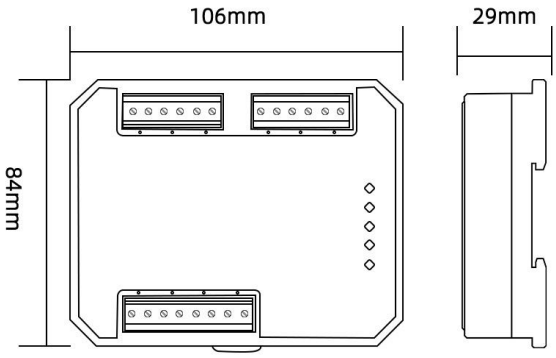
SPE8□□□- ME Three-Phase Energy Parameter Acquisition Module User Manual

scan the QR code to learn more

I. Precautions

- Do not operate this product beyond its design limits under any circumstances.
- The power supply for this product is 24V DC. Strictly prohibit the use of 220V AC power.
- This product should be installed in a safe location. The shell's maximum withstand temperature is +85°C.
- When used in environments with strong magnetic interference, Shielded cable is recommended for signal lines.
- Strictly prohibit unauthorized disassembly, modification, or repair of this product.
- Pay attention to the wiring method of this product to ensure correct Wiring and avoid damaging the product.
- Read this manual carefully before installation and use. If you have any questions, please contact our technical support personnel or refer to relevant technical guidance videos.
- Our company is not responsible for damage to components other than this product during use.
- Please download the latest electronic version of the documentation. The content of this manual is for reference only. We continuously improve the user experience, and technical parameters are subject to change without notice.



II. Product Dimensions

- Product dimensions: **106mm (L) X 84mm (W) X 29mm (H)**
- Industrial-grade flame-retardant plastic shell, standard DIN35 rail mounting.

III. Operating Environment

- Do not expose this product to excessively high or low temperatures.
- The surrounding environment must be free from strong vibration, impact, and electromagnetic interference such as large currents and sparks.
- The operating environment must not contain harmful substances that cause severe corrosion to metal or plastic components. Do not use or store the product in harsh environments, otherwise it will affect the electrical performance of the product.
- Operating Temperature: -40℃～+80℃ Relative Humidity: 10% ～ 90%RH (non-condensing)

IV. After-Sales Service

We are committed to providing you with comprehensive after-sales service and warranty policy. The product warranty period is three years. During the warranty period, if the product fails due to non-human factors, we will provide free repair or replacement service. Damage caused by violation of operating regulations and requirements will require payment of parts cost and repair fee. After the warranty period expires, we continue to provide technical support and assistance. During this period, replacement parts are provided at cost price.

