MIZUDA

Multifunctional Power Meter User Manual

Overview

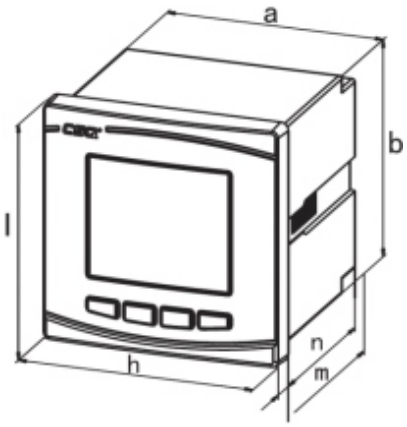
The digital display M30 series multifunctional power meter is a high-precision, high-reliability, and cost-effective power distribution meter product designed for power monitoring, intelligent control, and measurement assessment in power systems, industrial and mining enterprises, public facilities, and smart buildings.It can measure all electrical parameters in three-phase power grids, such as three-phase voltage (phase/line), three-phase current, active power,reactive power, apparent power, power factor, grid frequency, and four-quadrant energy measurement. It has a standard energy pulse output and a RS485 communication interface for remote transmission.

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

1. Technical Parameters

Item		Parameter		
Accuracy Level		Power measurement, active energy 0.5 level, reactive energy 1 level		
Signal Number Input	Wiring	Three-phase four-wire Y34/Three-phase three-wire V33		
	Voltage Range	AC 400V/100V	Overload	Continuous:1.2 times Instantaneous: 2 times (10s)
	Current Range	AC 5A/1A	Overload	Continuous:1.2 times Instantaneous: 10 times (5s)
	Power Consumption	Voltage: <1VA (per phase) Current <0.4VA (per phase)		
	Frequency	45-65Hz		
Operating Power Supply		Default: AC220V±10% (customizable AC/DC89-265V power supply) Power Consumption: <5VA		
Communication		Rs485 communication, physical layer isolation Modbus-RTU communication protocol Communication baud rate 4800-9600, Verification method: N81		
Analog output		4-20mA transmission output (programmable to set 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/LED display		
Display mode		Programmable, switchable, cyclic display		
Environment		Operating temperature: -10-55℃ Relative humidity: ≤93% Altitude: ≤2500m Storage temperature: -20-75℃ No rain, snow, salt spray, or corrosive gases		
Safety		Insulation: Signal, voltage, and output terminal to shell resistance > 50MΩ Withstand voltage: Signal input, power supply, and output terminal > AC2KV		

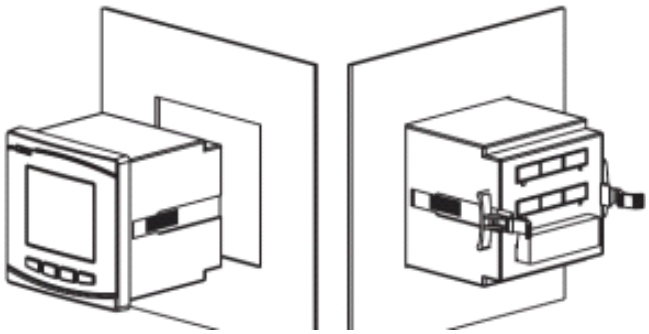
2. Installation and wiring
2.1 Instrument size (unit: mm)



Installation size: a x b Opening size: s x y Panel size: l x h

Appearance code	Instrument model	Appearance size (i x h)	Screen installation size (a x b)	Opening size (s x y)	Total length (N)	
					Type E Basic type	Type Z Add Function type
2	2S□	120*120	110*110	111*111	55	
9	9S□	96*96	90*90	91*91	55	86
3	3S□	83*83	75*75	76*76	95	
A	As□	72*72	66*66	67*67	95	

