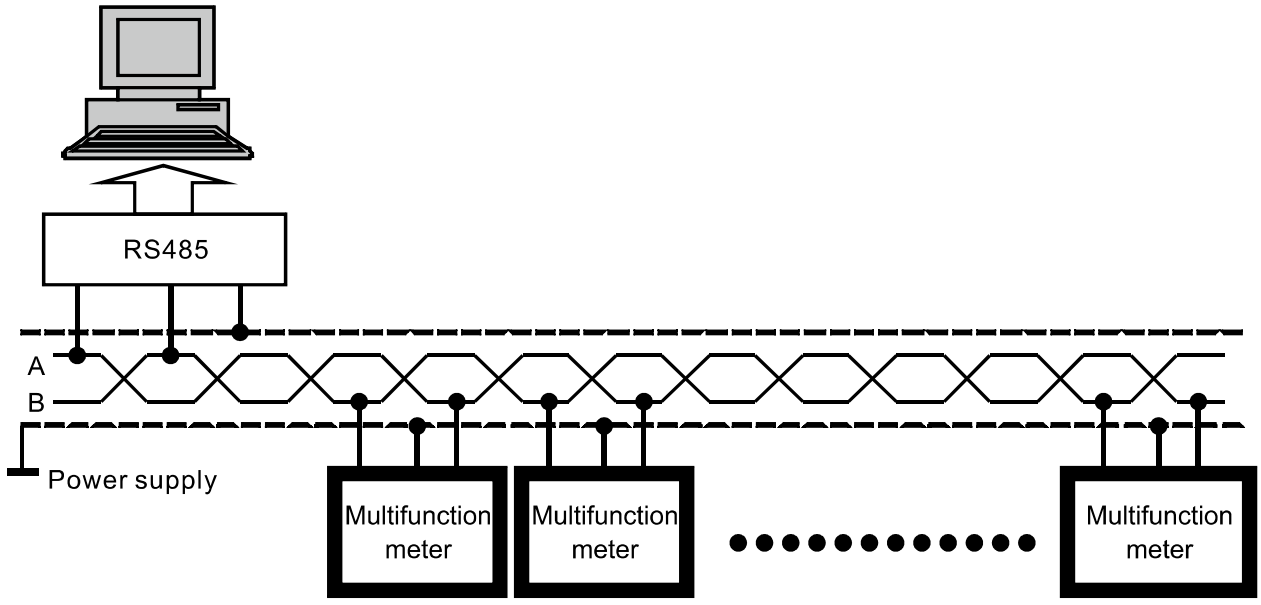
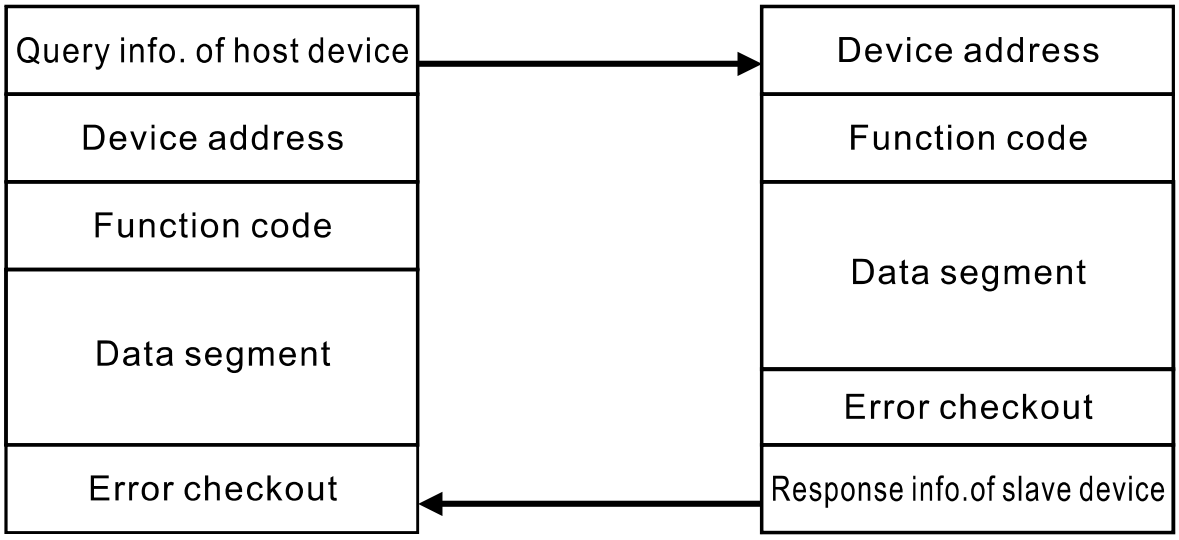


Fig.10

MODBUS-RTU communication protocol:
MODBUS protocol adopt host-slave response mode in one communication line. The signal of host computer addressing to the terminal device (Slave computer) with one address, then the terminal device send response signal back to host computer in the opposite direction. In one communication line, the communication data flow is transmitted in two opposite directions. (half-duplex working mode). MODUBUS protocol only allow the communication between Host computer (PC,PLC, etc) and terminal device(see Fig.11), not allow the data exchange between terminal devices, so each terminal device will not occupy the communication lines when initialized, but only response the query signal to the host computer.

