KPM10 Three-phase Multifunction

Power Meter

Instructions V2.1

Henan Compere Smart Technology Co., Ltd.

Contents

⚠ Danger and Warning

The device may only be installed by professionals. Caused any malfunction due to not follow the instructions in this manual, Manufacturers will not bear any responsibility.

⚠ Electric shock, burning and explosion

■Devices can only be qualified by the staff to install and maintain.

■Before any operation on the Devices, should be isolated from the voltage input and power supply, and the secondary windings of all current transformers are Short circuit.

■Verify that the device is live before operation.

■All mechanical parts and covers should be restored in place before the device is energized.

■Device in use should provide the correct voltage.

■Do not pay attention to these precautions may cause serious injury.

1. Outline

1.1 .Function introduction

KPM10 three-phase multi-function power meter was designed that using advanced 32-bit ARM processor and digital signal processing technology comprehensive set of three-phase electrical parameter measurement/display,power accumulation,fault alarm,harmonic measurement,digital inputs,relays output and network communications in one.Standard 72 panel,large screen LCD screen,standard 1-way RS485 communication interface.With high precision,strong isolation,stable performance, anti-interference ability and so on.

1.2. Application

Ø Measurement&Monitor energy parameter of distribution system.

Ø Collect energy consumption data that cost center analysis needs.

Ø Limit monitoring alarm(such as overvoltage, power consumption).

Ø Green building or DCS system data measurement.

1.3. Function Features

Ø Measuring three-phase AC voltage,current,active/reactive power,active/reactive energy,power factor and other 30 kinds of basic parameters.

Ø 0.5S level two-way four-quadrant power statistics.

Ø Working time, load time statistics.

Ø Support up to 21 harmonic distortion rate calculation,total harmonic distortion rate

calculation,voltage and current imbalance rate,the current K-factor calculation.

Ø Standard 1 channel RS485 interface,Modbus - RTU.

Ø Expandable 2-way DI

Ø Expandable 2 -way DO

Ø 128 points/cycle voltage,current sampling,high measurement accuracy.

Ø Large LCD screen，Micro-backlit display，Large viewing angles and in bright light environment is still good visual effect.

1.4. Functional selection

√:Standard configuration   -:No   O:Optional

Index	Item	KPM10	
1	Three phase/line voltage	√	
2	Three-phase current	√	
3	Three-phase active power and total active power	√	
4	Three - phase reactive power and total reactive power	√	
5	Three-phase apparent power and total apparent power	√	
6	Three - phase power factor and total power factor	√	
7	Monthly average power factor	-	
8	Frequency	√	
9	Active energy	√	
10	Reactive energy	√	
11	Four quadrant power	√	
12	1-way pulse out	√	
13	Multi-rate energy statistics	-	
14	Historical energy statistics	-	
15	Maximum&minimum	√	

16	Harmonic analysis	O(2..21 times)	
17	Zero sequence current	√	
18	Current imbalance rate	√	
19	Zero sequence voltage	√	
20	Voltage imblance rate	√	
21	Positive /Negative sequence	-	
22	Demand statistics	-	
23	Record	-	
24	Advanced power quality	-	
25	Load control	-	
26	Switch input	2(DI)	
27	Relay output	2(DO)	
28	1-way analog output	O	
29	1-way temperature	O	
30	Time statistics	√	
31	Applicable voltage level	Below 110kV	
32	2-way RS485 port	Standard 1 way	
33	Profibus-DP port	O	

2. Technical Parameters

2.1 Environmental conditions

Operating temperature: -25℃～+70℃   Storage temperature: -30℃～+75℃

Relative humidity: 5%～95% No condensation

Altitude :3000 meters below

2.2 Rated parameters

➢ Device working power supply

AC 85~265VAC，DC 80~300VDC

➢ Rated AC data

Phase voltage: 220V

AC current：5A

Frequency：power frequency 50Hz

➢ Switch input

Internal 24VDC DC power supply ,40ms debounce time switch output；

➢ Small high power relays

Contact capacity: 250VAC/5A,30VDC/5A

➢ Power consumption

AC voltage loop: ＜0.5VA / phase (rated)

AC current loop：   < 0.75VA / phase (5A)

