KPM73 Multifunctional power meter MODBUS-RTU Communication protocol_V1.45

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19. ANNEX 30

KPM73 provides MODBUS-RTU communication protocol, a start, 8-bit data bits, 1/0 parity, 1/2 stop bits, each byte length is 11 bits. Supported baud rates: 1200bps, 2400bps, 4800bps, 9600bps, 19200bps. Factory default communication parameters: 9600bps, no parity, 1 stop bit.

1. Function code introduction

1.1. Read command Function code 03H

The host reads N-word data frame format from the slave (the data is hexadecimal)：

Slave add	Function code	Start add Hi	Slave add Lo	Function code	Start add	Slave add	Functio n code
00H	03H	xxH	xxH	00H	xxH	xxH	xxH

Slave response return frame format (data is in hexadecimal)：

Slave add	Function code	Bytes counter	Data0	Data1	……	……	……
00H	03H	N			……	……	……

DataN	CRC16 Hi	CRC16 Lo
	xxH	xxH

1.2. Write command Function code 10H

Query data frame：

Function code 16 (decimal) (10H in hexadecimal) allows the user to change the contents of multiple registers.

The host writes the N-word data frame format to the slave:

Slave add	Function code	Start add Hi	Slave add Lo	Data counter Hi	Data counter Lo	Bytes counter
00H	10H	xxH	xxH	00H	N	2N

Data1	Data2	……	Data2N	CRC16 Hi	CRC16 Lo
40H	00H	……		xxH	xxH

Preset multi-register query data frames

Response data frame：

The normal response to a preset multiple register request is to respond to the machine address, function number, data start address, number of data, and CRC check code after the register value is changed. As the following table.

Slave add	Function code	Start add Hi	Slave add Lo	Data counter Hi	Data counter Lo	CRC16 Hi	CRC16 Lo
00H	10H	xxH	xxH	00H	N	xxH	xxH

Preset multi-register response data frames

1.3. Control and output status of control relay

1.3.1 Relay control (function code 05H)

Request data frame:

Addr	Fun	DO addr hi	DO addr lo	Value hi	Value lo	CRC16 hi	CRC16 lo
01H	05H	xx	xx	FFH	00H	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	FFH	00H	xxH	xxH

1.3.2 Read relay output status (function code 01H)

Query data frame:

Read Realy1 to Relay2 status:

Addr	Fun	Relay start reg hi	Relay start regs lo	Relay #of reg hi	Relay #of regs lo	CRC16 hi	CRC16 lo
01H	01H	00H	00H	00H	02H	xxH	xxH

Response data frame:

The slave responds to the host's data frame. Contains slave address, function code, number of data byte, relay status data, and CRC error check. Each relay in the data packet occupies one bit (1 = ON, 0 = OFF). Least significant bit of the first byte is the addressed relay state value, the rest are arranged in order of high position, and the useless bits are filled with 0.

Example of reading a digital output status response.

Addr	Fun	Byte count	Data	CRC16 hi	CRC16 lo
01H	01H	01H	03H	11H	89H

Data byte content（Relay1 、Relay2 ON）

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	1

1.4. Reading digital input status (function code 02H)

Query data frame:

This function allows the user to obtain the DI status ON / OFF (1 = ON, 0 = OFF). In addition to the slave address and the function field, the data frame needs to include the initial address and the DI number to be read in the data field. The address of DI starts at 0000H (DI1 = 0000H, DI2 = 0001H ... and so on).

The following example shows the status of the DI1 to DI2 read from the slave address 01

Addr	Fun	DI start reg hi	DI start regs lo	DI num hi	DI num lo	CRC16 hi	CRC16 lo

01H	02H	00H	00H	00H	04H	xx	xx

Response data frame:

The response contains the slave address, function code, number of data, packet and CRC error 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 rest are arranged in order of high, and the unused bits are filled with 0.

The following table shows an example of reading the digital output status (DI1=ON, DI2=ON).

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

Data

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	1

2. Status of digital input DI

This area is the current digital input DI status; users can read the Modbus protocol by 02H function code.

Address	Parameter	Numerical range	Data type	Attributes
0000H	DI1	1=ON，0=OFF	Bit	R
0001H	DI2	1=ON，0=OFF	Bit	R
0003H	DI3	1=ON，0=OFF	Bit	R
0004H	DI4	1=ON，0=OFF	Bit	R

3. DO relay output status

This area stores relay status. Users can use the function code 01H of Modbus protocol to read the current status and use 05H function code to control the output. Note that control relay 0000 is relay open, FF00 is relay close.

Address	Parameter	Numerical range	Data type	Attributes
0000H	Relay1	1=ON，0=OFF	Bit	R/W
0001H	Relay2	1=ON，0=OFF	Bit	R/W
0002H	Relay3	1=ON，0=OFF	Bit	R/W
0003H	Relay4	1=ON，0=OFF	Bit	R/W

4. System parameter area

This area stores system parameters related to equipment operation, including communication parameters, wiring modes, I/O settings, etc., which can be read by using

the Modbus protocol 03H function code or using the 10H function code setting.

Address	Parameter	Numerical range	Data type
0000H	Protection password	0~9999	Word
0001H	Modbus address	Modbus Add：1~247	Word
0002H	Baud rate and check mode	Baud rate (BIT0~7)： 0：1200bps 1：2400bps 2：4800bps 3：9600bps 4：19200bps 5：38400bps Data format (BIT8~15)： 0: 8,1,n （no check） 1: 8,1,even （even-parity） 2: 8,1,odd （odd-parity）	Word
0003H	Voltage ratio	0~9999	Word
0004H	Current ratio	0~9999	Word
0005H	Wiring	0-2 (3LN 3CT three-phase four-wire, 2LL 2CT three-phase three-wire, 2LL 3CT)	Word
0006H	Transmitting settings	0~25 (three-phase four-wire) in turn is three-phase voltage, three-phase current, three-phase line voltage, active power, reactive power, apparent power, power factor and frequency. 0~10 (three-phase three-wire) in turn is three-phase line voltage, three-phase current, total active power, total reactive power, total apparent power, power factor, and frequency.	
0007H	Backlighting time	0~120（min）	Word
0008H	Demand sliding window time	1~30（min）Sliding block method	Word
0009H	Max and min clearance	0: never clear 1: daily clear, 2: monthly clear	Word
000AH	Reserved		
000BH	Clear the max/min	Enter the AA78 command to immediately clear the maximum and minimum	

	value	values。	
000CH	Clear all electricity	Enter 5578 command to clear the electricity immediately	

5. System Time Statistics Area

This area stores the system running time and loading time statistics. These data can be read using the Modbus protocol 03H function code. The data format is unsigned 32-bit integer data.

