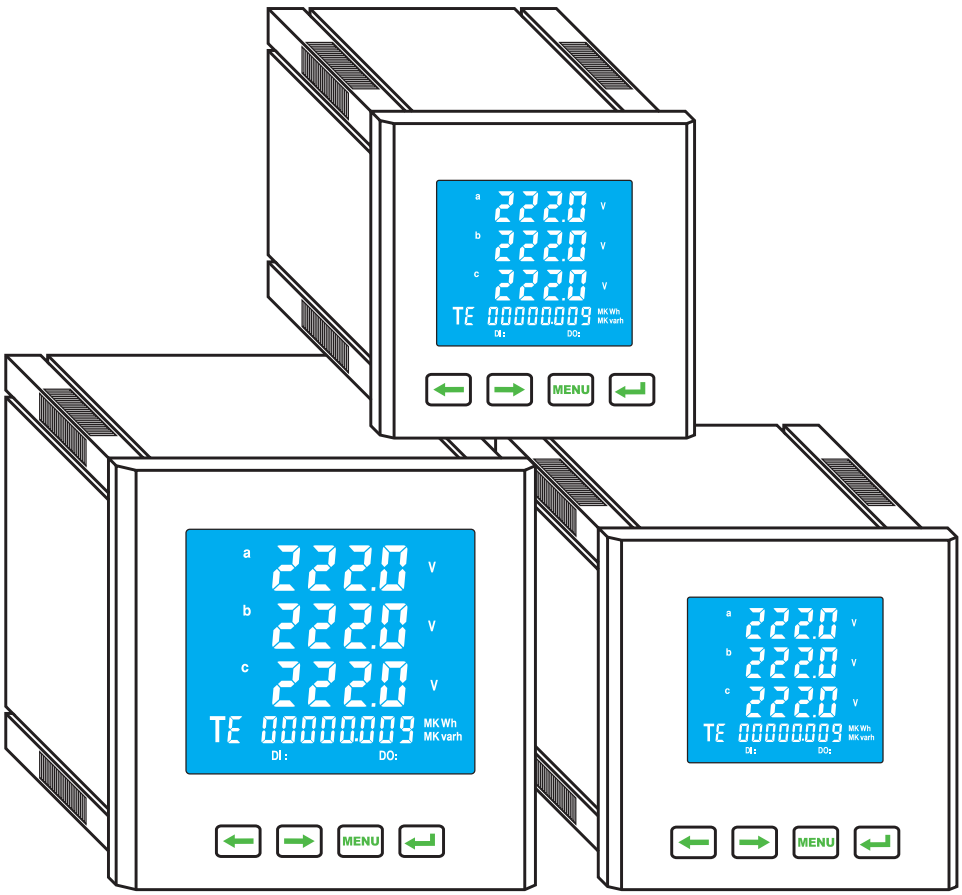
Harmonic Multifunctional Power Instrument (LCD)



Operational Instruction Manual

CATALOG

Harmonic Multifunctional Power Instrument(LCD)

Please read through the manual before installment and operation

Chapter 1. Product Function

Ordinary function

- Phase voltage: UA, UB, UC
- Line voltage: UAB, UBC, UCA
- Current: IA, IB, IC
- Active power: phase active power and total active power
- Reactive power: phase reactive power and total reactive power
- Apparent power: phase apparent power and total apparent power
- Power factor: phase power factor and total power factor
- Frequency
- Active electric energy
- Reactive electric energy
- Positive, Negastive sequence voltage; voltage unbalance
- Positive, Negastive sequence current; current unbalance
- Communication output: RS485

Extended function

- 4 channels analog quantity output
- 4 channels switch value output
- 4 channels switch value input
- Harmonic
- Multi rate

Chapter 2. Technical Parameters

Technical parameters			Index
Input	Net work		Three-phase three-wire, three-phase four- wire
	Voltage	Rated value	AC 0~500V
		Over load	Consistent:1.2 times instantaneous:2 times /30s
		Comsumption	<0.5VA(each phase)
		Impedance	>500kΩ
	Current	Rated value	AC 1A, 5A
		Over load	Consistent:1.2 times instantaneous:2 times /1s
		Impedance	<2mΩ
	Frequency		45~65Hz

Output	Communication	Output mode	RS485
		Protocol	MODBUS_RTU
		Baud rate	1200,2400,4800, 9600
	Analog quantity	Channel quantity	4 channels
		Output mode	0~20mA, 4~20mA
		Load ability	≤400Ω
	Switching value	Channel quantity	4 channels
		Output mode	Normally open relay contact output
		Contact capability	AC 250V/0.1A
	Switching value input		Four channel dry contact input modes
	Display mode		LCD(Blue back lighting)
Measuring accuracy	Voltage, current		±(0.5%FS+one digit)
	Active power, reactive power		±(0.5%FS+one digit)
	Frequency		±0.1Hz
	Power factor		±0.01PF
	Active energy		±0.5%(only for reference, not for meterage)
	Reactive energy		±1.0%(only for reference, not for meterage)
Power	Scope		AC 220V 50/60Hz or AC/DC 85~265V
	Consumption		<5VA
Safety	Withstand voltage	Input and sourse	>2kv50Hz/1min
		Input and output	>1kv50Hz/1min
		Output and sourse	>2kv50Hz/1min
	Insulating resistance		Any two of input, output, source, casing>20MΩ
Environment	Temperature		Operation: -10~50°C
			Storage: -25~70°C
	Humidity		≤85%RH，free of wet and corrosive gas
	Elevation		≤3000m

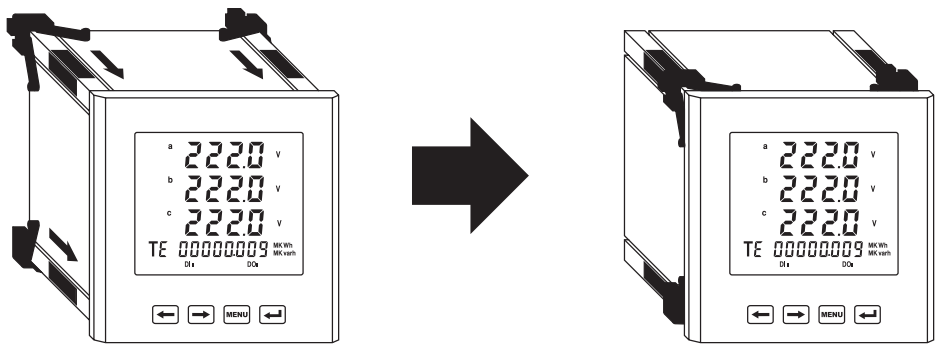
Chapter 3. Installment and wiring

3.1 Shape and cutout hole dimension(unit：mm)

Shape	Panel dimension		Case dimension			Cutout hole dimension	
	W	H	W	H	D	W	H
120×120Square	120	120	110	110	83	112	112
96×96Square	96	96	90	90	83	92	92
80×80Square	80	80	74	74	83	76	76
72×72Square	72	72	66	66	83	68	68

3.2 Method of installation

Choose the corresponding hole cutout dimension according to the instrument dimension from the table above, make a hole in the installation screen, insert the instruments into the hole, place the four clamping pieces into the clamping holder and push and tighten them by hand.



3.3 Terminal arrangement and function declaration of instrument.

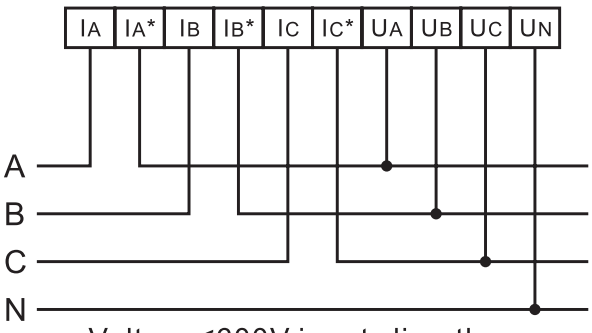
(Note: If it is not the same with the wiring schema of the instrument case, please accord to the one of instrument case.)

3.3.1 Auxiliary power supply(POWER): The voltage range of operational power supply is AC 220V 50/60Hz or AC/DC 85~265V. It is suggested to install a fuse of 1A beside of the live wire when using the AC supply to prevent the damage to the instrument. In the areas with poor power quality, the surge suppressor and quick pulse group suppressor should be installed in the power supply circuit.

