MIZUDA

Multifunction

Power Meter

(Harmonic Payment Rate)

User Manual

M30HM Model

MIZUDA

Overview

Digital display M30HM multifunction power meter is designed for power system, Industrial and mining enterprises, public facilities, intelligent buildings and other power monitoring, intelligent control, measurement and assessment applications of high precision, high reliability, cost-effective intelligent distribution meter products. It can measure all the power parameters in the three-phase power grid intelligently, such as: three-phase voltage (phase/line), three-phase current, active power, reactive power, apparent power, power factor, grid frequency, four-quadrant power measurement, and RS485 communication interface with standard power pulse output and remote transmission.

Harmonic table (H) includes the above functions, but also includes the measurement of voltage, current total harmonic content, 2-31 parity fraction content, voltage and current unbalance degree;

The multiple rate table (F), in addition to the above features, has a real-time clock, 4 rates, and 4 periods.

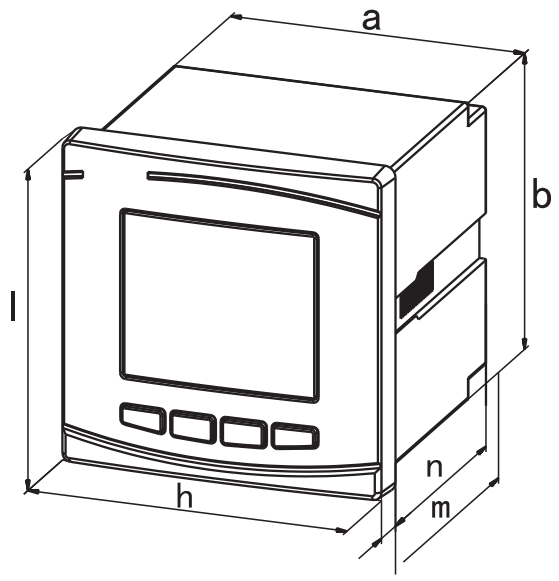
Optional 1-6 switching input (DI), 1-4 relay output (DO), 1-4 analog output (AO).

1. Technical Parameters

Items		Parameters		
Accuracy class		Power measurement, active power 0.5, reactive power 1		
Signal Input	Wiring	3 phase 4 wires Y34/3 phase 3 wires V33		
	Voltage range	AC400V/100V	Over load	Lasting : 1.2 times instant time:2 times(10 seconds)
	Current range	AC5A/1A	Over load	Lasting : 1.2 times instant time:10 times(5 seconds)
	Power consumption	Voltage: <1VA (per phase) current <0.4VA (per phase)		
	Frequency	40-65 Hz		
Power supply		Working range: AC220V±10% (AC/DC89-265V need to be customized) Power consumption: <5VA		
Communication		Rs485 communication, physical layer isolation Modbus-RTU communication protocol Communication baud rate 4800-9600, verification mode: N81		
Analog output		4-20mA transmission output (programmable setting of transmission items and corresponding values)		
Relay output		Programmable remote control/alarm output Contact capacity 3A/250VAC 3A/24VDC		
Telemetry switch		Passive dry contact input		
Display		LCD display		
Display mode		Programmable, change, cycle display		
Environment		Operating temperature: - 10 - 55°C Relative humidity: ≤93% Altitude: ≤2500 m Storage temperature: - 20 - 75°C no rain, snow, salt spray and corrosive gases		
Safety		Insulation: signal, voltage, output terminal resistance to case > 50 MΩ Withstand voltage: signal input, power supply, output terminal > AC 2 KV		

2. Installation and Wiring

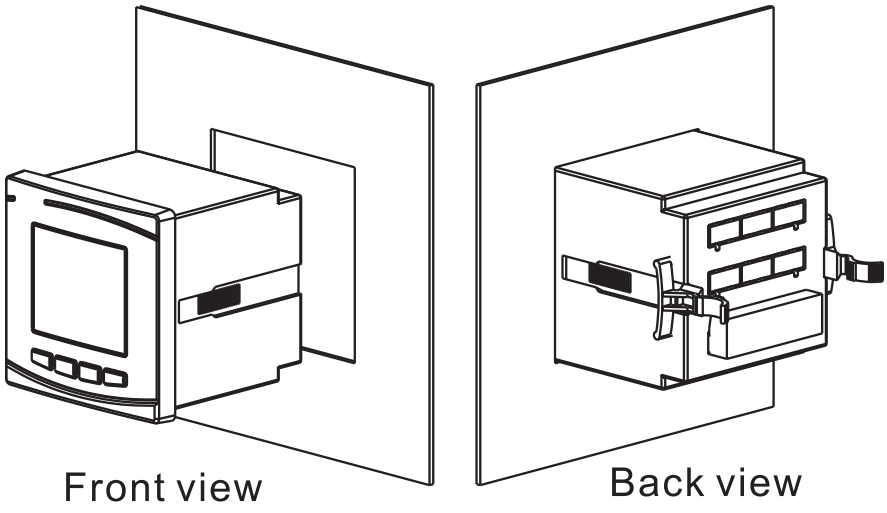
2.1 Meter's dimension(mm)



Installation dimension: a×b Hole size:s×y Panel dimension:l×h

Outline code	Model of Meter	Frame Dimension (l×h)	Screen Dimension (a×b)	Mounting Dimension (s×y)	Total length (N)	
					E type Basic type	Z-type Functional type
2	2H(F)Y	120×120	110×110	111×111	114	55
9	9H(F)Y	96×96	90×90	91×91	55	86

2. 2 Installation method

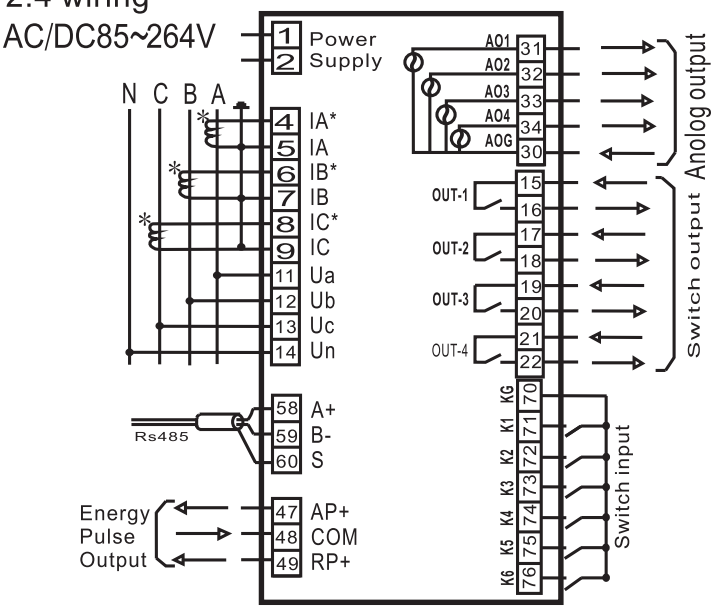


1）Open a s×y（mm）hole in the fixed distribution cabinets;
2）Take out the meter and remove the fixing bracket;
3）Meter is installed in the mounting hole in the front;
4）Insert meter's fixing bracket, and tighten the screws to keep the meter in place;

