产品合格证

产品合格证

符合标准: GB/T 22264

检 验 员: 检 01

出厂日期: 见产品或盒贴出厂编号

本产品经检验合格,准予出厂。

欣灵电气股份有限公司 XINLING ELECTRIC CO.,LTD

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National High-Tech EnterpriseZhejiang Mingjia Business Opportunity

欣灵

使用手册

Products Instructions

HCD194E-□S4

Series Network Multifunctional Power Meter

Thank you very much for using the Xinling Brand LED Network Multifunctional Power Meter. Please read the user manual before use.

09A047Q3

Contents

Ⅰ.Overview

The HCD194 series network multifunctional power meter (hereinafter referred to as the power meter) is a new type of panel-mounted digital meter. It can realize electrical quantity measurement, energy metering, data display, collection and transmission. It is also equipped with digital input/output, analog output and standard communication interfaces.

It can be widely applied in substation automation, distribution automation, intelligent buildings, as well as electrical energy measurement, management and assessment within enterprises.

Model Code	Name	Measurement	Display	Standard Functions	Optional Functions (Combination Available)
254 (42-square shape)	Network Multifunctional Power Meter	Three-phase: U, I, P, Q, EP+ , EP- , EQ+ , EQ- , SPF , PF, or partial parameters	Display	RS485 Communication, Energy Pulse Output	4DI, 4DO, 4AO, 21st Total Harmonic
954 (96-square shape)					
854 (80-square shape)					21st Total Harmonic Content
754 (72-square shape)					21st Total Harmonic Content

II.Technical Specifications

Function	Parameter		
Input Measurement & Display	Network		Three-Phase Three-Wire / Three-Phase Four-Wire
	Voltage	Rated Value	AC100V, AC500V (specify when ordering)
		Overload	Continuous: 1.2x; Instantaneous: 10x/10s
		Power Consumption	≤1VA (per phase)
		Impedance	>500kΩ
		Accuracy	Accuracy: RMS measurement (true effective value), accuracy class 0.5
	Current	Rated Value	AC1A, AC5A (specify when ordering)
		Overload	Continuous: 1.2x; Instantaneous: 10x/10s
		Power Consumption	<0.4VA (per phase)
		Impedance	<2mΩ
		Accuracy	RMS (true effective value) measurement, accuracy class 0.5
	Frequency		45Hz～55Hz
	Power		Apparent power; active power accuracy class 1.0; reactive power accuracy class 1.5
	Energy		Four-quadrant metering; active energy accuracy class 1.0; reactive energy accuracy class 1.5
	Harmonics		Total harmonic content: 3rd~21st order
Power Supply	Operating Range		AC 220V
	Power Consumption		≤3VA
Output	Digital Interface		RS-485, MODBUS-RTU protocol
	Pulse Output		2 channels of energy pulse output; pulse constant: 3200imp/h

Table Continuation

Function		Parameter
Environment	Operating Environment	-10℃～50℃
	Storage Environment	-20℃～75℃
Safety	Withstand Voltage	Input/Output 2kV, Input/Output 2kV, Power Supply/Output 2kV
	Insulation	Input, Output, Power Supply to ground ≥50MΩ
Energy Measurement Range		Active and reactive energy metering range: 0~999999999Wh; the meter will automatically reset to 0 and recount when exceeding this value

2.1 Auxiliary Power Supply

The power meter requires an auxiliary power supply to operate. Unless specified otherwise, the rated power supply of the meter is AC220V. Please ensure the provided power supply is suitable for this product series to avoid damaging the device.
Note: When using AC power supply, it is recommended to install a 1A fuse on the live wire side. If the power quality is poor, it is advisable to install a surge suppressor in the power circuit to prevent lightning strikes, and a fast pulse suppressor to improve anti-interference capability.

2.2 Input Signals

The power meter adopts a calculation method where each measurement channel collects data independently, ensuring complete symmetry. It supports multiple wiring methods and is applicable to different load types.

2.2.1 Voltage Input

The input voltage shall not exceed the product's rated input voltage of 500V. Otherwise, a PT (Voltage Transformer) should be considered. A 1A fuse must be installed at the voltage input terminal.

2.2.2 Current Input

The standard rated input current is 5A. For currents greater than 5A, an external CT (Current Transformer) should be used. If there are other meters connected to the CT, the wiring shall adopt series connection. Before disconnecting the meter's current input connection, the CT primary circuit must be disconnected or the secondary circuit short-circuited first. It is recommended to use a terminal block instead of direct connection to the CT for easy disassembly and assembly.

2.2.3 Ensure that the input voltage and current correspond to each other with consistent sequence and direction; otherwise, value and sign errors (for power and energy) will occur!

2.2.4The configuration of the meter's input network depends on the number of CTs in the system.

Therefore, when 2 CTs are used, select the three-phase three-wire two-element mode. When 3 CTs are used, select the three-phase four-wire three-element mode. The input network (N-element) set in the meter wiring and programming must match the connection mode of the measured load; otherwise, the voltage or power measured by the meter will be incorrect. Among them, the voltage measurement and display in three-phase three-wire mode are line voltages; while in three-phase four-wire mode, they are phase voltages.

III.Programming and Operation

3.1 Key Definitions

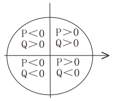
Enter Key	↵	Used for password entry confirmation, digital parameter modification confirmation, and digital shifting
Menu Key	Menu	Used to select the menu interface, exit functions, and return to the upper-level menu.
Right Key	▮▶	Used for display page switching during measurement display; acts as the digit increment key when modifying data.
Left Key	◀▮	Used for display page switching during measurement display; acts as the digit decrement key when modifying data.

3.2 Measurement Display

The electrical parameters of the power grid that can be measured and displayed include: Ua, Ub, Uc (phase voltages); Uab, Ubc, Uca (line voltages); Ia, Ib, Ic (currents); Ps (total active power); Qs (total reactive power); Pf (total power factor); Ss (total apparent power); F (frequency); as well as Ep (active energy) and Eq (reactive energy).All measured electrical quantity parameters are stored in the electrical quantity information table inside the meter, and these data can be accessed and collected via the meter's digital communication interface. However, the display content and mode may vary across different meter models—please refer to the specific instructions.
The calculation method for all electrical quantity parameters adopts a digitized discrete method based on the formulas below, specifically:

Formula	Notes		Formula	Notes
$U=\sqrt{\frac{1}{N}\sum_{n=1}^{N}U_n^2}$	Effective value of voltage		$P_S = UI$	Single-phase apparent power (cycle average value)

$I=\sqrt{\frac{1}{N}\sum_{n=1}^{N} I_n^2}$	Effective value of current	$\cos\Phi = P_P / P_S$	Power factor
$P_P = \frac{1}{N}\sum_{n=1}^{N} I_n U_n$	Single-phase active power (cycle average value)	$P_q = \sqrt{P_S^2 - P_P^2}$	Reactive power
$P = \frac{1}{N}\sum_{n=1}^{N}(I_{an}U_{an}+I_{bn}U_{bn}+I_{cn}U_{cn})$	Total active power (cycle average value)	$W = \int P dt$	Electrical energy

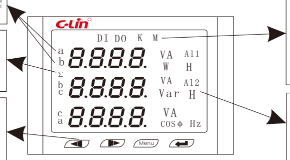


Note: Herein, when P > 0, the accumulated active energy refers to the absorbed active energy; when P < 0, the accumulated active energy refers to the released active energy. When Q > 0, the accumulated reactive energy is inductive; when Q < 0, the accumulated reactive energy is capacitive.

When one letter is lit, it indicates phase voltage or current; when two letters are lit, it indicates line voltage or current.

Closing indicator: When it is lit, it represents the closing state data.

The 4 keys are used for display switching or programming settings:
= Toggle key
= Up/back key
= Select/confirm key

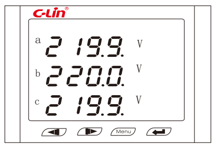


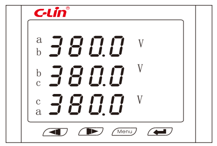
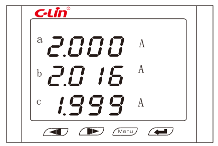
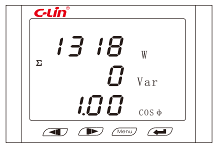
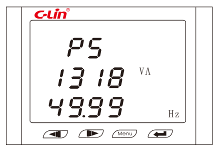
K (kilo) and M (mega) stand for the order of magnitude of the measured data. For example, under the voltage measurement line, if the LED displays "10.23" while the light is on, it means 10.23kV; if the K light is off, the voltage value is 10.23V.

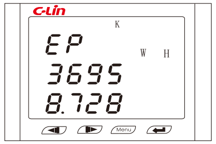
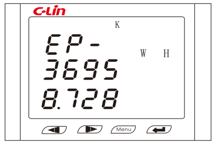
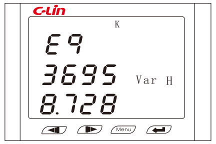
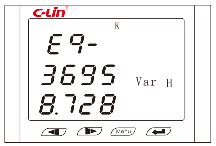
The corresponding measurement items are: three-phase voltage; three-phase current; active power, reactive power, apparent power; active energy, reactive energy, frequency information.