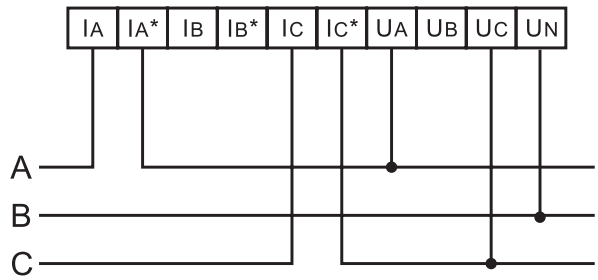
3.3.2 Electrical quantity signal input(I input and U input)： I input is A, B and C three-phase AC current signal input port and U input is A, B and C three-phase AC voltage signal input port. I* is current inlet wire. When connection, please ensure the phase sequence and polarity of input signal respond with the terminals

to avoid indicating value error. When the voltage is higher than the rated input voltage of the product, you should consider of using PT and installing fuse of 1A at the voltage input port; while the current is higher than rated input current of the product, you should consider of using the exterior CT.

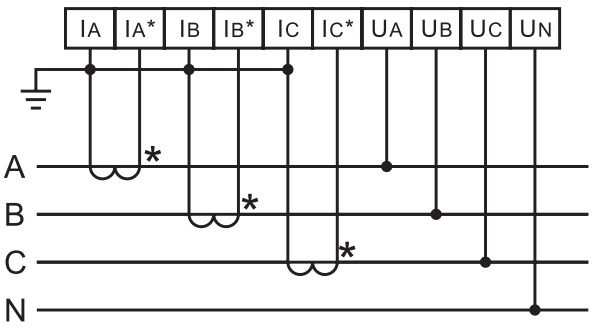
3.3.3 Typical connection



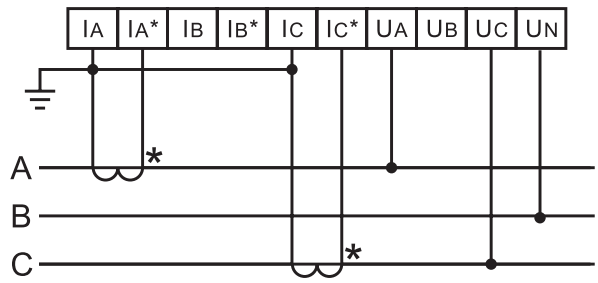
Voltage≤600V,input directly
Current≤5A,input directly



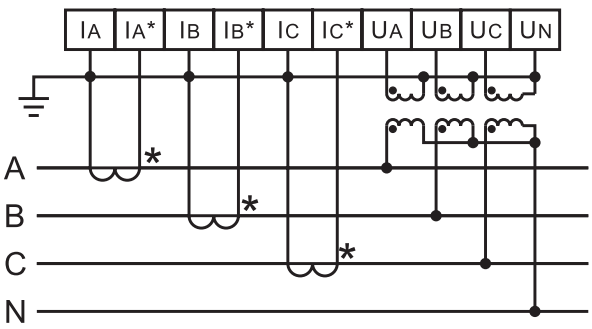
Voltage≤600V,input directly
Current≤5A,input directly



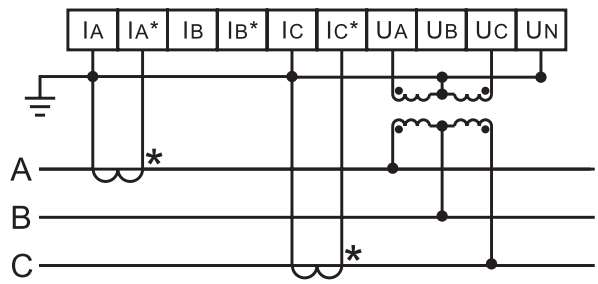
Voltage≤600V,input directly
Current>5A,input via CT



Voltage≤600V,input directly
Current>5A,input via CT



Voltage>600V,input via PT
Current>5A,input via CT



Voltage>600V,input via PT
Current>5A,input via CT

3.3.4 RS485 communication connection

The instrument supplies a RS485 communication interface and applies MODBUS_RTU communication protocol. Up to thirty-two instrument can be connected in one communication line at one time. Each instrument should have

the only communication address in the circuitry. Communication connection should use the shielded twisted paired with copper mesh, whose diameter should be not less than 0.5mm. Communication line should be far away from the high-voltage cables or other highfield environment and the maximum transmission distance is 1200 m. The typical network connections are shown in the following figure and users can choose other suitable connect mode under specific conditions.

3.3.5 Switching value input(DI input):DI1~DI4 are 1~4 way dry contact input port, inside of the instrumentthere is power supply of +5V

3.3.6 Switching output and ananlog transmitting output: can support four-channel switching value output and four-channel analog transmitting output.

3.5.6 Multi-rate

Multi-rate divides a day into 12 periods at most. There are four rates available for each period.If you divide a day into seven sections：6:00~8:30，8:30~12:00，12:00~13:30，13:30~18:00，18:00~20:00，20:00~22:00，22:00~6:00。They are seven periods：06:00，08:30，12:00，13:30，18:00，20:00，22:00。Each period number carries out the corresponding rate.There are four rates ： sharp, peak, flat and valley. The corresponding rates are：0、1、2、3；

After adding the rate number to the above seven periods, as follows:

06:00 02，08:30 00，12:00 02，13:30 00，18:00 01，20:00 02，22:00 03

06:00 02： the flat rate was implemented between 6:00 to 8:30；

08:30 00：the sharp rate was implemented between 8:30 to 12:00；

12:00 02：the flat rate was implemented between 12:00 to 13:30；

13:30 00：the sharp rate was implemented between 13:30 to 18:00；

18:00 01：the peak rate was implemented between 18:00 to 20:00；

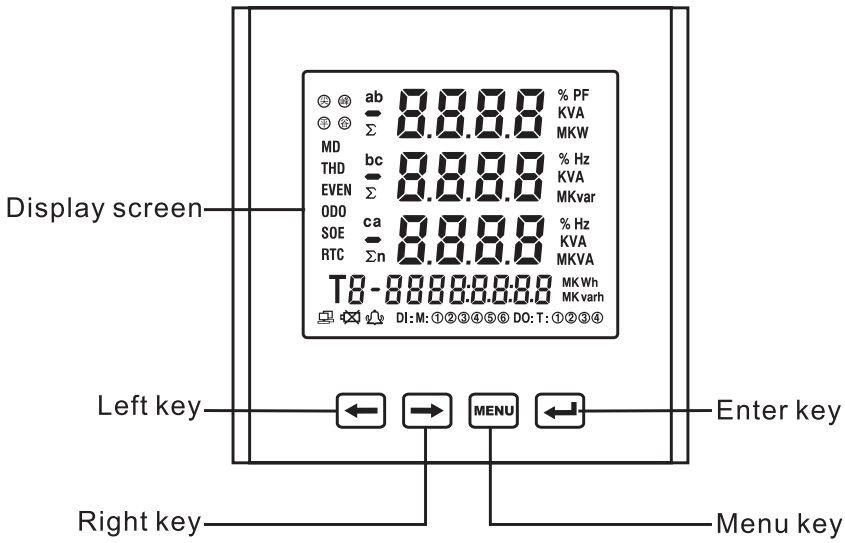
20:00 02：the flat rate was implemented between 20:00 to 22:00；

22:00 03：the valley rate was implemented between 22:00 to 06:00；

Note: The later period of time must be greater than the earlier period, otherwise errors will occur; The latter is not used.The segment is set to the same value as the last used segment.

Chapter 4. Program and usage

4.1Panel description



4.2 Description of key function

Left key: Under the programming mode. it is used for progressive decrease of parameter value or inter the previous menu. Under the measuring display mode, it is used to enter the previous display mode.

Right key: Under the programming mode. it is used for degressive increase of parameter value or inter the next menu. Under the measuring display mode, it is used to enter the next display mode.

MENU Menu key: under the measuring display status, press this key to enter the program mode. After input the correct password(factory password: 0001) "Code" prompted by the instrument, it is capable of programming and setting. Under the programming mode, it is used to enter the next menu and long press menu key to save and exit the programming mode. Under the three-phase voltage (current) measurement display state, press the menu key to view the positive sequence voltage (current), negative sequence voltage (current), voltage (current) unbalance.

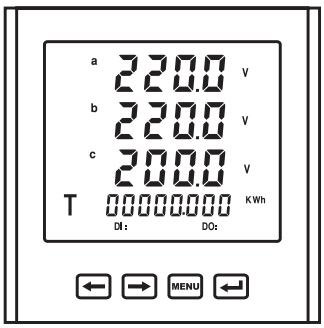
Enter key: Under the measuring display status, long press this key to enter the current time setting. After input the correct password(factory password: 0001)"Code" prompted by the instrument, it is capable of programming and setting. Under the measuring display status, press this key to view the current, current month, last month's peak and valley power situation.