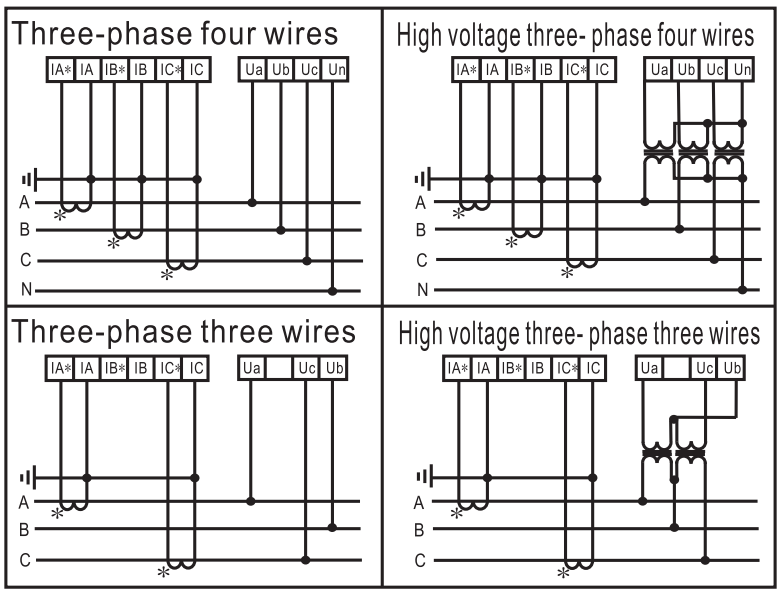
2.3 Wiring terminal function description
Signal and the function of terminal number

Power supply	1,2	Default AC220V±10% (customized AC/DC89-265)
Current signal	4,5,6,7,8,9	With *4, 6, and 8 are the end of the three-phase current inlet line
Voltage signal	11,12,13,14	Three-phase voltage input UA,UB,UC,UN
Relay output	15——22	4-way relay output (DO)
Transmitting Output	30——34	Four 4-20mA relay outputs (AO), 30 for the common end
Electric power pulse	47,48,49	47,49 is the positive end of the passive output and is connected to the positive end of the external supply
RS485	58,59	RS485 Communication A+,B-
Switch input	70——76	Six switch inputs (DI), 70 is the common end

2.4 wiring



Typical wiring diagram of low voltage network



Wiring instructions

（a）Voltage input: The input voltage should not be higher than the rated input voltage of the product (100V or 400V), otherwise PT (voltage transformer) should be considered, in order to facilitate maintenance, it is recommended to use wiring bars and front-end fuses.

（b）Current input: the standard rated current input is 5A or 1A. If the rated current is greater than the rated current, an external CT (current transformer) should be used. If there are other instruments on the CT used, the connection should be connected in series. Before removing the current input connection of the product, it is necessary to disconnect the CT primary circuit or short-circuit the secondary circuit.

（c）Ensure that the voltage and current phase correspond to each other, and the phase sequence and direction are the same, otherwise there will be errors in power and electric energy.

（d）The instrument housing is operated in three-phase four-wire or three-phase three-wire mode, and three-phase three-wire can be installed with only 2 CT (phase A and C).

Note: Two wiring modes can be set in the instrument, and the actual wiring mode must be the same as the setting mode in the instrument.

The specific wiring method is subject to the physical wiring diagram on the product.

3. Programming operation

3.1 Entry and exit programming state

Press the MENU key to enter the password authentication page. Press the “→” key or “← ”key to enter the password (0001 by default), and press“ ↵” to enter the programming status. Notice If no action is taken after the operation, the password is incorrectly entered. When you have retreated to the first layer MENU of the programming interface, press the “Menu” key and the instrument will prompt “SAVE-YES”. At this time, there are two kinds of operations available:

1: Save the preceding operation and exit. Press“ ↵ ”to save the operation and exit.

2: Do not save the operation just now, press the MENU key to stop saving and exit.

3.2 Use of keys in programming operations

Common functions of four buttons:

The “→”key or “←” key is used to switch the menu of the same layer, the “→” key is used to add numbers, and the“←”key is used to set the displacement of numbers. The MENU key is used to back up a menu or access the programming screen, and the “ ↵ ” key is used to confirm whether to access a lower menu or modify parameters.

How to set the number of tens of thousands to increase or decrease: Single-digit increase or decrease: The “→” key can add data 0-9 cyclesAdd and subtract other bits: The “←” key is used for shifting, and then the “→” key can add data 0-9 loops

For example, if the current-to-ratio is set to 1234 and the default current-to-ratio is 0001, press“→”3 to turn into 0004, press“←” to blink, press“→”3 to program 0034, and continue the preceding steps.

3.3 Programming Operations

3.3.1 Menu structure

In the programming state, the display interface adopts the hierarchical structure of the menu, the instrument provides four rows of digital display and a separate row of power display:

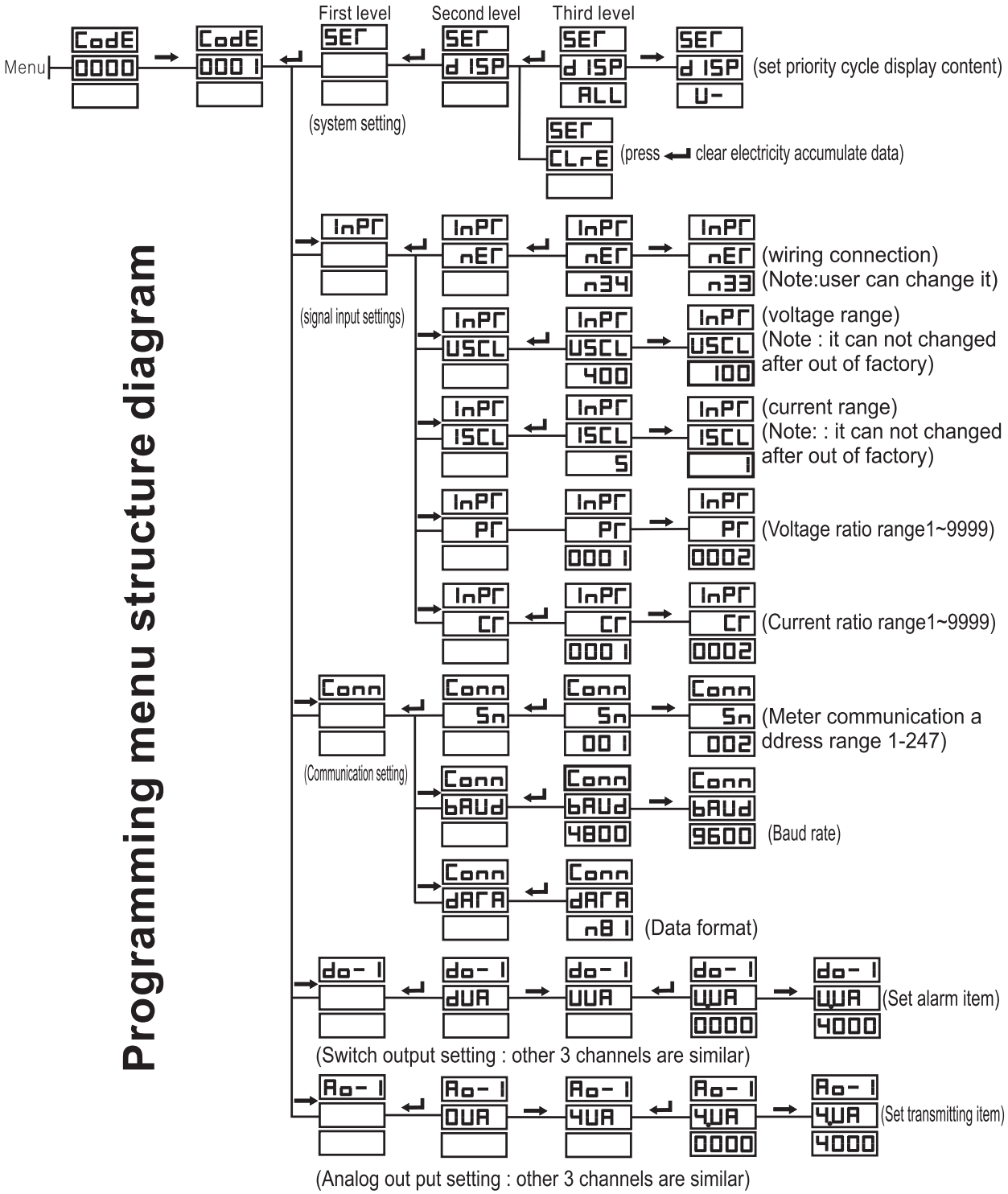
In the first layer (row) function menu, such as INPT signal input, signal output are realized in this menu;

In the second layer (row), the specific function setting menu, such as: CT indicates the current ratio;

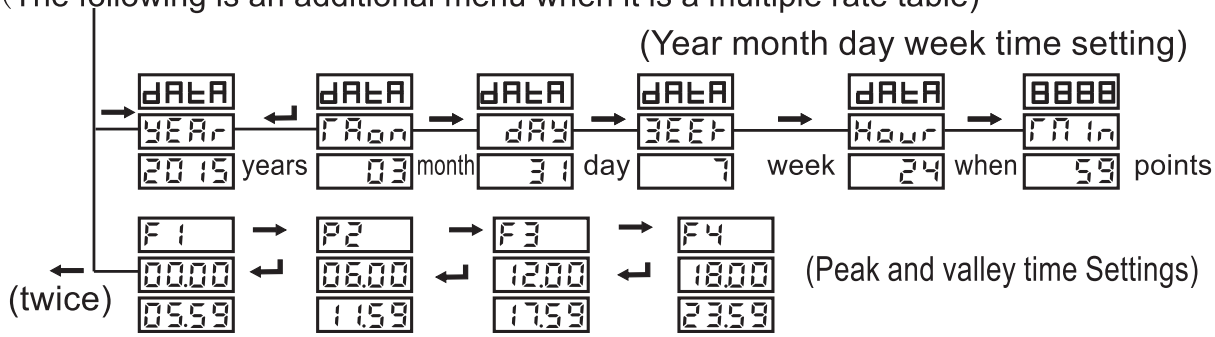
On the third layer (row), set specific parameters. For example, 0020 indicates that the current ratio is 20.

The structure of the display interface menu is as follows:

The structure diagram is as follows:



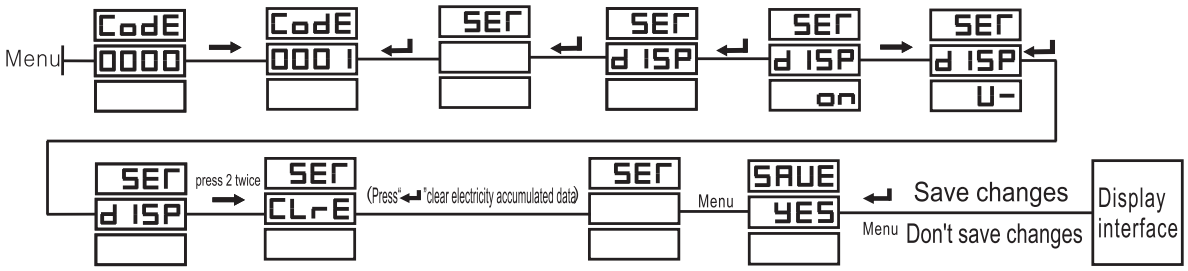
(The following is an additional menu when it is a multiple rate table)



First level	Second level	Third level	description
system settings SET	Password CODE	0-9999	Set User Password (default: 0001)
	Display DISP	ALL or other data	Set priority display items Set ALL for cyclic display (if set I, power display current)
	Clean electricity clean demand CLr	"↵" or "Menu"	Press ↵ to clear the power data. Press MENU to return unclear 0
signal input INPT	Wiring method NET	N.3.4 or N 3.3	Connection mode: three-phase four-wire or three-phase three-wire
	Voltage range U.SCL	400V or 100V	Voltage range (factory can not be modified)
	current range I.SCL	5A or 1 A	Current range (factory can not be modified)
	Voltage ratio PT	1-9999	1 scale /2 scale
	Current ratio CT	1-9999	1 scale /2 scale
communication setting	Address SN	1-247	Address range
	Communication speed BAUD	4800-9600	Baud rate
	Data format DATA	N data format	N81
Relay output set DO-i(i is 1-4)	See Appendix for selecting alarm items	Set the alarm project specific threshold value	Select the alarm item and set the alarm threshold. For example, DO-1,U,UA, or 3800 indicates that the output of the first relay is on when the A-phase voltage is greater than 380V.
Transfer output set AO-i(i is 1-4)	See Appendix for the selection of transfer items	Set the full scale of transmitting term	Select the transmission item and the corresponding power parameter For example, "AO-1", "IBH", "5000" indicates that the B-phase current 0-5A corresponds to the first 4-20mA transmission.
Calendar Settings(8L)	Select year month day week hour minute second	Set clock data	Select the corresponding item. For example, mon or 11 indicates November
Multiple rate setting(FL)	Select multiple rate time and time zone	Set multiple rate periods	Select Multiple rate period data 00.60 12.00 Period above 6 to 12 o 'clock is the peak period