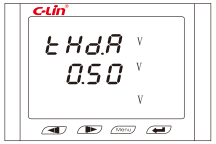
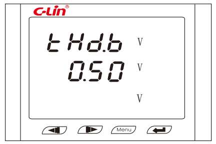
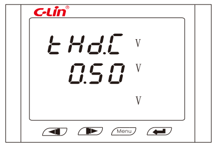
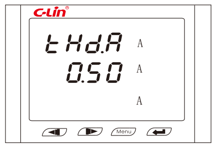
3.3 Page Display Diagram

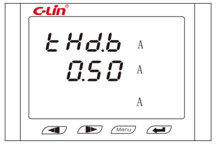
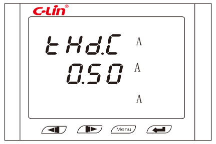
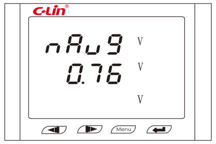
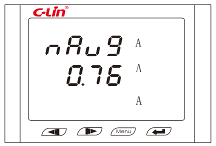
The Network Multifunctional Power Meter features 18 display pages for power parameters. Users can configure it for automatic switch display or manual switch display — page switching is completed via the keys.

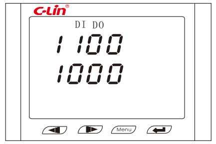
Page	Content	Description
Page 1		Displays phase voltages Ua, Ub, Uc respectively (for three-phase four-wire system): Ua=219.9V, Ub=220V, Uc=219.9V When the K light is illuminated, it indicates kV When the M light is illuminated, it indicates MV If the three-phase three-wire priority mode is enabled, this page will be Page 2

Page	Content	Description
Page 2		Displays line voltages Uab, Ubc, Uac respectively (for three-phase three-wire system): Uab=380V, Ubc=380V, Uac=380V When the K light is illuminated, it indicates kV When the M light is illuminated, it indicates MV If the three-phase three-wire priority mode is enabled, this page will be Page 1
Page 3		Displays three-phase currents Ia, Ib, Ic (unit: A): Ia=2.0A Ib=2.016A Ic=1.999A
Page 4		Displays active power (W), reactive power (var), and power factor CosΦ. In the left display: P = 1318W Q = 0Var Power factor = 1 When the K light is illuminated, it indicates kW or kvar; when the M light is illuminated, it indicates MW or Mvar.
Page 5		Displays apparent power / frequency (Hz). In the left display:- Row 1: "PS" Row 2: "PS" (apparent power): 1318VA Row 3: Frequency: 49.99Hz

Page	Content	Description
Page 6		Displays the forward active energy value: The second row of the 7-segment display corresponds to the upper 4 digits The third row corresponds to the lower 4 digits They form an 8-digit value. The left display indicates the forward active energy value is 36958.728kWh. EP: Forward active energy
Page 7		Displays the reverse active energy value: The second row of the 7-segment display corresponds to the upper 4 digits The third row corresponds to the lower 4 digits They form an 8-digit value. The left display indicates the reverse active energy value is 36958.728kWh. EP: Reverse active energy
Page 8		Displays the forward reactive energy value: The second row of the 7-segment display corresponds to the upper 4 digits The third row corresponds to the lower 4 digits They form an 8-digit value. The left display indicates the forward reactive energy value is 36958.728kvarh. EQ: Forward reactive energy
Page 9		Displays the reverse reactive energy value: The second row of the 7-segment display corresponds to the upper 4 digits The third row corresponds to the lower 4 digits They form an 8-digit value. The left display indicates the reverse reactive energy value is 36958.728kvarh.EQ: Reverse reactive energy (note: the original text labels this as "Ep", which is likely a typo)

Page	Content	Description
Page 10		Displays THD.A/0.50 Total harmonic distortion content of phase A voltage The total harmonic distortion content of phase A voltage shown in the left figure is: 0.50%
Page 11		Displays THD.B/0.50 Total harmonic distortion content of phase B voltage The total harmonic distortion content of phase B voltage shown in the left figure is: 0.50%
Page 12		Displays THD.C/0.50Total harmonic distortion content of phase C voltage The total harmonic distortion content of phase C voltage shown in the left figure is: 0.50%
Page 13		Displays THD.A/0.50Total harmonic distortion content of phase A voltage The total harmonic distortion content of phase A voltage shown in the left figure is: 0.50%

Page	Content	Description
Page 14		Displays THD.B/0.50 (Phase B current total harmonic distortion content). The left display indicates the total harmonic distortion content of Phase B current is 0.50%.
Page 15		Displays THD.C/0.50 (Phase C current total harmonic distortion content). The left display indicates the total harmonic distortion content of Phase C current is 0.50%.
Page 16		Displays naug/0.76 (total three-phase voltage unbalance degree). The left display indicates the voltage unbalance degree is 0.76%.
Page 17		Displays naug/0.76 (total three-phase current unbalance degree). The left display indicates the current unbalance degree is 0.76%.

Page 18		Displays digital input/output information: "0" represents open; "1" represents closed Row 1 (1100): Indicates Digital Input 1 and 2 are open; Digital Input 3 and 4 are closed - Row 2 (1000): Indicates Digital Output 1 is closed; Digital Output 1, 2 and 3 are open

3.4 Programming Operation

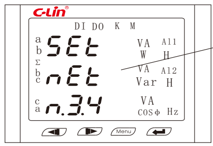
Under programming operation, the meter provides 4 basic items: password verification and modification (COdE), display settings (Dis), system settings (SEt), and communication settings (COnn). It also includes 8 extended menu items: 4-channel analog output settings (AO-1/2/3/4) and 4-channel digital output settings (DO-1/2/3/4).

It adopts a hierarchical menu structure management method via LED display:

The 1st row of LEDs displays 1st-level menu information

The 2nd row of LEDs displays 2nd-level parameter information

The 3rd row of LEDs displays 3rd-level menu information



This menu management method adopts a hierarchical structure. The programming items in the diagram (as shown in the left figure) are:

1st level: SEt (parameter settings)

2nd level: nEt (wiring mode)

3rd level: n.3.4 (three-phase four-wire system)

The programming operation of the keypad adopts a 4-key operation mode, namely: Left/Right Navigation Keys ( ), Menu Back Key ((Menu)), and Menu Enter/Confirm Key ( ) to complete all operations of the above functions.

(Menu) : If the current normal display is the voltage interface, press this key to enter programming mode. In programming mode, press this key to return to the previous menu. If the current menu is the Level 1 menu, press this key to enter the parameter saving interface; select "yes/no" and press the Confirm Key to return to the normal display interface.

: This is the navigation key, which is used to switch menu items or increase/decrease the digital value.

: This is the select/confirm key. If the current normal display is the voltage interface, pressing this key can switch between "phase voltage/line voltage" (this function is available in HCD display series meters). In programming mode, press this key to enter the next-level menu; during settings, it controls the cursor to move to the next character.

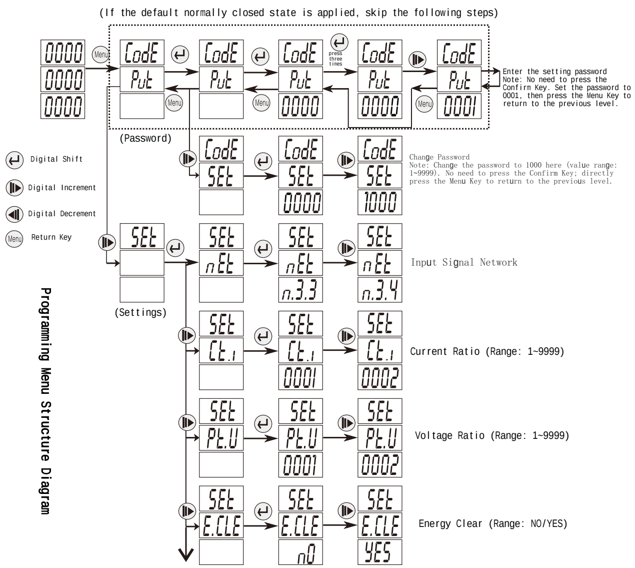
When returning to the measurement mode from the programming mode, the meter will prompt "SAVE-YES". Use the Left/Right Keys to select "yes" or "no" to confirm whether to save, then select the corresponding option and press the Key to exit.

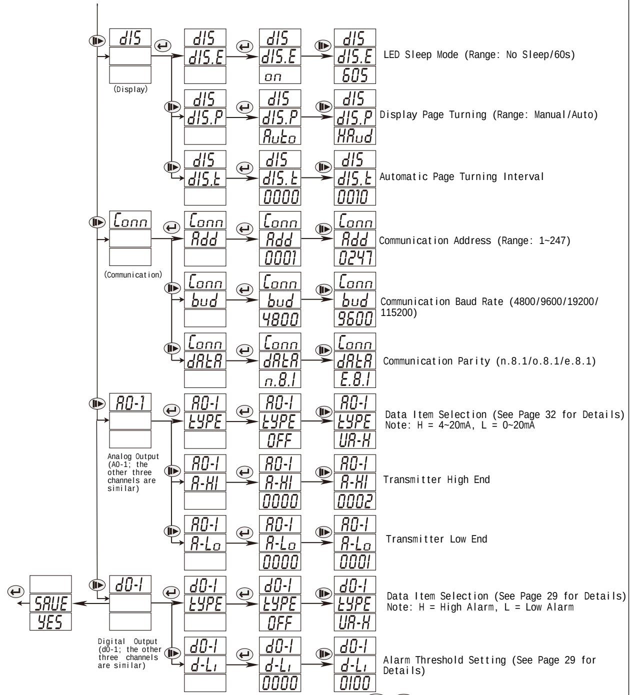
Notes:
a) Each time you access the settings interface from the measurement interface, you must enter the correct password to modify the setting parameters. If you fail to enter the correct password, you can only view the parameters (but cannot modify the setting parameters).
b) After entering the correct password, return to the "code" interface, then follow the menu (detailed on Page 14) to modify the parameters in sequence. Do not return to the measurement interface during this process; if you do return to the measurement interface, the password modification will become invalid, and you will need to reconfigure it.

3.5 The menu structure is as follows: Users can select appropriate programming setting parameters based on actual conditions.