4. 3 Description of display mode

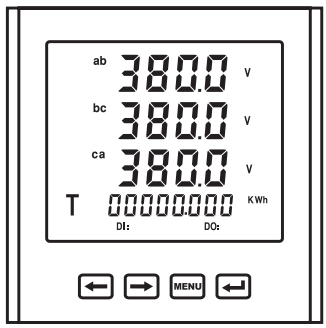
Through programming on the″diSP″parameters of the menu, it can choose one of the display mode and also can manually switch the display modes by″Right key″and″Left key″. ″dISP″value display mode: 1. three-phase phase voltage, positive active energy; 2. three-phase line voltage, opposite active energy; 3. three-phase current, positive reactive energy 4. total active, reactive, apparent power, opposite reactive energy; 5. total power factor, frequency, total current, positive active energy; 6. three-phase active power, positive active energy; 7. three-phase reactive power, positive active energy; 8. three-phase apparent power, positive reactive energy; 9. three-phase power factor, positive active energy. Under the display mode, switch the display object among the different parameters by press the Left key or Right key.

It will auto display the parameters when the ″diSP″value was ″0″.

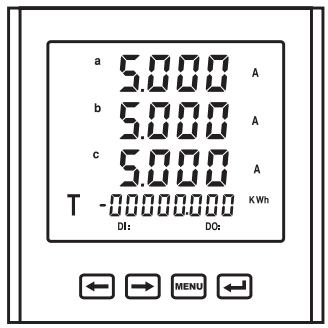
diSP=1



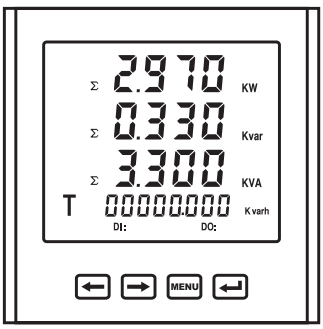
diSP=2



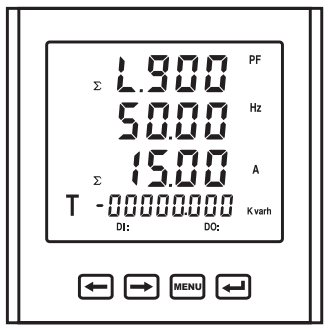
diSP=3



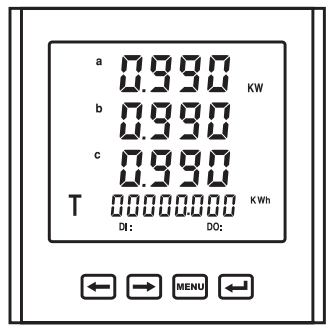
diSP=4



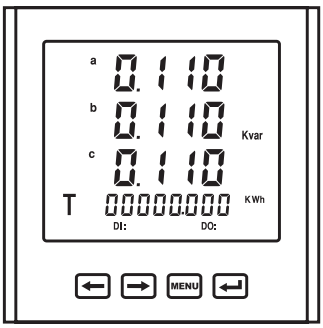
diSP=5



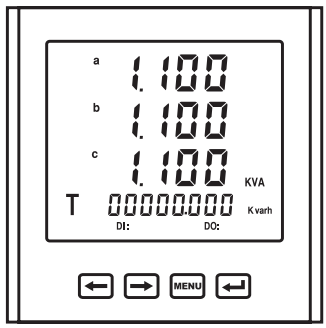
diSP=6



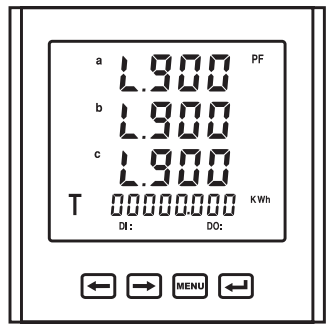
diSP=7



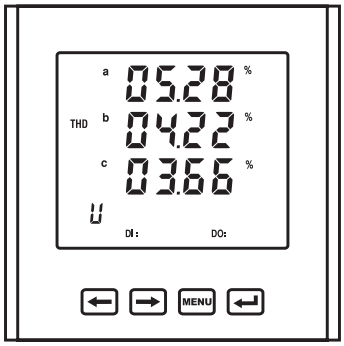
diSP=8



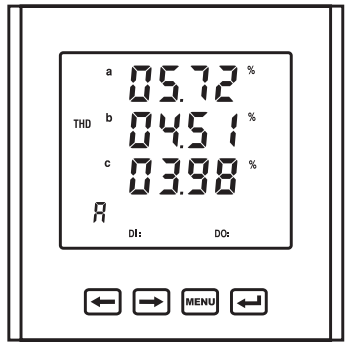
diSP=9



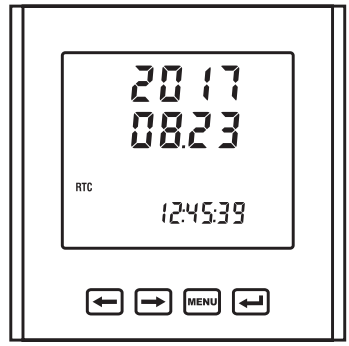
diSP=10



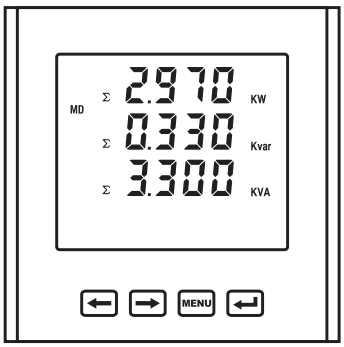
diSP=11



diSP=12

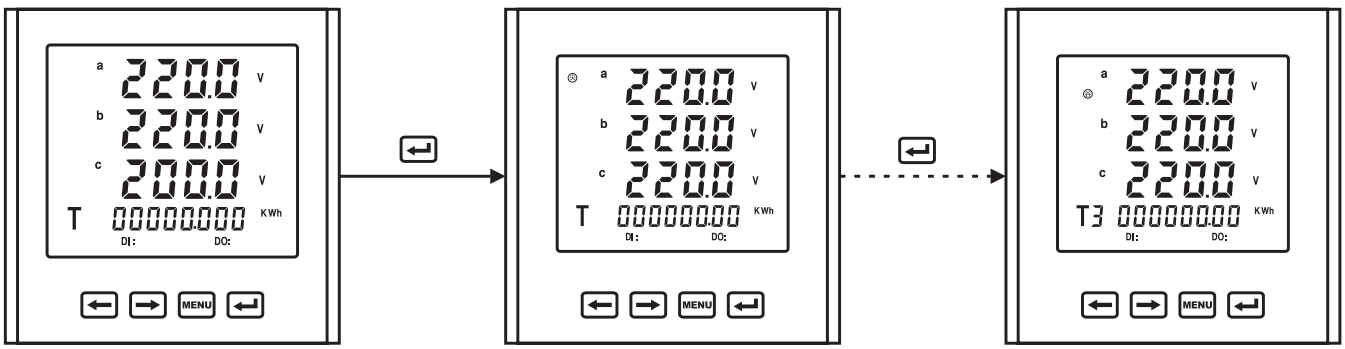


diSP=13

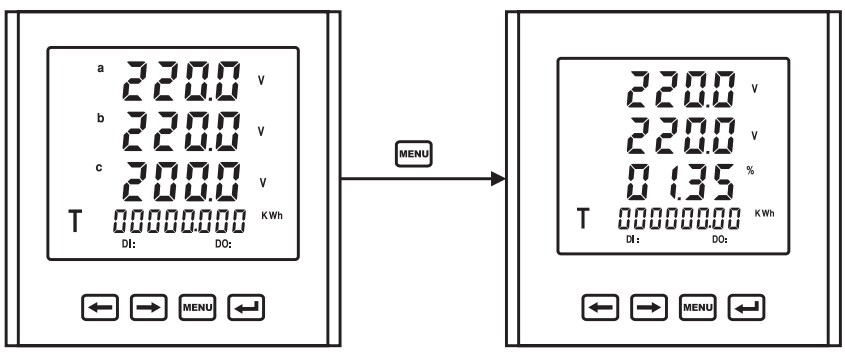


10.Harmonic distortion rate of three-phase voltage, THD value; 11.Harmonic distortion rate of three-phase current, THD value; 12.Clock, current time; 13.15 minutes active power, reactive power, apparent power requirement value;