AC current loop：   < 0.25VA / phase (1A)

device power supply circuit: <3VA

➢ Overload capacity

AC voltage loop :1.2 times the rated voltage Continuous operation

2 times the rated voltage , Allow 10S

AC current loop: 1.2 times the rated voltage, Continuous operation

20 times the rated voltage ,Allow 1S

➢ Precision index

Parameter	Accuracy	Resolution	Parameter	Accuracy	Resolution
Voltage	±0.2%	0.01V	Power factor	±0.5%	0.01
Current	±0.2%	0.01A	Active energy	0.5S	0.1kWh

Active power	±0.5%	0.1W	Reactive	±2.0%	0.1kvarh
Reactive power	±2.0%	0.1var	Frequency	0.02	0.01HZ
Apparent power	±0.5%	0.1VA			

2.3. Electrical insulation performance

Power frequency withstand voltage: In line with GB /T13729-2002 provisions, Power frequency voltage 2KV,Insulation resistance 1 minute: In line with GB / T13729-2002 provisions, Insulation resistance of not less than 50MΩ impulse voltage: In line with GB / T13729-2002 provisions, Bear the impact of 1.2 / 50US peak for 5KV standard lightning.

2.4. Mechanical properties

Vibration response: GB / T11287-2000 provisions, Harsh grade level 1

Vibration durability: GB/T11287-2000 provisions, Harsh grade level 1

Impact response: GB/T14537-1993 provisions, Harsh grade level 1

Impact durability: GB/T14537-1993 provisions, Harsh grade level 1

Collision: GB/T14537-1993 provisions, Harsh grade level 1

2.5. EMC performance

Electrostatic discharge immunity: GB / T17626.2-2006 level 4

Fast pulse group immunity: GB / T17626.4-2008 level 4

Surge immunity: GB / T17626.5-2008 level 4

Power frequency magnetic field immunity: GB / T17626.8-2008 level 4

3. Installation and wiring

3.1. Selection criteria

Standard of optional type :

KPM 10 □

Rated parameters
R-2-way relay output
K- 2-way switch value input

Product series

Compere Power Meter

Basic Function:Current,Voltage,Power Factor,Active Power,Reactive Power,Active Energy,Reactive Energy,Frequency,Time Statistics.

Example: KPM10RK: Rated voltage 380V,5A Current,voltage,power factor,active power,reactive power,apparent power Active energy,reactive energy frequency,time statistics,1-way RS485 communication,2-way relay outputs,2-way switch value inputs,Three-phase multi-function power meter.

3.2 Shape and hole size
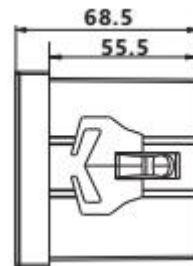
Front view	Side view
Top view	Bore hole drawing
Dimensions: 72*72*68.5mm	Hole Size: 68*68mm
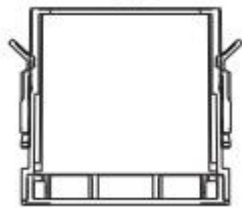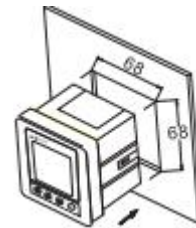
3.3 .Terminal wiring

U/+	N/-	485A	485B			DI/	DI2	DIC	DO/1	DO/2	DO21	DO22
1	2	3	4	5	6	7	8	9	10	11	12	13

14	15	16	17	18	19	20	21	22	23
Ia+	Ia-	Ib+	Ib-	Ic+	Ic-	Un	Uc	Ub	Ua
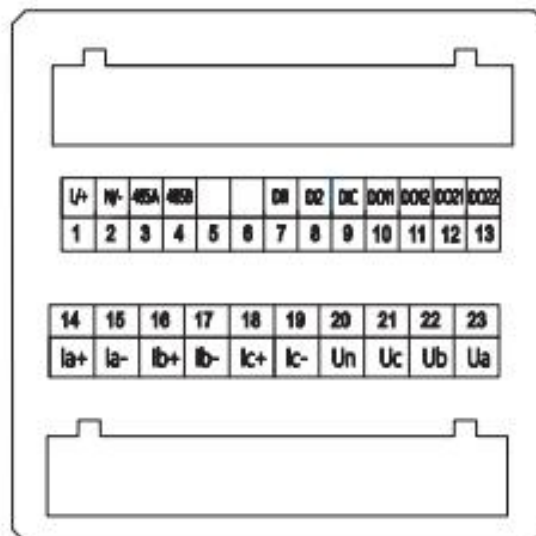
Index	Mark	Define	Index	Mark	Define
1	L/+	positive	13	DO22	Relay output 2
2	N/-	negative	14	Ia+	A-phase current into the line
3	485A	RS485 positive	15	Ia-	A-phase current outlet
4	485B	RS485 negative	16	Ib+	B-phase current into the line
5			17	Ib-	B-phase current outlet
6			18	Ic+	C-phase current into the line
7	DI1	Switch input 1	19	Ic-	C-phase current outlet
8	DI2	Switch input 2	20	Un	Voltage neutral line
9	DIC	Switch terminal	21	Uc	Phase C voltage
10	DO11	Relay output 1 forward	22	Ub	Phase B voltage
11	DO12	Relay output 1 negative	23	Ua	Phase A voltage
12	DO21	Relay output 2 forward			