Address	Parameter	Data type	Unit
0012H	System running time statistics.	unsigned int	min
0014H	System load time statistics	unsigned int	min

6. Clock parameter area

本区域存储日历时钟参数，这些数据可使用Modbus协议03H号功能码读取，可使用10H号功能码设置。

This area stores the calendar clock parameters that can be read using the Modbus protocol 03H function code, which can be set using the 10H function code.

Address	Parameter	Numerical range	Data type
0020H	year	2000~2099	Word
0021H	mon	1~12	Word
0022H	day	1~31	Word
0023H	hour	0~23	Word
0024H	min	0~59	Word
0025H	sec	0~59	Word

7. Basic Measurement Parameters Area

基本测量区域，主要测量基本电压、电流、功率、功率因数等；序量及不平衡分析，电网中电压和电流不平衡时衡量电能质量的一个重要参数，电压和电流不平衡度是负序/正序。零序电压和电流能反映出中线电流和中线电压。

需量的计算是采用滑动区块法计算，就是设定一个窗口时间，即需量的计算周期，窗口每1分钟滑动一次，需量值更新一次。

本区域的各参数均为实时测量参数，采用Modbus协议03H号功能码读取。数据格式是Floating point据，本区域数据已经乘过变比。

Basic measurement area, mainly measuring basic voltage, current, power, power factor, etc.; Sequential quantity and unbalance analysis, An important parameter for measuring power quality when voltage and current are unbalanced in the grid. The voltage and current imbalance are negative/positive. The zero-sequence voltage and current can reflect the neutral current and the neutral voltage.

The demand is calculated using the sliding block method, which is setting a window

time (the calculation period of the demand), The window slides every 1 minute and the demand is updated in the meantime.

All parameters in this area are real-time measurement parameters and could be read using the Modbus protocol function code 03H. The data format is floating-point data, and the data in this area has been multiplied by the transformation ratio.

Address	Parameter	Data type	Unit
0030H	Phase voltage Ua	Floating point	V
0032H	Phase voltage Ub	Floating point	V
0034H	Phase voltage Uc	Floating point	V
0036H	Line voltage Uab	Floating point	V
0038H	Line voltage Ubc	Floating point	V
003AH	Line voltage Uca	Floating point	V
003CH	Phase current Ia	Floating point	A
003EH	Phase current Ib	Floating point	A
0040H	Phase current Ic	Floating point	A
0042H	Split-phase active power Pa	Floating point	W
0044H	Split-phase active power Pb	Floating point	W
0046H	Split-phase active power Pc	Floating point	W
0048H	System active power Psum	Floating point	W
004AH	Split-phase reactive power Qa	Floating point	var
004CH	Split-phase reactive power Qb	Floating point	var
004EH	Split-phase reactive power Qc	Floating point	var
0050H	System reactive power Qsum	Floating point	var
0052H	Split-phase apparent power Sa	Floating point	VA
0054H	Split-phase apparent power Sb	Floating point	VA
0056H	Split-phase apparent power Sc	Floating point	VA
0058H	System apparent power Ssum	Floating point	VA
005AH	Split-phase power factor PF1	Floating point	
005CH	Split-phase power factor PF2	Floating point	
005EH	Split-phase power factor PF3	Floating point	
0060H	System power factor PF	Floating point	
0062H	System frequency F	Floating point	HZ
0064H	Positive sequence voltage U1	Floating point	V
0066H	Negative sequence voltage U1	Floating point	V
0068H	Positive sequence current I1	Floating point	A
006AH	Negative sequence current I1	Floating point	A
006CH	Voltage unbalance Yv	Floating point	%
006EH	Current imbalance Yi	Floating point	%
0070H	Active demand	Floating point	W
0072H	Reactive demand	Floating point	var

0074H	Apparent demand	Floating point	VA
0076H	Temperature	Floating point	℃
0078H	Three-phase average phase voltage	Floating point	V
007AH	Three-phase average line voltage	Floating point	V
007EH	Zero-sequence voltage value U0	Floating point	V
0080H	Zero-sequence current value I0	Floating point	A

8. Power quality measurement parameter area

The device measurement includes total distortion rate, 2~51th harmonic content rate, odd number distortion rate, even number distortion rate, crest factor and K coefficient. This data is enlarged 1000 times. If it is data 185, the awareness is 18.5%.

The data can be read using the Modbus protocol 03H function code.

Address	Parameter	Numerical range	Instructions	Data type
0100H	UA or UAB Total Harmonic Distortion Rate THD_V1	0~1000	0~100.0%	Word
0101H	UB or UBC total harmonic content（THD_V2）	0~1000	0~100.0%	Word
0102H	UC or UCA total harmonic content（THD_V3）	0~1000	0~100.0%	Word
0103H	Ua or Uab odd harmonic distortion ratio	0~1000	0~100.0%	Word
0104H	Ua or Uab even harmonic distortion ratio	0~1000	0~100.0%	Word
0105H	Ub odd harmonic distortion ratio	0~1000	0~100.0%	Word
0106H	Ub even harmonic distortion ratio	0~1000	0~100.0%	Word
0107H	Uc or Ubc odd harmonic distortion ratio	0~1000	0~100.0%	Word
0108H	Uc or Ubc even harmonic distortion ratio	0~1000	0~100.0%	Word
0109H	Ia Total Harmonic Distortion ratio THD_I1	0~1000	0~100.0%	Word
010AH	Ib Total Harmonic Distortion ratio THD_I2	0~1000	0~100.0%	Word
010BH	Ic Total Harmonic Distortion ratio THD_I3	0~1000	0~100.0%	Word
010CH	Ia odd harmonic distortion ratio	0~1000	0~100.0%	Word
010DH	Ia even harmonic distortion ratio	0~1000	0~100.0%	Word