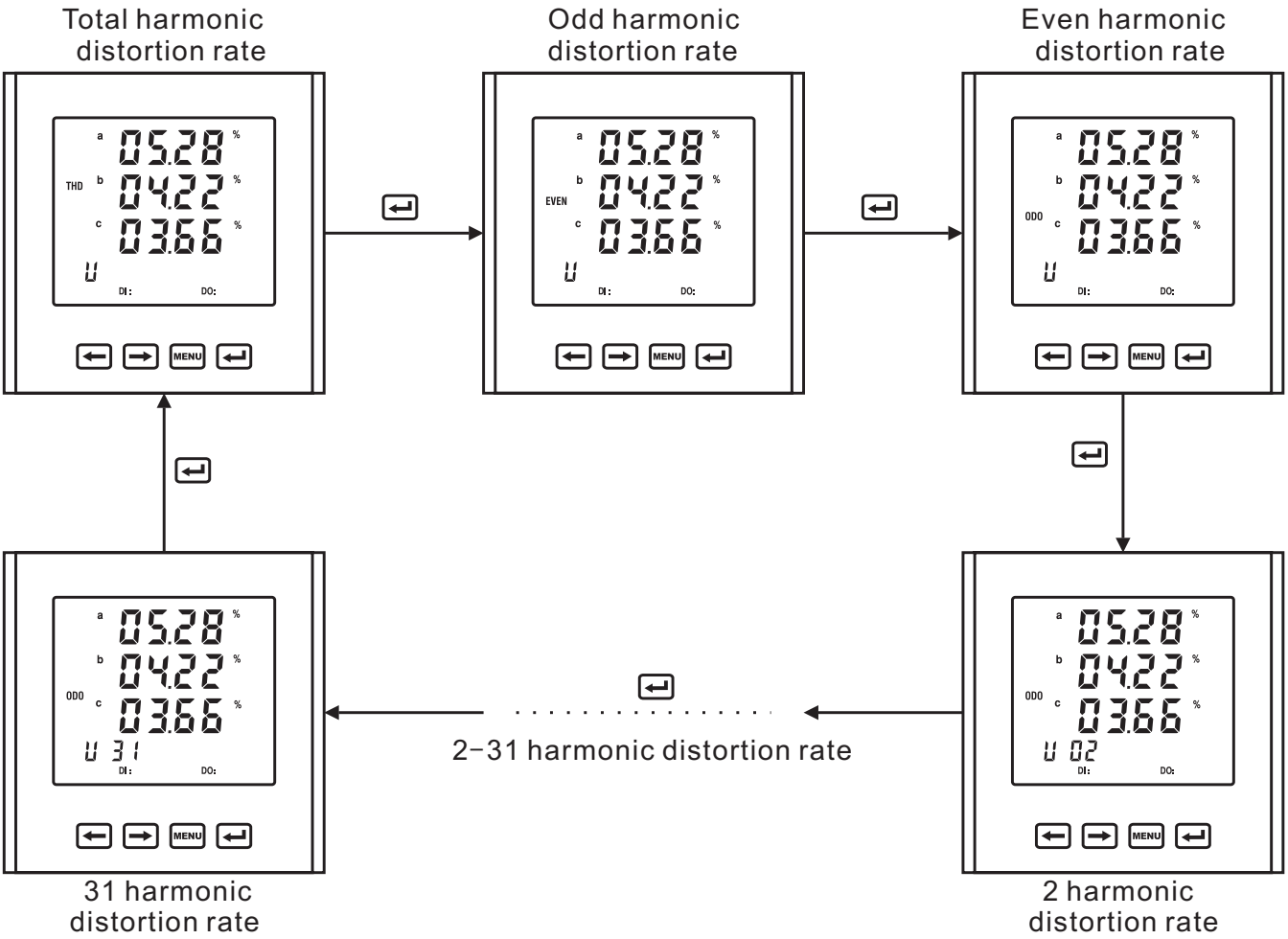
4. 3. 1 Press the Enter key on the page with the power display to view the current power (T), this month's power (T1), last month's power consumption (T2), last month of last month's power consumption (T3) and peak and valley power consumption in each period.



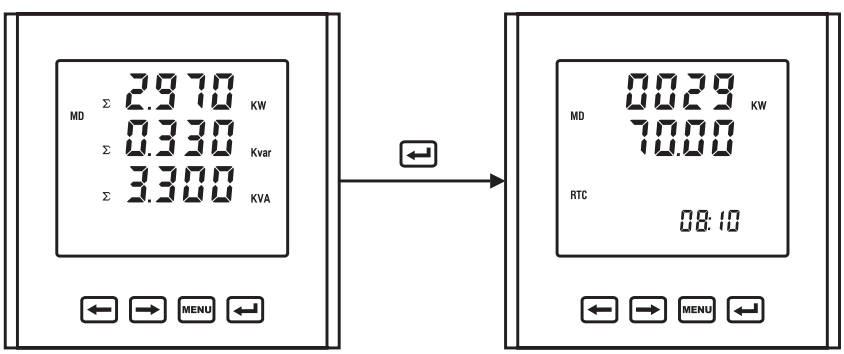
4. 3. 2 At the interface of three-phase voltage (current) display, the unbalance of positive sequence voltage (current), negative sequence voltage (current) and three-phase voltage (current) can be viewed according to menu price.



4. 3. 3 The total harmonic distortion rate, odd harmonic distortion rate, even harmonic distortion rate and 2-31 harmonic distortion rate can be viewed in turn at the three-phase voltage (current) harmonic distortion rate THD display interface according to the key.



4. 3. 4 Active power, reactive power, apparent power requirement display interface can view active power, reactive power in turn, depending on the generation time of power requirement value.。



4. 4 Menu significations

Order	Description	Display	Range
Enter	Password enter menu	CodE	0000~9999
	Prompt the input programmable password is codE, and can only enter the programmable mode with correct password.(Factory CodE:0001)		
1	Connection mode	nEt	3P3L 3P4L
	Select input network “nEt”,n.3.3 : three-phase three-wire n.3.4 : three-phase four-wire		
2	Voltage multiplying rate	Pt	1~9999
	Set multiplying power of voltage transformer (Primary value/second value of voltage transformer)		
3	Current multiplying rate	Ct	1~9999
	Set multiplying power of current transformer (Primary value/second value of current transformer)		
4	Display mode	diSP	0~13
	Select display mode “diSP”		
5	Communication address	Addr	1~247
	Instrument address, Used to Identify local machine in multiprocessor mommunication		
6	Baud rate of communication	bAUd	1200, 2400, 4800, 9600
	Select communication baud rate“bAud”:1200,2400,4800 or 9600		
7	Verification mode	dAtA	n.8.1 o.8.1 E.8.1
	Protocol form n.8.1 : n-no check, 8-eight data bits, 1-one stop bit o.8.1 : o-odd check, 8-eight data bits, 1-one stop bit E.8.1 : o-even check, 8-eight data bits, 1-one stop bitt		
8	Clear energy	ECLr	YES no
	Pressing“ Enter key”to clear the electric energy data of the instrument		

9	LCD Backlight opening time	bon.t	0~9999
	0 :LCD backlight normally open; 1~9999 seconds		
10	Set the password to enter the menu	CodE	0000~9999
	Factory code : 0001		
11	1st relay control term	d1-S	0~255
	0:remote control, other settings can refer to relay operation instructions		
12	1st relay low alarm value	d1-L	0~9999
	Refer to Relay Operation Instructions		
13	1st relay high alarm value	d1-H	0~9999
	Refer to Relay Operation Instructions		
14	1st relay alarm return difference	d1-n	0~9999
	Refer to Relay Operation Instructions		
15	1st relay alarm delay value	d1-t	0~9999
	Refer to Relay Operation Instructions		
16	2nd relay control term	d2-S	0~255
	0:remote control, other settings can refer to relay operation instructions		
17	2nd relay low alarm value	d2-L	0~9999
	Refer to Relay Operation Instructions		
18	2nd relay high alarm value	d2-H	0~9999
	Refer to Relay Operation Instructions		
19	2nd relay alarm return difference	d2-n	0~9999
	Refer to Relay Operation Instructions		

20	2nd relay alarm delay value	d2-t	0~9999
	Refer to Relay Operation Instructions		
21	3rd relay control term	d3-S	0~255
	0:remote control, other settings can refer to relay operation instructions		
22	3rd relay low alarm value	d3-L	0~9999
	Refer to Relay Operation Instructions		
23	3rd relay high alarm value	d3-H	0~9999
	Refer to Relay Operation Instructions		
24	3rd relay alarm return difference	d3-n	0~9999
	Refer to Relay Operation Instructions		
25	3rd relay alarm delay value	d3-t	0~9999
	Refer to Relay Operation Instructions		
26	4th relay control term	d4-S	0~255
	0:remote control, other settings can refer to relay operation instructions		
27	4th relay low alarm value	d4-L	0~9999
	Refer to Relay Operation Instructions		
28	4th relay high alarm value	d4-H	0~9999
	Refer to Relay Operation Instructions		
29	4th relay alarm return difference	d4-n	0~9999
	Refer to Relay Operation Instructions		
30	4th relay alarm delay value	d4-t	0~9999
	Refer to Relay Operation Instructions		