2.2 Installation method



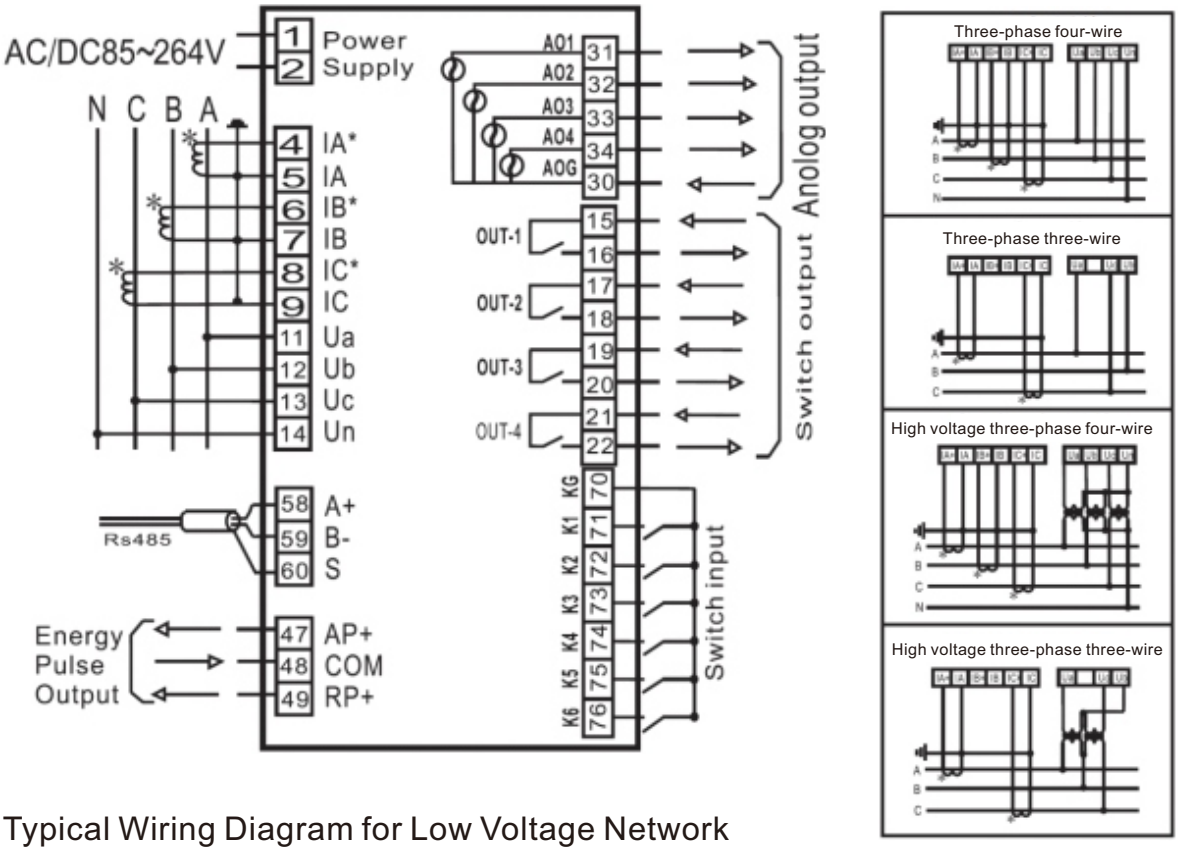
Front view Rear view

1. Drill a hole of s x y(mm) in the fixed distribution cabinet;
2. Take out the instrument and remove the fixing bracket;
3. The meter is installed from the front into the mounting hole;
4. Insert the meter fixing bracket and fix the meter.

2.3 Terminal function description
Signal and function terminal number

Operating Power Supply	1, 2	Default AC220V±10% (customizable AC/DC89-265)
Current signal	4, 5, 6, 7, 8, 9	With*4, 6, 8 are three-phase current input terminals
Voltage signal	11, 12, 13, 14	Three-phase voltage input UA,UB,UC,UN
Relay output	15---22	4 relay outputs (DO)
Transmitter output	30---34	4 channels of 4-20mA transmitter output (AO), 30 is the common terminal
Energy pulse	47, 48, 49	47, 49 are the positive terminals of the passive output, connected to the external positive terminal
RS485	58, 59	RS485 communication A+, B-
Digital input	70---76	6 channels of digital input (DI), 70 is the common terminal

2.4 Wiring



Typical Wiring Diagram for Low Voltage Network

Wiring Instructions:

(a) Voltage Input: The input voltage should not exceed the rated input voltage of the product (100V or 400V). If it does, consider using a PT (Voltage Transformer). For ease of maintenance, it is recommended to use a terminal block and a front-end fuse.

(b) Current Input: The standard rated current input is 5A or 1A. If the current exceeds the rated current, an external CT (Current Transformer) should be used. If the CT is used with other instruments, the wiring should be connected in series. Before removing the current input connection of the product, make sure to disconnect the CT primary circuit or short the secondary circuit once. For ease of maintenance, it is recommended to use a terminal block.

(c) Ensure that the voltage and current correspond to each other, and the phase sequence and direction are consistent, otherwise errors may occur in power and energy, etc.

(d) The meter shell works in three-phase four-wire or three-phase three-wire mode. For three-phase three-wire, only 2 CTs (A and C phases) can be installed.

Note: There are two wiring methods that can be set inside the meter. The actual wiring method must be consistent with the setting inside the meter.

Please refer to the physical wiring diagram on the product for the specific wiring method.

3. Programming Operation

3.1 Entering and Exiting Programming Mode

Press the 'MENU' key once in the display state to enter the password authentication page. Use the '→' key or '←' key to enter the password (default is 0001), and then press the '↲' key to enter the programming mode.Note: If there is no response after the operation, it means that the password input is incorrect.

In the first layer menu situation after returning to the programming interface, press the "MENU" key, the instrument will prompt "SAVE-YES", at this time there are two operations to choose from:

1: Save the recent operation and exit, press the "↲" key to save and exit;

2: Do not save the recent operation, press the "MENU" key to not save and exit.

3.2 Use of keys in programming operations

Common functions of the four keys:

The "→" key or "←" key is used to switch between menus on the same layer. The "→" key is used for number addition, and the "←" key is used for digit displacement when setting numbers;

The "MENU" key is used to go back to the menu or enter the programming interface,↲The " " key is used to enter the lower-level menu or confirm after modifying parameters.

How to increase or decrease the digits of tens, hundreds, and thousands:

Increase or decrease single digits: the '→' key can cycle through numbers 0-9

Increase or decrease other digits: use the '←' key to shift, then the '→' key can cycle through numbers 0-9

For example, if the current ratio is set to 1234, in the default current ratio of 0001, press the '→' key 3 times to change it to 0004, then press the '←' key to make the tens digit flash, press the '→' key 3 times to program 0034, continue with the above steps.