3.3.2 Typical program operation example

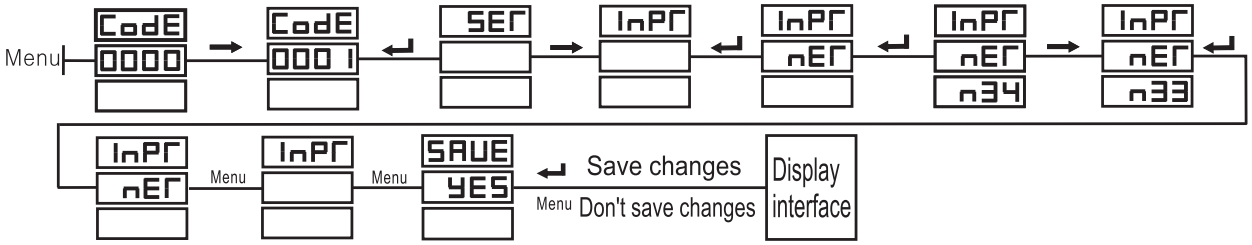
(1) System Settings (the user changes the cycle display mode to voltage priority and clears the power data)



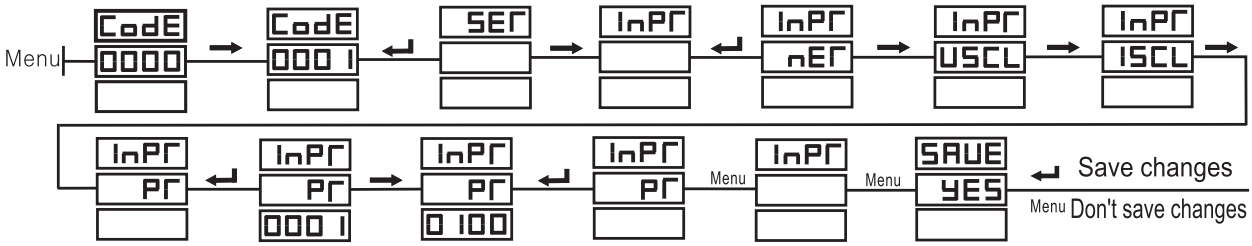
If you only clear power, skip the step of modifying the measurement information display mode.

(2) The setting of the input signal (Wiring method, voltage, current ratio)

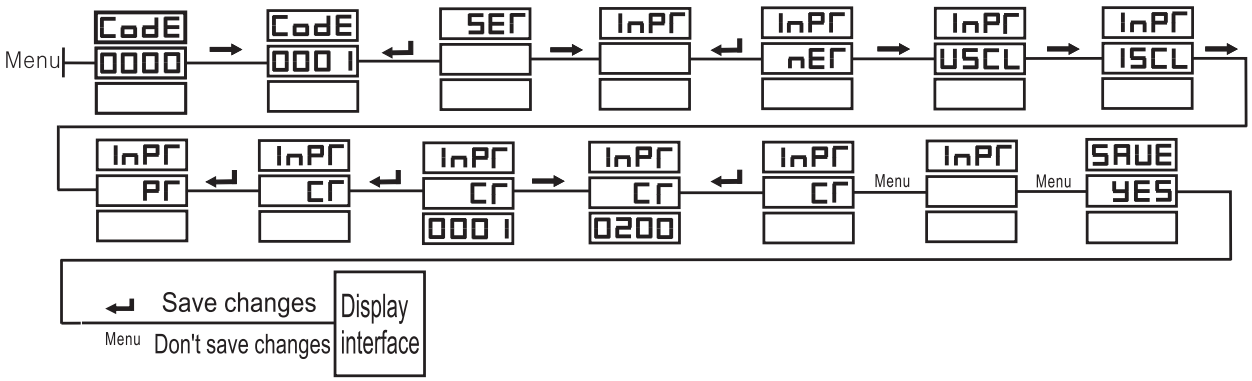
a: Change the wiring mode (three-phase four-wire to three-phase three-wire) :



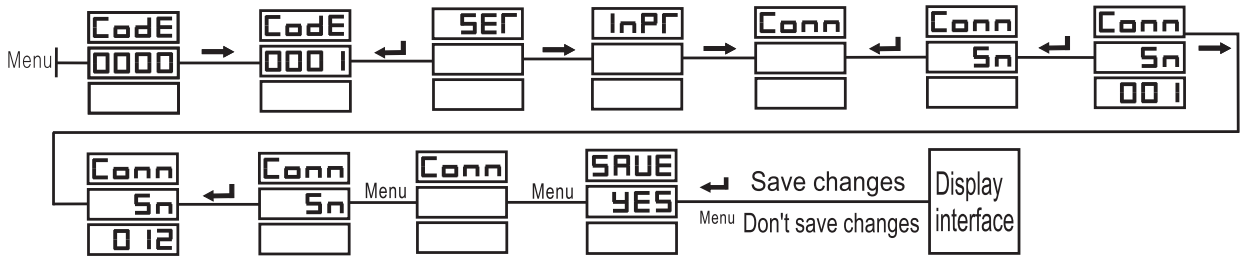
b: Voltage ratio setting (initial value is 1, set to 100) : such as 10KV/100V, 1 scale /2 scale =100