Level 1	Level 2	Level 3	Description
Password (codE)	Verify Password PUt	Password Data (0~9999)	When the entered password is correct, you can enter programming. Default password: 0001
	Change Password SEt	Password Data (0~9999)	You can change the password only after successful password verification
System Settings SEt	Network nEt	N.3.4 and N.3.3	Select the input network for the measurement signal
	Current Ratio Ct1	1~9999	Set the current signal ratio = 1st scale / 2nd scale, e.g., 200A/5A = 40
	Voltage Ratio Ptu	1~9999	Set the voltage signal ratio = 1st scale / 2nd scale, e.g., 10kV /100V = 100
	Clear Energy E.CLE	YES/no	If "YES" is selected, exit the programming menu and press Confirm to clear the energy; if "NO" is selected, the energy will not be cleared
Display Settings dIS	Display dIS.E	On/60s	Select "On" to enable continuous display; select "60s" to make the product stop displaying if no key is pressed for over 60 seconds (this function is not supported by LED displays).
	Display Page Turn dIS.P	Auto/HAnd	Auto: indicates automatic page turning; HAnd: indicates manual page turning
	Switching Time dIS.t	0~60	Time interval for automatic page turning
Communication Parameters Conn	Address ADD	1~247	The meter address range is 1~247
	Communication Baud Rate bud	4800~115200	Baud rates include 4800, 9600, 19. 20 (19200), 115.2 (115200)
	Communication Parity DATA	N.8.1/o.8.1/E.8.1	N.8.1: No parity; o.8.1: Odd parity; E.8.1: Even parity
Transmitter Settings AO-1/2/3/4	Data Item Selection tYPE	OFF/UA-H/… (refer to the attached table for details)	OFF: No transmission output for this channel; UA-H: This channel transmits Phase A voltage (4~20mA)
	Transmitter High End A-HI	0000	Corresponding value for full scale; see transmitter setting instructions for configuration
	Transmitter Low End A-LO	0000	Corresponding value for transmitter low end; see transmitter setting instructions for configuration
Digital Output Settings (Alarm) dO-1/2/3/4	Data Item Selection tYPE	OFF/UA-H/…	OFF: No alarm item for this channel; UA-H: This channel is Phase A voltage upper limit; see alarm setting instructions for configuration
	Alarm Threshold Setting d-LI	0000	Alarm threshold for the current alarm item; see alarm setting instructions for configuration

3.6 Programming Menu Structure Diagram (Users can select appropriate programming setting parameters according to actual conditions)

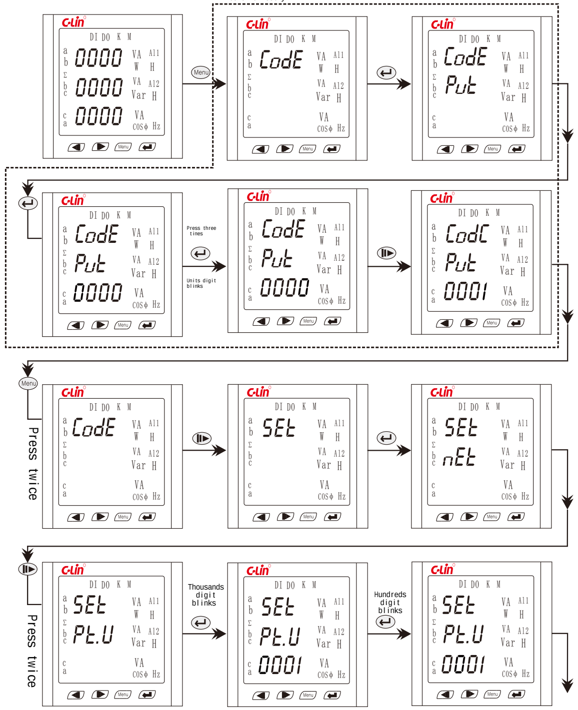


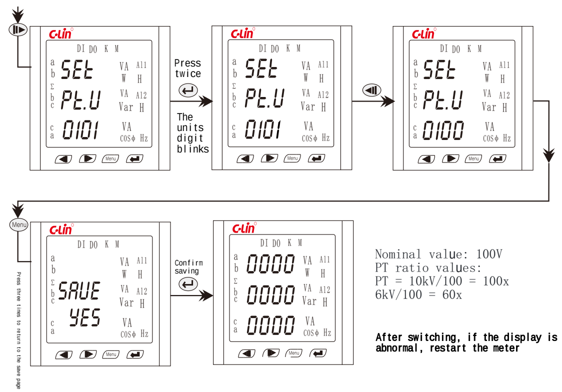


Note: When exiting menu settings and "SAVE YES" appears; use the Keys to select whether to save (SAVE-YES: Save; SAVE-NO: Do not save), then press the Key to return to the measurement interface.

Example 1: Voltage Ratio Adjustment (Example: 10KV/100V)

The password is entered by default; if there is no password, follow the process below directly.





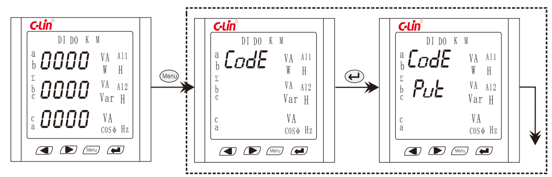
Nominal value: 100V
PT ratio values:
PT = 10kV/100 = 100x
6kV/100 = 60x

After switching, if the display is abnormal, restart the meter

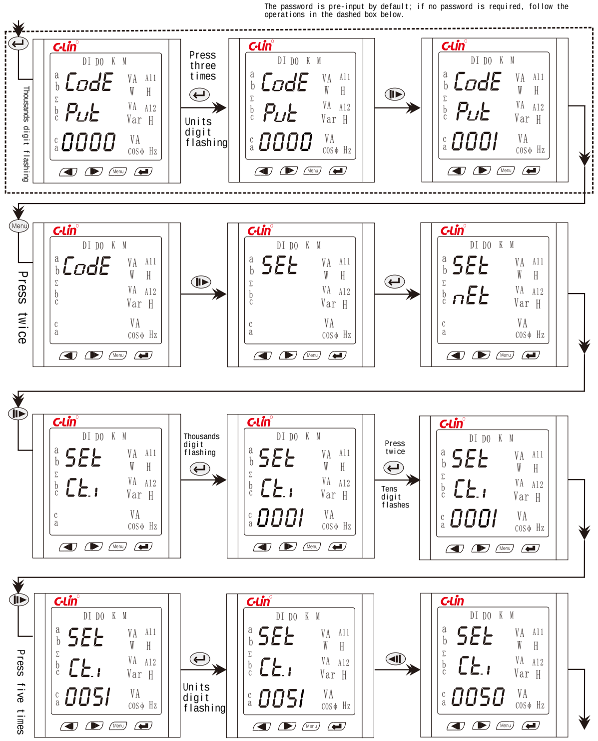
CodE	Put	SEt	nEt	Pt.U	SAUE YES
Password	Input	Setting	Phase Line Network	Voltage Multiplier	Save

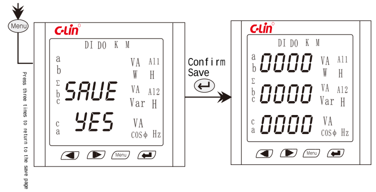
Example 2: Current Ratio Adjustment (Example: 250A/5A)

The password is entered by default; if there is no password, follow the operation in the dashed box below



The password is pre-input by default; if no password is required, follow the operations in the dashed box below.



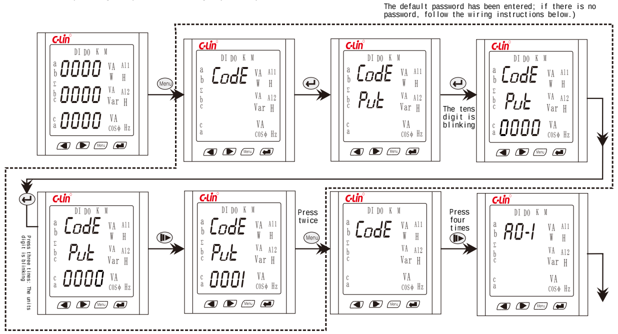


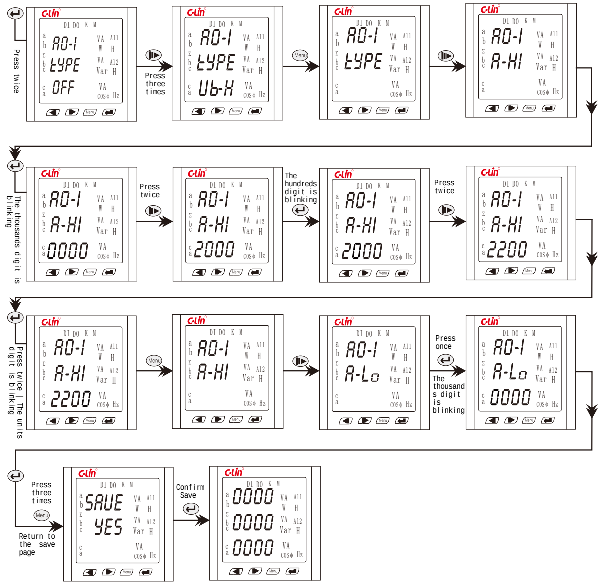
Nominal value: 5A
CT ratio values are as follows:
CT = 250A/5A = 50 times
500A/5A = 100 times

CodE	Ct.1	SAVE YES
Password	Current Ratio	Save

Example 3: Analog Transmitter Output Setting (Example: Set AO1; Output a 4-20mA analog signal corresponding to phase B voltage (0-220V).