3.4 .Typical wiring

KPM10   provides star system and triangular system wiring mode, the common wiring mode is as follows:

3.4.1 Star system wiring mode
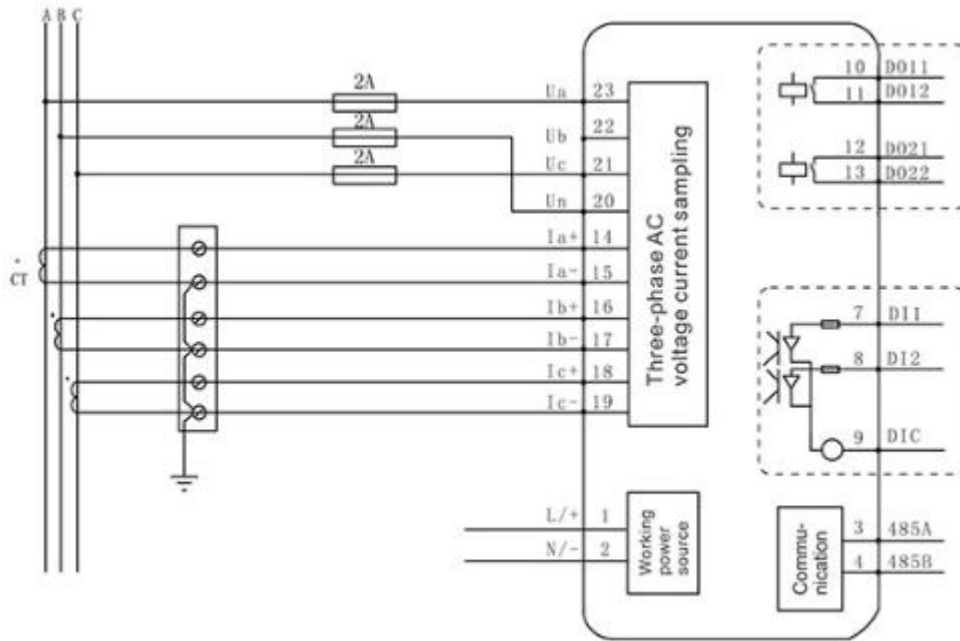
Four lines star system：Direct wiring without voltage transformer(PT)(The device is set to 3Ln3Ct)