010EH	Ib odd harmonic distortion ratio	0~1000	0~100.0%	Word
010FH	Ib even harmonic distortion ratio	0~1000	0~100.0%	Word
0110H	Ic odd harmonic distortion ratio	0~1000	0~100.0%	Word
0111H	Ic even harmonic distortion ratio	0~1000	0~100.0%	Word
0112H	Va or Vab Crest factor	0~65535	65.535	Word
0113H	Vb or Vbc Crest factor	0~65535	65.535	Word
0114H	Vc or Vca Crest factor	0~65535	65.535	Word
0115H	Ia K factor	0~65535	65.535	Word
0116H	Ib K factor	0~65535	65.535	Word
0117H	Ic K factor	0~65535	65.535	Word
0120H~0151H	Ua or Uab harmonic content ratio（2-51harmonics）	0~1000	0~100.0%	Word
015EH~018FH	Ub harmonic content ratio（2-51harmonics）	0~1000	0~100.0%	Word
019CH~01CDH	Uc or Ucb harmonic content ratio（2-51harmonics）	0~1000	0~100.0%	Word
01DAH~020BH	Ia harmonic content ratio（2-51harmonics））	0~1000	0~100.0%	Word
0218H~0249H	Ib harmonic content ratio（2-51harmonics）	0~1000	0~100.0%	Word
0256H~0287H	Ic harmonic content ratio（2-51harmonics））	0~1000	0~100.0%	Word

9. Angle measurement

The phase angle difference is Ub, Uc, and the phase relationship between current and Ua. The angle is from 0 to 360.0. This function can help the user to connect, prevent from connecting the wrong line. Meanwhile, it can directly reflect the angle relationship between the voltage and current of the grid. Because the three-phase three-wire and three-phase four-wire connection are different, the reference input voltage is not the same, so the protocol specifically separates the two connection mode data. Users can read different data ranges according to the connection mode.

The data can be read using the Modbus protocol 03H function code.

Address	Parameter	Numerical range	Instructions	Data type
0300H	Phase angle difference between Ub and Ua	0~3600	Three-phase four-wire：0~360.0°	Word
0301H	Phase angle difference	0~3600	Three-phase four-wire：	Word

	between Uc and Ua		0~360.0°	
0302H	Phase angle difference between Ia and Ua	0~3600	Three-phase four-wire：0~360.0°	Word
0303H	Phase angle difference between Ib and Ua	0~3600	Three-phase four-wire：0~360.0°	Word
0304H	Phase angle difference between Ic and Ua	0~3600	Three-phase four-wire：0~360.0°	Word
0305H	Phase angle difference between Ubc and Uab	0~3600	Three-phase three-wire：0~360.0°	Word
0306H	Phase angle difference between Ia and Uab	0~3600	Three-phase three-wire：0~360.0°	Word
0307H	Phase angle difference between Ib and Uab	0~3600	Three-phase three-wire：0~360.0°	Word
0308H	Phase angle difference between Ic and Uab	0~3600	Three-phase three-wire：0~360.0°	Word

10. Relay settings

When DI is turned on, the anti-shake time can be set by software, and the relay pulse output width can be set, only valid when the relay is set to remote control mode and the output type is pulse output, other modes are invalid.

Use Modbus protocol 03H function code reading, or use 10H function code settings.

Address	Parameter	Explanation of meaning	Defaults	Data type
0460H	Switch input 1 anti-shake time	0~9999 mS (system default 20ms)	20	Word
0461H	Switch input 2 anti-shake time	0~9999 mS (system default 20ms)	20	Word
0462H	Switch input 3 anti-shake time	0~9999 mS (system default 20ms)	20	Word
0463H	Switch input 4 anti-shake time	0~9999 mS (system default 20ms)	20	Word
0464H	Relay 1 pulse output width	50~9999 ， (additional 1 number is 1mS)	200	Word
0465H	Relay 2 pulse output width	50~9999，(Each additional number is 1mS,)	200	Word
0466H	Relay 3 pulse output width	50~9999 ， (additional 1 number is 1mS)	200	Word
0467H	Relay 4 pulse output width	50~9999，(Each additional number is 1mS,)	200	Word
0468H	Relay remote control method	Bit0~3 Corresponds to the 1st to 4th relay output	0	Word

		patterns 0-Remote control method。 1-Alarm method		
0469H	Relay Switch output method	Bit0~3Corresponds to the 1st to 4th relay output patterns 0 — Pulse output 1 — Electrical level output	0	Word

11. Alarm event function

The device has 8 sets of alarm records. Each alarm set can be output to the relay. Note that the relay must be set to the alarm mode to be effective. If the relay is set to pulse mode, the relay will operate and the relays will be output in a pulse mode after the alarm occurs. If this alarm condition is continually established, only one pulse is output. If the alarm condition is not established, the alarm will be resumed. If the relay is opened in a level output mode, the alarm condition is continually established and the relay is always output. Once the alarm condition is not established, the relay returns to the open state.