The default password has been entered; if there is no password, follow the wiring instructions below.)



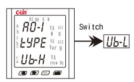


Ub-H	Ub-L
4~20mA	0~20mA

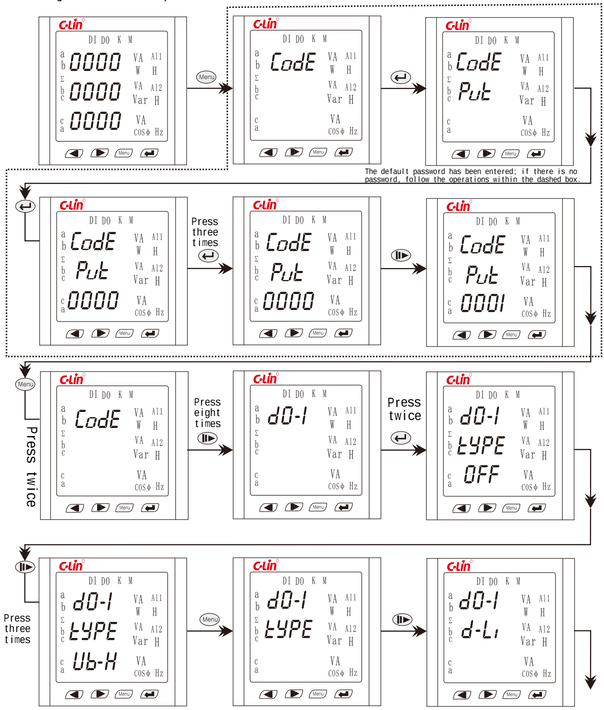
A-HI	A-Lo
Transmitter high-end corresponding value	Transmitter low-end corresponding value

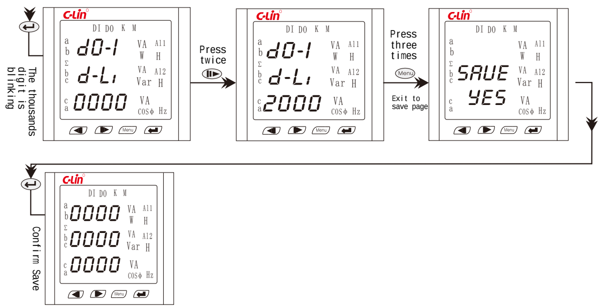
A-Hi: 2200 indicates 220.0V corresponds to 20mA
A-Lo: 0000 indicates 0.0V corresponds to 4mA

Note: If you want to set a 0~20mA transmitter output, simply switch to Ub-L.



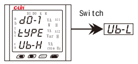
Example 4: Alarm Output Setting (Example: Set DO1; trigger an alarm when phase B voltage exceeds 2000V)





-Li	Ub-L	Ub-H
Alarm Threshold	Lower Limit Alarm	Upper Limit Alarm

d-Li: Alarm Threshold
Note: If you want to set it as the lower limit alarm threshold, simply switch to Ub-L.

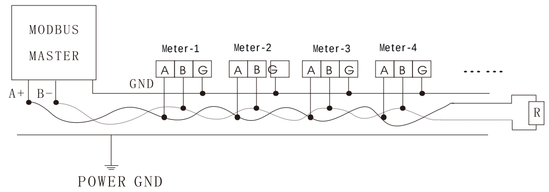


IV.Digital Communication

The network meter provides a serial asynchronous half-duplex RS485 communication interface, using the MODBUS-RTU protocol. All kinds of data information can be transmitted over the communication line.

Up to 32 network power meters can be connected to the same 485 bus at the same time. Each network power meter can be configured with its communication address (Address NUM). The communication terminal numbers may vary for different series of meters.

For communication connections, shielded twisted-pair cables with a copper mesh (and a wire diameter of no less than 0.5mm²) should be used . When routing the cables, keep the communication lines away from high-voltage cables or other strong electric field environments. The T-type network connection method is recommended; star or other connection methods are not advised.



MODBUS/RTU Communication Protocol

The MODBUS protocol uses a master-slave response communication connection mode over a single communication line. First, the signal from the host computer addresses a unique terminal device (slave device), then the response signal sent by the terminal device is transmitted back to the host in the opposite direction—meaning all communication data streams are transmitted in two opposite directions over a single communication line (half-duplex working mode).

The MODBUS protocol only allows communication between the host (such as PC, PLC) and terminal devices; data exchange between independent terminal devices is not permitted. This ensures that each terminal does not occupy the communication line during its initialization, and only responds to query signals addressed to itself.

Host Query: A query message frame includes the device address code, function code, data information code, and check code.The address code indicates the slave device to be selected; the function code informs the selected slave device of the function to execute. For example, function code 03 requires the slave device to read registers and return their contents.The data segment contains additional messages related to the function the slave device needs to perform. For instance, in a read command , the data segment includes the starting register and the number of registers to read.The check code verifies the correctness of a message frame, providing the slave device with a way to validate the information content. It follows the CRC16 calibration rule.

A message consists of the slave address code, function code, data information code, and CRC16 check code. The data information code includes data collected by the slave device (e.g., register values or statuses). If an error occurs, we stipulate that the slave device will not respond.
The transmission method refers to the transmission mode of a series of independent data structures within a data frame and RTU data. The bits of each byte are defined below: 1 start bit, 8 data bits, (parity bit), 1 stop bit (when parity bit is present) or 2 stop bits (when no parity bit is present). This is the message frame format.

Data Frame Structure: Message Format

Start Bit	Function Code	Data Code	Check Code
1 bit	1 byte	N bytes	2 bytes

Address Code
The address is set in the range of 0~255 (decimal), represented by one byte (8 bits) in binary. Among these addresses, only 1~247 are used; other addresses are reserved. These addresses identify the terminal device specified by the user. Each terminal device must have a unique address. Only the device addressed by the host will respond to the query containing this address. When the terminal sends a response, the slave address data in the response tells the host which terminal it is communicating with. Function Code
Tells the addressed terminal which function to execute. The table below lists the function codes supported by this meter, along with their meanings and functions.

Code	Meaning	Function
03H	Read Data	Obtain the current data of one or more registers
08H	Energy Reset	Reset the energy data of the operated meter
10H	Preload Multiple Registers	Write multiple sets of binary data into multiple registers

Data Code
Contains the data required for the terminal to perform a specific function, or the data collected by the terminal when responding to a query. The content of this data may be a numerical value, reference address, or setting value.
For example: If the function code instructs the terminal to read a register, the data field needs to specify which register to start reading from and how many data points to read; the slave device's data code then includes the data length and corresponding data.
Check Code
The error check (CRC) field occupies 2 bytes and contains a 16-bit binary value. The CRC value is calculated by the transmitting device and appended to the data frame. When receiving data, the receiving device recalculates the CRC value and compares it with the value in the received CRC field. If the two values do not match, an error has occurred.

The process for generating a CRC is as follows:
1) Preset a 16-bit register to FFFFH (hexadecimal, all 1s), and refer to it as the CRC register.
2) Perform an XOR operation between the 8 bits of the first byte in the data frame and the low byte of the CRC register, then store the result back into the CRC register.
3) Shift the CRC register right by one bit, fill the most significant bit (MSB) with 0, and shift out the least significant bit (LSB) for detection.
4) (From the previous step) If the shifted-out bit is 0: repeat Step 3; if it is 1: perform an XOR operation between the CRC register and a preset fixed value (0AA01H).
5) Repeat Steps 3 and 4 until 8 shifts are completed. This finishes processing one full 8-bit byte.
6) Repeat Steps 2 to 5 to process the next 8-bit byte, until all bytes have been processed.
7) Finally, the value in the CRC register is the CRC value.
4.1 Message Format Commands

4.1.1 Read Data Register Values (Function Code 03H)

Read Data Register: This function allows users to obtain the data collected and recorded by the terminal device, as well as the system parameters of the slave device.
The host can request up to 16 data points in a single collection, but it cannot exceed the defined address range.

For example, to read four data points from the slave device with terminal device address 01H: Pa (phase A active power), Pb (phase B active power), Pc (phase C active power), and Pab (combined phase active power).
Then, in the host's request data code:The address of the starting register Pa occupies 2 bytes. (Refer to the MODBUS-RTU Communication Address Information Table in Appendix 1: the high byte of Pa is 00H, and the low byte is 29H.)
The number of registers (4) occupies 2 bytes. (High byte: 00H; Low byte: 04H.)

The CRC check code occupies 2 bytes and is calculated by the host.

	Frame Structure	Address Code	Function Code	Data Code		Check Code
				Starting Register Address	Number of Registers	
Host Request	Bytes Occupied	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Data Range	1～247	03H		Max 16	CRC
	Message Example	01H	03H	0029H	0004H	95H C1H
Slave Response	Frame Structure	Address Code	Function Code	Data Code		Check Code
				Register Byte Count	Register Value	
	Bytes Occupied	1 byte	1 byte	1 byte	n bytes	2 bytes
	Message Example	01	03H	08H	(8-byte data)	CRC

Note：The register address in the host request is the address for querying the power grid's energy or other data; the number of registers refers to the length of the queried data. For example, the starting register address "0029H" in the above example represents the address of phase A active power, and the number of registers "0004H" represents 4 registers. Please refer to the MODBUS-RTU Communication Address Information Table in Appendix 1.