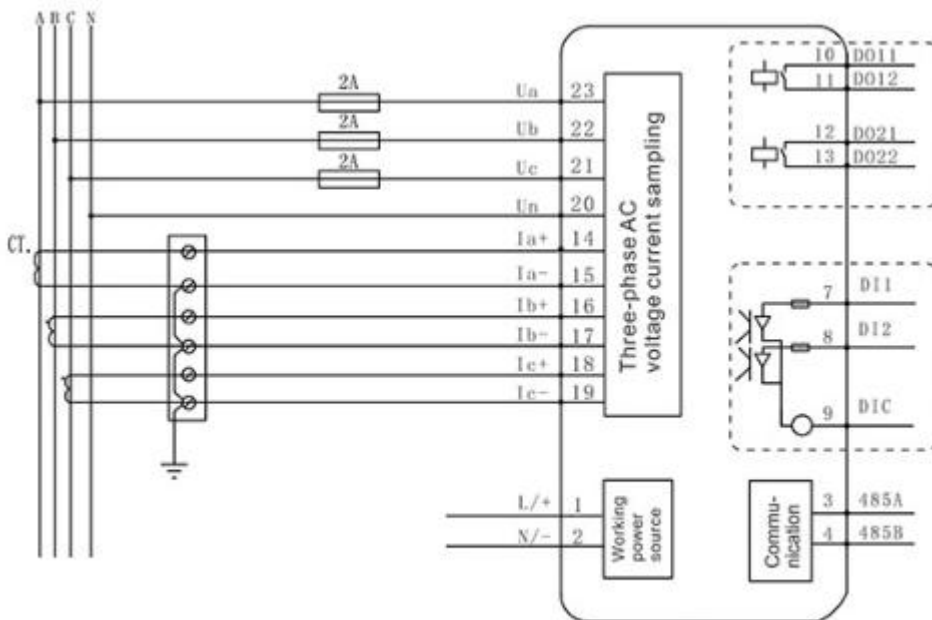## 3.4.2 Triangular system wiring mode

Triangle system: No voltage transformer(PT), 3 current transformers(CT)(device is set to 2LL3Ct)

4. Function Description

4.1. Power symbol

KPM10 provides bidirectional power calculation, power and power factor polarity as shown in the figure.
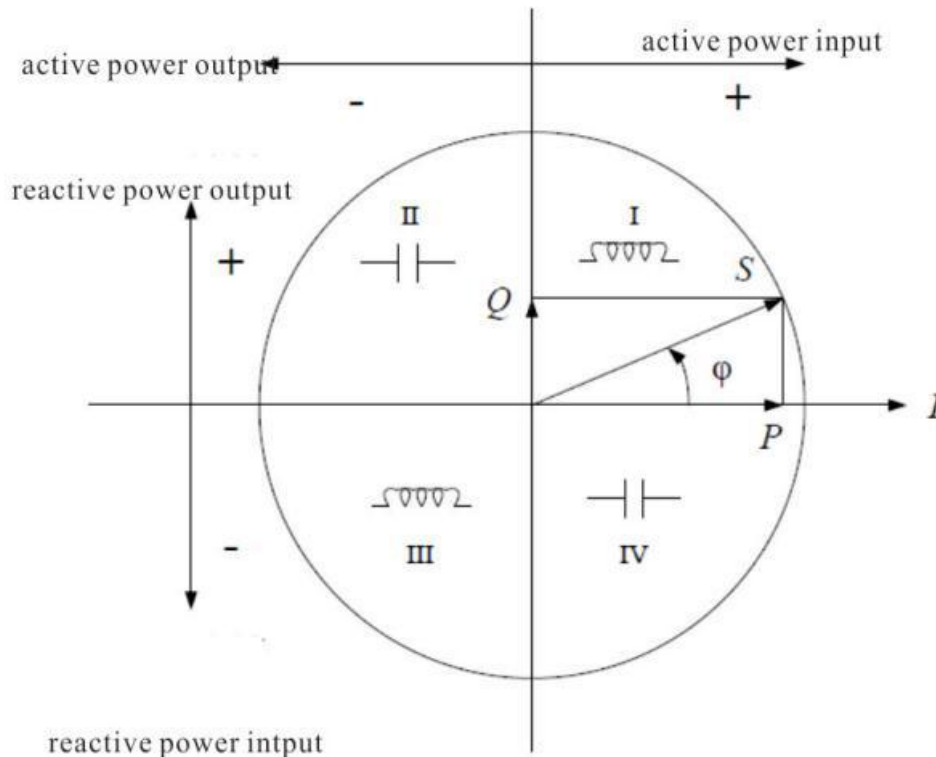
4.2. Power measurement

KPM10 bidirectional recording power sum of active and reactive energy, and the negative bi-directional power, voltage and current negative net power.

4.3. Switch input

KPM10 provide 2-channel switch input, used to detect the circuit breaker position signal, switch position signal and other status information. DC24V power supply is provided inside the equipment, when the scene requires a binary input function, external access passive contact signal, when the external contact closed, the corresponding switch input state is also turned on.
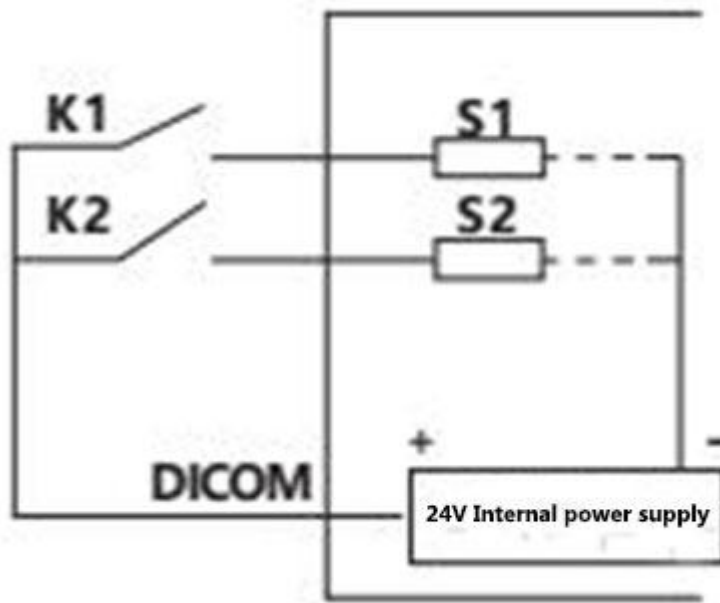
4.4 Relay output