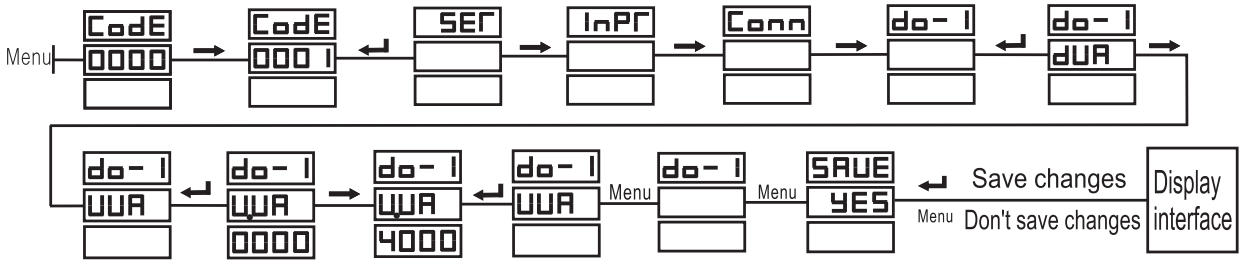
c: Current ratio setting (initial value is 1, set to 200) : for example, 1000A/5A, 1 scale /2 scale =200



(3) Communication Settings (default address is 1, modify the communication address is 12)



(4) Relay alarm output setting (set phase A voltage > 400V first relay on)

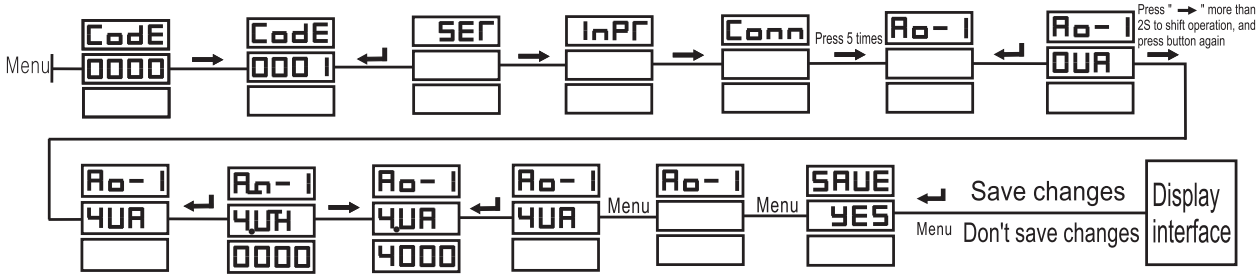


dUA First letter d indicates setting alarm offline (low)

UUA The first letter U indicates setting the alarm online (high).

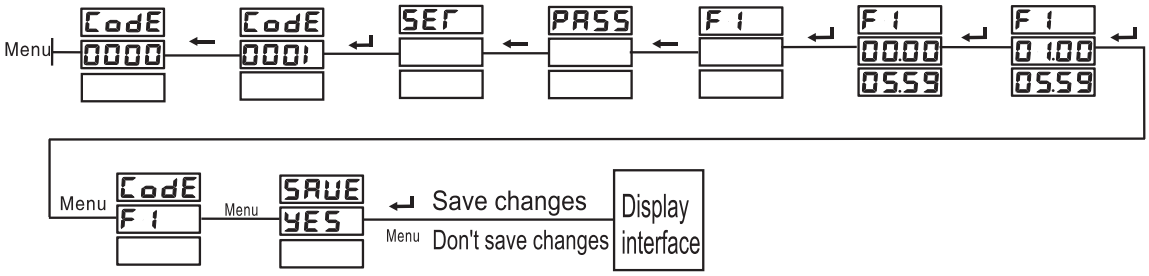
When the first letter blinks, press "→ " to switch between (d-U), press "← " to switch between alarm Settings except for the first letter, and press "→ " to switch other alarm Settings. See Appendix.

(5) Analog output setting (set A-phase voltage 0-400V to strain output 4-20mA)



Note: The full scale value of the transmission item should be set accurately, otherwise the transmission output is not accurate.

(6) Double rate setting (press "← " to modify the time, press "→ " to shift)



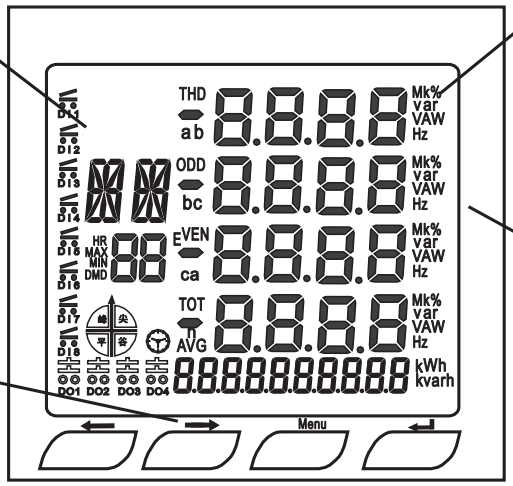
After changing the communication address and cable connection mode, power off and restart the meter or press "↵ " frequently for 3s to reset.

The above example is a single parameter modification method. You can also follow the steps to modify all parameters to be set and then save the modification.

4. Display panel description and measurement information

4.1 Product Panel and Display Information

5 LCD display is devided into eight pages display measurement information : three phase phase voltage,three phase line voltage, active power , reactive power, power factor,frequency, two way active power, two-way reactive power.



K- thousand
M- megabytes is the measurement grade.For example.the first line of LCD display 10.23 ,at the same time, k and V bright .It indicates that Ua=10.23KV.If K and M do not bright,then voltage is Ua=10.23V.

Measure the unit or mark three phase voltage , three phase current A active power power W ,reactive power Var ,power factor, frequency HZ.switch imput and switch output.

Four key is used to display or programming setting:"→ ""← " is change page or number's increasing or decreasing.MENU means to enter the programming setting or enter or exit key. "↵" is confirm key or same page information change key.

Hold down "← " to display the harmonic information page for about 2 seconds, hold down "→ " to switch to the power display, or press "→ " or "← " to switch to the basic electrical parameters page

Steps for setting multiple rates:

1: Set the time period (start time hh,mm; End time hh, mm);

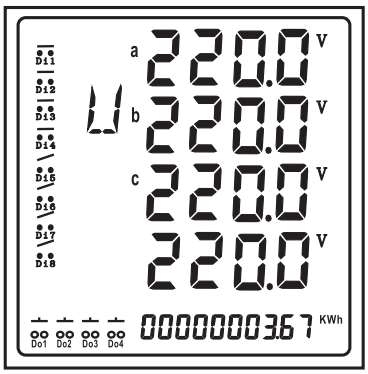
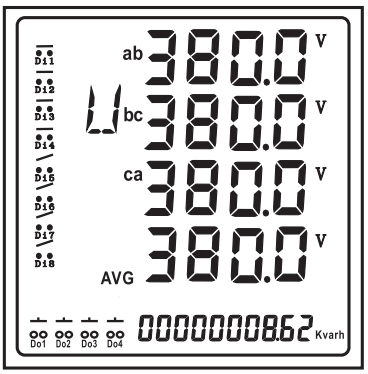
2: Set voltage ratio (PT), current ratio (CT) and wiring mode;