The corresponding parameters of the alarm measured parameters are as follows：

No.	Corresponding parameters
0~35	The basic measurement parameter data corresponding to this group of coefficients

Use Modbus protocol 03H function code reading, or use 10H function code settings

Address	Parameter	Explanation of meaning	Numerical range	Defaults	Data type
0470H	Alarm group open/close	Bit0~bit8 One alarm group per bit 0：Close 1：Open		0	
0471H	Alarm group and DO1 relay (this relay must be set to alarm is valid)	Bit0~bit8 One alarm group per bit 0：Close 1：Open		0	
0472H	Alarm group and DO2 relay (this relay must be set to alarm is valid)	Bit0~bit8 One alarm group per bit 0：Close 1：Open		0	
0473H	Alarm group and DO3 relay (this relay must be set to alarm is valid)	Bit0~bit8 One alarm group per bit 0：Close 1：Open		0	

0474H	Alarm group and DO4 relay (this relay must be set to alarm is valid)	Bit0~bit8 One alarm group per bit 0：Close 1：Open		0	
0475H	Alarm group delay	0~999S	0~999S	0	Word
0476H	Group 1 : Parameter no.	Check record table meaning (increase temperature alarm)	0~36	0	Word
0477H	Group 1：Setting value	Related to specific parameters			Floating point
0479H	Group 1 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment	0~1	1	Word
047AH	Group 2 : Parameter no.	Check record table meaning	0~36	0	Word
047BH	Group 2：Setting value	Related to specific parameters			Floating point
047DH	Group 2 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment	0~1	1	Word
047EH	Group 3 : Parameter no.	Check record table meaning	0~36	0	Word
047FH	Group 3：Setting value	Related to specific parameters			Floating point
0481H	Group 3 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment	0~1	1	Word
0482H	Group 4 : Parameter no.	Check record table meaning	0~36	0	Word
0483H	Group 4：Setting value	Related to specific parameters			Floating point
0485H	Group 4 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment	0~1	1	Word
0486H	Group 5 : Parameter no.	Check record table meaning	0~36	0	Word
0487H	Group 5 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment			Floating point
0489H	Group 6 : Parameter no.	Check record table meaning	0~1	1	Word
048AH	Group 6：Setting value	Related to specific parameters	0~36	0	Word

048BH	Group 6 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment			Floating point
048DH	Group 7 : Parameter no.	Check record table meaning	0~1	1	Word
048EH	Group 7：Setting value	Related to specific parameters	0~36	0	Word
048FH	Group 7 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment			Floating point
0491H	Group 8 : Parameter no.	Check record table meaning	0~1	1	Word
0492H	Group 8：Setting value	Related to specific parameters	0~36	0	Word
0493H	Group 8 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment			Floating point
0495H	Group 5 : Comparison method	0 : Less than , Lower limit of judgment 1: More than，Upper limit of judgment	0~1	1	Word

12. Multi-rate electricity tariff setting region and segment time

This area is divided into 4 time zones, 8 time slots.
Section setting for time-sharing: Up to 4 time zones (or seasonal) can be set. Each time zone can be set up to 8 time slots. Each time zone can be assigned to 4 rates (point, peak, valley, flat).
Time zones and time slots are not set to "seconds", and seconds are defaulted to 0 seconds.
Time zone setting format: The first time zone start time is 0:0 on January 1st, and the start time zones of the remaining segments are the end time of the previous segment. The last time period must be set to 24:00 on December 31. If you do not need multiple time zones, you only need to set the last time zone to 24:00 on December 31. If there is an error in the time zone, the last time zone defaults to 24:00 on December 31st.
Time slots setting format: The default starting time of the first segment is 00:00, the starting time of the remaining segments is the ending time of the previous segment, and the last segment must be set to 24:00. If no time slot is required, then the last paragraph required is set to a time of 24:00.

Users can choose different time zones and different time slots to meet individual needs. However, in order to ensure that the time setting is reasonable and effective, the meter will perform a strict time setting check. If the setting is correct and the time-sharing function is turned on, the time-division metering will be performed, otherwise the time-sharing meter will not be performed.

The parameters of this area are the segmentation time and rate setting area, which

can be read by Modbus protocol 03H function code or by using function code 10H. Write up to 12 registers at a time

According to the set time zone number, the last time zone end time is December 31st, 24:00.

The time zone setting must be enabled at least one time zone, the time slot is checked from the end time of the first time zone of the present time zone, to find the rates less than the end time of the first accumulation period.

Multi-rate setting parameters required:

1. The end time of the last enabled time zone must be December 31st, 24:00., otherwise it defaults to December 31st, 24:00.
2. The end time of the previous period in the time period must be less than the end time of the next period
3. If the user setting is unreasonable, an error will occur in time-division measurement.

地址	参数	数值范围	数据类型
0500H	Enabled time zone 1	1~4	Word
0501H~0504H	1st time zone end time：4 Month, day, hour, minute.	month：1~12 day：1:31 hour： 0~24 minute： 0~59	Word
0505H~0508H	2nd time zone end time：4 Month, day, hour, minute.	month：1~12 day：1:31 hour： 0~24 minute： 0~59	Word
0509H~050CH	3rd time zone end time：4 Month, day, hour, minute.	month：1~12 day：1:31 hour： 0~24 minute： 0~59	Word
050DH~0510H	4th time zone end time：4 Month, day, hour, minute.	month：1~12 day：1:31 hour： 0~24 minute： 0~59	Word
0511H~ 0512H	1st time zone 1st segment end time	Hour： 0~24 Minute： 0~59	Word
0513H~ 0514H	1st time zone 2nd segment end time	Hour： 0~24 Minute： 0~59	Word
0515H~ 0516H	1st time zone 3rd segment end time	Hour： 0~24 Minute： 0~59	Word
0517H~ 0518H	1st time zone 4th segment end time	Hour： 0~24 Minute： 0~59	Word
0519H~ 051AH	1st time zone 5th segment end time	Hour： 0~24 Minute： 0~59	Word
051BH~ 051CH	1st time zone 6th segment end time	Hour： 0~24 Minute： 0~59	Word
051DH~ 051EH	1st time zone 7th segment end time	Hour： 0~24 Minute： 0~59	Word

051FH~ 0520H	1st time zone 8th segment end time	Hour：0~24 Minute：0~59	Word
0521H	1st time zone 1st segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0522H	1st time zone 2nd segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0523H	1st time zone 3rd segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0524H	1st time zone 4th segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0525H	1st time zone 5th segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0526H	1st time zone 6th segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0527H	1st time zone 7th segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0528H	1st time zone 8th segment tariff	0~3(Corresponds sharp, peak, flat, valley)	Word
0529H~0540H	2nd time zone setting	Same as 1st time zone	Word
0541H~0558H	3rd time zone setting	Same as 1st time zone	Word
0559H~0570H	3rd time zone setting	Same as 1st time zone	Word

13. Multi-rate electric energy parameters

The parameters of this area are the cumulative amount of energy, which can be read by Modbus protocol 03H function code.