Fig.11



Host PC enquiry:
The query information frames include device address code, function code, data information code ,checkout code. The address code indicate the selected slave PC device; The function code indicate the executed function of selected slave device, for example, function code 03 or 04 means that the slave device will read the register and send back the content; The data segment include the other additional information of executed function, for example, in reading command, reading from which register? How many register to be read? The checkout code used for checking the correctness of one frame information, providing the information verification method for slave device, it adopts CRC 16 checkout rules.

Slave PC response:
If slave PC respond normally, the information include the slave address code, function code, data code and CRC 16 checkout code. Data code include the collected data from slave device, for example, register value or status. If the error occurs, the slave device will not respond. The transmission mode means one series independence data structure in one data frame and the rules for data transmission. The below defines the transmission mode compatible with MODBUS protocol RTU mode. Each bit of byte: 1 start bit, 8 data bit,(odd-even check bit),1 stop bit (with odd-even check bit) or 1 stop bit (without odd-even check bit).

Data frame structure (Message format) see Table 7

Table 7

Address code	Function code	Data code	Checkout code
1 BYTE	1 BYTE	N BYTE	2 BYTE

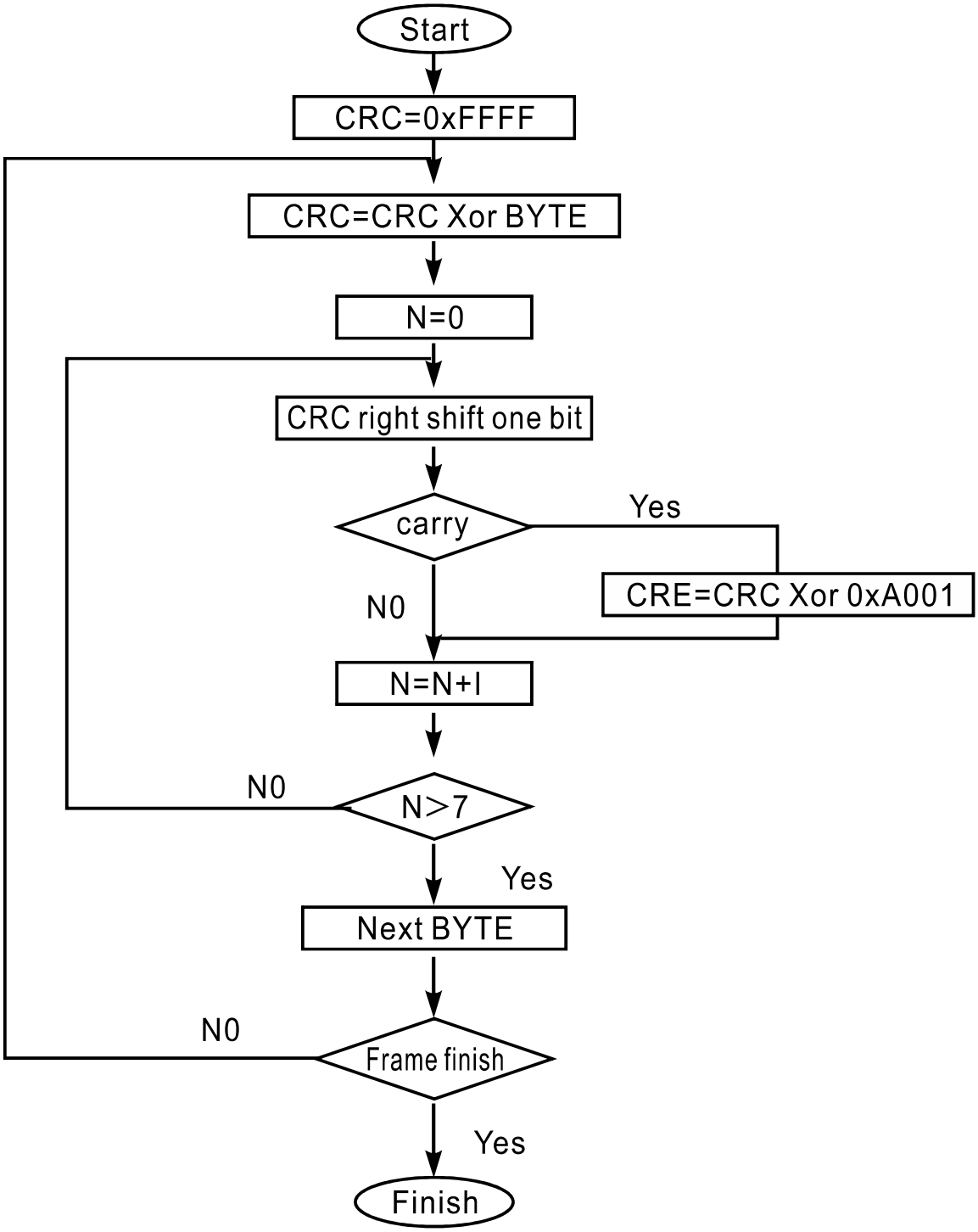
Slave PC response:
If slave PC respond normally, the information include the slave address code, function code, data code and CRC 16 checkout code. Data code include the collected data from slave device, for example, register value or status. If the error occurs, the slave device will not respond. The transmission mode means one series independence data structure in one data frame and the rules for data transmission. The below defines the transmission mode compatible with MODBUS protocol RTU mode. Each bit of byte: 1 start bit, 8 data bit,(odd-even check bit),1 stop bit (with odd-even check bit) or 1 stop bit (without odd-even check bit).