KPM10 provides two relay actions, the user to identify the relay is in the remote control or control alarm. Different control mode, the relay action mode is different.

Remote control:

Relay through the communication with the command to control by the PC or PLC.

Limit alarm control:

The relay is controlled by an electrical parameter inside the meter as a response to a set point control alarm condition.

The two relays action mode as follows：

Remote control:

By accepting a PC or PLC command, relay closes. The relay status will remain on still the PC or the PLC will issue a release command, or the meter power loss.

Limit alarm control:

When the alarm signal of the trigger relay is generated, relay action.Until the alarm condition of all trigger relays disappears or the meter is out of order,the relay is released. If the meter recovers the power and the alarm condition persists, the relay will act again.

5. Operating instructions

5.1.Interface display
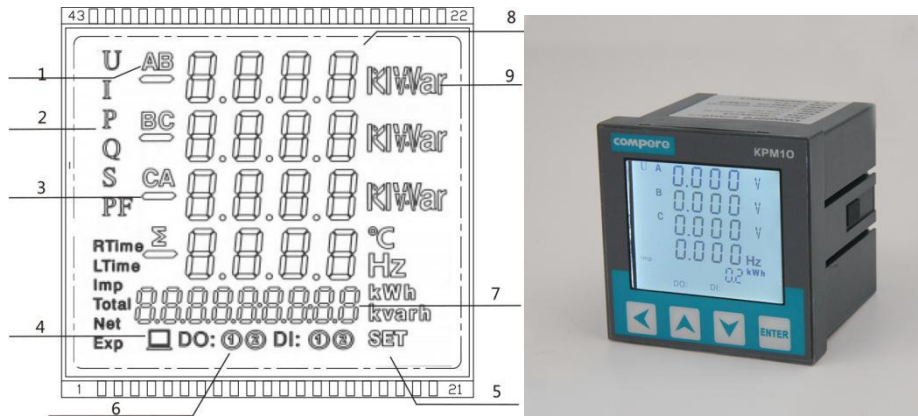
index	Display content	Detailed Description
1	Phase sequence indication	Indicated A, B, C-phase value, AB, BC, CA three-line value and Σ three-phase sum, such as three-phase total active power, total reactive power, total apparent power and so on, N represents zero line
2	Measurement data type	Identifies the parameter name displayed in the current measurement data display area in alphabetical form： Voltage is U, current is "I", active power is "P" reactive power is "Q", apparent power is "S", power factor is "PF", frequency is "F", demand is "DM", harmonic is "HD", unbalance is "UNB", maximum is "Max", minimum is "Min", temperature is "T", meter operation time is " RTime", load time is "LTime", two months ago is "B Mon",last month is "L Mon", this month is "T Mon", the day before yesterday is "B Day", yesterday is "LDay"，today is "T Day".
3	negative sign	Displayed when the measured data is negative

4	Communication indication	If two small computers all faded, that there is no communication message; two small computers all show that the communication
5	Set	When the set light is on, it indicates that it has entered the parameter setting state.
6	Relay output status	When there is a digital display, it indicates that the corresponding loop relay is closed.
7	Power and time display area	Display a variety of electrical measurement data, real-time clock, parameter settings, such as data settings.
8	Measurement data display area	Display the main measurement data: voltage, current, power, power factor, frequency, temperature, harmonic data, demand, maximum, minimum, parameter setting data, etc.
9	Electrical parameter unit symbol	voltage：V，kV；current：A，kA；active power：W，kW，MW，reactive power var，kvar, Mvar, Apparent power：VA，kVA，MVA；frequency Hz，active electricity：kWh；reactive electricity：kvarh；apparent electricity：kVAh percentage：%； etc.