Address	Parameters	Value range	Unit	Data type
Four quadrant energy				
0580H	Total positive active energy		kWh	Floating point
0582H	Total negative active energy		kWh	Floating point
0584H	Total inductive reactive energy		kvarh	Floating point
0586H	Total capacitive reactive energy		kvarh	Floating point
Total time slot energy				
0588H	Total active energy		kWh	Floating point
058AH	Total reactive energy		kvarh	Floating point
058CH	Current month total active energy		kWh	Floating point
058EH	Current month total reactive energy		kvarh	Floating point
0590H	Last month total active energy		kWh	Floating point
0592H	Last month total reactive energy		kvarh	Floating point
0594H	Before last month total active energy		kWh	Floating point
0596H	Before last month total reactive energy		kvarh	Floating point
Peak time slot energy				

0598H	Total peak active energy		kWh	Floating point
059AH	Total peak reactive energy		kvarh	Floating point
059CH	Current month total peak active energy		kWh	Floating point
059EH	Current month total peak reactive energy		kvarh	Floating point
05A0H	Last month total peak active energy		kWh	Floating point
05A2H	Last month total peak reactive energy		kvarh	Floating point
05A4H	Before last month total peak active energy		kWh	Floating point
05A6H	Before last month total peak reactive energy		kvarh	Floating point
Sharp time slot energy				
05A8H	Total sharp active energy		kWh	Floating point
05AAH	Total sharp reactive energy		kvarh	Floating point
05ACH	Current month total sharp active energy		kWh	Floating point
05AEH	Current month total sharp reactive energy		kvarh	Floating point
05B0H	Last month total sharp active energy		kWh	Floating point
05B2H	Last month total sharp reactive energy		kvarh	Floating point
05B4H	Before last month total sharp active energy		kWh	Floating point
05B6H	Before last month total sharp reactive energy		kvarh	Floating point
Flat time slot energy				
05B8H	Total flat active energy		kWh	Floating point
05BAH	Total flat reactive energy		kvarh	Floating point
05BCH	Current month total flat active energy		kWh	Floating point
05BEH	Current month total flat reactive energy		kvarh	Floating point
05C0H	Last month total flat active energy		kWh	Floating point
05C2H	Last month total flat reactive energy		kvarh	Floating point
05C4H	Before last month total flat active energy		kWh	Floating point
05C6H	Before last month total flat reactive energy		kvarh	Floating point
Valley time slot energy				
05C8H	Total valley active energy		kWh	Floating point
05CAH	Total valley reactive energy		kvarh	Floating point
05CCH	Current month total valley active energy		kWh	Floating point
05CEH	Current month total valley reactive energy		kvarh	Floating point
05D0H	Last month total valley active energy		kWh	Floating point
05D2H	Last month total valley reactive energy		kvarh	Floating point
05D4H	Before last month total valley active energy		kWh	Floating point
05D6H	Before last month total valley reactive energy		kvarh	Floating point
Average power factor				
05DAH	Current month average power factor			Floating point
05DCH	Last month average power factor			Floating point

05DEH	Before last month average power factor			Floating point
Split phase energy metering				
05E0H	Phase A positive active energy		kWh	Floating point
05E2H	Phase A negative active energy		kWh	Floating point
05E4H	Phase A positive reactive energy		kvarh	Floating point
05E6H	Phase A negative reactive energy		kvarh	Floating point
05E8H	Phase B positive active energy		kWh	Floating point
05EAH	Phase B negative active energy		kWh	Floating point
05ECH	Phase B positive reactive energy		kvarh	Floating point
05EEH	Phase B negative reactive energy		kvarh	Floating point
05F0H	Phase C positive active energy		kWh	Floating point
05F2H	Phase C negative active energy		kWh	Floating point
05F4H	Phase C positive reactive energy		kvarh	Floating point
05F6H	Phase C negative reactive energy		kvarh	Floating point

14. Maximum and minimum statistics area

This area statistics the maximum and minimum voltage current, power, power factor, power demand, frequency, voltage and current imbalance. And the statistical period can be set to "Month Clear", "Day Clear", "Never Clear". Set to "Month Clear", which is the start time of the month, the maximum and minimum values are cleared and re-compared; "Daily Clear" is the zero hour of each day, the maximum and minimum values are cleared and re-compared; "Never Clear" is the highest value if not Manually clear, the value is always compared.

This area stores the maximum and minimum values of important parameters and their time stamps. The data can be read using the Modbus protocol 03H function code.

Address	Parameter	Numerical range	Instructions	Unit
0320H	Ua max		Floating point	V
0322H	Ua max occurred moments	Year：2000~2099	Word	
0323H		Month：1~12	Word	
0324H		Day：1~31	Word	
0325H		Hour：0~23	Word	
0326H		Minute：0~59	Word	
0327H		Second+millisecond：0~59999	Word	
0328H	Ub max		Floating point	V
032AH~032FH	Ub max Occurred moments	Same as Ua time format	Word	
0330H	Uc max		Floating point	V