3.3 Programming Operation

3.3.1 Menu Structure

In programming mode, the display interface adopts a hierarchical menu structure. The instrument provides three rows of numerical displays:

In the first row (rank) function menu, both signal input and signal output are implemented in this menu.

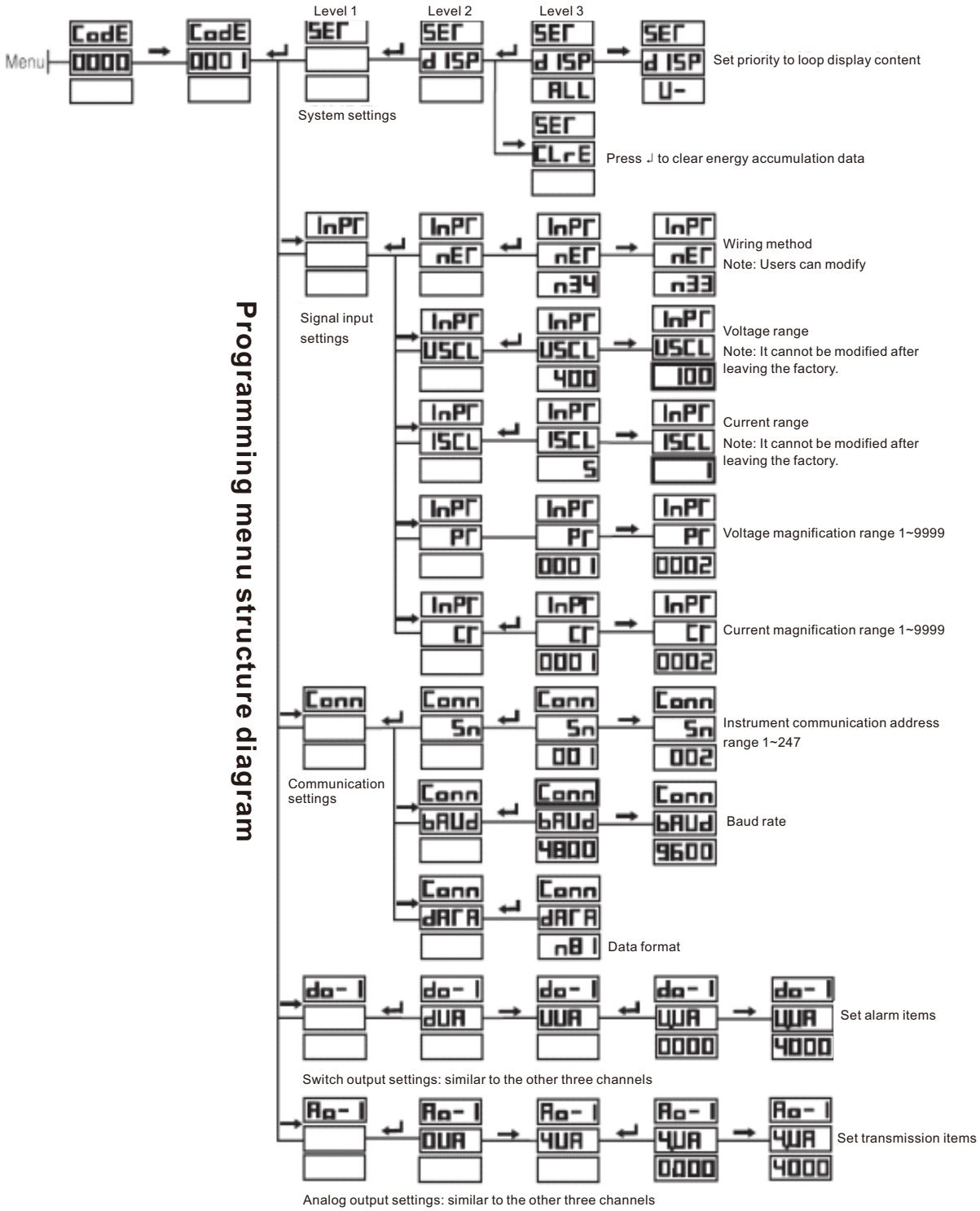
In the specific function setting menu on the 2nd floor (row), such as: CT represents current transformation ratio;

In the specific parameter setting menu on the 3rd floor (row), for example: 0020 represents a current transformation ratio of 20.

The structure organization of the display interface menu is as follows:

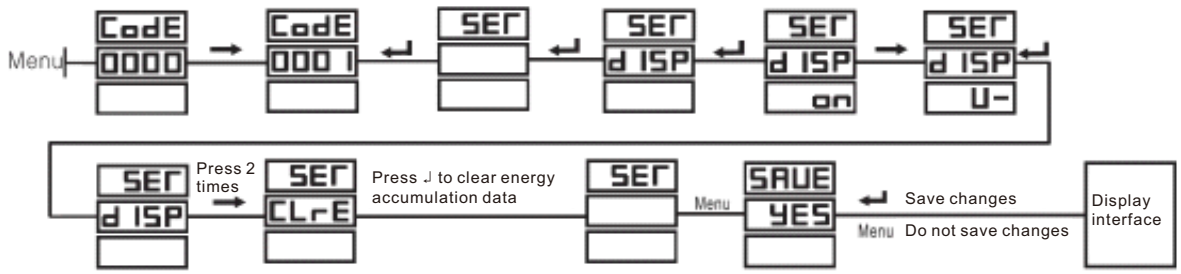
1st floor	2nd floor	3rd floor	Description
System settings SET	Password CODE	0-9999	Set user password (default 0001)
	Display DISP	ALL or other codes	Set priority display item, setting ALL will cycle display (e.g. setting I will display current when powered on)
	Reset energy CLRE	"↵or MENU	Press↵to reset energy data to 0, press MENU to return without resetting
Signal input INPT	Wiring method NET	N34 or N33	Wiring method: three-phase four-wire or three-phase three-wire
	Voltage range USCL	400V/100V	Voltage range (cannot be modified at the factory)
	Current range ISCL	5A/1A	Current range (cannot be modified at the factory)
	Voltage ratio PT	1-9999	1st scale/2nd scale
	Current ratio CT	1-9999	1st scale/2nd scale
Communication settings Conn	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)	Select alarm items Refer to the appendix	Set the specific threshold values for alarm items	Select alarm items and set alarm threshold values,For example, "DO-1", "U,UA" "3800" means that when the voltage of phase A is greater than 380V, the first relay will be turned on.
Transmitter output Set AO-i (i is 1-4)	Select transmission items Refer to the appendix	Set the full scale value for transmission items	Select transmission items and corresponding power parameters For example, "AO-1" "IBH" 5000 means that when the current of phase B is 0-5A, the first channel of 4-20mA transmission will be used.

The structural diagram is as follows



3.3.2 Typical Programming Operation Example

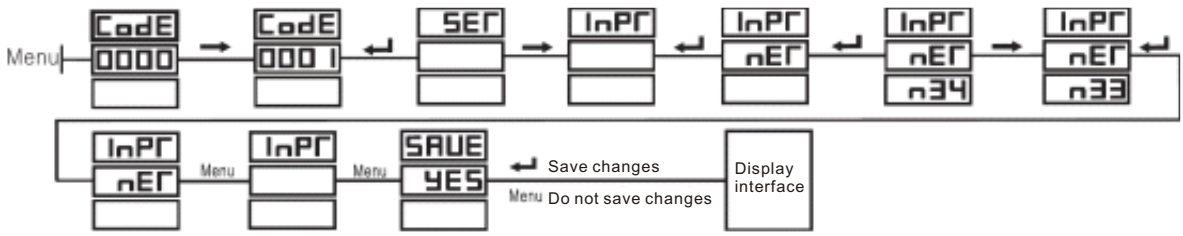
(1) System Settings (User changes the cyclic display mode to voltage priority and clears energy data)



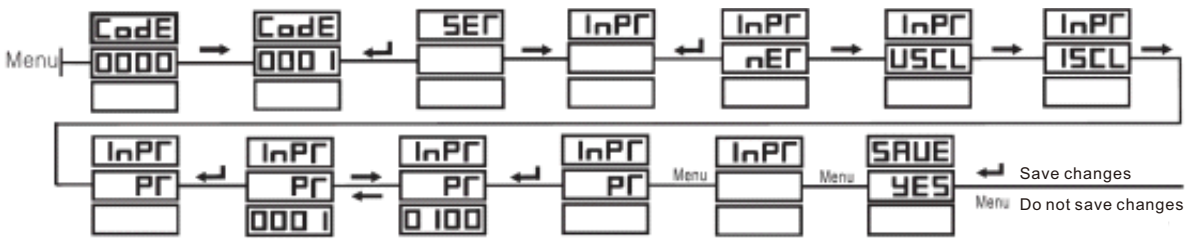
If only clearing energy data, you can skip the operation steps of modifying the measurement information display mode.

(2) Input Signal Settings (Wiring method, voltage, current ratio)

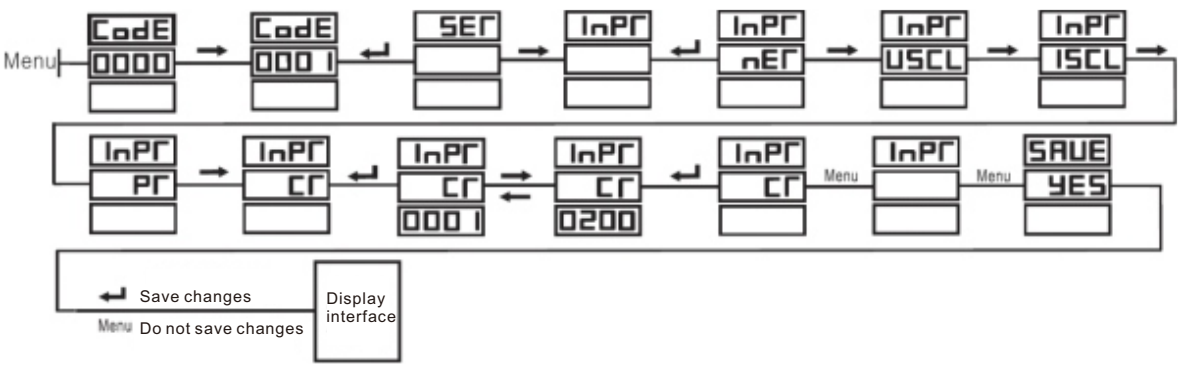
a: Modify the wiring method (change from three-phase four-wire to three-phase three-wire):