V. Application Fields


Automation Equipment


Medical Electronics


Remote Monitoring


Process Control

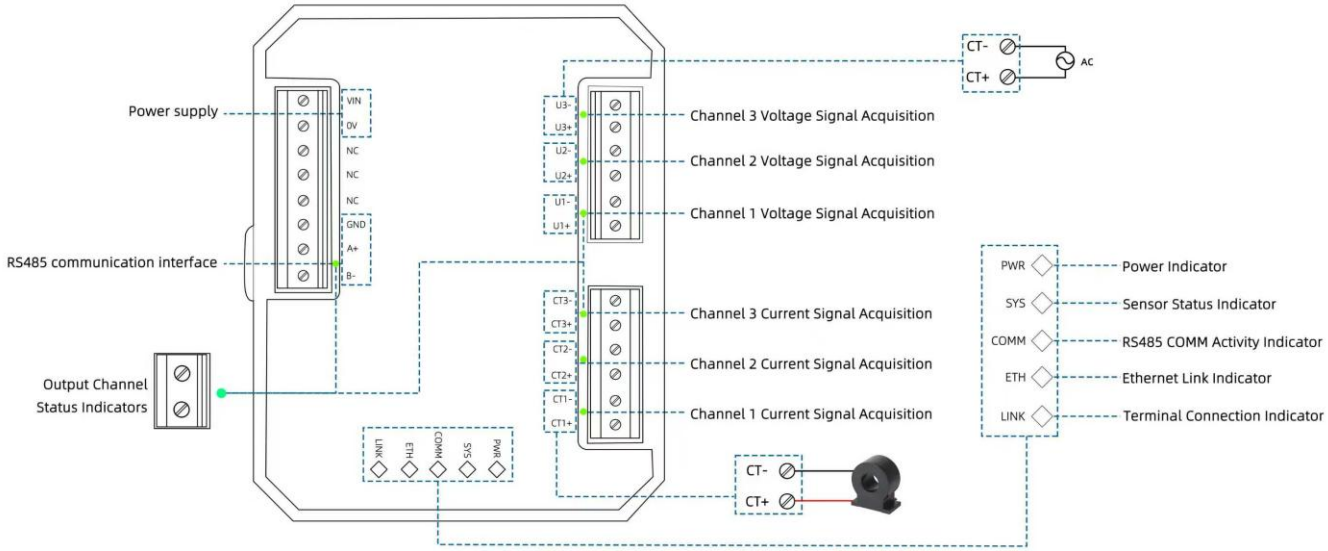
· Product Introduction

The SPE power signal data acquisition module is meticulously designed based on a new-generation embedded system. It features isolated communication interfaces, allowing it to communicate independently with a PC or PLC, or to be networked with multiple communication modules. Additionally, the module is equipped with a transient suppression circuit, which effectively suppresses various surge pulses and ensures reliable operation in harsh environments.

The SPE8□□□-ME series energy parameter acquisition module includes three-phase AC current acquisition, three-phase AC voltage acquisition, and three-phase power acquisition. It is equipped with an RS485 communication interface and integrates six Delta-Sigma ADCs along with a high-precision energy metering core. With a resolution of up to 19 bits and a measurement accuracy better than 0.05%, the module ensures high performance. The power supply, inputs, and communication outputs are isolated from each other, making it suitable for various industrial applications and automation systems. It facilitates communication with host computers, enables rapid networking, and supports the construction of monitoring systems.

This product requires an independent power supply and is mounted on a standard 35mm DIN rail, offering simple on-site installation and flexible use, suitable for a variety of field applications.

· Wiring and indication



Note:

1. This module is available in three communication versions: RS485, Ethernet (ETH), and RS485 + Ethernet.
2. The Ethernet port is active only in versions equipped with Ethernet functionality.
3. For specific Ethernet features and operation, please refer to the Serial Server Manual.

· Technical Parameters

Basic Parameters	
Power Supply	DC12～36V(DC24V recommended)
Power Consumption	＜1.0W
Temperature Drift	≤200ppm/℃
Sampling Frequency	≤3Hz
Isolation Voltage	3000VDC
Power Protection	Reverse connection voltage< -40V
Dielectric Strength	1500 VAC / 1 minute (Power, Input, Output)
Insulation Resistance	100MΩ (power, input, output)
EMC Compatibility	Complies with GB/T18268.1 (IEC61326-1)
Applicable Field Devices	Configuration software, PLCs, touch screens, computers, and other devices supporting the MODBUS-RTU protocol
Input Terminal	
Acquisition Channels	3 Channels
Input Signals	Three-phase AC voltage <500V; Three-phase load current <500A
Input Range	Input range parameters correspond to product naming
Input Frequency	45Hz to 65Hz
Output Terminal	
Output Signal	RS-485 communication signal
Communication Protocol	Standard MODBUS-RTU protocol
Communication Distance	1200m (typical)
Voltage Accuracy	<0.05%F.S (+25℃)
Current Accuracy	<0.05%F.S (+25℃)
Active Power Accuracy	<0.05%F.S (+25℃)
Apparent Power Accuracy	<0.05%F.S (+25℃)
Frequency Accuracy	±0.1Hz
Environmental Conditions	
Operating Temperature	-40℃～+80℃
Storage Temperature	-40℃～+85℃
Relative Humidity	10%～90%RH (non-condensing)
Atmospheric Pressure	80kPa～106kPa