Special Note: Read the Status of Digital Input and Output (function code: 03H; refer to Notes 17 and 18 for X1, X2, X3, X4)

	Address Code	Function Code	Data Code		Check Code
			Register Address	Number of Registers	
Host Request	01H	03H	Digital Input: 0053H Digital Output: 0054H	0001H	CRC
Slave Response	Address Code	Function Code	Data Code		Check Code
			Register Byte Count	Register Value	
	01H	03H	02H	0000X1X2X3X4	CRC

4.1.2 Set Register Command (Function Code 10H)

This function allows the user to modify the contents of multiple registers. It should be emphasized that the data to be written are writable attribute parameters; refer to the communication address information table for details on attribute specifications. The number of registers to be written cannot exceed 16.
For example, to change the current transformation ratio (CT) of the meter with terminal device address 01H to 80 (400A/5A = 80), and the voltage transformation ratio (PT) to 100 (10KV/100V = 100):
In the data code of the host’s message: the address of the starting register (CT) occupies 2 bytes, which is 0003H;
The number of registers (2) occupies 2 bytes: 00H (high byte) and 02H (low byte);
The number of data bytes (4) occupies 1 byte, which is 04H;
The written data occupies 4 bytes: CT: 80 = 0050H;
PT: 100 = 0064H;
The check code is calculated by the host.

Host Request	Frame Structure	Address Code	Function Code	Data Code				Check Code
				Starting Register Address	Number of Registers	Number of Data Bytes	Written Data	
	Bytes Occupied	1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes	2 bytes
	Data Range	1～247	10H		Max 16	Max 2×16		CRC
	Message Example	01H	10H	0003H	0002H	04H	0050H 0064H	B240

Slave Response	Frame Structure	Address Code	Function Code	Data Code		Check Code
				Starting Register Address	Number of Registers	
	Bytes Occupied	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Message Example	01H	10H	0003H	0002H	B1C8

Notes:
1.To ensure normal communication, the number of registers is limited to 16 per host request. In the above example:The starting register address "0003H" refers to the initial address for setting the current transformation ratio;The number of registers "0002" indicates that 2 register data (for current transformation ratio and voltage transformation ratio) are being configured;The written data "0050H 0064H" means setting the current transformation ratio to 80 and the voltage transformation ratio to 100.For register addresses, refer to the MODBUS-RTU Communication Address Information Table in Appendix 1.
2.This function also allows users to configure a single register of the meter on the host. In this scenario:Set the number of registers to 1;Set the data byte length to 2 bytes;Point the starting address to the register address to be modified.

4.1.3 Energy Register Reset Command (Function Code 08H)

This function allows users to reset the energy register of the meter on the host.
For example, to reset the energy data of the meter with address 01H:
In the host’s message format:
The address code occupies 1 byte;
The function code occupies 1 byte;
The energy register occupies 2 bytes;
The register value occupies 2 bytes.
Energy register address: 00H (high byte) FFH (low byte)
Register value: FFH (high byte) 00H (low byte)

The check code is calculated by the host

Host Request	Frame Structure	Address Code	Function Code	Address Code		Check Code
				Register Address	Register Value	
	Bytes Occupied	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Data Range	1～247	08H			CRC
	Message Example	01H	08H	00FFH	FF00H	91CBH

Slave Response	Frame Structure	Address Code	Function Code	Address Code		Check Code
				Register Address		
	Bytes Occupied	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Message Example	01H	08H	00FFH	FF00H	91CBH

Note: The above example is to reset the energy register of the meter with address 1. For detailed addresses, refer to the MODBUS-RTU Communication Address Information Table in Appendix 1. The message format of the slave response is identical to that of the message sent by the host.

Special Note: Remote Control Relay Output (Function Code: 10H)

Example: Close the First Relay

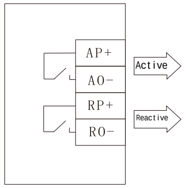
Host Request	Address Code	Function Code	Data Code				Check Code
			Register Address	Number of Registers	Number of Data Bytes	Written Data	
	01H	10H	0053H	0001H	02H	0011H	6A3F

Slave Response	Address Code	Function Code	Data Code		Check Code
			Register Address	Number of Registers	
	01H	10H	004BH	0001H	71DF

4.2 Energy Pulses

4.2 Energy Pulses

Our company's network power meter provides bidirectional active and reactive energy metering, a 2-channel energy pulse output function, and an RS485 digital interface to complete the display and transmission of energy data.
The meter realizes one-time measurement of active energy and reactive energy data; the energy pulses of the open-collector optocoupler relay enable the transmission of active energy and reactive energy. Remote computer terminals, PLCs, or DI switch acquisition modules can be used to collect the total number of pulses of the meter, so as to realize cumulative energy metering. The adopted output method is the method for energy accuracy verification (national metrological regulations: pulse error comparison method of standard meters).



Energy Pulse Output Diagram

4.2.1 Electrical Characteristics
In the circuit diagram of the pulse acquisition interface, the parameters meet: VCC ≤ 48V and IZ ≤ 50mA.

4.2.2 Pulse Constant
3200imp/kWh (for all ranges). Its meaning is: when the meter accumulates 1kWh of energy, the number of pulse outputs is 3200. It should be emphasized that this 1kWh refers to the secondary energy data. In scenarios involving PT (voltage transformer) and CT (current transformer), 3200 pulses correspond to the primary energy data, which is calculated as: 1kWh × voltage transformation ratio (PT) × current transformation ratio (CT).
4.2.3 Application Example
A PLC terminal uses a pulse counting device. Assume that N pulses are collected within a time period t, and the meter's input parameters are 10kV/100V (PT) and 400A/5A (CT). Then the cumulative energy of the meter in this period is calculated as: (N / 3200) × 100 × 80 kWh (degrees of electricity).

4.3 Digital Input (Optional Function)

Our company's network power meter can be optionally equipped with 2 to 4 channels of digital input; please refer to the first page for details.
The digital input module adopts the dry contact resistance switch signal input method. The meter is equipped with a +15V working power supply internally, so external power supply is not required. It can be used to monitor statuses such as fault alarm nodes, switching (opening/closing) status, handcart position, and capacitor activation status of capacitor compensation cabinets. Status information can be remotely transmitted to intelligent monitoring systems via the communication interface. When combined with the remote control/alarm relay function, it can conveniently realize automatic switching (opening/closing).

4.4 Digital Output (Optional Function)

Our company's network power meter can provide 4 channels of relay digital output.
Relay capacity: AC250V/5A, DC30V/5A
If customers require relays with special capacity specifications, they can contact our company's Marketing Department for custom-made solutions.
The relay output module has two optional working modes: power alarm mode and communication remote control mode. Each relay channel can flexibly set the working mode, alarm item, and alarm limit through programming operations:
For example, the setting "dO-1:UA-H; d-Li:4000" indicates that when UA > 400.0V, the 1st channel relay outputs an alarm;
The setting "DO-2:Ib-L; d-Li:2000" indicates that when Ib < 2.000A, the 2nd channel relay outputs an alarm.
Note: The data format of the alarm range is integer data of the secondary power grid; please refer to the table below for the specific format.

Digital Output Comparison Table

Alarm Item (An "H" following the alarm item indicates high alarm output; an "L" indicates low alarm output)			Alarm Value Unit	Alarm Item (An "H" following the alarm item indicates high alarm output; an "L" indicates low alarm output)			Alarm Value Unit
1	Ua (Phase A Voltage) Scale value unit V	H	V	27	Qa (Phase A Reactive Power) Scale value unit var	H	Var
2		L		28		L	
3	Ub (Phase B Voltage) Scale value unit V	H	V	29	Qb (Phase B Reactive Power) Scale value unit var	H	Var
4		L		30		L	

Digital Output Comparison Table

	Alarm Item (An "H" following the alarm item indicates high alarm output; an "L" indicates low alarm output)		Alarm Value Unit		Alarm Item (An "H" following the alarm item indicates high alarm output; an "L" indicates low alarm output)		
5	Uc (Phase C Voltage) Scale value unit V	H	V	31	Qc (Phase C Reactive Power) Scale value unit var	H	Var
6		L		32		L	
7	Uab (AB Line Voltage) Scale value unit V	H	V	33	Qs (Total Reactive Power) Scale value unit var	H	Var
8		L		34		L	
9	Ubc (BC Line Voltage) Scale value unit V	H	V	35	Sa (Phase A Apparent Power) Scale value unit VA	H	VA
10		L		36		L	
11	Uca (CA Line Voltage) Scale value unit V	H	V	37	Sb (Phase B Apparent Power) Scale value unit VA	H	VA
12		L		38		L	
13	Ia (Phase A Current) Scale value unit A	H	A	39	Sc (Phase C Apparent Power) Scale value unit VA	H	VA
14		L		40		L	
15	Ib (Phase B Current) Scale value unit A	H	A	41	Ss (Total Apparent Power) Scale value unit VA	H	VA
16		L		42		L	
17	Ic (Phase C Current) Scale value unit A	H	A	43	COS (Power Factor) Scale value unit Cosφ	H	Cosφ
18		L		44		L	
19	Pa (Phase A Active Power) Scale value unit W	H	W	45	Fr (Frequency) Scale value unit Hz	H	Hz
20		L		46		L	
21	Pb (Phase B Active Power) Scale value unit W	H	W	47	TH.Ua (Total Harmonic Content of Phase A Voltage)		%
22		L		48	TH.Ub (Total Harmonic Content of Phase B Voltage)		%
23	Pc (Phase C Active Power) Scale value unit W	H	W	49	TH.Uc (Total Harmonic Content of Phase C Voltage)		%
24		L		50	TH.Ia (Total Harmonic Content of Phase A Current)		%
25	Ps (Total Active Power) Scale value unit W	H	W	51	TH.Ib (Total Harmonic Content of Phase B Current)		%
26		L		52	TH.Ic (Total Harmonic Content of Phase C Current)		%
0	OFF (Alarm function disabled; only remote control available)						ms

Relevant Notes:

1. High/Low Alarm
Low alarm: When the value of the alarm item is lower than the alarm threshold, the relay switch closes and conducts. High alarm: When the value of the alarm item is higher than the alarm threshold, the relay switch closes and conducts.