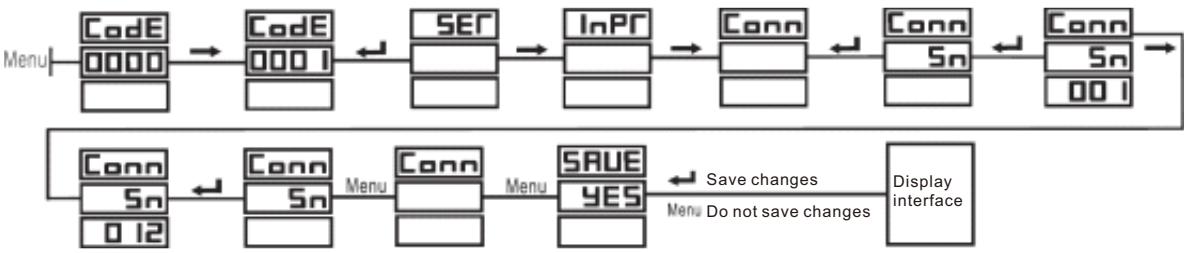
b: Voltage ratio setting (initial value is 1, set to 100): e.g. 10KV/100V, 1 scale/2 scale = 100



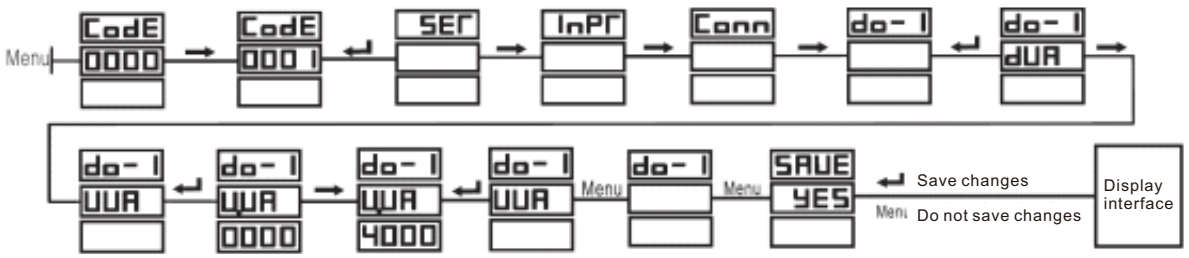
c: Current ratio setting (initial value is 1, set to 200): e.g. 1000A/5A, 1 scale/2 scale = 200



(3) Communication settings (default address is 1, modify communication address to 12)



(4) Relay alarm output settings (set A phase voltage > 400V, first relay conducts)

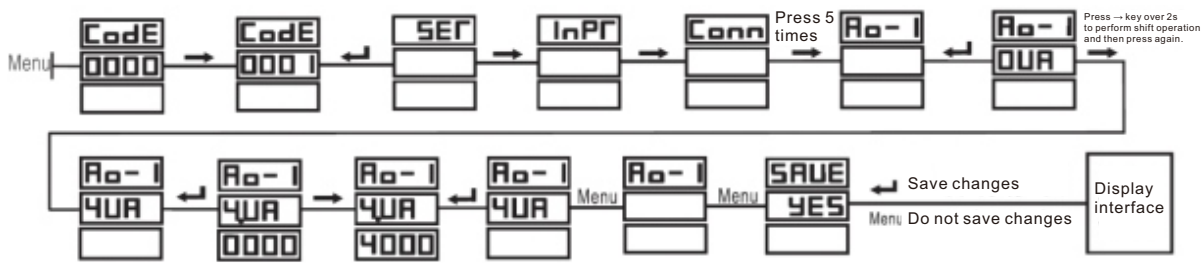


The first letter 'd' in dUA represents setting the alarm lower limit (low)

The first letter 'U' in UUA represents setting the alarm upper limit (high)

When the first letter is flashing, press the '→' key to switch between (d-U), press the '←' key to make the display except the first letter flash, indicating the specific alarm setting item, press the '→' key to switch to other alarm items, refer to the appendix.

(5) Analog transmission output settings (set A phase voltage 0-400V corresponds to transmission output 4-20mA)



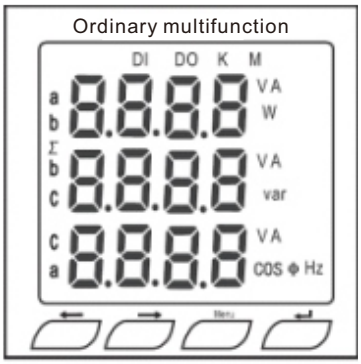
Note: The full scale value of the transmitter project needs to be set accurately, otherwise the transmitter output will be inaccurate.

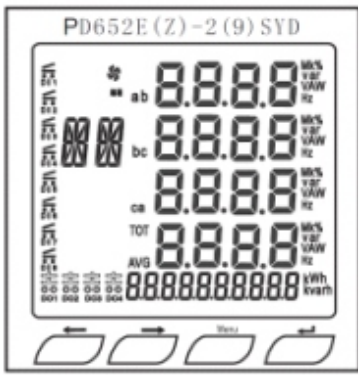
After modifying the communication address and wiring method, the meter needs to be powered off and restarted or press and hold the Press the 'Reset' key for 3 seconds to reset.