5.2 Operation display

There are four touch buttons on the front panel,the four keys are marked as key left ◀ ,key up ▲ key down ▼ , key enter ENTER . Through the operation of four keys can be achieved in different measurement data display and parameter settings.

Buttonname	Functional description
Left key	Switch the items of electrical parameter in the electrical measurement interface; in the parameter setting interface state as move parameter bit key.
Up key down key	In a different function display interface, press the up or down key to cycle through all the parameters of the function item, in the parameter setting mode ,press the up key to increase the value of the modified bit in the parameter setting state. Press the down key to decrease the value of the modified bit.
ENTER	Enter the programming state; in the parameter setting state is used to enter the menu, programming parameters and confirmation.
Left key+Down key	Enter or exit the harmonic parameters query interface.

Left key+Up key	Exit setting data interface.

In the electrical parameter measurement   interface,press up key or down key to display real-time measurement data in turn, as shown.Phase voltage ,phase active power,reactive power,apparent power and power factor won't be displayed in the mode of 2LL2CT and 2LL3CT.

Electrical parameter query interface

```
┌─────────────────────────────────────────┐
│  Three-phase phase voltage and frequency │ ◄──┐
└─────────────────────────────────────────┘    │
        │  ▲                                     │
        ▼  │                                     │
┌─────────────────────────────────────────┐    │
│  Three-phase phase current and frequency │    │
└─────────────────────────────────────────┘    │
        │  ▲                                     │
        ▼  │                                     │
┌─────────────────────────────────────────┐    │
│  Three-phase line voltage and frequency  │    │
└─────────────────────────────────────────┘    │
        │  ▲                                     │
        ▼  │                                     │
┌─────────────────────────────────────────┐    │
│  Three-phase active power                │    │
└─────────────────────────────────────────┘    │
        │  ▲                                     │
        ▼  │                                     │
┌─────────────────────────────────────────┐    │
│  Three-phase reactive power              │    │
└─────────────────────────────────────────┘    │
        │  ▲                                     │
        ▼  │                                     │
┌─────────────────────────────────────────┐    │
│  Three-phase apparent power              │    │
└─────────────────────────────────────────┘    │
        │  ▲                                     │
        ▼  │                                     │
┌─────────────────────────────────────────┐    │
│  Three-phase power factor                │ ───┘
└─────────────────────────────────────────┘
```
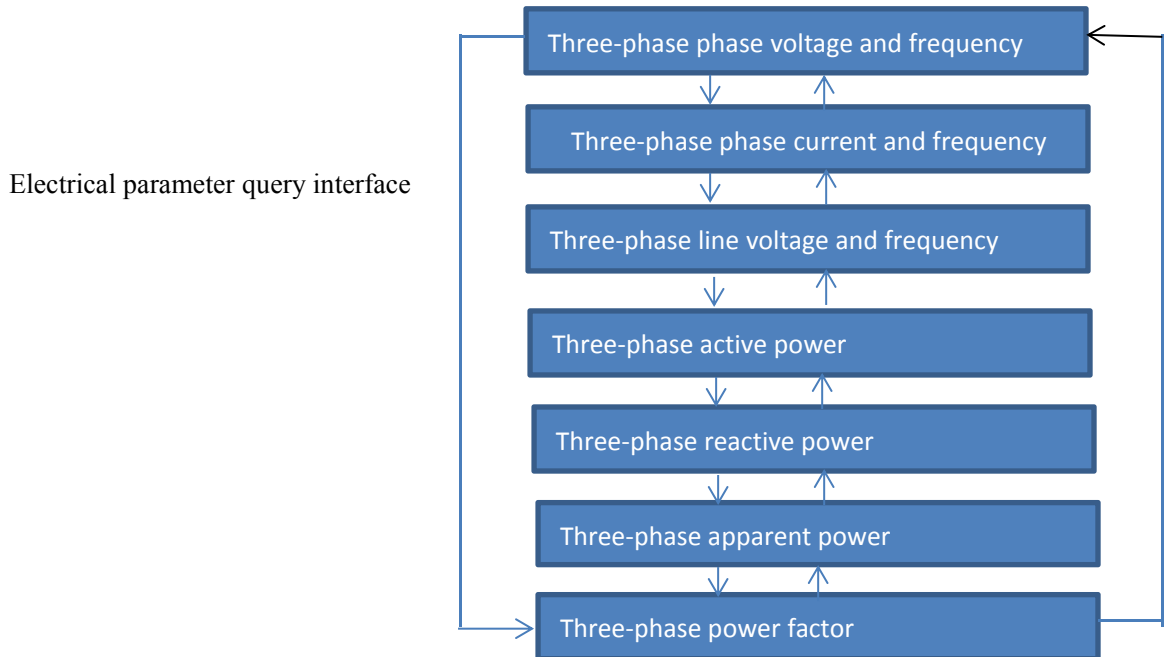
In the electrical parameter measurement interface, "Hd_"is on, you can use the down key or use the up key to see the three-phase voltage and current harmonic total distortion rate and 2 ~ 31 harmonic content. The upper left corner shows "U", for this parameter indicates a three-phase harmonic voltage, when display "I", for this parameter indicates a three-phase harmonic current, the first three lines show the total harmonic distortion and fractional harmonic content, the fourth line represents the current harmonic data type, the total harmonic distortion is displayed when "THd" is displayed, when "HR" is displayed, the data indicates the fractional harmonic content, 2 ~ 31 that the corresponding number of harmonics.