Function code: (see Table 8)
The code indicate which function should be operated by the terminal. Below Table shows the function code and their meaning and function.

Table 8

Code	Meaning	Action
01	Read switching output status	Get switching output status
02	Remote switch capacity input status	Get switching input status
03	Read the value of data register	
04	Read the value of data register	
05	Remotely control single switching output operation	
06	Write single register	Set the binary value to relative one register
0F	Remotely control more than one switching output operation	Get present binary value of one or more register
10H	Write preset register	Set the binary value to relative registers

Checkout code:
Error checkout (CRC) domain take 2 bytes, include one 16 bit binary value.CRC value is calculated by transmission device, then attached to data frame; When receiving device receive data, CRC value will be calculated again, then compare with the received value of CRC domain, if two values are not equal, the error occurs.



7.3 Message instruction format

Read switching output status 0 x 01 (see Table 9)

Table 9

Host PC query the command			Slave PC response	
Slave PC address	1 Byte	1 ~247	Slave PC address	1 Byte
Function code	1 Byte	0x01	Function code	1 Byte
Starting relay address	2 Bytes	0x0000(Fixed)	Byte number of register	1 Byte
Relay quantity	2 Bytes	0x0004(MAX)	Register value	N Bytes
CRC checkout code	2 Bytes		CRC checkout code	2 Bytes

Input status command of remote-check switch 0 x 02 (see Table 10)

Table 10

Host PC query the command			Slave PC response	
Slave PC address	1 Byte	1 ~247	Slave PC address	1 Byte
Function code	1 Byte	0x02	Function code	1 Byte
Starting switch address	2 Bytes	0x0000(Fixed)	Byte number of register	1 Byte
Remote-check switch quantity	2 Bytes	0x000C(MAX.)	Register value	N Bytes
CRC checkout code	2 Bytes		CRC checkout code	2 Bytes

Command of remote-control single-loop switching output 0 x 05 (see Table 11)

Table 11

Host PC query the command			Slave PC response	
Slave PC address	1 Byte	1 ~247	Slave PC address	1 Byte
Function code	1 Byte	0x05	Function code	1 Byte
Starting relay address	2 Bytes	0x0000~ 0x0003	Starting relay address	2 Bytes
Relay action value	2 Bytes	0xFF00/ 0x0000	Relay action value	2 Bytes
CRC checkout code	2 Bytes		CRC checkout code	2 Bytes

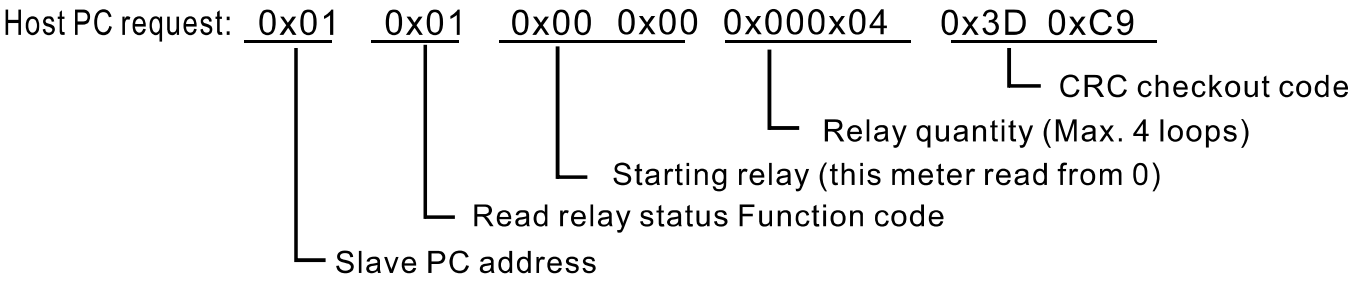
Output command of remote-check multi-loop switch 0 x 0F (see Table 12)