The above examples are individual parameter modification methods. Alternatively, you can modify all the parameters that need to be set step by step and then save the modifications at the end.

4. Panel Instructions and Measurement Information Display
4.1 Product Panel and Display Information

Ordinary multifunction





Character Display	Explanation
V	Voltage
A	Current
W	Active Power
var	Reactive Power
VA	Apparent Power
HZ	Frequency
COSΦ	Power Factor
PF	
DI	Digital input
DO	Relay output
a b c	Phase voltage, current
ab bc ca	Line voltage
K	Unit: Thousand
M	Unit: Mega
kWh	Forward Active Energy
-kWh	Reverse Active Energy
kvarh	Forward Reactive Energy
-kvarh	Reverse Reactive Power Energy

4.2 digital display multifunctional display interface information

Switch pages using the '→' key or '←' key (e.g., press the '→' key on the three-phase current interface to display the three-phase active power interface), switch same-page information using the '↲' key (e.g., press the '↲' key on the three-phase active power interface to display the total active power of the three phases)

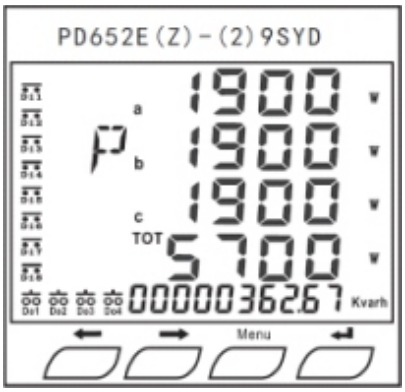
Display content	Explanation	Display content	Explanation
Display interface 1: Phase voltage 	Display three-phase phase voltages separatelyUa,Ub,Uc, The content displayed in the left image is the product of the first measurement voltage value and the set PT change value	Display interface 2: Line voltage 	Display three-phase LineVoltageUab, Ubc,Uca The content displayed in the left image is the product of the first measurement voltage value and the set PT change value

Display content	Explanation	Display content	Explanation
Display interface 3: Current 	Display three-phase currents separatelyIa, Ib, Ic, the content displayed in the left image is the product of the first measurement current value and the set CT change value	Display interface 4: Active power 	Display active power separately for three phasesW
Display content	Explanation	Display content	Explanation
Display interface 5: Reactive power 	Display reactive power separately for three phasesar	Display interface 6: Apparent power 	Display apparent power separately for three phasesVA
Display content	Explanation	Display content	Explanation
Display interface 7: Power factor 	Display power factor separately for three phases COSΦ	Display interface 8: Frequency 	Display frequency separately for three phasesHz

The following four figures are for displaying common multifunctional energy and input/output interfaces:

Display content	Explanation	Display content	Explanation
Display interface 9: Active energy 	Display total active The left figure displaystotal active energy68.63kWh, Press the 'Enter' key to switch between (total-positive forward -reverse)active energy Display active energyinterval	Display interface 10: Reactive energy 	Display total reactive energy,The left figure displays energy, total reactive energy is 28.04kvarh,Press the 'Enter' key to switch between (total-positive forward-reverse) active energy Reactive energy interval
Display content	Explanation	Display content	Explanation
Meter reading content - forward active energy 	On the interfacePress 'Enter' key for 9 The forward active power energy is displayed below, and the left figure shows the electricity consumption: 10007060.63kWh	Display interface 11: Input and Output 	The left figure shows that input DI channels 2-4 are in the connected state, and output channels 1-2 are in the conducting state

Also, as shown in the figure belowPD652E(Z)-2(9)SYD displays the energy and input/output interface instructions



Different from ordinary multifunctional devices

1：In the home page, you can directly read the four-quadrant energy,6-channel switch input DI and 4-channel relay output DO status, more convenient and intuitive.

2: PF = Power Factor COSΦ

As shown in the left figure, the ABC three-phase active power values are displayed, TOT represents the total value of the three phases, AVG represents the average value of the three phases, all DI1-8 switch inputs are connected, all DO1-4 relay outputs are conducting, and the forward reactive power energy is 362.67Kvarh

Four-quadrant energy switching display: The last row defaults to display forward active energy Kwh, press the '→' key for about 2s to switch between the four-quadrant energy

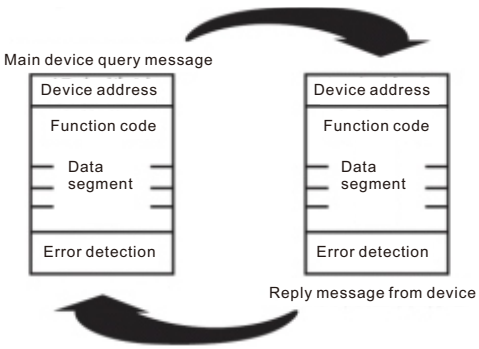
5. Function module
5.1 Communication
5.1.1 Physical layer

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

5.1.2 Communication protocol MODBUS-RTU

Up to 32 meters can be connected on one communication bus, please strictly follow the RS485 wiring requirements for the communication bus layout.