Press the left key in the electrical parameter measurement interface can enter power and time query interface.Continuous press will display the following interface.

正向有功电能
反向有功电能
绝对值有功电能
净有功电能
正向无功电能
反向无功电能

负载时间统计:时分
运行时间统计:时分
日期：年月日
时间：时分秒
净无功电能
绝对值无功电能

电能数据和时间的查询界面

Positive active electric energy	Load time statistics:H, min
Negative active electric energy	Operation time statistics:H. min
Absolute active electric energ	Date:Year/month/day
Net active electric energy	Time:H/min/S
Positive reactive electric energy	Net reactive electric energy
Negative reactive electric energy	Absolute reactive electric energy

Power and time query interface

5.3.parameter setting

Press the ENTER key to enter the password input interface in the electrical parameter measurement interface , the default password 6666, press the ENTER key after the password input is confirmed. If the input correctly enters the parameter setting interface, if the input error returns to the display interface of the measurement parameters. Press the ENTER key to enter the parameter size of the modified state, and accompanied by the modification of the characters flashing, after the change is completed, press the ENTER key to confirm the parameters of the parameters can be changed , You can modify the next parameter, you can also leave the left side of the parameters of the modified state, return to the measurement interface.

When the user in the modified state of the parameters within 60 seconds without key operation will automatically return to the electrical parameters of the measurement display interface.

Factory default value

parameter	Display	Default	implication
Password protection	PASS	6666	Used to protect non-staff to modify
Wiring method	SYSS	3Ln3CT	Three-phase four-wire system , 2LL2CT and 2LL3CT Three-phase three-wire system

Voltage ratio		Pt_U	1	Voltage transformer ratio
current		Ct_I	1	Current transformer ratio
communication address		Adr	1	The address of the meter when the network is in communication 1~247
Baud rate		bAUd	9600	Communication Baud rate address
Data format		dAtA	81N	Data frame format：8 data bits, a parity bit
backlight	BLt	1		units：minute；If set to 0, the backlight will never go out; set to other values, the last time after the delay set the time off.
System data	dAtE	Current date		Such as： 2012.05.08
System time	tinE	Current time		Such as： 09:35:20
Electric energy clear	cLr Eny	Cleared		Used to clear the energy parameters.
Firmware	VEr			The firmware version and date of the instrument

6. communication

KPM10 three-phase multifunction power meter provides MODBUS-RTU communication protocol, a start, 8-bit data bits, 1/0 parity, 1/2 stop bits, each byte length of 11 bits.

Supported baud rates: 1200, 2400, 4800, 9600, 19200bps.

Factory default communication parameters: 9600, no parity, 1 stop bit.

RTU mode format for each byte:

  1 start bit + 8 data bits + 1 parity bit + 1 stop bit

The format of the data frame is as follows:

Address field + Command field + Data field + CRC check area

Supported function codes			
DEC	**HEX**	**definition**	**Operation description**
01	0x01	Read relay output	Read one or more relay outputs
02	0x02	Read switch input	Read one or more switch input

03	0x03	Read register data	Read the value of one or more registers
05	0x05	Write a single relay output	Control all the way to close or disconnect the relay
16	0x10	Write multiple registers	Write multiple register data at a time

6.1 Relay output control and status read

This area stores the relay status. The user can read the current status using the Modbus protocol 01H function code and use the function code 05H to control the output.