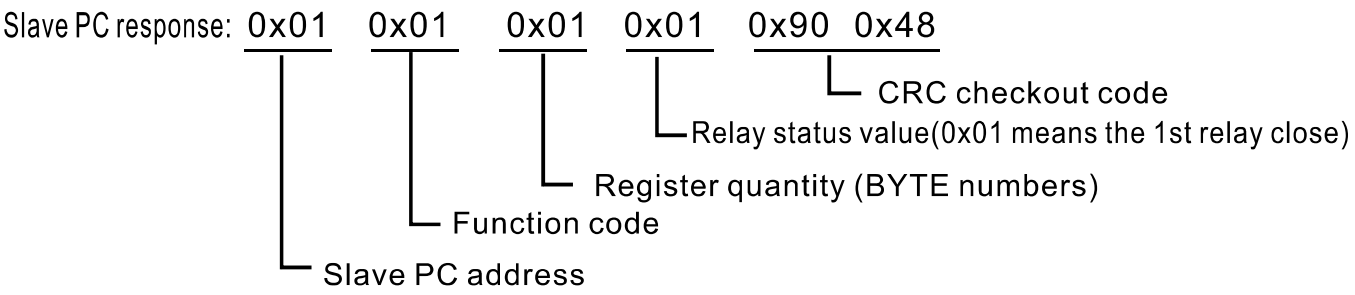
Table 12

Host PC query the command			Slave PC response	
Slave PC address	1 Byte	1 ~247	Slave PC address	1 Byte
Function code	1 Byte	0x0F	Function code	1 Byte
Starting relay address	2 Bytes	0x0000(Fixed)	Starting relay address	2 Bytes
Relay quantity	2 Bytes	0x0004(Fixed)	Relay quantity	2 Bytes
Byte numbers of data	1 Byte	0x01	CRC checkout code	2 Bytes
Multi-Relay action value	1 Byte			
CRC checkout code	2 Bytes			

7.4 Message examples

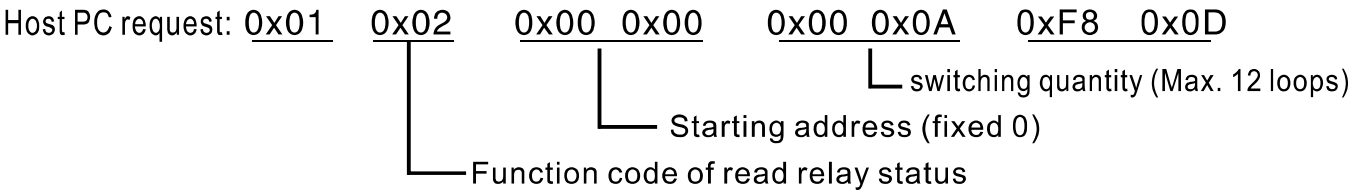
(1) Read remote-control/Alarm switching output status (Function code0 x 01)

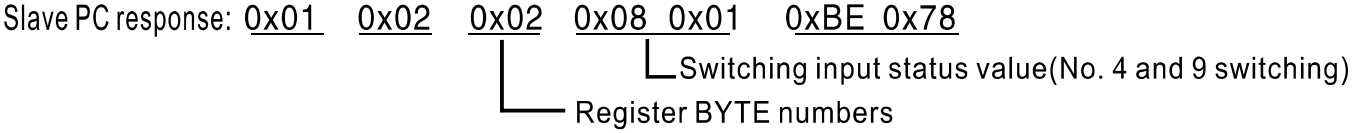




Description: The relay status value corresponds to the status value of each switch output starting from the lowest bit of each byte according to the MODBUS protocol. 1 means the ON status and 0 means the OFF status. Binary “ 0000 0011” of “0x03” Indicates that the first and second relays are closed.

(2) Remote-check switching input status (Function code0 x 02)





Description: The switching input status value corresponds to the status value of each switching input starting from the lowest bit of each byte according to the MODBUS protocol. 1 means the ON status and 0 means the OFF status.

(3) Remote-control single switching output status (Function code 0 x 05)

NOTE:This meter has a maximum of 4 switching output. The use of remote control commands must require the relay to work in remote control mode.