Query response cycle chart



Data frame structure: message format

Address code	Function code	Data code	Checksum code
1 BYTE	1 BYTE	N BYTEs	2 BYTEs

Address code: 1-247 can be set, but the address must be unique

Function code: tells the addressed terminal what function to perform

Function code	Significance
03/04	Read data register value
05/10	Remote control and modification

Data code: contains the data required for the terminal to perform specific functions or the data collected when the terminal responds to a query

Checksum code: error check (CRC) with the low byte first

Example of communication message:

Read data (function code 03/04): allows the user to obtain the collected and recorded data of the terminal equipment, as well as system parameters.There is no limit to the number of data collected in one request from the host, but it must not exceed the defined address range.

The following are 3 data Ia, Ib, Ic read from the slave with terminal device address 12 (0CH). Each data address in the data frame occupies 2 bytes, and the starting address of Ia is 03 (03H), with a data length of 3 bytes.

Query data frame (issued by the host)

Address	Command	Starting register address		Number of registers		CRC16 Low byte	CRC16 High byte
		High byte	Low byte	High byte	Low byte		
0CH	03H	00H	03H	00H	03H	F4H	D6H

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

Address	Command	Data byte length	Data 1 2 3 4 5 6	CRC16 Low byte	CRC16 High byte
0CH	03H	06H	13H88H13H88H13H89H	D3H	61H

Predefined data (function code: 10H): This function can change the content of the register (PD652E(Z)-2(9)SYD cannot perform this operation)
Example: Modify the current transformation ratio to 80 (current transformer is 400/5A)
Host sends command:

Address	Command	Starting register address		Number of registers		Write Number of bytes	Write data	CRC16 Low byte	CRC16 High byte
		High byte	Low byte	High byte	Low byte				
0CH	10H	00H	5AH	00H	01H	02H	00H 50H	F2H	06H

Slave returns: indicating successful ratio setting

Address	Command	Starting register address		Number of registers		CRC16 Low byte	CRC16 High byte
		High byte	Low byte	High byte	Low byte		
0CH	10H	00H	5AH	00H	01H	C6H	D8H

5.2 Energy metering and energy pulse output

The multifunction power meter provides bidirectional active and reactive energy metering and energy pulse output functions
And RS485 digital communication interface to achieve data display and remote transmission.

1) Electrical characteristics: pulse acquisition interface

VCC≤48V,Iz≤50mA

2) Pulse constant: 51200 imp/kWh

3) Application example: PLC terminal uses pulse counting device, assuming the number of pulses collected in time t is N, the energy accumulated by the meter in this period is: N/51200 * 100 * 80 degrees.

5.3 Transmitter Output

Refer to the transmitter output reference table, transmitter output 4-20mA

Accuracy level: 1S Load: Rmax = 400Ω

Overload: 120% effective output, maximum current 24mA, voltage 12V

If fully loaded with 5A, the transmitter outputs 20mA, if it is 5.05A, the transmitter also outputs 20mA

5.4 Relay Output and Input

There are two modes for operating the relay output: alarm threshold setting mode and communication remote control mode

Refer to the alarm item setting table for threshold alarm mode

Input (DI) and output (DO) are represented by binary 1 for on and 0 for off.

6. Frequently Asked Questions and Solutions

6.1 After connecting the wires, the normal power meter does not show any response.

Answer: There is a wiring diagram on each instrument. Check whether the connection wire is wrong and whether the working voltage is within the normal range.

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

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

6.3 The voltage, current and other data displayed by the meter are incorrect

Answer: First of all, make sure that the voltage and current signal lines are correctly connected to the meter, and that there will be no phase sequence errors and that the current incoming and outgoing wires are correct. If you feel that the connections are correct, you can use a multimeter to measure the voltage and a clamp meter to measure the current. The signal is used to judge whether the meter display is correct. In addition, the meter displays the primary grid value. If the voltage and current transformation ratio is incorrectly set, the displayed data must be wrong.

6.4 The meter’s electric energy reading is incorrect.

Answer: The accumulation of electric energy is based on the measurement of power. First check whether the wiring and transformation ratio are correct as in 6.3. Common mistakes are that the signal wires from the transformer are connected in reverse, or the transformation ratio setting is incorrect, and the phase sequence is wrong. It will also affect electrical energy.

6.5 The communication connection of the meter cannot be established or the returned data is incorrect

Answer: First, make sure that the address, baud rate and other information of the communication settings are consistent with the host computer. If all the meters on site do not transmit data back, first take a separate meter to test. If it is normal when used alone, please make sure the communication bus is correct and reliable, such as A single watch is not normal. Please check and confirm the problem of the host computer software, or try to use the serial port tool to debug without using the host computer. If there are multiple watches in one place but a few indicate that communication is not available, you can use batch testing first. Check the communication bus, and then exchange the communication addresses of the abnormal instrument and the normal instrument, or directly exchange the installation locations of the two instruments and then power on the communication to troubleshoot the problem.
If you think that the returned data is incorrect, the open data of the instrument includes primary power grid float type data and secondary power grid int/long type data. Please carefully read the notes in the communication address table and the conversion display of each data format.

6.6 Other abnormal situations

Answer: If the screen is damaged or other abnormal conditions are not summarized, the user should record the on-site situation in detail and then contact us.
After-sales service, our company will analyze possible causes and solutions based on feedback.
Note: Digital display instruments, especially liquid crystal digital display instruments, are precision instruments. When installing and debugging, pay attention to whether the use environment is suitable. Handle them with care to avoid accidents. The instrument is damaged by external force.