31	1st transmit output control term	A1-S	0~255
	0:remote control, other settings can refer to transmit operation instructions		
32	1st transmit output upper limit corresponding value	A1-H	0~9999
	Refer to Transmit Operation Instructions		
33	2nd transmit output control term	A2-S	0~255
	0:remote control, other settings can refer to transmit operation instructions		
34	2nd transmit output upper limit corresponding value	A2-H	0~9999
	Refer to Transmit Operation Instructions		
35	3rd transmit output control term	A3-S	0~255
	0:remote control, other settings can refer to transmit operation instructions		
36	3rd transmit output upper limit corresponding value	A3-H	0~9999
	Refer to Transmit Operation Instructions		
37	4th transmit output control term	A4-S	0~255
	0:remote control, other settings can refer to transmit operation instructions		
38	4th transmit output upper limit corresponding value	A4-H	0~9999
	Refer to Transmit Operation Instructions		
39	1st period fee rate of multi-rate	C-S1	0~3
	0：sharp；1：peak；2：flat；3：vally		
40	Time for 1st period fee	C-t1	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
41	2nd period fee rate of multi-rate	C-S2	0~3
	0：sharp；1：peak；2：flat；3：vally		

42	Time for 2nd period fee	C-t2	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
43	3rd period fee rate of multi-rate	C-53	0~3
	0：sharp；1：peak；2：flat；3：vally		
44	Time for 3rd period fee	C-t3	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
45	4th period fee rate of multi-rate	C-54	0~3
	0：sharp；1：peak；2：flat；3：vally		
46	Time for 4th period fee	C-t4	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
47	5th period fee rate of multi-rate	C-55	0~3
	0：sharp；1：peak；2：flat；3：vally		
48	Time for 5th period fee	C-t5	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
49	6th period fee rate of multi-rate	C-56	0~3
	0：sharp；1：peak；2：flat；3：vally		
50	Time for 6th period fee	C-t6	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
51	7th period fee rate of multi-rate	C-57	0~3
	0：sharp；1：peak；2：flat；3：vally		
52	Time for 7th period fee	C-t7	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		

53	8th period fee rate of multi-rate	C-58	0~3
	0：sharp； 1：peak； 2：flat； 3：vally		
54	Time for 8th period fee	C-t8	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
55	9th period fee rate of multi-rate	C-59	0~3
	0：sharp； 1：peak； 2：flat； 3：vally		
56	Time for 9th period fee	C-t9	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
57	10th period fee rate of multi-rate	C510	0~3
	0：sharp； 1：peak； 2：flat； 3：vally		
58	Time for 10th period fee	Ct10	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
59	11th period fee rate of multi-rate	C511	0~3
	0：sharp； 1：peak； 2：flat； 3：vally		
60	Time for 11th period fee	Ct11	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
61	12th period fee rate of multi-rate	C512	0~3
	0：sharp； 1：peak； 2：flat； 3：vally		
62	Time for 12th period fee	Ct12	00:00~23:59
	Hours before the decimal point, ranging from 0 to 23; Minutes after the decimal point, ranging from 0 to 59.		
63	Clear demand value	dCLr	YES no
	Clear demand value		

Quit	Save parameter and quit		
	Press menu key long to save and quit programming mode		

4. 5 Current Time Setting(Long press Enter Key for 3 seconds)

Order	Description	Display	Range
Enter	Password enter menu	CodE	0000~9999
	Prompt the input programmable password is codE, and can only enter the programmable mode with correct password.(Factory CodE:0001)		
1	Set years and months	t-yy	
	18.05 means May 2018		
2	Set days and hours	t-dd	
	15.16 means 15 date, 16 o'clock		
3	Set minutes and seconds	t-nn	
	35. 43 means 35 minutes 43 seconds		
Quit	Save parameter		
	Press menu key long to save and quit programming mode		

Chapter 5. Communication protocol

5.1 This series instrument are provided with Rs485 communication interface and apply MODBUS_RTU communication protocol.

Start	Address code	Function code	Data sector	CRC code	End
Halt time more than 3.5 bytes	1 byte	1 byte	N byte	2byte	Halt time more than 3.5 bytes

5.2 Communication message transmitting process

When communication instructions transmit from master device to slave device, the slave device with corresponding address code receives communication orders and reads the massage according to functional code and relational requirements. After successful CRC verification without error, the corresponding operation will be conducted and the result (data), including address code, function code, data after execution and CRC verification code, is returned to the master device. In case of CRC verification failure, no message would be returned.

5. 2. 1 Address code:

Address code is the first byte (8 bits) of each communication message frame, from 1 to 247. Every slave device must have the only address code and only the slave device conforming to the address code can respond and return the message. When the slave device returns the message, all of the return data start with each address code. The address code sent by master device shows the receiving address of slave device, while the address code returned by slave device shows the returning slave address. The responding address code shows where the message comes from.

5. 2. 2 Function code

Function code is the second byte of each communication message frame. The master device sends and tells that what operation the slave device should carry out by means of function code. Then the slave device responds. The functional code returned by slave device is the same as the one sent by master device, which shows that slave device has responded the master device and carry out the relational operation. The instrument supports three function codes as following:

Function code	Operation
01H	Read relay output status
02H	Read switch input status
03H/04H	Read data of single or multiple resigister
05H	Remote control single relay action
0FH	Remote control multiple relay action
10H	write data of single or multiple resigister

5.2.3 Data sector

Data sector are different following the different function code. These data could be numerical value, reference address and son on. For different slave device, the address and data information are different (There should be communication information table). The master device utilizes the communication order (Function code03H) to read and amend the data register of the slave device. The data length read out or written in should not exceed the effective range of the data register address once.

5. 3 16-bit CRC verification code

Algorithm of CRC code:

5.3.1 Presetting a 16-bit register to hex FFFF (namely 1 for all bits in binary system). The register is called CRC register;

5.3.2 XORing the first 8-bit binary data (the first byte of the communication message frame) with the low 8-bit of 16-bit CRC register, then storing the result in CRC register;

5.3.3 Right-shifting the register data by one bit (towards lower bit) and filling the highest bit with 0, then verificationing the shift-out bit;

5.3.4 If the shift-out bit is 0, repeat step 3 (right-shifting one more bit);If the shift-out bit is1, XOR the CRC register data with polynomial A001 (1010 0000 0000 0001);

5.3.5 Repeating step 3 and step 4 until all of the 8-bit data have been processed after 8 right-shift operations;

5.3.6 Repeating step 2 to step 5 to process the next byte of the communication message frame;

5.3.7 When calculation procedures of the first 5 bytes in the communication message frame are completed, the 16-bit CRC verification code will be generated in the 16-bit CRC register.

5.4 Communication messages Example：

5.4.1 Read relay output status (function code 01H): 4-way Relay Address is 0~3

Master device request: read the output status of 4-way relay

Address	Function	Start relay address	Relay number	Check code
01H	01H	00H, 00H	00H, 04H	9DH, C9H

Slave device response：relay 1, 3 are on and relay 2, 4 are off.

Address	Function	Data length	Data	Check code
01H	01H	01H	05H	91H, 8BH

5.4.2 Read switch intput status (function code 02H): 4-way switch input address is 0~3

Master device request: read the input status of 4-way switch

Address	Function	Start switch address	Switch number	Check code
01H	02H	00H, 00H	00H, 04H	79H, C9H

Slave device response：switch 1, 2 are on and switch3, 4 are off.

Address	Function	Data length	Data	Check code
01H	02H	01H	03H	E1H, 89H

5.4.3 Read data register value(Function code:03H/04H)

Master device request：read three phase current value

Address	Function	Staring register address	Register number	Check code
01H	04H	00H, 1AH	00H, 03H	91H, CCH

Slave device response：

IA=5. 000A，IB=4. 996A, IC=4. 980A

Address	Function	Data length	Data	Check code
01H	04H	06H	13H, 88H, 13H, 84H, 13H, 74H	CBH, 95H

5.4.4 Remote single relay action(Function code:05H)：4 relay address0~3

Master device request：remote single relay output

Address	Function	Relay address	Relay action value	Check code
01H	05H	00H, 00H	FFH, 00H	8CH, 3AH

Slave device response：

Address	Function	Relay address	Relay action value	Check code
01H	05H	00H, 00H	FFH, 00H	8CH, 3AH

5.4.5 Remote multiple relay action(Function code:0FH)：4 relay address0~3
Master device request：remote 1st and 3rd relay output, 2nd and 4th in off

Address	Function	Staring relay address	Relay number	Data bytes	Relay action value	Check code
01H	0FH	00H, 00H	00H, 04H	01H	05H	FEH, 95H

Slave device response：

Address	Function	Staring relay address	Relay number	Check code
01H	0FH	00H, 00H	00H, 04H	54H, 08H

5.4.6 write data register(funtion code：10H)：
master device request：set current rate CT=300，voltage rate PT=100

Address	Function	Staring register address	Register number	Data bytes	Data segment	Check code
01H	10H	00H, 02H	00H, 02H	04H	00H,64H,01H,2CH	33H, E4H

Slave device response：

Address	Function	Staring register address	Register number	Check code
01H	10H	00H, 02H	00H, 02H	E0H, 08H

5.5 MODBUS_RTU address information form(the address is demonstrated with decimal system). Indicate：R/W-read and write，R-only read.