3: power zero;

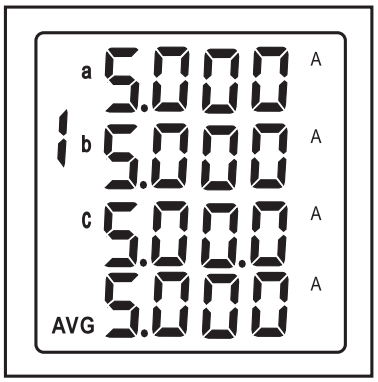
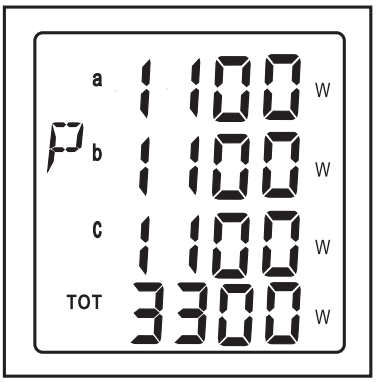
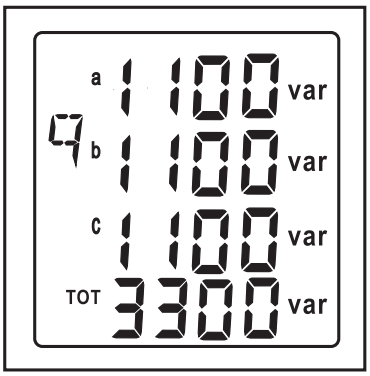
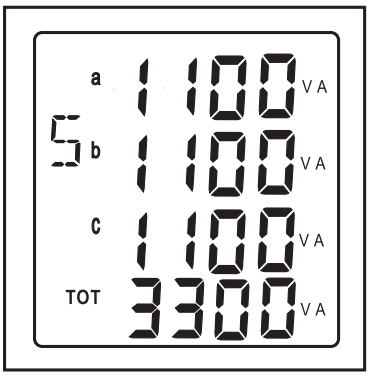
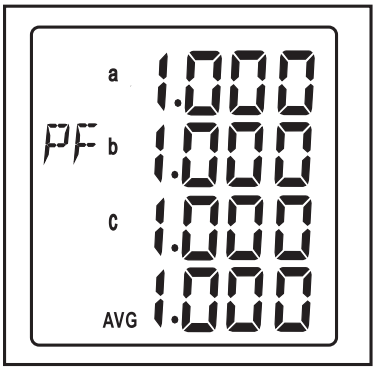
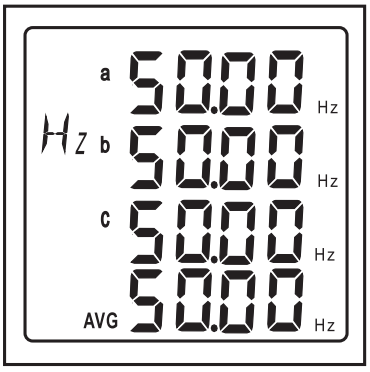
4: To join the signal, you must follow the above steps.

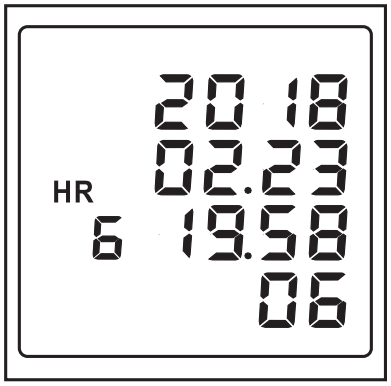
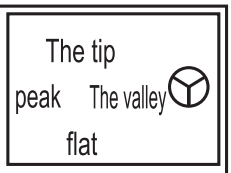
4. Multifunctional display of interface information

The "→ " key or "← " key can be used to switch pages (for example, press "→ " on the three-phase current screen to display the three-phase active power screen).

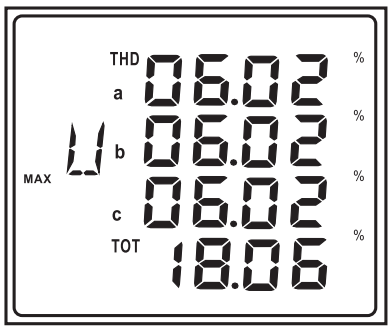
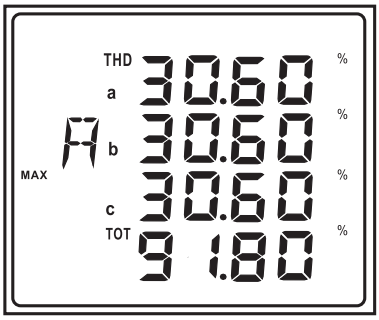
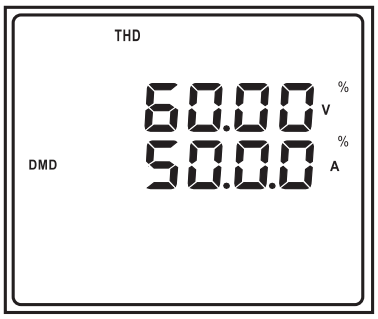
Display content	Introduction	Display content	Introduction
Display interface1: Phase voltage 	Ua,Ub,Uc are 220V, the average voltage AVG is 220V, the input signal (DI)1-4 is closed, the output (DO) 1-2 is closed, and the positive active energy is 3.67KWh	Display inrterface2: Line voltage 	The Uab,Ubc and Uca are 380V, the average voltage AVG is 380V, the input signal (DI)1-4 is closed, the output (DO) 1-2 is closed, and the forward reactive power is 8.62Kvarh

Special note: Ordinary multi-function in the monitoring interface as shown in the above figure, long press "→" key for 2 seconds to switch between the four-quadrant power, such as the left picture shows 3.67KWh, long press "→" key for 2 seconds to show 8.62Kvarh on the right picture.
The following interface does not describe the input (DI), output (DO), and power interfaces.