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

<table>
<tr><th>Transmitter project</th><th>Transmitter type setting</th><th>Range</th><th>Explanation (4-20mA transmitter output)</th></tr>
<tr><td>Phase A/B/C voltage</td><td>4.UA/4.Ub/4.UC</td><td>2200</td><td>Transmitter output for Phase A/B/C voltage 0-220V</td></tr>
<tr><td>Phase AB/BC/CA voltage</td><td>4.UAb/4.Ubc/4.UCA</td><td>4000</td><td>Transmitter output for AB/BC/CA line voltage 0-400V</td></tr>
<tr><td>Phase A/B/C current</td><td>4.IA/4.Ib/4.IC</td><td>5000</td><td>Transmitter output for Phase A/B/C current 0-5A</td></tr>
<tr><td>Phase A/B/C active power</td><td>4.PA/4.Pb/4.PC</td><td colspan="2" rowspan="10">Transmitter setting method (using current as an example):
If the current transformer is 400/5, set the current ratio to 80 first,
then set the transmitter range to4000.
If the current transformer is 1600/5, set the current ratio to 320 first,
then set the transmitter range to 1600.</td></tr>
<tr><td>Total active power</td><td>4.PS</td></tr>
<tr><td>Phase A/B/C reactive power</td><td>4.qA/4.qb/4.qC</td></tr>
<tr><td>Total reactive power</td><td>4.qS</td></tr>
<tr><td>Phase A/B/C power factor</td><td>4.PFA/4.PFb/4.PFC</td></tr>
<tr><td>Total Power Factor</td><td>4.PFS</td></tr>
<tr><td>Instantaneous Power of Phase A/B/C</td><td>4.SA/4.Sb/4.SC</td></tr>
<tr><td>Total Apparent Power</td><td>4.SS</td></tr>
<tr><td>Frequency</td><td>4.Fr</td></tr>
</table>

Alarm Item Setting Table (Each threshold needs to be set separately, e.g.: Alarm Item A B C can only set the alarm range for Phase A)

<table>
<tr><th>Transmitter project</th><th>Transmitter type setting</th><th>Range</th><th>Explanation</th></tr>
<tr><td rowspan="2">Phase A/B/C voltage</td><td>d.UA/d.Ub/d.UC</td><td>1000</td><td>Alarm setting for voltage below 100V in Phase A/B/C</td></tr>
<tr><td>U.UA/U.Ub/U.UC</td><td>2200</td><td>Alarm setting for voltage above 220V in Phase A/B/C</td></tr>
<tr><td rowspan="2">Phase AB/BC/CA voltage</td><td>d.UAb/d.Ubc/d.UCA</td><td>3000</td><td>Alarm setting for line voltage below 300V in AB/BC/CA</td></tr>
<tr><td>U.UAb/U.Ubc/U.UCA</td><td>4000</td><td>Alarm setting for line voltage above 400V in AB/BC/CA</td></tr>
<tr><td rowspan="2">Phase A/B/C current</td><td>d.IA/d.Ib/d.IC</td><td>1000</td><td>Alarm setting for current below 1A in Phase A/B/C</td></tr>
<tr><td>U.IA/U.Ib/U.IC</td><td>5000</td><td>Alarm setting for current above 5A in Phase A/B/C</td></tr>
<tr><td rowspan="2">Phase A/B/C
active power</td><td>d.PA/d.Pb/d.PC</td><td colspan="2" rowspan="16">Alarm setting method (using current as an example):
If the current transformer is 400/5, requires an upper limit alarm of 350A. First, set the current transformation ratio to 80, and then set the alarm range to 3500.
If the current transformer is 1600/5, requires an upper limit alarm of 1500A. First, set the current transformation ratio to 320, and then set the alarm range to 1500.
If the current transformer is 1600/5, requires an upper limit alarm of 500A. First, set the current transformation ratio to 320, and then set the alarm range to 0500.</td></tr>
<tr><td>U.PA/U.Pb/U.PC</td></tr>
<tr><td rowspan="2">Total active power</td><td>d.PS</td></tr>
<tr><td>U.PS</td></tr>
<tr><td rowspan="2">Phase A/B/C
reactive power</td><td>d.qA/d.qb/d.qC</td></tr>
<tr><td>U.qA/U.qb/U.qC</td></tr>
<tr><td rowspan="2">Total reactive power</td><td>d.qS</td></tr>
<tr><td>U.qS</td></tr>
<tr><td rowspan="2">Phase A/B/C
power factor</td><td>d.PFA/d.PFb/d.PFC</td></tr>
<tr><td>U.PFA/U.PFb/U.PFC</td></tr>
<tr><td rowspan="2">Total Power Factor</td><td>d.PFS</td></tr>
<tr><td>U.PFS</td></tr>
<tr><td rowspan="2">Instantaneous Power
of Phase A/B/C</td><td>d.SA/d.Sb/d.SC</td></tr>
<tr><td>U.SA/U.Sb/U.SC</td></tr>
<tr><td rowspan="2">Total Apparent Power</td><td>d.SS</td></tr>
<tr><td>U.SS</td></tr>
<tr><td rowspan="2">Frequency</td><td>d.Fr</td></tr>
<tr><td>U.Fr</td></tr>
</table>