Host PC request: 0x01 0x05 0x00 0x00 0xFF 0x00 CRC

- 0xFF 0x00 — Relay action value (0xFF00:OFF 0x0000:ON)
- 0x00 0x00 — Remote-control relay address(0x0000-0x0003)

Slave PC response: 0x01 0x05 0x00 0x00 0xFF 0x00 CRC

(4) Remote-control multi-loop switching output status (Function code 0 X 0F)

Host PC request: 0x01 0x0F 0x00 0x00 0x00 0x04 0x01 0x0F CRC

- 0x01 — Function code of remote-control multi-loop relay 0x0F
- 0x0F — Starting address of remote-control relay (Fixed 0 X 0000)
- 0x00 0x00 — Loop quantity of remote-control relay (fixed 0 X 0004)
- 0x00 0x04 — Data Byte numbers
- 0x01 — Action value(0x0F 4 loops close)

Slave PC response: 0x01 0x0F 0x000x00 0x00 0x04 CRC

The communication protocol of this meter follows the standard MODBUS-RTU protocol. And in the communication address Table, there are both floating-point primary power grid data and secondary power grid fixed-point integers. Customers can choose to read the corresponding data according to their own system requirements. MODBUS protocol communication address information table is shown in Table 17.

Communication message examples:

Read data(function code:03): this function makes the user get the data collected and recorded by terminal device and The system parameter. There is no quantity limit when the host PC collect the data in one time, but can't exceed the range of defined address. The below example is from terminal device addressing 12(0CH), read 3 data Ia, Ib, Ic (each address take 2 byte, the beginning address of Ia is 43 (2BH) , data length is 3(03H)byte.

Query the data frame (Host PC) (See Table 13)

Table 13

Address	Command	The beginning register address (high)	The beginning register address (low)	Register quantity (high)	Register quantity (low)	CRC16 (low)	CRC16 (High)
01H	03H	00H	58H	00H	02H	45H	D8H

Response data frame (slave PC) (see Table 14)
It means Ia=0000C317H(4.9943).

Table 14

Address	Command	Data length	Data 1234	CRC16 (low)	CRC16 (High)
01H	03H	04H	00H 00H C3H 17H	72H	E5H

Preset data (function code: 16): this function allows to change the contents of multiple registers (electrical measurement can be written with this function number, it should be emphasized that the written data is a writable attribute parameter, the number does not exceed the address Range), the following example is a communication method with a current transformation ratio of 400 / 5A = 80.

Query the data frame (Host PC) (See Table 15)

Table 15

Address	Command	The beginning register address (high)	The beginning register address (low)	Register quantity (high)	Register quantity (low)	Number of characters	Written data	CRC16 (low)	CRC16 (High)
01	10	00	2E	00	01	02	0050	A0	22

Query the data frame (Slave PC),indicates that the data has been written (See Table 16)

Table 16

Address	Command	The beginning register address (high)	The beginning register address (low)	Register quantity (high)	Register quantity (low)	CRC16 (low)	CRC16 (High)
01	10	00	2E	00	01	61	C0

MODBUS Address Data Table (see Table 17)

Table 17

Address		Description	Data format	Data length	Read/ write	Explanation
0001						
0002		Corresponding item of output 1	uchar	1	R/W	Corresponding item of switching output
		Level delay of output 1	uchar	1	R/W	Unit: Second
0003		Corresponding value of output 1	uint	2	R/W	Alarm value
0004		Return difference value of output 1	uint	2	R/W	Returned value
0005		Limit alarm of output 1	uint	2	R/W	Min. value of lower alarm
0006-0019		Output 2-6 loops				
001A		Corresponding item of analog output 1	uchar	1	R/W	Corresponding item of analog output
		Corresponding mode of analog output 1	uchar	1	R/W	0,4-20mA 1,0-20mA
001B		Corresponding value of analog output 1	uint	2	R/W	Analog corresponding value
001C-0021		2-4 loops of analog output				
0022-0027		Backup				
0028		Power display setting	uchar	1	R/W	Reserve
		Wiring mode selection	uchar	1	R/W	see the address explanation
0029		Power-on display	uchar	1	R/W	displayed contents
		Back-light delay time	uchar	1	R/W	Back-light delay time
002A		Luminance	uchar	1	R/W	LED Luminance
		CT quantity	uchar	1	R/W	0,3CT 1,2CT
002B		Time setting of scrolling display				
002C		Voltage multiplying power	uint	2	R/W	1-9999
002D		PT divisor	uint	2		1-9999
002E		Current multiplying	uint	2	R/W	1-9999
002F		Backup				
0030		Voltage null	uint	2	R/W	0.001-9.999
0031		Current null	uint	2	R/W	0.001-.500
0032		Power null	uint	2	R/W	0.001-9.999
0033		Communication protocol	uint	2	R/W	0-RS485Modbus
0034		Communication address	uint	2	R/W	0-247
0035		Baud rate	uint	2	R/W	1-6,1:1200,2:2400, 3:4800,4:9600(default), 5:19200,6:38400