Display content	Introduction	Display content	Introduction
Display interface3: Current 	The three-phase current Ia,Ib and Ic are displayed respectively. The left figure shows the current value of one test multiplied by the set CT change value. AVG is the three-phase average current	Display interface4: Active power 	The three-phase active power WTOT is shown as the three-phase total active power
Display interface5: Reactive power 	The three-phase reactive power var. TOT is the total reactive power of the three phases	Display interface6: Apparent power 	The three phase apparent power VA. TOT is the total apparent power of the three phases
Display interface7: Power factor 	The three-phase power factor (COSΦ) and the three-phase average power factor (AVG) are shown respectively	Display interface8: Frequency 	The three-phase frequency Hz. AVG is displayed as the three-phase average frequency

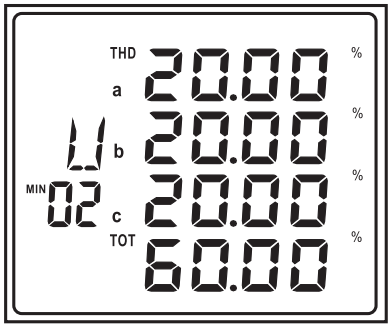
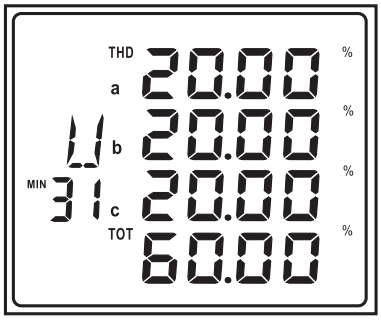
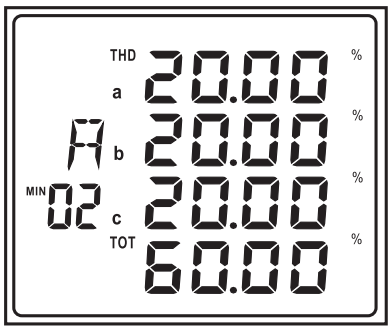
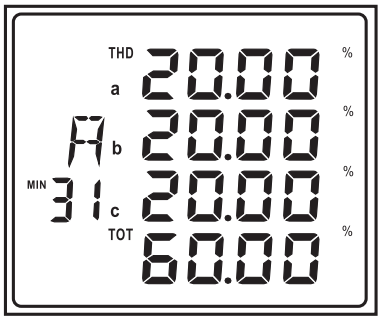
Multiple rate display: Main screen	Instructions	When a multiple rate schedule: There are 20 power switching displays, and the switching mode is also to long press the“→ ” key for 2 seconds to switch a power interface, such as:
Display screen 9: Calendar 	The calendar I nterface is only available when the rate is repeated, and the left picture is 19:58:06 on February 23, 2018, Sunday 6	  

For the harmonic (multiple rate) table: On the home page, hold down “← ” for 2 seconds to enter the Harmonic display screen

Hidden interface 1	Introduction	Hidden interface 1	Introduction
Display 1: Total harmonic content of three-phase voltage 	Total harmonic content of three-phase voltage	Display 2: Total harmonic content of three-phase current 	Press“→ ” to switch the harmonics display interface. The left picture shows the total harmonic content of the three-phase current
Interface 3: three-phase voltage and current unbalance 	Press “→ ”to switch the harmonics display interface. The left picture shows the three-phase voltage and current unbalance		

Hide the screen for the harmonic (multiple rate) table. 1 Hold down “← ”for 2 seconds to enter the screen that displays the voltage harmonic content

Hidden interface 2	Introduction	Hidden interface 2	Introduction

Display 1: three-phase voltage 2 times divided Harmonic content  	Second harmonic content of three-phase voltage	Display 2: three-phase voltage 31 times Harmonic content  	Press "→" or "←" to switch the display interface of the three-phase voltage 2-31 fractional harmonic content, the left picture is the 31st
Hide the screen for the harmonic (multiple rate) table. 2 Press "←"for 2 seconds to enter the screen that displays the current harmonic content			
Hidden interface 3	Introduction	Hidden interface 3	Introduction
Display 1: The three-phase current is divided twice Harmonic content  	Second harmonic content of three-phase voltage	Display 2: three-phase current 31 times Harmonic content  	Press "→" or "←" to switch the display interface of the three-phase voltage 2-31 fractional harmonic content, the left picture is the 31st

5. Function module.

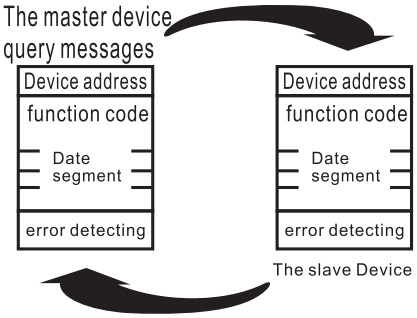
5.1 Communication

5.1.1 Physical Layer

1) RS485 communication interface, asynchronous half-duplex mode;
2) Communication speed 4800-9600bps can be set, factory default 9600;
3) Byte transfer format: N81.

5.1.2 Communication protocol MODBUS-RTU

A maximum of 32 instruments are connected to one communication bus. Please arrange the communication bus strictly according to the wiring requirements of RS485. Query response period graph



The structure of the data frame: Message Format

Address Code	Function Code	Data Code	Check Code
1 BYTE	1 BYTE	N BYTE	2 BYTE

Address code: 1-247 can be set, but the address must be unique
Function code: tells the terminal being addressed what function to perform

Code	Meaning
03	Read the value of data register
05	Remote control and modification

Data code: contains the data required by the terminal to perform a specific function or the data collected when the terminal responds to a query
Check code: Error check (CRC) is the first
Example communication message:
Read data (function code 03) : Enables the user to obtain the data collected and recorded by the terminal device, as well as the system parameters. There is no limit on the number of data collected by the host at a time, but it cannot exceed the defined address range.
The following is from the terminal device address 12 (0CH) slave machine, read 3 data Ia,Ib,Ic(data frame data each address occupies 2 bytes, Ia start address is 03 (03H), the length of the data is 3 bytes.

Querying Data frames (delivered by host)

Address	Order	Start register address		Register count		CRC 16 Low	CRC 16 High
		high bit	Low bit	high bit	Low bit		
0CH	03H	00H	03H	00H	03H	F4H	D6H

The response data frame (slave answer) indicates: Ia=1388H(5.000) Ib=1388H(5.000) Ic=1389H(5.001)

Address	Order	Length of data byte	Data 123456	CRC 16 Low	CRC 16 High
0CH	03H	06H	13H 88H 13H 88H 13H 89H	D3H	61H

5.2 Power metering and power pulse output
Multifunctional power meter can provide bidirectional active power, bidirectional reactive power metering and power pulse output function and RS485 digital communication interface to complete the data display and remote transmission.
1) Electrical characteristics: pulse acquisition interface
VCC≤48V,Iz≤50mA
2) Pulse constant: 51200 imp/kWh
3) Application example: The PLC terminal uses a pulse counting device, assuming that the number of pulses collected within the length of t is N, and the input of the instrument is: 10kV/ 100V-400A /5A, the electric energy accumulation of the instrument during this period of time is: N/51200 * 100 * 80 degrees.
5.3 Transfer Output
Refer to the converter output table, the converter output is 4-20mA
Accuracy level: 1S Load: Rmax = 400Ω
Overload: 100% effective output, maximum withstand current 24mA, voltage 12V
For example, if the full load is 5A, 20mA is transferred, and if the full load is 5.05A, 20mA is transferred

5.4 Relay output and input

The relay output has two modes to operate: alarm threshold setting mode and communication remote control mode Threshold alarm mode refer to the alarm item setting table

The input (DI) and output (DO) are binary 1 for on-going and 0 for off.