Address	Parameter	Numerical range	Data type	Read-write property
0000H	Relay1 (DO1)	1=ON ,0=OFF	Bit	R/W

6.1.1 Read relay output status (function code 01H)

Request data frame: Read the status of Relay1.

Addr	Fun	Start Reg hi	Start Reg lo	Reg Num hi	Reg Num lo	CRC16 hi	CRC16 lo
01H	01H	00H	00H	00H	01H	xxH	xxH

Response Data Frame: The slave responds to the host's data frame. (1 = ON, 0 = OFF), the lowest bit of the first byte is one of the lowest bits of the first byte. The first bit of the first byte is the lowest byte of the first byte. Address the relay state value, the rest of the order to the high order, useless bits filled with 0.

Read the contents of the digital output status response example.

Addr	Fun	Byte count	Data	CRC16 hi	CRC16 lo
01H	01H	01H	01H	90H	48H

Data byte content (Relay1 is closed)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	0	0	1

6.1.2 Relay control (function code 05H)

Note that the control relay 0xAA00 is the relay divider, 0xAA55 relay sets the data frame

Addr	Fun	DO addrhi	DOaddrlo	Valuehi	Valuelo	CRC16hi	CRC16lo
01H	05H	xx	xx	AAH	55H	xxH	xxH

Response data frame

Addr	Fun	DO addr hi	DO addr lo	Value hi	Value lo	CRC16 hi	CRC16 lo
01H	05H	xx	xx	AAH	55H	xxH	xxH

6.2   Read switch input status (function code 02H)

Query data frame: This function allows the user to obtain the status of the binary input DI ON / OFF (1 = ON, 0 = OFF). In addition to the slave address and the function field, the data frame needs to be included in the data field. The initial address and the number of DIs to be read

The address of DI in KPM10 starts at 0000H (DI1 = 0000H, DI2 = 0001H ... and so on). The binary input terminals DI1 to DI2 correspond to Bit0 to Bit1, respectively. The following example shows the state of the DI1 to DI2 read from the slave address 01

Addr	Fun	DI start reg hi	DIstart reg lo	DI num hi	DI num lo	CRC16 hi	CRC16 lo
01H	02H	00H	00H	00H	04H	xx	xx

Response Number of Frames: The response contains the slave address, function code, number of data, packet and CRC check, each bit in the packet occupies one bit (1 = ON, 0 = OFF), the least significant bit of the first byte is the addressed DI1 value, the other is followed by the higher order, and the useless bit is filled with 0. The following table shows an example of a read-through input (DI1 = ON, DI2 = ON) response.

Addr	Fun	Byte count	Data	CRC16 hi	CRC16 lo
01H	02H	01H	03H	E1H	89H

Data byte content (Relay1 is closed)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	1	0	1	1

7. Common malfunction Analysis

Ø Nothing is displayed after the unit is powered on

• heck that the supply voltage and other wiring are correct and that the supply voltage should be within the operating range

• Turn off the device and the host computer, and then reboot

Ø   The device is not working properly after power on

• Turn off the device and the host computer, and then reboot

Ø Voltage or current readings incorrect

•   Check if the wiring mode setting matches the actual wiring mode

• Check whether the voltage transformer (PT), current transformer (CT) ratio is set correctly

• Check that GND is properly grounded

•   Check that the shield is grounded

• Check the voltage transformer (PT), current transformer (CT) is intact

Ø The power or power factor reading is incorrect, but the voltage and current readings are correct

• Comparison of the actual input voltage and current wiring and wiring diagram, to check whether the correct phase relationship

Ø RS-485 communication is not normal

•Check whether the communication baud rate, ID and communication protocol settings of the host computer are consistent with the meter

•Please check the data bits, stop bits, parity settings and the host computer is consistent

•Check that the RS-232 / RS-485 converter is working properly

•Check whether the problem entire communications network lines (short circuit, open circuit, grounding, shielding in a single properly grounded, etc.)

•Turn off the device and the host computer, and then reboot

• The communication line length is recommended to connect approximately 100 to 200 ohm matching resistors at the end of the communication line

Note: If there are some unsolved problems, please contact our company's after-sales service department

8. Contact

Telephone：0371-67890039

Fax：0371-67890037

Technical hotline：18838136363

Sales hotline：18838136262

Web：www.compere-power.com

Address： China, No.21, Dongming Road, Zhengzhou, Henan Province

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