0036		checking	uint	2	R/W	0-2,0:even checking, 1:odd checking, 2:no checking(default)
0037		Backup				
0038-003B		645 communication address	uchar	8	R/W	BCD code
003C		Baud rate of No.2 loop	uint	2	R/W	1-6,1:1200,2:2400, 3:4800,4:9600(default), 5:19200,6:38400
003D		No.2 loop checking	uint	2	R/W	0-2,0:even checking, 1:odd checking, 2:no checking(default)
003E-003F		Backup				
0040		Switching output information	uint	2	R	High 8 bit backup, low 8 bit valid 0: OFF 1: ON
0041		Switching input information	uint	2	R	0: OFF 1: ON
0042		A phase voltage	ulong	4	R	4 decimal point (0.0001V)
0043						
0044		B phase voltage	ulong	4	R	4 decimal point (0.0001V)
0045						
0046		C phase voltage	ulong	4	R	4 decimal point (0.0001V)
0047						
0048		Average phase voltage	ulong	4	R	4 decimal point (0.0001V)
0049						
004A		Phase voltage unbalance	ulong	4	R	0.01-99.99 2 decimal point (%)
004B						
004C		AB line voltage	ulong	4	R	4 decimal point (0.0001V)
004D						
004E		BC line voltage	ulong	4	R	4 decimal point (0.0001V)
004F						
0050		CA line voltage	ulong	4	R	4 decimal point (0.0001V)
0051						
0052		Average line voltage	ulong	4	R	4 decimal point (0.0001V)
0053						
0054		Zero-sequence voltage	ulong	4	R	4 decimal point (0.0001V)
0055						

0056 0057		Line voltage unbalance	ulong	4	R	0.01-99.99 2 decimal point (%)
0058 0059		A phase current	ulong	4	R	4 decimal point (0.0001A)
005A 005B		B phase current	ulong	4	R	4 decimal point (0.0001A)
005C 005D		C phase current	ulong	4	R	4 decimal point (0.0001A)
005E 005F		Average current	ulong	4	R	4 decimal point (0.0001A)
0060 0061		Zero-sequence current	ulong	4	R	4 decimal point (0.0001A)
0062 0063		Current unbalance	ulong	4	R	0.01-99.99 2 decimal point (%)
0064 0065		A phase active power	long	4	R	4 decimal point (0. 0001kW)
0066 0067		B phase active power	long	4	R	4 decimal point (0. 0001kW)
0068 0069		C phase active power	long	4	R	4 decimal point (0. 0001kW)
006A 006B		Total active power	long	4	R	4 decimal point (0. 0001kW)
006C 006D		A phase reactive power	long	4	R	4 decimal point (0. 0001kvar)
006E 006F		B phase reactive power	long	4	R	4 decimal point (0. 0001kvar)
0070 0071		C phase reactive power	long	4	R	4 decimal point (0. 0001kvar)
0072 0073		Total reactive power	long	4	R	4 decimal point (0. 0001kvar)
0074 0075		A phase apparent power	long	4	R	4 decimal point (0. 0001kVA)

0076		B phase apparent power	long	4	R	4 decimal point (0. 0001kVA)
0077						
0078		B phase apparent power	long	4	R	4 decimal point (0. 0001kVA)
0079						
007A		Total apparent power	long	4	R	4 decimal point (0. 0001kVA)
007B						
007C		A phase power factor	int	2	R	3 decimal point
007D		B phase power factor	int	2	R	3 decimal point
007E		C phase power factor	int	2	R	3 decimal point
007F		Total power factor	int	2	R	3 decimal point
0080		Frequency	uint	2	R	Frequency 2 decimal point
0081		Backup				
0082		Total positive active energy	ulong	3	R	Secondary side (0.001kWH)
0083						
0084		Total negative active energy	ulong	3	R	Secondary side (0.001kWH)
0085						
0086		Total positive reactive energy	ulong	3	R	Secondary side (0.001kvarH)
0087						
0088		Total negative reactive energy	ulong	3	R	Secondary side (0.001kvarH)
0089						
008A		Total positive active energy	float		R	Primary side
008B						
008C		Total negative active energy	float		R	Primary side
008D						
008E		Total positive reactive energy	float		R	Primary side
008F						
0090		Total negative reactive energy	float		R	Primary side
0091						

8. Function output

8.1 Energy measurement and pulse output

This series meter adopt 3 row 12 digit to display primary energy, VH-0 show total active energy, VH-1 show negative active energy, VAHO show negative reactive energy, VAH1 show negative reactive energy, pulse normal value is 8000imp/kwh.

(VH-0)=(VH-0)+(VH-1) VAH0=VAH0+VAH1

8.2 switching value part:

This series meter supply 2 loops of switching value input function and 2 loops of switching value output function , 4 loops of switching input adopt dry contact resistance switch signal input, The inside of meter is equipped with 12V working power supply and no need external power supply.When connect to external power supply, the switch input module D1 of meter will collect the POWER-ON information and the meter will display 1. when disconnect to external power,the switch input module D1 of meter will collect POWER-OFF information and the meter will display 0. Switch input module not only can collect and display switch message,but also can realize remote-control transmission function through RS485 interface, which is remote-communication function. 4 loops of optocoupler relay output (switching value output) is applied to many situation such as alarm indication, protection and control function.If the switch output is effective, and the relay is working, the meter will display 1. If the switch output is not effective, and the relay is closed, the meter will display 0.