2. Harmonic AlarmHarmonic alarms only support high alarm (no low alarm). When the total harmonic content exceeds the alarm threshold of the alarm item, the relay closes and conducts.

3. Remote Control Relay OutputThe alarm function must be disabled for remote control relay output. You can set the pulse width of the relay output: If the setting value is "0100", the pulse width of the remote control relay output is 100ms. If the setting value is "0000", the remote control relay output will maintain a constant high level.

4.5 Transducer Output

This meter provides up to 4 channels of transducer output, which can be flexibly programmed to set transducer quantity items. For example, the setting "AO-1:UA H:2200; A-Lo:0000" indicates that one analog channel is the transducer output for Phase A voltage (UA), where UA in the range of 0.00V to 220.0V corresponds to 4mA to 20mA.
Note: The data format of the transducer range is integer data of the secondary power grid. For the specific format, please refer to the table below - or refer to the secondary power grid data format in the communication address information table.

4.5.1 Electrical Parameters
Output: 0/4~20mA, 0~5/10V.
4.5.2 Accuracy Class
The accuracy class is 0.5s.
4.5.3 Overload
120% of effective output; maximum current: 24mA, maximum voltage: 12V.
4.5.4 Load Rmax
Rmax = 400Ω.
4.5.5 Transducer Items

Phase voltage, line voltage, phase current, per-phase active power, total active power, per-phase reactive power, total reactive power, per-phase apparent power, total apparent power, power factor, frequency, signed total active power and signed total reactive power.

4.5.6 Transducer Module Options for Customer Orders

Customers can specify several types of transducer modules when placing orders: 0/4～20mA, 0～5/10V.The default transducer module is: 0/4～20mA, with the transducer item set to Ua. When the input is a rated signal, the output is 20mA.Users can modify the transducer item and transducer range according to actual application needs, but cannot modify the electrical parameters (0/4～20mA, 0～5/10V).

Customers can also specify the transducer item and transducer range in detail when placing orders; the meter will be pre-configured with the relevant parameters as required by the user before factory shipment. Detailed transducer items can refer to the Transducer Output Comparison Table.

Detailed transducer items can refer to the Transducer Output Comparison Table.

Note: The setting format of the transducer range is the integer quantity of the secondary power grid. For the specific format, refer to the table below, the unit of the value in the Transducer Output Comparison Table, or the secondary power grid data format in the Communication Address Information Table.

Transducer Output Comparison Table

Transducer Item Value	Transducer Item		Transducer Output			
	Distinguish the transducer output quantity by the suffix H or L in the digital display interface		0～20mA	4～20mA	0～10～20mA	4～12～20mA
1	Ua (Phase A Voltage) Scale value unit V	H		Yes		
2		L	Yes			
3	Ub (Phase B Voltage) Scale value unit V	H		Yes		
4		L	Yes			

Table (Continued) Transducer Output Comparison Table

Transducer Item Value	Transducer Item		Transducer Output			
	Distinguish the transducer output quantity by the suffix H or L in the digital display interface		0～20mA	4～20mA	0～10～20mA	4～12～20mA
5	Uc (Phase C Voltage) Scale value unit V	H		Yes		
6		L	Yes			
7	Uab (AB Phase Voltage) Scale value unit V	H		Yes		
8		L	Yes			
9	Ubc (BA Phase Voltage) Scale value unit V	H		Yes		
10		L	Yes			
11	Uca (CA Phase Voltage) Scale value unit V	H		Yes		
12		L	Yes			
13	Ia (Phase A Current) Scale value unit A	H		Yes		
14		L	Yes			
15	Ib (Phase B Current) Scale value unit A	H		Yes		
16		L	Yes			
17	Ic (Phase C Current) Scale value unit A	H		Yes		
18		L	Yes			

Table (Continued) Transducer Output Comparison Table

Transmission Item Value	Transmission Item		Transmitter Output			
	Distinguish the transmission output quantity by the suffix H or L in the digital display interface		0～20mA	4～20mA	0～10～20mA	4～12～20mA
19	Pa (Phase A Active Power) Scale Value Unit: W	H		Yes		
20		L	Yes			
21	Pb (Phase B Active Power) Scale Value Unit: W	H		Yes		
22		L	Yes			
23	Pc (Phase C Active Power) Scale Value Unit: W	H		Yes		
24		L	Yes			
25	Ps (Total Active Power) Scale Value Unit: W	H		Yes		
26		L	Yes			
27	Qa (Phase A Reactive Power) Scale Value Unit: Var	H		Yes		
28		L	Yes			
29	Qb (Phase B Reactive Power) Scale Value Unit: Var	H		Yes		
30		L	Yes			
31	Qc (Phase C Reactive Power) Scale Value Unit: Var	H		Yes		
32		L	Yes			

Table (Continued) Transmitter Output Comparison Table

Transmitter Item Value	Transmitter Item		Transmitter Output			
	The transmitter output quantity is distinguished by the suffix H or L in the digital display interface		0～20mA	4～20mA	0～10～20mA	4～12～20mA
33	Qs (Total Reactive Power) Scale Value Unit: Var	H		Yes		
34		L	Yes			
35	Sa (Phase A Apparent Power) Scale Value Unit: VA	H		Yes		
36		L	Yes			
37	Sb (Phase B Apparent Power) Scale Value Unit: VA	H		Yes		
38		L	Yes			
39	Sc (Phase C Apparent Power) Scale Value Unit: VA	H		Yes		
40		L	Yes			
41	Ss (Total Apparent Power) Scale Value Unit: VA	H		Yes		
42		L	Yes			
43	PF (Power Factor) Scale Value Unit: Cosφ	H		Yes		
44		L	Yes			
45	Fr (Frequency) Scale Value Unit: Hz	H		Yes		
46		L	Yes			

Table (Continued) Transmitter Output Comparison Table

Transmitter Item Value	Transmitter Item		Transmitter Output			
	The transmitter output quantity is distinguished by the suffix H or L in the digital display interface		0~20mA	4~20mA	0~10~20mA	4~12~20mA
47	-Ps (Negative Active Power) Scale Value Unit: W	H				Yes
48		L			Yes	
49	-Qs (Total Reactive Power) Scale Value Unit: Var	H				Yes
50		L			Yes	
51	-PF (Power Factor) Scale Value Unit: Cosφ	H				Yes
52		L			Yes	

MODBUS-RTU Communication Address Information Table

Address	Code	Variable Name	Unit	Value Range	Read/Write	Remarks
01H	CODE	Meter Password		0~9999	W/R	
02H	NET	Wiring Network		0~1	W/R	Note 1
03H	CT	Current Transformer Ratio		0~9999	W/R	
04H	PT	Voltage Transformer Ratio		0~9999	W/R	Note 2
05H	E.CLE	Energy Reset		0~1	R	Note 3
06H	DISE	LED Segment Display Brightness		0~1	W/R	Note 4
07H	DISP	Energy Cycle Display (Auto/Manual Selection)		0~1	W/R	
08H	DIST	Energy Cycle Display Time	Seconds	0~60	W/R	
09H	ADD	Communication Address		1~247	W/R	
0AH	BUAD	Communication Baud Rate		0~3	W/R	Note 5
0BH	DATA	Parity Check Bit		0~2	W/R	Note 6
0CH	AO-1	First Channel Transmitter Item		0~52	W/R	Note 7
0DH	A-Hi	First Channel Transmitter High Value		0~9999	W/R	
0EH	A-LO	First Channel Transmitter Low Value		0~9999	W/R	
0FH	AO-2	Second Channel Transmitter Item		0~52	W/R	Note 7
10H	A-Hi	Second Channel Transmitter High Value		0~9999	W/R	
11H	A-LO	Second Channel Transmitter Low Value		0~9999	W/R	
12H	AO-3	Third Channel Transmitter Item		0~52	W/R	Note 7
13H	A-Hi	Third Channel Transmitter High Value		0~9999	W/R	
14H	A-LO	Third Channel Transmitter Low Value		0~9999	W/R	
15H	AO-4	Fourth Channel Transmitter Item		0~52	W/R	Note 7
16H	A-HI	Fourth Channel Transmitter High Value		0~9999	W/R	
17H	A-LO	Fourth Channel Transmitter Low Value		0~9999	W/R	
18H	DO-1	First Channel Digital Output Item		0~52	W/R	Note 8
19H	D-Li	First Channel Digital Output Comparison Value		0~9999	W/R	
1AH	DO-2	Second Channel Digital Output Item		0~52	W/R	Note 8
1BH	D-Li	Second Channel Digital Output Comparison Value		0~9999	W/R	

MODBUS-RTU Communication Address Information Table

Address	Code	Variable Name	Unit	Value Range	Read/Write	Remarks
1CH	DO-3	Third Channel Digital Output Item		0～52	W/R	Note 8
1DH	D-Li	Third Channel Digital Output Comparison Value		0～9999	W/R	
1EH	DO-4	Fourth Channel Digital Output Item		0～52	W/R	Note 8
1FH	D-Li	Third Channel Digital Output Comparison Value		0～9999	W/R	
20H	Ua	Phase A Voltage	V	0～9999	R	Note 9
21H	Ub	Phase B Voltage	V	0～9999	R	Note 9
22H	Uc	Phase C Voltage	V	0～9999	R	Note 9
23H	Uab	A-B Line Voltage	V	0～9999	R	Note 9
24H	Ubc	B-C Line Voltage	V	0～9999	R	Note 9
25H	Uca	C-A Line Voltage	V	0～9999	R	Note 9
26H	Ia	Phase A Current	A	0～9999	R	Note 10
27H	Ib	Phase B Current	A	0～9999	R	Note 10
28H	Ic	Phase C Current	A	0～9999	R	Note 10
29H	Pa	Phase A Active Power	W	-9999～9999	R	Note 10