0332H~0337H	Uc max Occurred moments	Same as Ua time format	Word	
0338H	Uab max		Floating point	V
033AH~033FH	Uab max Occurred moments	Same as Ua time format		
0340H	Ubc max		Floating point	V
0342H~0347H	Ubc max Occurred moments	Same as Ua time format		
0348H	Uca max		Floating point	V
034AH~034FH	Uca max Occurred moments	Same as Ua time format		
0350H	Ia max		Floating point	A
0352H~0357H	Ia max Occurred moments	Same as Ua time format		
0358H	Ib max Ib		Floating point	A
035AH~035FH	Ib max Occurred moments	Same as Ua time format		
0360H	Ic max		Floating point	A
0362H~0367H	Ic max Occurred moments	Same as Ua time format		
0368H	System active power maximum		Floating point	W
036AH~036FH	P max Occurred moments	Same as Ua time format		
0370H	System reactive power maximum		Floating point	var
0372H~0377H	Q max Occurred moments	Same as Ua time format		
0378H	System apparent power maximum		Floating point	VA
037AH~037FH	S max Occurred moments	Same as Ua time format		
0380H	System power factor maximum		Floating point	
0382H~0387H	PF max Occurred moments	Same as Ua time format		
0388H	Frequency maximum		Floating	Hz

			point	
038AH~038FH	F max Occurred moments	Same as Ua time format		
0390H	Maximum voltage imbalance			%
0392H~0397H	Maximum voltage imbalance occurs moments	Same as Ua time format		
0398H	Current imbalance maximum			%
039AH~039FH	Maximum current imbalance occurs moment	Same as Ua time format		
03A0H	System active power demand maximum		Floating point	
03A2H~03A7H	System active power demand maximum occurs moment	Same as Ua time format		
03A8H	System reactive power demand maximum		Floating point	
03AAH~03AFH	System reactive power demand maximum occurs moment	Same as Ua time format		
03B0H	System apparent power demand maximum		Floating point	
03B2H~03B7H	System apparent power demand maximum occurs moment	Same as Ua time format		
03B8H	Temperature maximum		Floating point	℃
03BAH~03BFH	Temperature max occurred moments	Same as Ua time format		
Minimum record				
03C0H	Ua min		Floating point	V
03C2H~03C7H	Ua min Occurred moments			
03C8H	Ub min		Floating point	V
03CAH~03CFH	Ub min Occurred moments	Same as Ua time format	Word	
03D0H	Uc min		Floating point	V
03D2H~03D7H	Uc min Occurred moments	Same as Ua time format	Word	
03D8H	Uab min		Floating point	V
03DAH~03DFH	Uab min Occurred moments	Same as Ua time format		
03E0H	Ubc min		Floating	V

			point	
03E2H~03E7H	Ubc min Occurred moments	Same as Ua time format		
03E8H	Uca min		Floating point	V
03EAH~03EFH	Uca min Occurred moments	Same as Ua time format		
03F0H	Ia min		Floating point	A
03F2H~03F7H	Ia min Occurred moments	Same as Ua time format		
03F8H	Ib min Ib		Floating point	A
03FAH~03FFH	Ib min Occurred moments	Same as Ua time format		
0400H	Ic min		Floating point	A
0402H~0407H	Ic min Occurred moments	Same as Ua time format		
0408H	System active power minimum		Floating point	W
040AH~040FH	P min Occurred moments	Same as Ua time format		
0410H	System reactive power minimum		Floating point	var
0412H~0417H	Q min Occurred moments	Same as Ua time format		
0418H	System apparent power minimum		Floating point	VA
041AH~041FH	S min Occurred moments	Same as Ua time format		
0420H	System power factor minimum		Floating point	
0422H~0427H	PF min Occurred moments	Same as Ua time format		
0428H	Frequency minimum		Floating point	Hz
042AH~042FH	F min Occurred moments	Same as Ua time format		
0430H	Voltage imbalance minimum			%
0432H~0437H	Voltage imbalance Occurred moments	Same as Ua time format		
0438H	Current imbalance minimum		Floating	%

			point	
043AH~043FH	Current imbalance minimum Occurred moments	Same as Ua time format		
0440H	System active power demand minimum		Floating point	
0442H~0447H	System active power demand minimum occurs moment	Same as Ua time format		
0448H	System reactive power demand minimum		Floating point	
044AH~044FH	System reactive power demand minimum occurs moment	Same as Ua time format		
0450H	System apparent power demand minimum		Floating point	
0452H~0457H	System apparent power demand minimum occurs moment	Same as Ua time format		
0458H	Temperature minimum		Floating point	℃
045AH~045FH	Occurred moments of temperature min	Same as Ua time format		

15. Switch input SOE（ 100 groups）

The device has 4 DI inputs and can record status change information (status, occurrence time) with a time resolution of 1 millisecond. The first group of data defaults to the recent SOE event. The last group defaults to the earliest occurrence of a SOE event. The SOE record is stored using a first-in, first-out model, and the most recently sent SOE event replaces the earliest occurring SOE. **This function is to detect the dislocation of the DI terminal continuously, have the function of SOE, and record the time and mode of the dislocation.**

Can read by function code 03H using Modbus protocol.

Address	Parameter	Numerical range	Data type
0600H	The most recent 1st SOE description	Bit0~bit7： 1：From low to high (open)； 2：From high to low (closed)； Bit8~ Bit15： DI address（1~8）	Word
0601H	The most recent 1st SOE time	year：2000~2099	Word
0602H		month：1~12	Word
0603H		day：1~31	Word
0604H		hour：0~23	Word
0605H		minute：0~59	Word

0606H		sec+millisecond ：0~59999	Word
0607H~060DH	The most recent 2nd SOE description and time	Same format as the first group	Word
060EH~0614H	The most recent 3rd SOE description and time	Same format as the first group	Word
0615H~061BH	The most recent 4th SOE description and time	Same format as the first group	Word
061CH~0622H	The most recent 3th SOE description and time	Same format as the first group	Word
0623H~0629H	The most recent 6th SOE description and time	Same format as the first group	Word
062AH~0630H	The most recent 7th SOE description and time	Same format as the first group	Word
0631H~0637H	The most recent 8th SOE description and time	Same format as the first group	Word
0638H~063EH	The most recent 9th SOE description and time	Same format as the first group	Word
063FH~0645H	The most recent 10th SOE description and time	Same format as the first group	Word
0646H~064CH	The most recent 11th SOE description and time	Same format as the first group	Word
064DH~0653H	The most recent 12th SOE description and time	Same format as the first group	Word
065DH~065AH	The most recent 13th SOE description and time	Same format as the first group	Word
065BH~0661H	The most recent 14th SOE description and time	Same format as the first group	Word
0662H~0668H	The most recent 15th SOE description and time	Same format as the first group	Word
0669H~066FH	The most recent 16th SOE description and time	Same format as the first group	Word
0670H~0676H	The most recent 17th SOE description and time	Same format as the first group	Word
0677H~067DH	The most recent 18th SOE description and time	Same format as the first group	Word
067EH~0684H	The most recent 19th SOE description and time	Same format as the first group	Word
0685H~068BH	The most recent 20th SOE description and time	Same format as the first group	Word
068CH~0692H	The most recent 21th SOE description and time	Same format as the first group	Word
0693H~0699H	The most recent 22th SOE	Same format as the	Word