8.2.1 Electrical parameter:

switch input DI: Power-on resistance R<5000;c Power-off resistance >100KΩ

switch out DO: AC 250V ,0.1A

8.2.2 Register (see Table 18)

DI0 information register(0X0021): this register indicate the status and information of 12 loops of switch input and 4 loops of switch output.

Table 18

Di0 register	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Corresponding switch port	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	DI9	DI10	DI11	DI12	D01	D02	D03	D04
Reset	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Di0 information register low 4 bit(BIT3,BIT2,BIT1,BIT0) is switch output status. Register display 000000000000 0101 means that switch output port 2,4 loop is power on;1,3 way is power off;DI0 message register high 12 bit(BIT15-BIT4) is switch input status. Register display 1101 000000000000 means that switch input port the 1,,2,4 loop is power on, other loops is power off. All DI0 information will display on the screen.The alarm output parameters of each switch are stored in

3 consecutive address spaces of DOSI. If the first loop use 3 bytes of address 10, 11,12(BTYE2,BYTE1,BYTE0) to save. Address lowest byte(address 10)save the parameter of alarm output.Ua low alarm parameter is 1,high alarm parameter is 129; 0 means remote mode. other 2 byte (address 11,12) is alarm over limit parameter. Other 3 loops is similar. Corresponding address refer to the below table.(See Table 19)

Table 19

Item	Variate	Meaning:DOSI (BYTE2,BYTE1,BYTE0)
Switch output 1	DO 1	BYTE2 (1~255),alarm item 1-26 corresponding to lower alarm of measured electric quantity items.129-154 corresponding to higher alarm. 0 indicate reserve method. the details refer to the table of switching value output, analog output energy parameter. BYTE 10(1~9999). alarm limit parameter,the data format is same to electric quantity format, the decimal point should be noticed.
Switch output 2	DO 2	
Switch output 3	DO 3	
Switch output 4	DO 4	

8.2.3 Application example:

A. switch input function :

Switch module is provided with 12 loops of switch input collect function. After collecting the input signal, the meter display “ON 1” or “OFF 0 ”information to monitor switch signal. Switchover the meter to switch message display status, “DI” indication light will ON. refer to Page 20 DISP=13 Fig.

Through meter RS485 protocol, the message of switch register(DI 0) can be transmitted to remote PC terminal.

B. switch output function:

It can control 2 loops of switch output through upper computer writing in control message to DI 0 message register. Write in 1 corresponding Port ON, write in 0 corresponding port OFF;for example: If write in binary number 1 0 0 0 0000, it indicate 1 loop output port is ON, 2 loop is OFF. This function can't be used with another limit alarm function of switch output module in the same time. if using remote function, need set the power parameter to 0, close alarm output function, and set the second line of switching value setting to 0. please refer to Page 21 DISP=14. under remote-control status, No.1 loop is ON status, No.2 is OFF status.

Another function of switch output module is over limit alarm output. when the electric parameter over the set range, the corresponding switch output port is ON status, the meter show 1 on the corresponding position, when signal return back to the range, the meter show 0.

DOI (3byte) of meter inside is switch setting register, write in parameter through the communication protocol of mete,realize the alarm setting; and setting the alarm value and items through the panel key.

8.2.4 Programme example (see Table 20)
If the Meter specification is10kV/100V,400A/5A, set D01 Ua>11kV alarm, D02 Ia>400A alarm,D03 PF>0.9 alarm, D04 F>51.00Hz alarm, the control word should be set as belows:

Table 20

Sort	Alarm condition	Control word (high Byte in the front)		
		BYTE2	BYTE1	BYTE0
Switch output 1	Ua＞11.00kV	128+1=129	1100(04H4CH)	
Switch output 2	Ia＞400A	128+7=135	5000(13H88H)	
Switch output 3	PF＜0.900	21	900(03H84H)	
Switch output 4	F＞50.00Hz	128+26=154	5100(13HECH)	

Switching value parameter DOI can be set and programmed through the panel key of product. In programming operation, DOI menu parameter value is corresponding to DO1 relative parameter (see Table 21). Alarm setting in Fig 6: DO-1 means that the set item is switch output module 1; 0129 means Ua high alarm in power alarm item. 6000 is alarm value , when Ua>6000(Ua>600V), DO1 output the alarm signal and the relay is ON.