2AH	Pb	Phase B Active Power	w	-9999～9999	R	Note 11
2BH	Pc	Phase C Active Power	w	-9999～9999	R	Note 11
2CH	P	Combined Phase Active Power	w	-9999～9999	R	Note 11
2DH	Qa	Phase A Reactive Power	Var	-9999～9999	R	Note 11
2EH	Qb	Phase B Reactive Power	Var	-9999～9999	R	Note 11
2FH	Qc	Phase C Reactive Power	Var	-9999～9999	R	Note 11
30H	Q	Combined Phase Reactive Power	Var	-9999～9999	R	Note 11
31H	Sa	Phase A Apparent Power	VA	0～65535	R	Note 11
32H	Sb	Phase B Apparent Power	VA	0～65535	R	Note 11
33H	Sc	Phase C Apparent Power	VA	0～65535	R	Note 11
34H	S	Combined Phase Apparent Power	VA	0～65535	R	
35H	PF	Combined Phase Power Factor		-1000～1000	R	Note 12
36H	Fr	Frequency	Hz	0～9999	R	Note 13

Table (Continued) MODBUS-RTU Communication Address Information Table

Address	Code	Variable Name	Unit	Value Range	Read/ Write	Remarks
37H 38H 39H 3AH	EP	Forward Active Energy (Primary Measurement)	Wh	$0\sim1x10^{15}$	R	Note 14
3BH 3CH 3DH 3EH	EP-	Reverse Active Energy (Primary Measurement)	Wh	$0\sim1x10^{15}$	R	Note 14
3FH 40H 41H 42H	EQ	Forward Reactive Energy (Primary Measurement)	Varh	$0\sim1x10^{15}$	R	Note 14
43H 44H 45H 46H	EQ-	Reverse Reactive Energy (Primary Measurement)	Varh	$0\sim1x10^{15}$	R	Note 14
47H	U-THD.A	Phase A Voltage Total Harmonic Distortion		0～9999	R	Note 15
48H	U-THD.B	Phase B Voltage Total Harmonic Distortion		0～9999	R	Note 15

49H	U-THD.C	Phase C Voltage Harmonic Content		0～9999	R	Note 15
4AH	I-THD.A	Phase A Current Harmonic Content		0～9999	R	Note 15
4BH	I-THD.B	Phase B Current Harmonic Content		0～9999	R	Note 15
4CH	I-THD.C	Phase C Current Harmonic Content		0～9999	R	Note 15
4DH	U-NAUG	Three-Phase Voltage Balance Degree		0～9999	R	Note 16
4EH	I-NAUG	Three-Phase Current Balance Degree		0～9999	R	Note 16
4FH		Maximum Voltage Demand		0～65535	R	
50H		Maximum Current Demand		0～65535	R	
51H		Maximum Active Power Demand		0～65535	R	
52H		Maximum Reactive Power Demand		0～65535	R	
53H		Digital Output		0～255	W/R	Note 18
54H		Digital Input		0～15	R	Note 17
55H		1-channel Analog Output	mA	0～9999	R	Note 19

Table (Continued) MODBUS-RTU Communication Address Information Table

56H		2-channel Analog Output	mA	0~9999	R	Note 19
57H		3-channel Analog Output	mA	0~9999	R	Note 19
58H		4-channel Analog Output	mA	0~9999	R	Note 19

Relevant Communication Notes:

Note 1: Wiring Network
0: Three-Phase Four-Wire 1: Three-Phase Three-Wire

Note 2: Energy Reset
0: Do Not Reset Energy 1: Reset Energy

Note 3: Nixie Tube Brightness
0: Nixie Tube Always On 1: Nixie Tube Turns Off After 60s of Inactivity

Note 4: Power Display Type
0: Auto-Switch Display 1: Manual-Switch Display

Note 5: Communication Baud Rate
0: 4800 1: 9600 2: 19200 3: 115200

Note 6: Parity Check Bit
0: No Check 1: Even Parity 2: Odd Parity

Note 7: Transmitter Item

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OFF	Ua H	Ua L	Ub H	Ub L	Uc H	Uc L	UabH	UabL	UbcH	UbcL	UcaH	UcaL	Ia H	Ia L	Ib H
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ib L	Ic H	Ic L	Pa H	Pa L	Pb H	Pb L	Pc H	Pc L	Ps H	Ps L	Qa H	Qa L	Qb H	Qb L	Qc H
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Qc L	Qs H	Qs L	Sa H	Sa L	Sb H	Sb L	Sc H	Sc L	Ss H	Ss L	PF H	PF L	Fr H	Fr L	-P H
48	49	50	51	52											
-P L	-Q H	-Q L	-PFH	-PFL											

Note 8: Digital Item

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OFF	Ua H	Ua L	Ub H	Ub L	Uc H	Uc L	UabH	UabL	UbcH	UbcL	UcaH	UcaL	Ia H	Ia L	Ib H
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ib L	Ic H	Ic L	Pa H	Pa L	Pb H	Pb L	Pc H	Pc L	Ps H	Ps L	Qa H	Qa L	Qb H	Qb L	Qc H
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Qc L	Qs H	Qs L	Sa H	Sa L	Sb H	Sb L	Sc H	Sc L	Ss H	Ss L	PF H	PF L	Fr H	Fr L	THUa
48	49	50	51	52											
THUb	THUc	THIa	THIb	THIc											

Note 9: Phase Voltage & Line Voltage Description
Primary voltage value = Data × 0.01 × PT
Secondary voltage value = Data × 0.01

Note 10: Current Description
Primary current = Data × 0.0001 × CT
Secondary current value = Data × 0.0001

Note 11: Power Description
The secondary power value measured by the meter is DataPrimary power value = Data × PT × CT

Relevant Communication Notes:

Note 12: Power Factor Description
The power factor value measured by the meter = Data × 0.001

Note 13: Frequency Description
The frequency measured by the meter = Data × 0.01

Note 14: Forward/Reverse Active/Reactive Energy Description
Secondary-side energy data consists of 8 bytes (high byte first, low byte last)
Actual energy value E = (High 32 bits × 10^8) + Low 32 bits

Note 15: Harmonic Content Description
The harmonic content value measured by the meter = Data × 0.01 (Unit: %)

Note 16: Current & Voltage Unbalance Degree
The unbalance value measured by the meter = Data × 0.01 (Unit: %)

Note 17: Digital Input Query Description(Please refer to the special instructions on Page 25 for query operations)

Special Instructions

High-Order Data	Low-Order Data							
	4th Digital Input		3rd Digital Input		2nd Digital Input		1st Digital Input	
0000	X4		X3		X2		X1	
	0	1	0	1	0	1	0	1
	Switch Open	Switch Closed	Switch Open	Switch Closed	Switch Open	Switch Closed	Switch Open	Switch Closed

Note 18: Digital Output Description
Query Digital Output
(Please refer to the special instructions on Page 25 for query operations)

High-Order Data	Low-Order Data							
	4th Digital Output (X4)		3rd Digital Output (X3)		2nd Digital Output (X2)		1st Digital Output (X1)	
0000	X4		X3		X2		X1	
	0	1	0	1	0	1	0	1
	OFF	ON	OFF	ON	OFF	ON	OFF	ON

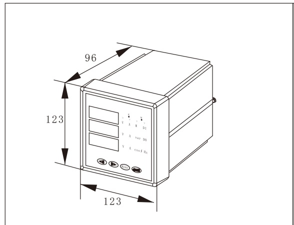
Remote Control Digital Output (Please refer to the special instructions on Page 27 for remote control operations)

High-Order Data								Low-Order Data							
4th Digital Output 004 (Y4)		3rd Digital Output 003 (Y3)		2nd Digital Output 002 (Y2)		1st Digital Output 001 (Y1)		4th Digital Output 004 (Y4)		3rd Digital Output 003 (Y3)		2nd Digital Output 002 (Y2)		1st Digital Output 001 (Y1)	
Y4		Y3		Y2		Y1		X4		X3		X2		X1	
0	1	0	1	0		0	1	0	1	0	1	0	1	0	1
Maintain State	Change State	Maintain State	Change State	Maintain State	Change State	Maintain State	Change State	Maintain State	Change State	Maintain State	Change State	Maintain State	Change State	Maintain State	Change State

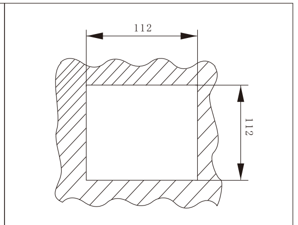
Note 19: Analog Output Description
The analog output value measured by the meter is Data × 0.01mA

V. Wiring Diagram

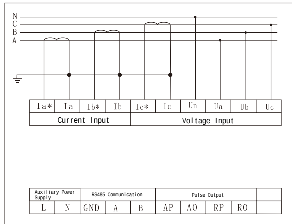
42 Square Type (Overall Dimensions: 123*123*96; Mounting Hole Dimensions: 112*112)



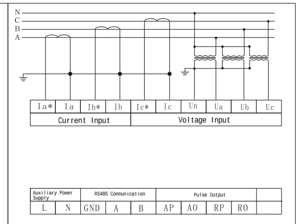
Overall Dimensions: 123*123*96



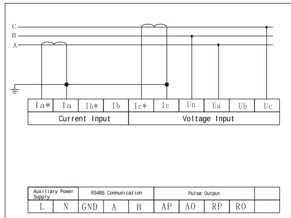
Mounting Hole Dimensions: 112*112



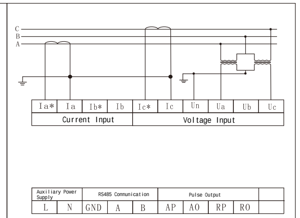
Three-Phase Four-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Four-Wire: Current Input via CT, Voltage Input via PT