	description and time	first group	
069AH~06A0H	The most recent 23th SOE description and time	Same format as the first group	Word
06A1H~06A7H	The most recent 24th SOE description and time	Same format as the first group	Word
06A8H~06AEH	The most recent 25th SOE description and time	Same format as the first group	Word
06AFH~06B5H	The most recent 26th SOE description and time	Same format as the first group	Word
06B6H~06BCH	The most recent 27th SOE description and time	Same format as the first group	Word
06BDH~06C3H	The most recent 28th SOE description and time	Same format as the first group	Word
06C4H~06CAH	The most recent 29th SOE description and time	Same format as the first group	Word
06CBH~06D1H	The most recent 30th SOE description and time	Same format as the first group	Word
06D2H~08BBH	31~100th SOE description and time	Same format as the first group	Word

16. Switch output SOE (Tentative 100 groups)

Record relay operation events and record relay action patterns and times.

Can read by function code 03H using Modbus protocol

Address	Parameter	Numerical range	Data type
0900H	The most recent 1st SOE description	Bit0~bit7： 1：From low to high (open)； 2：From high to low (closed)； Bit8~ Bit15： DO address（1~8）	Word
0901H	The most recent 1st SOE time	year：2000~2099	Word
0902H		month：1~12	Word
0903H		day：1~31	Word
0904H		hour：0~23	Word
0905H		minute：0~59	Word
0906H		sec+millisecond ：0~59999	Word
0907H~090DH	The most recent 2nd SOE description and time	Same format as the first group	Word
090EH~0914H	The most recent 3rd SOE	Same format as the	Word

	description and time	first group	
0915H~091BH	The most recent 4th SOE description and time	Same format as the first group	Word
091CH~0922H	The most recent 5th SOE description and time	Same format as the first group	Word
0923H~0929H	The most recent 6th SOE description and time	Same format as the first group	Word
092AH~0930H	The most recent 7th SOE description and time	Same format as the first group	Word
0931H~0937H	The most recent 8th SOE description and time	Same format as the first group	Word
0938H~093EH	The most recent 9th SOE description and time	Same format as the first group	Word
093FH~0945H	The most recent 10th SOE description and time	Same format as the first group	Word
0946H~094CH	The most recent 11th SOE description and time	Same format as the first group	Word
094DH~0953H	The most recent 12th SOE description and time	Same format as the first group	Word
095DH~095AH	The most recent 13th SOE description and time	Same format as the first group	Word
095BH~0961H	The most recent 14th SOE description and time	Same format as the first group	Word
0962H~0968H	The most recent 15th SOE description and time	Same format as the first group	Word
0969H~096FH	The most recent 16th SOE description and time	Same format as the first group	Word
0970H~0976H	The most recent 17th SOE description and time	Same format as the first group	Word
0977H~097DH	The most recent 18th SOE description and time	Same format as the first group	Word
097EH~0984H	The most recent 19th SOE description and time	Same format as the first group	Word
0985H~098BH	The most recent 20th SOE description and time	Same format as the first group	Word
098CH~0BBBH	The most recent 21th SOE description and time	Same format as the first group	Word

17. Fault alarm record（ 100 groups）

The system has 8 groups of alarms. If an alarm occurs, the area records the alarm event and records the most recent fault.

Can read by function code 03H using Modbus protocol.

Address	Parameter	Numerical range	Data type
0C00H	The most recent 1st fault event description	Specific fault events（0~36） Write alarm group best	Word
0C01H	The most recent 1st fault event time	year：2000~2099	Word
0C02H		month：1~12	Word
0C03H		day：1~31	Word
0C04H		hour：0~23	Word
0C05H		minute：0~59	Word
0C06H		sec+millisecond ：0~59999	Word
0C07H~0C0DH	The most recent 2nd fault event description and time	Same format as the first group	Word
0C0EH~0C14H	The most recent 3th fault event description and time	Same format as the first group	Word
0C15H~0C1BH	The most recent 3th fault event description and time	Same format as the first group	Word
0C1CH~0C22H	The most recent 3th fault event description and time	Same format as the first group	Word
0C23H~0C29H	The most recent 3th fault event description and time	Same format as the first group	Word
0C2AH~0C30H	The most recent 3th fault event description and time	Same format as the first group	Word
0C31H~0C37H	The most recent 3th fault event description and time	Same format as the first group	Word
0C38H~0C3EH	The most recent 3th fault event description and time	Same format as the first group	Word
0C3FH~0C45H	The most recent 3th fault event description and time	Same format as the first group	Word
0C46H~0C4CH	The most recent 3th fault event description and time	Same format as the first group	Word
0C4DH~0C53H	The most recent 3th fault event description and time	Same format as the first group	Word
0C5DH~0C5AH	The most recent 3th fault event description and time	Same format as the first group	Word
0C5BH~0C61H	The most recent 3th fault event description and time	Same format as the first group	Word
0C62H~0C68H	The most recent 3th fault event description and time	Same format as the first group	Word
0C69H~0C6FH	The most recent 3th fault event description and time	Same format as the first group	Word