· Terminal Description

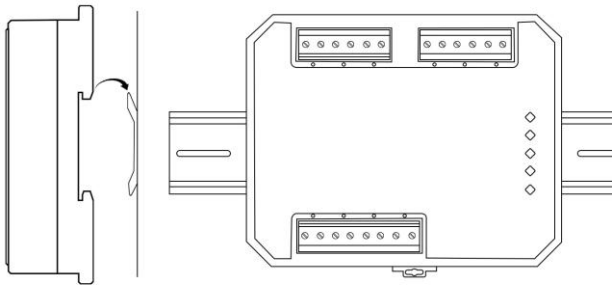
Terminal Mark	Function Description
VIN	Power supply positive terminal, DC12-36V input
0V	Power supply negative terminal
NC	No Connection (Empty pin)
NC	No Connection (Empty pin)
NC	No Connection (Empty pin)
GND	RS-485 communication signal ground
A+	RS-485 communication signal positive terminal
B-	RS-485 communication signal negative terminal
CT1+	Channel 1 input signal acquisition, Requires external current transformer
CT1−	Channel 1 input signal acquisition, Requires external current transformer
CT2+	Channel 2 input signal acquisition, Requires external current transformer
CT2−	Channel 2 input signal acquisition, Requires external current transformer
CT3+	Channel 3 input signal acquisition, Requires external current transformer
CT3−	Channel 3 input signal acquisition, Requires external current transformer
U1+	Channel 1 Voltage Input Signal Positive Terminal
U1−	Channel 1 Voltage Input Signal Negative Terminal
U2+	Channel 2 Voltage Input Signal Positive Terminal
U2−	Channel 2 Voltage Input Signal Negative Terminal
U3+	Channel 3 Voltage Input Signal Positive Terminal
U3−	Channel 3 Voltage Input Signal Negative Terminal
ETH	Ethernet port（optional）

· Indicator Description

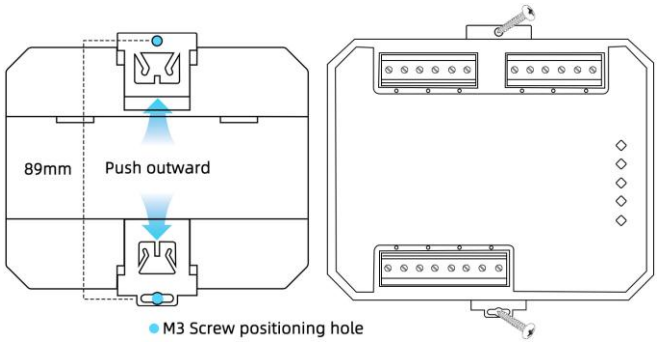
Indicator Mark	Function Description
PWR	Power indicator
SYS	System Status Indicator
COMM	RS485 Communication LED - Flashes during data transmission
ETH	Ethernet Link LED
LINK	Host Connection LED

· Installation Instructions

This module uses the DIN35mm rail mounting method. The rail should comply with the installation dimension specifications for the TH35-7.5 type rail according to the national standard GB/T19334-2003. Users can easily install or remove the module on the rail. Installation must be stable and secure. This module also supports screw mounting without a rail.



– Installation method of guide rail –



– Screw installation method –

· Product Naming Rules

SPE8029-ME01L as an example: Power parameter acquisition module, 0-500V/0-10A input, no analog output, RS485 communication function module, DC12-36V power supply, M appearance								
SPE	6	01	2	M	A	1	1	L
Product Type	Signal Type	Number of Channels	Input Range	Product Form Factor	Acquisition Resolution	Analog Output	Comm Method	Power Supply
Electric signal acquisition module	1. AC voltage 2 AC current 3 Active power 4 reactive power 5 apparent power 6 frequencies 7 power factor 8 Comprehensive Electric Energy 9 Customization	1-32	1 0-10A 0-500Vac 2 0-20A 0-500Vac 3 0-20A 0-500Vac 4 0-50A 0-500Vac 9 Other	N Form Factor K Form Factor M Form Factor W Form Factor F Form Factor R Form Factor Y Form Factor Q Form Factor S Form Factor	A 12-bit ADC B 16-bit ADC C 24-bit ADC D 32-bit ADC E 19-bit ADC	0 No Output 1 0-5V 2 0-10V 3 4-20mA 4 0-20mA	0 No Comm 1 RS485 2 ETH 3 RS485+ETH 4 CAN 9 Other Comm	L DC12-36V H AC220V C +12V D +24V