6. Common problems and solutions

6.1 After the cable is connected, the normal ammeter does not show no response

A: There is a wiring diagram above each instrument to check whether the connection line is wrong and whether the working voltage is in the normal range.

6.2 The instrument does not respond to any operation and cannot detect data

A: Observe whether the display and buttons of the instrument are intact, and try to power them on again.

6.3 The voltage, current and other data displayed on the instrument are incorrect

A: First of all, ensure that the correct connection of the voltage and current signal line to the meter, to ensure that there will be no phase sequence error of the current inlet and outlet terminal is correct, if you feel that the connection is correct, you can use a multimeter to measure the voltage, clamp meter to measure the current signal to determine whether the meter display is correct, and the meter display is a primary grid value, if the voltage and current ratio is set incorrectly, The data shown must be wrong.

6.4 The electrical energy of the meter is incorrect

A: The power accumulation is based on the measurement of power. First check whether the wiring and transformer ratio are correct as shown in 6.3. Generally, the common error is that the incoming and outgoing lines of the signal line from the transformer are connected in reverse, or the transformer ratio is set incorrectly.

6.5 The communication of the instrument is not connected or the return data is incorrect

A: First of all, ensure that the communication set address, baud rate and other information is consistent with the host computer, if all the tables on the site have no data return, first take a separate instrument test, if the use is normal alone, please ensure that the communication bus is correct and reliable, if a single table is not normal, please check and confirm the software problem of the host computer, or do not use the host computer first, try debugging with serial port tools. If there are multiple tables in a place but a few are not communicated, batch testing can be used to check the communication bus first, and then the abnormal instrument and the normal instrument communication address can be exchanged, or the two instrument installation positions can be exchanged and then powered on communication to troubleshoot the problem. If you think that the return data is incorrect, the open data of the instrument has primary grid float data and secondary grid int/long data, please carefully read the remarks in the communication address table and the conversion display of each data format.

6.6 Other Exceptions

A: If the screen is damaged or other abnormal circumstances are not summarized, the user should record the scene situation in detail, and then contact the company's after-sales service, and analyze the possible causes and solutions according to the feedback.

Note: the digital display instrument, especially the liquid crystal digital display instrument, is a precision instrument, pay attention to whether the use environment is suitable for installation and commissioning, and handle gently to avoid external damage to the instrument.

Appendix:
Transmission item setting table (each item needs to be set separately, such as: transmission item A, B, C can only set the transmission range of phase A)

Transfer item	The transfer type is set	range	Description (4-20mA transmission output)
A/B/C phase voltage	4.UA/4.Ub/4.UC	2200	The A/B/C phase voltage 0-220V converter output
AB/BC/CA phase voltage	4.UAb/4.Ubc/4.UCA	4000	The AB/BC/CA line voltage is 0-400V
A/B/C phase current	4.IA/4.Ib/4.IC	5000	The A/B/C phase current 0-5A is transmitted to the output
Active power of A/B/C phase	4.PA/4.Pb/4.PC	Alarm setting method (current as an example) : If the transformer is 400/5, it needs 350A online alarm, first set the current ratio to 80, and then set the alarm range to 3500. If the transformer is 1600/5, and 1500A is required for online alarm, first set the current ratio to 320, and then set the alarm range to 1500. If the transformer is 1600/5, it needs 500A offline alarm, first set the current ratio to 320, and then set the alarm range to 0500.	
Total active power	4.PS		
A/B/C phase reactive power	4.qA/4.qb/4.qC		
Total reactive power	4.qS		
A/B/C phase power factor	4.PFA/4.PFb/4.PFC		
Total power factor	4.PFS		
A/B/C look at each other in power	4.SA/4.Sb/4.SC		
Total apparent power	4.SS		
frequency	4.Fr		

Alarm item setting table (each threshold needs to be set separately, such as: alarm item A, B, C can only set the alarm range of phase A)

Transfer item	The transfer type is set	range	Description
A/B/C phase voltage	d.UA/d.Ub/d.UC	1000	Alarm setting for A/B/C phase voltage below 100V
	U.UA/U.Ub/U.UC	2200	Alarm setting for A/B/C phase voltage higher than 220V
AB/BC/CA phase voltage	d.UAb/d.Ubc/d.UCA	3000	Alarm setting for AB/BC/CA line voltage below 300V
	U.UAb/U.Ubc/U.UCA	4000	Alarm setting for AB/BC/CA line voltage higher than 400V
A/B/C phase current	d.IA/d.Ib/d.IC	1000	Alarm setting for A/B/C phase current below 1A
	U.IA/U.Ib/U.IC	5000	Alarm setting for A/B/C phase current higher than 5A
Active power of A/B/C phase	d.PA/d.Pb/d.PC	Alarm setting method (current as an example) : If the transformer is 400/5, it needs 350A online alarm, first set the current ratio to 80, and then set the alarm range to 3500. If the transformer is 1600/5, and 1500A is required for online alarm, first set the current ratio to 320, and then set the alarm range to 1500. If the transformer is 1600/5, it needs 500A offline alarm, first set the current ratio to 320, and then set the alarm range to 0500.	
	U.PA/U.Pb/U.PC		
Total active power	d.PS		
	U.PS		
A/B/C phase reactive power	d.qA/d.qb/d.qC		
	U.qA/U.qb/U.qC		
Total reactive power	d.qS		
	U.qS		
A/B/C phase power factor	d.PFA/d.PFb/d.PFC		
	U.PFA/U.PFb/U.PFC		
Total power factor	d.PFS		
	U.PFS		
A/B/C look at each other in power	d.SA/d.Sb/d.SC		
	U.SA/U.Sb/U.SC		
Total apparent power	d.SS		
	U.SS		
frequency	d.Fr		
	U.Fr		