0C70H~0C76H	The most recent 3th fault event description and time	Same format as the first group	Word
0C77H~0C7DH	The most recent 3th fault event description and time	Same format as the first group	Word
0C7EH~0C84H	The most recent 3th fault event description and time	Same format as the first group	Word
0C85H~0C8BH	The most recent 3th fault event description and time	Same format as the first group	Word
0C8CH~0C92H	The most recent 3th fault event description and time	Same format as the first group	Word
0C93H~0C99H	The most recent 3th fault event description and time	Same format as the first group	Word
0C9AH~0CA0H	The most recent 3th fault event description and time	Same format as the first group	Word
0CA1H~0CA7H	The most recent 3th fault event description and time	Same format as the first group	Word
0CA8H~0CAEH	The most recent 3th fault event description and time	Same format as the first group	Word
0CAFH~0CB5H	The most recent 3th fault event description and time	Same format as the first group	Word
0CB6H~0CBCH	The most recent 3th fault event description and time	Same format as the first group	Word
0CBDH~0CC3H	The most recent 3th fault event description and time	Same format as the first group	Word
0CC4H~0CCAH	The most recent 3th fault event description and time	Same format as the first group	Word
0CCBH~0CD1H	The most recent 3th fault event description and time	Same format as the first group	Word
0CD2H~0EBBH	30~100th fault event description and time	Same format as the first group	Word

18. Waveform recording data

18.1. Fault record setting area

Can use Modbus protocol 03H function code reading, or use 10H function code settings.

Address	Parameter	Numerical range	Instruction	Data type
1000H	Start recording manually	0~1	0：Manually start 3 voltages 1：Manually start 3 items of current	Word
1001H	Rated current	1or 5	Transformer： 1A or 5A	Word
1002H	Rated voltage	10~660	Fault record Un	Word

1003H	fault record on or off	0x00~0x1FF	Bit0:A phase A over-current Bit1:B phase B over-current Bit2:C phase C over-current Bit3:Phase A over-voltage Bit4:Phase B over-voltage Bit5:Phase C over-voltage Bit6:Phase A under-voltage Bit7:Phase B under-voltage Bit8:Phase C under-voltage	Word
1004H	Over-current alarm threshold (3-phase current threshold is the same)	20～200	0.2In~2.0 0In	Word
1005H	Over-current alarm delay time (3-phase current threshold is the same)	0～9999	0.01~99.99S	Word
1006H	Over-voltage alarm threshold (3-phase voltage threshold is the same)	20～200	0.2In~2.0 0In	Word
1007H	Over-voltage alarm delay time(3-phase voltage threshold is the same)	0～9999	0.01~99.99S	Word
1008H	Under-voltage lower limit alarm threshold (3-phase voltage threshold is the same)	20～200	0.2In~2.0 0In	Word
1009H	Under-voltage alarm delay time (3-phase voltage threshold is the same)	0～9999	0.01~99.99S	Word

18.2. Fault record waveform record

This area records the cause of the fault. By the cause of the fault, it can be distinguished that the recorded data is a 3-phase voltage or a 3-phase current, recording a total of 10 cycles and 64 cycles per cycle; the recorded wave data has been converted into a standard data format, current data, Expanding 1000 times, for example, data is 5000 for 5.000A; voltage data is increased by 100 times, for example, 2200 for data, which is 220.0V. Note that the data inside is not a quadratic value, and the user multiplies it by the ratio to obtain the corresponding data.

Can use Modbus protocol 03H function code reading.

Address	Parameter	Numerical range	Data type
1100H	Group 1 Fault Record Fault Causes	0= Manual voltage recording 1= Manual current recording 2=Phase A current exceeds the limit record; 3= Phase B current exceeds the limit record; 4= Phase C current exceeds the limit record; 5= Phase A voltage exceeds the limit record; 6= Phase B voltage exceeds the limit record 7= Phase C voltage exceeds the limit record 8= Phase A voltage lower limit alarm 9= Phase B voltage lower 10= Phase C voltage lower	word
1101H	Group 1 Fault Record Recorded wave current（voltage）	0——65535 Current :（0~65.535） Voltage : (0~6553.5)	word
1102H	Group 1 Fault Record year	2000~2999	word
1103H	Group 1 Fault Record month	1~12	word
1104H	Group 1 Fault Record day	1~31	word
1105H	Group 1 Fault Record hour	0~23	word
1106H	Group 1 Fault Record minute	0~59	word
1107H	Group 1 Fault Record millisecond	0~59999	word
1108H~1387H	Group 1 Fault Record A phase voltage（current）1~10 cycles data (64 points per cycle)		word
1388H~1607H	Group 1 Fault Record B phase voltage（current）1~10 cycles data (64 points per cycle)		word
1608H~1887H	Group 1 Fault Record C phase voltage（current1~10 cycles data (64 points per cycle)		word
1888H~200FH	All parameters of the second group fault record	Same as the first group	word
2010H~2797H	All parameters of the third group	Same as the first group	word

	fault record		
279EH~2F26H	All parameters of the 4th group fault record	Same as the first group	word
2F27H~36B0H	All parameters of the 5th group fault record	Same as the first group	word

19. Annex

Transfer project：

Three-phase four-wire			**3 phase 3 wire**	
0	Ua		0	Uab
1	Ub		1	Ubc
2	Uc		2	Uca
3	Ia		3	Ia
4	Ib		4	Ib
5	Ic		5	Ic
6	Uab		6	PS
7	Ubc		7	QS
8	Uca		8	SS
9	Pa		9	PFs
10	Pb		10	F
11	Pc			
12	Ps			
13	Qa			
14	Qb			
15	Qc			
16	Qs			
17	Sa			
18	Sb			
19	Sc			
20	Ss			
21	PFa			
22	Pfb			
23	PFc			
24	PFs			
25	F			

Instruction：***P=(Px-12)×Pe×CT×PT／8***

Px is the measured value of analog，Unit: ***mA***;

Pe is the corresponding rated power value，Unit: ***W***

Different voltage levels correspond to different PE values, as follows:

200V/5A：*Pe*=3000W

200V/1A：*Pe*=600W

100V/5A：*Pe*=1500W

100V/1A：*Pe*=300W

Active power and reactive power follow the power curve