Address	Parameter	Description	Data type	Attribute	Explanation
Programming information					
0	Password		Short	R/W	Range：0~9999
1	Display mode		Short	R/W	
	Connection mode			R/W	Range,0:3P3W,1:3P4W

2	Multiplying power of potential transformer	Short	R/W	Range：1~9999
3	Multiplying power of current transformer	Short	R/W	Range：1~9999
4	Communication address	Short	R/W	Range：1~247
	Communication baud rate		R/W	Range：0:1200bps~3:9600bps
5	Protocol form	Short	R/W	0：n.8.1 1：o.8.1 2：E.8.1
6	Backlight	Short	R/W	Range：0~9999
16	Clear energy data	Short	R/W	Write 55AAH to clear all
17	Clear demand data	Short	R/W	Write 55AAH to clear all
18	Clear SOE event record	Short	R/W	Write 55AAH to clear all
19	Switch input status	Short	R	Refer to Notes (1)
	Relay ouput status		R/W	
20	A-phase voltage	Short	R	Refer to Notes (2)
21	B-phase voltage	Short	R	
22	C-phase voltage	Short	R	
23	AB-line voltage	Short	R	
24	BC-line voltage	Short	R	
25	CA-line voltage	Short	R	
26	A-phase current	Short	R	Refer to Notes (3)
27	B phase current	Short	R	
28	C phase current	Short	R	
29	Power sign	Short	R	Refer to Notes (4)
30	A phase active power	Short	R	Refer to Notes (5)
31	B phase active power	Short	R	
32	C phase active power	Short	R	
33	Total active power	Short	R	
34	A phase reactive power	Short	R	
35	B phase reactive power	Short	R	
36	C phase reactive power	Short	R	
37	Total reactive power	Short	R	
38	A-phase apparent power	Short	R	
39	B-phase apparent power	Short	R	

40	C-phase apparent power	Short	R	Refer to Notes (5)
41	Total apparent power	Short	R	
42	A-phase power factor	Short	R	Refer to Notes (6)
43	B-phase power factor	Short	R	
44	C-phase power factor	Short	R	
45	Total power factor	Short	R	
46	Frequency	Short	R	Refer to Notes (7)
47,48	Positive active energy (integer part)	Long	R/W	Refer to Notes (8)
49	Positive active energy (decimal part)	Short	R/W	
50,51	Negative active energy (integer part)	Long	R/W	
52	Negative active energy (decimal part)	Short	R/W	
53,54	Inductive active energy (integer part)	Long	R/W	
55	Inductive active energy (decimal part)	Short	R/W	
56,57	Capacitive active energy (integer part)	Long	R/W	
58	Capacitive active energy (decimal part)	Short	R/W	
75	Three-phase current vector sum	Short	R	Refer to Notes (3)
76	Three-phase voltage vector sum	Short	R	Refer to Notes (2)
77	Three-phase voltage phase sequence	Short	R	0：positive ； 1： negative
78	Temperature measurements	Short	R	Signed short integers
212	1st relay control term	Short	R/W	Range：0~255
213	1st relay low alarm value	Short	R/W	Range：0~9999
214	1st relay high alarm value	Short	R/W	
215	1st relay alarm return difference	Short	R/W	
216	1st relay alarm delay value	Short	R/W	
217	2nd relay control term	Short	R/W	Range：0~255
218	2nd relay low alarm value	Short	R/W	Range：0~9999
219	2nd relay high alarm value	Short	R/W	
220	2nd relay alarm return difference	Short	R/W	
221	2nd relay alarm delay value	Short	R/W	
222	3rd relay control term	Short	R/W	Range：0~255
223	3rd relay low alarm value	Short	R/W	Range：0~9999

224	3rd relay high alarm value	Short	R/W	Range：0~9999
225	3rd relay alarm return difference	Short	R/W	
226	3rd relay alarm delay value	Short	R/W	
227	4th relay control term	Short	R/W	Range：0~255
228	4th relay low alarm value	Short	R/W	Range：0~9999
229	4th relay high alarm value	Short	R/W	
230	4th relay alarm return difference	Short	R/W	
231	4th relay alarm delay value	Short	R/W	
236	1st transmit output control term	Short	R/W	Range：0~255
237	1st transmit output upper limit corresponding value	Short	R/W	Range：0~9999
238	2nd transmit output control term	Short	R/W	Range：0~255
239	2nd transmit output upper limit corresponding value	Short	R/W	Range：0~9999
240	3rd transmit output control term	Short	R/W	Range：0~255
241	3rd transmit output upper limit corresponding value	Short	R/W	Range：0~9999
242	4th transmit output control term	Short	R/W	Range：0~255
243	4th transmit output upper limit corresponding value	Short	R/W	Range：0~9999
252	1st transmit output value	Short	R/W	Range: 0 ~ 9999 (corresponding to 0 ~ 20mA or 0 ~ 5V). When the transmitter output item is set to 0, the corresponding transmitter output can be written to the value control, and the current value of the transmitter output can be read.
253	2nd transmit output value	Short	R/W	
254	3rd transmit output value	Short	R/W	
255	4th transmit output value	Short	R/W	
256	A phase voltage total harmonic	Short	R	Refer to Notes (9)
257	B phase voltage total harmonic	Short	R	
258	C phase voltage total harmonic	Short	R	
259	A phase voltage odd harmonic	Short	R	
260	B phase voltage odd harmonic	Short	R	
261	C phase voltage odd harmonic	Short	R	
262	A phase voltage even harmonic	Short	R	
263	B phase voltage even harmonic	Short	R	
264	C phase voltage even harmonic	Short	R	
265	A phase current total harmonic	Short	R	
266	B phase current total harmonic	Short	R	

267	C phase current total harmonic	Short	R	Refer to Notes (9)
268	A phase current odd harmonic	Short	R	
269	B phase current odd harmonic	Short	R	
270	C phase current odd harmonic	Short	R	
271	A phase current even harmonic	Short	R	
272	B phase current even harmonic	Short	R	
273	C phase current even harmonic	Short	R	
274~303	A phase voltage 2~31 harmonic	Short	R	
304~333	B phase voltage 2~31 harmonic	Short	R	
334~363	C phase voltage 2~31 harmonic	Short	R	
364~393	A phase current 2~31 harmonic	Short	R	
394~423	B phase current 2~31 harmonic	Short	R	
424~453	C phase current 2~31 harmonic	Short	R	
454	A phase voltage peak coefficient	Short	R	3-digit decimal
455	B phase voltage peak coefficient	Short	R	
456	C phase voltage peak coefficient	Short	R	
457	A phase current K coefficient	Short	R	2-digit decimal
458	B phase current K coefficient	Short	R	
459	C phase current K coefficient	Short	R	
460	A phase telephone waveform factor	Short	R	
461	B phase telephone waveform factor	Short	R	
462	C phase telephone waveform factor	Short	R	
472	Zero sequence voltage	Short	R	Secondary side value, 1-digit decimal
473	Positive sequence voltage	Short	R	
474	Negative sequence voltage	Short	R	
475	Voltage unbalance	Short	R	1-digit decimal
476	Zero sequence current	Short	R	Secondary side value, 3-digit decimal
477	Positive sequence current	Short	R	
478	Negative sequence current	Short	R	
479	Current unbalance	Short	R	1-digit decimal
512	Year	Short	R	System current time

513	Month	Short	R/W	System current time
514	day	Short	R/W	
515	hour	Short	R/W	
516	minute	Short	R/W	
517	second	Short	R/W	
518~520	Time for 1st period fee	Short	R/W	The multi-rate information is divided into 12 periods and four rates, each period occupies three registers: the first register is time-consuming, the second register is time-consuming, and the third register is rate-consuming; the four rates are 0-tip, 1-peak, 2-flat and 3-valley, respectively.
521~523	Time for 2nd period fee	Short	R/W	
524~526	Time for 3rd period fee	Short	R/W	
527~529	Time for 4th period fee	Short	R/W	
530~532	Time for 5th period fee	Short	R/W	
533~535	Time for 6th period fee	Short	R/W	
536~538	Time for 7th period fee	Short	R/W	
539~541	Time for 8th period fee	Short	R/W	
542~544	Time for 9th period fee	Short	R/W	
545~547	Time for 10th period fee	Short	R/W	
548~550	Time for 11th period fee	Short	R/W	
551~553	Time for 12th period fee	Short	R/W	
554,555	Total positive active sharp energy	Long	R	Secondary side value, 3-digit decimal
556,557	Total negative active sharp energy	Long	R	
558,559	Total inductive reactive sharp energy	Long	R	
560,561	Total capacitive reactive sharp energy	Long	R	
562,563	Total positive active peak energy	Long	R	
564,565	Total negative active peak energy	Long	R	
566,567	Total inductive reactive peak energy	Long	R	
568,569	Total capacitive reactive peak energy	Long	R	
570,571	Total positive active flat energy	Long	R	
572,573	Total negative active flat energy	Long	R	
574,575	Total inductive reactive flat energy	Long	R	
576,577	Total capacitive reactive flat energy	Long	R	
578,579	Total positive active valley energy	Long	R	
580,581	Total negative active valley energy	Long	R	