· Product Model Selection Guide

SPE8029-ME01L-BLE: Module with built-in Bluetooth function for terminal connection (default version)
SPE8029-ME01L -4G: Module with 4G function for terminal connection
SPE8029-ME01L -WIFI: Module with Wi-Fi function for terminal connection
SPE8029-ME01L: Basic version, without terminal connection function

· MODBUS-RTU Communication Protocol

The MODBUS-RTU protocol defines multiple function codes to achieve different functions. This manual explains the message format for commonly used function codes. This module only supports some of these function codes: 0X03, 0X04, 0X06, 0X10.

Function Code	Register add	Function Description
0X01	0XXXX	Read Coil Status (bit operation), e.g., read relay or digital output current state (ON/OFF)
0X02	0XXXX	Read Input Status (bit operation), e.g., read one or more groups of digital input states (ON/OFF)
0X05	0XXXX	Write Single Coil (bit operation), e.g., force a relay or digital output ON/OFF
0X03	4XXXX	Read Holding Registers
0X04	4XXXX	Read Input Registers (can be replaced by 0X03)
0X06	4XXXX	Write Single Holding Register
0X10	4XXXX	Write Multiple Holding Registers

· Communication Parameter Settings

Parameter	Setting Range	Default Value
Address	1～247	1
Baud Rate	1200、2400、4800、9600、14400、19200、38400、56000、57600、115200	9600
Parity	None, Even, Odd	None
Stop Bits	1, 2, 0.5, 1.5	1

· Communication Protocol Description

This communication board complies with the MODBUS RTU bus protocol, RS485 interface. The communication format is 11 bits:

1 start bit

8 data bits

1 parity bit (if used)

1 stop bit (with parity), 2 stop bits (without parity)

Data type: Unsigned int

With Parity

Start Bit	1	2	3	4	5	6	7	8	Parity Bit	Stop Bit

Without Parity

Start Bit	1	2	3	4	5	6	7	8	Stop Bit	Stop Bit

The message frame starts with a silence interval of more than 3.5 character times. The first field transmitted is the module add, followed by the function code, then the register add then the data, followed by the CRC16 check. It ends with a silence interval of more than 3.5 character times. The frame format is as follows:

Start Bit	Module add	Function Code	Register add High Byte	Register add Low Byte	Register Data High Byte	Register Data Low Byte	CRC16 calibration	End
>3.5 Chars	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Byte	>3.5 Chars
	1–247	0X03 0X06	0X00	0X01	0X00	0X01	CRC	

Function Code: 0X01

1.Host Request Frame:

1 Byte	2 Byte	3 Byte	4 Byte	5 Byte	6 Byte	7 Byte	8 Byte
ADR	0X01	Start address Hi	Start address Lo	Qty Hi	Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	coil start address to be read		number of coils to be read		CRC16 checksum from bytes1 to 6	

2.Slave Response Frame (Correct) : Coil status 0 = OFF and 1 = ON

1	2	3	4、5	6、7	……	N-1、N	N+1	N+2
ADR	0X01	Coil status Byte Count	Coil Status 1 Data	Coil Status 1 Data	……	Coil Status N Data	CRC16 Lo	CRC16 Hi
Module address (1~247)	Function code	Returns the number of bytes in coil status	Returns the wire net status data (one coil status is two bytes)				CRC16 checksum from bytes 1 to N	

Function Code: 0X02

1.Host Request Frame:

1	2	3	4	5	6	7	8
ADR	0X02	Start address Hi	Start address Lo	Qty Hi	Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	The coil input start address to be read		number of coils to be read		CRC16 checksum from bytes1 to 6	