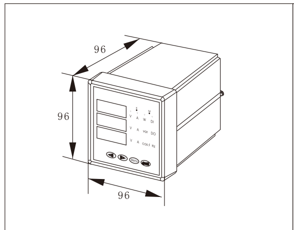


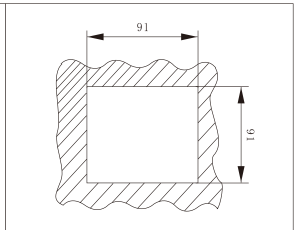
Three-Phase Three-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Three-Wire: Current Input via CT, Voltage Input via PT

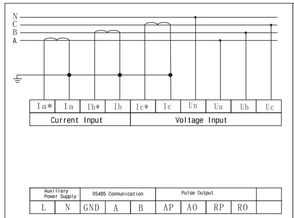
96 Square Type (Overall Dimensions: 96*96*96; Mounting Hole Dimensions: 91*91)



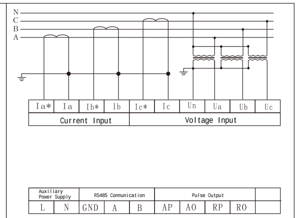


Overall Dimensions: 96*96*96

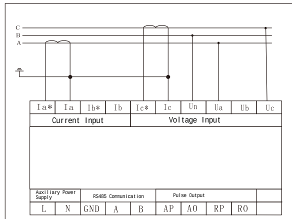
Mounting Hole Dimensions: 91*91



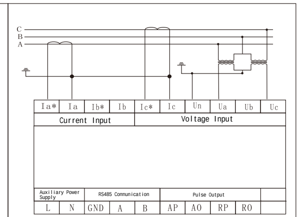
Three-Phase Four-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Four-Wire: Current Input via CT, Voltage Input via PT

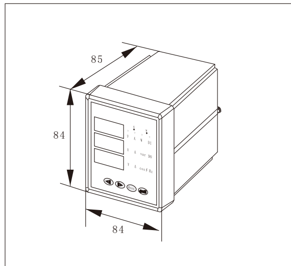


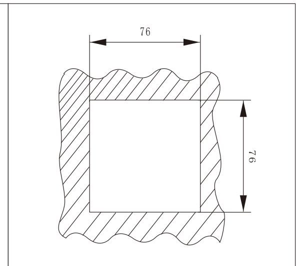
Three-Phase Three-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Three-Wire: Current Input via CT, Voltage Input via PT

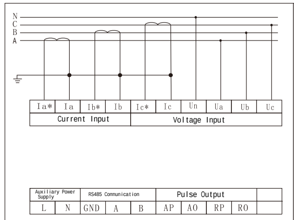
80 Square Type (Overall Dimensions: 84*84*85; Mounting Hole Dimensions: 76*76)



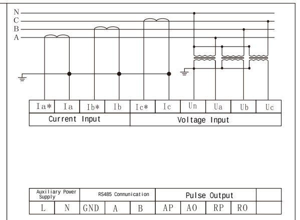


Overall Dimensions: 84*84*85

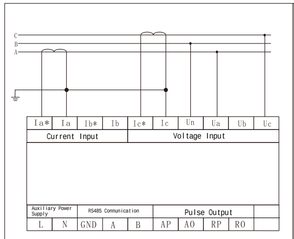
Mounting Hole Dimensions: 76*76



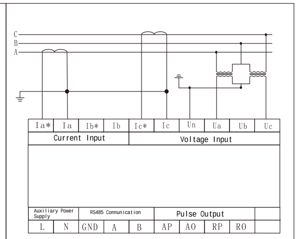
Three-Phase Four-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Four-Wire: Current Input via CT, Voltage Input via PT

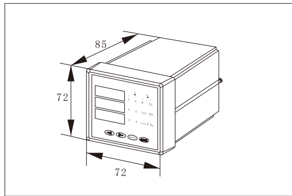


Three-Phase Four-Wire: Current Input via CT, Voltage Direct Input

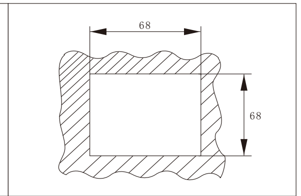


Three-Phase Four-Wire: Current Input via CT, Voltage Input via PT

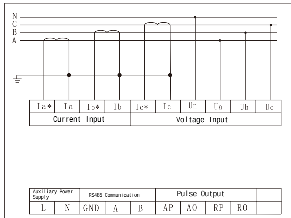
72 Square Type (Overall Dimensions: 72*72*85; Mounting Hole Dimensions: 68*68



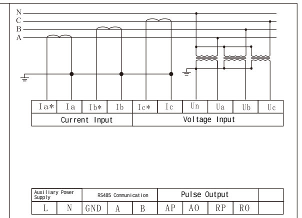
Overall Dimensions: 72*72*85



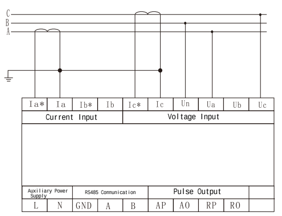
Mounting Hole Dimensions: 68*68



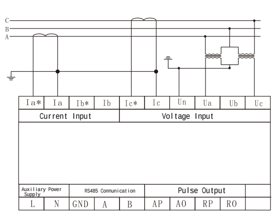
Three-Phase Four-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Four-Wire: Current Input via CT, Voltage Input via PT



Three-Phase Three-Wire: Current Input via CT, Voltage Direct Input



Three-Phase Three-Wire: Current Input via CT, Voltage Input via PT

VI.Common Issues and Solutions

6.1 Regarding Communication

6.1.1 The meter does not return data

First, ensure that the meter's communication settings (such as slave address, baud rate, parity method, etc.) match the requirements of the host computer: If multiple on-site meters fail to return data via communication, check whether the on-site communication bus connection is accurate and reliable, and whether the RS485 converter is functioning normally.If only a single or a few meters have communication abnormalities, also check the corresponding communication cables. You can test by changing the slave addresses of abnormal and normal meters to rule out or confirm host computer software issues; alternatively, test by swapping the installation positions of abnormal and normal meters to rule out or confirm meter faults.

6.1.2 The data returned by the meter is inaccurate

Please carefully read the instructions on data storage addresses and storage formats in the communication address table, and ensure that the corresponding data format conversion is performed.
It is recommended that customers contact the distributor to obtain and download MODSCAN, a testing software for the MODBUS-RTU communication protocol. This software complies with the standard MODBUS RTU communication protocol, and data can be processed in integer type, floating-point

...floating-point, hexadecimal, and other formats for display, which can be directly compared with the data shown on the meter.

6.2 Regarding Inaccurate Measurements of U, I, P, etc.

First, confirm that the voltage and current signals in use have been connected to the meter. You can use a multimeter to measure the voltage signal, and a clamp meter to measure the current signal if needed. Second, ensure the signal connections are correct—for example, check the incoming terminal (i.e., the same-name terminal) of the current signal, and whether the phase sequence of each phase is wrong.
For multi-function power meters, you can check the power interface display: generally, during reverse power transmission, the active power is bounded and not supplied externally; the active power will only appear under normal operation. If the active energy symbol is negative, it may be caused by reversed current incoming/outgoing lines; incorrect phase sequence can also lead to abnormal active energy.
In addition, note that the electrical quantity displayed by the meter is the primary grid value. If the ratio of the voltage/current transformers set in the meter does not match the ratio of the transformers actually in use, the meter's electrical quantity display will also be inaccurate. The voltage and current ranges in the meter cannot be modified after factory shipment. Ensure the wiring network mode is consistent; otherwise, incorrect display information will also occur.In addition, note that the electrical quantity displayed by the meter is the primary grid value. If the ratio of the voltage/current transformers set in the meter does not match the ratio of the transformers actually in use, the meter's electrical quantity display will also be inaccurate. The voltage and current ranges in the meter cannot be modified after factory shipment. Ensure the wiring network mode is consistent; otherwise, incorrect display information will also occur.

6.3 Regarding Inaccurate Energy Metering

The meter's energy accumulation is based on power measurement. First, check whether the meter's power value matches the actual load. Multi-function power meters support bidirectional energy metering: in case of wiring errors, if the total active power is negative, the energy will accumulate to the reverse active energy (the forward active energy will not increase).The meter's energy accumulation is based on power measurement. First, check whether the meter's power value matches the actual load. Multi-function power meters support bidirectional energy metering: in case of wiring errors, if the total active power is negative, the energy will accumulate to the reverse active energy (the forward active energy will not increase).The most common on-site issue is reversed incoming/outgoing lines of the current transformer. Multi-function power meters can display signed active power; if the power is negative, it may indicate a wiring error. In addition, incorrect phase sequence can also cause abnormal energy metering of the meter.

6.4 Ensure Proper Auxiliary Power Supply

Ensure that the appropriate auxiliary power supply (AC220V) is connected to the auxiliary power terminals of the meter. Exceeding the specified range of the auxiliary power supply voltage may (Note: The original content is incomplete here.)

...may damage the meter, and the damage cannot be repaired. You can use a multimeter to measure the voltage of the auxiliary power supply. If the power supply voltage is normal but the meter shows no display, you can try powering it off and then on again. If the meter still fails to display normally, please contact our company's technical service department.

VII.Environmental Protection and Other Legal Regulations

To protect the environment, when this product or its components are scrapped, please dispose of them properly as industrial waste; or hand them over to a recycling station for classified disassembly, recycling, and reuse in accordance with relevant national regulations.

VIII.User Usage Record