582,583	Total inductive reactive valley energy	Long	R	Secondary side value, 3-digit decimal
584,585	Total capacitive reactive valley energy	Long	R	
586,587	Total positive active energy	Long	R	
588,589	Total negative active energy	Long	R	
590,591	Total inductive reactive energy	Long	R	
592,593	Total capacitive reactive energy	Long	R	
594,595	This month's positive active sharp energy	Long	R	
596,597	This month's negative active sharp energy	Long	R	
598,599	This month's inductive reactive sharp energy	Long	R	
600,601	This month's capacitive reactive sharp energy	Long	R	
602,603	This month's positive active peak energy	Long	R	
604,605	This month's negative active peak energy	Long	R	
606,607	This month's inductive reactive peak energy	Long	R	
608,609	This month's capacitive reactive peak energy	Long	R	
610,611	This month's positive active flat energy	Long	R	
612,613	This month's negative active flat energy	Long	R	
614,615	This month's inductive reactive flatp energy	Long	R	
616,617	This month's capacitive reactive flat energy	Long	R	
618,619	This month's positive active valley energy	Long	R	
620,621	This month's negative active valley energy	Long	R	
622,623	This month's inductive reactive valley energy	Long	R	
624,625	This month's capacitive reactive valley energy	Long	R	
626,627	This month's positive active energy	Long	R	
628,629	This month's negative active energy	Long	R	
630,631	This month's inductive reactive energy	Long	R	
632,633	This month's capacitive reactive energy	Long	R	
634,635	Last month's positive active sharp energy	Long	R	
636,637	Last month's negative active sharp energy	Long	R	
638,639	Last month's inductive reactive sharp energy	Long	R	
640,641	Last month's capacitive reactive sharp energy	Long	R	
642,643	Last month's positive active peak energy	Long	R	

644,645	Last month's negative active peak energy	Long	R	Secondary side value, 3-digit decimal
646,647	Last month's inductive reactive peak energy	Long	R	
648,649	Last month's capacitive reactive peak energy	Long	R	
650,651	Last month's positive active flat energy	Long	R	
652,653	Last month's negative active flat energy	Long	R	
654,655	Last month's inductive reactive flatp energy	Long	R	
656,657	Last month's capacitive reactive flat energy	Long	R	
658,659	Last month's positive active valley energy	Long	R	
660,661	Last month's negative active valley energy	Long	R	
662,663	Last month's inductive reactive valley energy	Long	R	
664,665	Last month's capacitive reactive valley energy	Long	R	
666,667	Last month's positive active energy	Long	R	
668,669	Last month's negative active energy	Long	R	
670,671	Last month's inductive reactive energy	Long	R	
672,673	Last month's capacitive reactive energy	Long	R	
674,675	Last Last month's positive active sharp energy	Long	R	
676,677	Last Last month's negative active sharp energy	Long	R	
678,679	Last Last month's inductive reactive sharp energy	Long	R	
680,681	Last Last month's capacitive reactive sharp energy	Long	R	
682,683	Last Last month's positive active peak energy	Long	R	
684,685	Last Last month's negative active peak energy	Long	R	
686,687	Last Last month's inductive reactive peak energy	Long	R	
688,689	Last Last month's capacitive reactive peak energy	Long	R	
690,691	Last Last month's positive active flat energy	Long	R	
692,693	Last Last month's negative active flat energy	Long	R	
694,695	Last Last month's inductive reactive flatp energy	Long	R	
696,697	Last Last month's capacitive reactive flat energy	Long	R	
698,699	Last Last month's positive active valley energy	Long	R	
700,701	Last Last month's negative active valley energy	Long	R	
702,703	Last Last month's inductive reactive valley energy	Long	R	
704,705	Last Last month's capacitive reactive valley energy	Long	R	

706,707	Last Last month's positive active energy	Long	R	Secondary side value, 3-digit decimal
708,709	Last Last month's negative active energy	Long	R	
710,711	Last Last month's inductive reactive energy	Long	R	
712,713	Last Last month's capacitive reactive energy	Long	R	
768	Demand of maximum active power	Short	R	Secondary side value, 1-digit decimal
769~773	Time of active power demand	Short	R	Year，month，day，hour，minute
774	Demand of maximum reactive power	Short	R	Secondary side value, 1-digit decimal
775~779	Time of reactive power demand	Short	R	Year，month，day，hour，minute
780	Demand of maximum apparent power	Short	R	Secondary side value, 1-digit decimal
781~785	Time of apparent power demand	Short	R	Year，month，day，hour，minute
1024	Number of SOE records	Short	R	
1025~1031	SOE event record 1	Short	R	The first register of event record is event: high byte 0~3 represents DI 1~4, high byte 16~19 represents DO 1~4, low byte 1 represents switching input separated or switching output inactive, low byte 2 represents switching input closed or switching output action; the second to seventh registers represent year, month, day ,hour,minute,second.
1032~1038	SOE event record 2	Short	R	
1039~1045	SOE event record 3	Short	R	
1046~1052	SOE event record 4	Short	R	
1053~1059	SOE event record 5	Short	R	
1060~1066	SOE event record 6	Short	R	
1067~1073	SOE event record 7	Short	R	
1074~1080	SOE event record 8	Short	R	
1081~1087	SOE event record 9	Short	R	
1088~1094	SOE event record 10	Short	R	
1095~1101	SOE event record 11	Short	R	
1102~1108	SOE event record 12	Short	R	
1109~1115	SOE event record 13	Short	R	
1116~1122	SOE event record 14	Short	R	
1123~1129	SOE event record 15	Short	R	
1130~1136	SOE event record 16	Short	R	
1137~1472	SOE event record 17~64	Short	R	

Notes:

(1) The byte bits BIT0, BIT1, BIT2 and BIT3 of the switch input state indicate the state of the switch input port 1, 2, 3 and 4, 0 indicates that the switch input port is off, and 1 indicates that the switch input port is on.Writing this byte has no effect on the input port.Relay output status bytes, when reading: Bit BIT4, BIT5, BIT6, BIT7 respectively indicate the output status of relay 1, 2, 3, 4, 0 indicates that the relay is disconnected, 1 indicates that the relay is connected;BIT4, BIT5, BIT6 and BIT7 represent the write enabling states of write relays 1, 2, 3 and 4, 1 indicates the relay allowance of write control counterparts, 0 indicates the disallowance, bit BIT0, BIT1, BIT2, BIT3 respectively indicate the values of fixed control relays 1, 2, 3 and 4, 1 indicates the relay conduction of control counterparts, 0 indicates that the relay of control counterparts is disconnected, only the current relay. The remote control operation is effective only when the device is in the remote control operation mode and the writing enablement corresponds to the position of 1.

(2) The read-out voltage is the voltage value of the secondary side, which is fixed at 1 decimal digit. The voltage value of the secondary side = the read-out value/10, and the voltage value of the primary side = the read-out value×PT ratio/10.

(3)The read-out current is the current value of the secondary side, which is fixed at 3 decimal digits. The current value of the secondary side = the read-out value/1000, and the current value of the primary side = the read-out value×CT ratio/1000.

(4)Power, power factor symbol bit registers, low byte bits BIT0, BIT1, BIT2, BIT3, BIT4, BIT5, BIT6, BT7 represent A phase active power, B phase active power, C phase active power, total active power, A phase reactive power, B phase reactive power, C phase reactive power, total reactive power symbol bit, 0 represents positive, 1 represents negative. High byte bits BIT0, BIT1, BIT2 and BIT3 represent the inductivity or compatibility of phase A power factor, phase B power factor, phase C power factor and total power factor respectively, 0 represents the inductivity and 1 represents the compatibility.

(5)The read-out power is the power value of the secondary side, which is fixed at one decimal digit. The power value of the secondary side = the read-out value/10, and the power value of the primary side = the read-out value×PT ratio×CT ratio/10.

(6)Power factor fixed 3 decimal digits, power factor value = readout value / 1000.

(7)Frequency fixed 2 decimal digits, frequency value = readout value / 100.

(8)Electric energy value is composed of three registers (Word0, Word1, Word2). The first two registers form a long integer, representing the value of the integer part, and the last one is an integer, representing the value of the decimal part, which is a three-digit decimal. Electric energy value = Word0× 65536 + Word1 + Word2/ 1000 in KWh or Kvarh.