Table 21

Item	Switching output item TYPE	
	Corresponding parameter (Low alarm)	Corresponding parameter (high alarm)
Ua (A phase voltage)	1	129
Ub (B phase voltage)	2	130
Uc (C phase voltage)	3	131
Uab (AB line voltage)	4	132
Ubc (BC line voltage)	5	133
Uca (CA line voltage)	6	134
Ia (A phase current)	7	135
Ib (B phase current)	8	136
Ic (C phase current)	9	137
Pa (A phase active power)	10	138

Pb (B phase active power)	11	139
Pc (C phase active power)	12	140
Ps (TOTAL active power)	13	141
Qa (A phase reactive power)	14	142
Qb (B phase reactive power)	15	143
Qc (C phase reactive power)	16	144
Qs (Total reactive power)	17	145
PFa (A phase power factor)	18	146
PFb (B phase power factor)	19	147
PFc (C phase power factor)	20	148
PFs (Total power factor)	21	149
Sa (A phase apparent power)	22	150
Sb (B phase apparent power)	23	151
Sc (C phase apparent power)	24	152
Ss (Total apparent power)	25	153
F (Frequency)	26	154
Voltage unbalance		155
Current unbalance		156
Linkage(close)		157
Linkage(open)		158
-Ps (Two-way active power)		
-Qs (Two-way reactive power)		
-F (Two- way frequency)		
-PF (Two-way power factor)		
Residual current		163
Any phase in three phase voltage	36	164
Any phase in three phase current	37	165

Leave-factory default of analog quantity (switching) set: Switching output count according to secondary value of CT.
1st loop is A phase current :TYPE is 135,UAL is 5000;5000 corresponding to secondary side current 5A.
2nd loop is B phase current :TYPE is 136,UAL is 5000;5000 corresponding to secondary side current 5A.
3rd loop is C phase current :TYPE is 137,UAL is 5000;5000 corresponding to secondary side current 5A.

4th loop is A phase voltage :TYPE is 129,UAL is 3800;3800 corresponding to secondary side voltage 380V.
Total active power: TYPE is 141, UAL is 3300;3300 corresponding to secondary power value 3300W.
Total power factor: TYPE is 149,UAL is 1000;1000 corresponding to secondary power factor value 1.000.
Frequency: TYPE is 154,UAL is 5000;5000 corresponding to secondary frequency value 50.00Hz
Notice: when TYPE set 0000,mean “ remote-control ” status.

9.Ordinary problem and solution
9.1 About communication
● Meter no data return back
Ans:
First make ensure the setting of mater communication such as slave address, baud rate, checkout mode meet the requirements of master PC.
If there is many meters don’t send back the data, detect if the connection of communication bus is correct and reliable and Rs485 converter is normal.If only one or few meter communication is abnormal ,also need check corresponding communication wires.the user can revise the address of abnormal and normal meter, remove or confirm the master software problem , or exchange the installation position of abnormal and normal meter installation position, to exclude or confirm the meter fault.
● The data returned by meter not correct
Ans:
This series meters communication data for customer is primary grid float type and secondary grid int/long type. Please read carefully about data store address and data store format in communication address table, and make ensure converting according to corresponding data format.
9.2 About U, I , P measurement not accurate
Ans:
First make sure the correct voltage and current signal have already connected to the meter. The voltage signal can be measured by the meter, the current signal can be measured by clamp meter. Second, make sure the signal wiring is correct. for example. the input terminal of current signal, and the phase sequence. This meter have power display , only under reverse current delivery status, the active power is negative. under normal status.active power symbol is positive. if active

power symbol is negative , the current input and output wires maybe connect wrong, or maybe phase sequence is incorrect. And the displayed energy is primary grid value, if the multiple rate setting of voltage/current transformer is different to actual rate,it will result in inaccurate display of energy. The measurement range can't change after leaving factory.
The wiring can be revised according to on-site practical situation, Connect, but the wiring method setting in programming menu should be same to the actual method, otherwise will result in error display.
9.3 About the energy counting not accurate
Ans
The energy accumulation is based on the power, first check if the meter power value conform to practice load. This series meter can support two-way energy accumulation. Under incorrect wiring situation, total active power is negative, the energy accumulation to negative active power, negative active power can't accumulate. The normal problem happened in on-site is current transformer input and output wiring reversed. This series product can check the active power symbol of each phase,if power is negative, the wring maybe wrong. Phase sequence wiring wrong will result in energy counting not accurate.
9.4 Meter no bright
Ans
Make ensure connect correct auxiliary power(refer to the label on the cover) already connect to the auxiliary power terminal of meter. If the auxiliary power over the range,the meter will be damaged and can't recover. The meter can be used to measure the voltage of auxiliary power, if power voltage is normal, meter still not have any display, please power-off then power-on again, If meter still display abnormally, please contact with our technical dept.
9.5 Meter no respond to any operation
Ans:
Press meter button " SET " " ← " " → " " ↵ " to power-off the meter then power-on again. If the meter can't back to normal, please contact our technical dept.
9.6 Other abnormal condition
Ans:
Please contact our technical service department , the user should describe the details of the situation, our technical staff will analyse the possible reasons according to your feedback. If the problem that cannot be resolved after communication, we will arrange technical personal to on-site to solve the problem.