(9)The harmonic value is fixed to 2 decimal digits. For example, the total harmonic content of the read A phase voltage is 342, and the actual harmonic content is 3.42%

Chapter 6. Switch value module

The output module of relay has three working modes: power alarm mode, switch control mode and remote control mode. Each relay can flexibly set working mode, alarm items and alarm range in programming operation.
Remote control function: The output state of the relay can be read by 01H command, and the output state of the relay can be controlled by 05H and 0FH. The control information can also be written to the DO information register by 10H command, which can control the switching on and off of the input port, write the corresponding port of 1 to turn on and write the corresponding port of 0 to turn off. If the binary number 00110001 is written, it means that one switch output port is on, two switch output ports are off, and the output of three or four relays is unaffected. To use remote control function, alarm parameters should be set to 0, and remote control function should be used.
In remote control mode, the relay works in two modes (self-holding mode and pulse mode). When the delay time is set to 0, it works in self-holding mode; when the delay time is not set to 0, it works in pulse mode, the delay time is the action

time of pulse relay, and when the action exceeds the set delay time, the relay automatically resets.

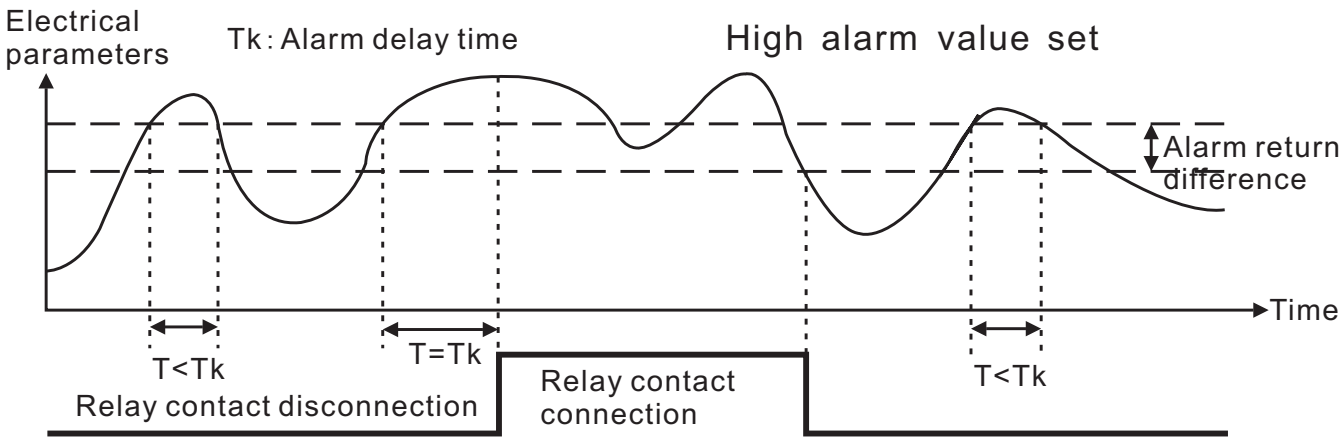
The alarm delay value refers to that when the power alarm mode or the switch control mode, the corresponding relay will only act after the alarm delay time which satisfies the alarm condition is set continuously.

Electricity alarm: Set the parameters to be alarmed, alarm mode (upper limit, lower limit or upper limit), lower limit alarm value, upper limit alarm value and alarm return difference value. When the measured electric parameters exceed the alarm value range, the corresponding switch output port is on-state. When the measured electric parameters return to the normal range, the switch output port is off.The setting value of alarm parameters is the value of secondary side. When setting, the setting value of primary side should be converted to that of secondary side. For voltage, the setting value of alarm is equal to alarm value/PT ratio, for current, the setting value of alarm is equal to alarm value/CT ratio, and for power, the setting value of alarm is equal to alarm value/(PT ratio ×CT ratio).

Programming examples: For 10KV/100V and 400A/5A instruments, DO1 is set as Ua > 11KV alarm, DO2 is Ia > 400A alarm, and its alarm is set as follows:

Item	Alarm condition	Relay control item	Alarm value
Relay1	UA>11KV	65	110.0
Relay2	IA>400A	71	5.000

Switch quantity alarm: The switch quantity output port is controlled by the switch quantity input port. It can be set as the switch quantity input port to turn on the control output port or the switch quantity input port to turn off the control input port to turn on. Diagram of alarm action:



Switch output term (transmit output term) comparison table

The alarm item is set to 0 and the relay is in the remote control state.

Item	Switch output			Transmit output			
	Low alarm (switch input on alarm)	Hihg alarm (switch input cut off alarm)	high and low alarm	0~20mA	4~20mA	0~10~20 mA	4~12~20 mA
UA(A phase voltage)	1	65	129	1	65		
UB(B phase voltage)	2	66	130	2	66		
UC(C phase voltage)	3	67	131	3	67		
UAB(AB line voltage)	4	68	132	4	68		
UBC(BC line voltage)	5	69	133	5	69		
UCA(CA line voltage)	6	70	134	6	70		
UA(A phase current)	7	71	135	7	71		
UB(B phase current)	8	72	136	8	72		
UC(C phase current)	9	73	137	9	73		
PA(A phase active power)	10	74	138	10	74	138	202
PB(B phase active power)	11	75	139	11	75	139	203
PB© phase active power)	12	76	140	12	76	140	204
PS(total active power)	13	77	141	13	77	141	205
QA(A phase reactive power)	14	78	142	14	78	142	206
QB(B phase reactive power)	15	79	143	15	79	143	207
QC(C phase reactive power)	16	80	144	16	80	144	208
QS(total reactive power)	17	81	145	17	81	145	209
SA(A phase apparent power)	18	82	146	18	82		
SB(B phase apparent power)	19	83	147	19	83		
SC(Cphase apparent power)	20	84	148	20	84		
SS(total apparent power)	21	85	149	21	85		
PFA(A phase power factor)	22	86	150	22	86	150	214
PFB(B phase power factor)	23	87	151	23	87	151	215
PFC(C phase power factor)	24	88	152	24	88	152	216
PFS(total power factor)	25	89	153	25	89	153	217
F(frequency)	26	90	154	26	90	154	218
A phase voltage total harmonic	27	91	155	27	91		
B phase voltage total harmonic	28	92	156	28	92		

Item	Switch output			Transmit output			
	Low alarm (switch input on alarm)	Hihg alarm (switch input cut off alarm)	high and low alarm	0~20mA	4~20mA	0~10~20 mA	4~12~20 mA
C phase voltage total harmonic	29	93	157	29	93		
A phase current total harmonic	30	94	158	30	94		
B phase current total harmonic	31	95	159	31	95		
C phase current total harmonic	32	96	160	32	96		
UA、UB、UC simultaneous monitoring	45	109	173				
UAB、UBC、UCA simultaneous monitoring	46	110	174				
IA、IB、IC simultaneous monitoring	47	111	175				
Negative total active power	48	112	176				
DI1(switch input1)	49	113					
DI2(switch input2)	50	114					
DI3(switch input3)	51	115					
DI4(switch input4)	52	116					

Chapter 7. Analog transmitting output module

The instrument can offer the function of four-channel analog transmitting output. Each channel can choose to set any of the 26 parameters,with the instrument's function for analog transmitting output module, to reach the function of parameter 's analog transmitting output(0-20mA/4-20mA).The corresponding relation can be set at random.

Parameter:output 0-20mA,4-20mA,0~5V,0~10V,class:0.5

Overload:120% effective output,the maximum current:24mA,the maximum volt:16V

Load:Rmax=500Ω.

The transmitting output item in the menu is used to set which of the 26 electric parameters is used as the transmitting output item. Meanwhile, it is pointed out that the transmitter-output type is 0~20mA, 4~20mA, 0~10~20mA4~12~20mA. The relationship between the transmitting output item and the electric parameters can be seen in the reference table of the transmitter-output item. Transmitting output range is used to set the measurement value of the corresponding electrical parameters when the transducer output limit is 20 mA. The measurement value here is the secondary side value. The primary side value is converted to the secondary side value method and the setting of the alarm output value of the relay. Refer to the setting of the alarm output value. Power factor transducer output fixed at 0.500-1.000 corresponds to DC0-20mA or 4-20mA.

0-10-20 mA or 4-12-20 mA are bidirectional transmitter outputs. For bi-directional frequency transducer output, the transducer output is centered at 50Hz. If the set value is 5.00Hz, the corresponding transducer output range is 45.00Hz ~ 50.00Hz ~ 55.00Hz.For active power (or reactive power) bidirectional transmitting output, if set to 3300W, the corresponding transducer output range is -3300W~ 0~+3300W; for power factor bidirectional transmitting output, the corresponding transmitting output is fixed to C0.500~1.000~L0.500.