2.Slave Response Frame (Correct) : Coil status 0 = OFF and 1 = ON

1	2	3	4、5	6、7	……	N-1、N	N+1	N+2
ADR	0X02	Coil status Byte Count	Coil Status 1 Data	Coil Status 1 Data	……	Coil Status N Data	CRC16 Lo	CRC16 Hi
Module address (1~247)	Function code	Returns the number of bytes in coil status	Returns multiple coil input status data				CRC16 checksum from bytes1 to N	

Function Code: 0X05

1.Host Request Frame: Coil status 0 = OFF and 1 = ON

1	2	3	4	5	6	7	8
ADR	0X05	Coil address Hi	Coil address Lo	Force Data Hi	Force Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Written coil address		Number of coils written		CRC16 checksum from bytes1 to 6	

2.Slave Response Frame (Correct) :

1	2	3	4	5	6	7	8
ADR	0X05	Coil address Hi	Coil address Lo	Force Data Hi	Force Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Written coil address		Returns coil status data		CRC16 checksum from bytes1 to 6	

Function Code: 0X03

1.Host Request Frame:

1 Byte	2 Byte	3 Byte	4 Byte	5 Byte	6 Byte	7 Byte	8 Byte
ADR	0X03	Start address Hi	Start address Lo	Reg Qty Hi	Reg Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	The register starting address to read is		Number of registers read		CRC16 checksum of bytes 1 to 6	

2.Slave Response Frame (Correct) :

1	2	3	4、5	6、7	·····	N-1、N	N+1	N+2
ADR	0X03	Byte Count	Reg 1 Data Hi	Reg 1 Data Lo	.....	Reg N Data Hi, Reg N Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Returns the effect of reading register bytes	Returns multiple register data (one register data is two bytes)				CRC16 checksum of bytes 1 to N	

Function Code: 0X06

1.Host Request Frame:

1	2	3	4	5	6	7	8
ADR	0X06	Reg address Hi	Reg address Lo	Reg Data Hi	Reg Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Register address to be written		Register data to be written		CRC16 checksum of bytes 1 to 6	

2.Slave Response Frame (Correct) :

1	2	3	4	5	6	7	8
ADR	0X06	Reg address Hi	Reg address Lo	Reg Data Hi	Reg Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Returns the register address written		Returns the written register data		CRC16 checksum of bytes 1 to 6	

Function Code: 0X10

1.Host Request Frame:

1	2	3、4	5、6	7	8、9	10、11	·····	N-1、N	N+1	N+2
ADR	0X10	Start Add	Reg Qty	Byte Count	Reg 1 Data	Reg 2 Data	.....	Reg N Data	CRC Check	CRC Check
Module address (1~247)	Function code	The starting address of the register to be written	Validity of register written	Number of register data bytes written	Multiple register data written (One register data is two bytes)				CRC16 checksum of bytes 1 to N	

2.Slave Response Frame (Correct) :

1	2	3	4	5	6	7	8
ADR	0X10	Start Add Hi	Start Add Lo	Reg Qty Hi	Reg Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Returns the starting address of the register written		Returns the number of registers written		CRC16 checksum of bytes 1 to 6	

· Register Definition Table

PLC add	Register add (HEX)	Function Definition	R/W Attribute	Value Range and Description
40002	1	A-phase AC voltage value	Read Only	Unit: 0.01V. For example, if the reading is 22050, the corresponding voltage is 220.5V
40003	2	B-phase AC voltage value	Read Only	Unit: 0.01V. For example, if the reading is 22050, the corresponding voltage is 220.5V
40004	3	C-phase AC voltage value	Read Only	Unit: 0.01V. For example, if the reading is 22050, the corresponding voltage is 220.5V
40005	4	Total-phase AC voltage value	Read Only	Unit: 0.01V. For example, if the reading is 22050, the corresponding voltage is 220.5V
40006	5	A-phase AC current value	Read Only	Unit: 0.01A. For example, if the reading is 1043, the corresponding current is 10.43A
40007	6	B-phase AC current value	Read Only	Unit: 0.01A. For example, if the reading is 1043, the corresponding current is 10.43A
40008	7	C-phase AC current value	Read Only	Unit: 0.01A. For example, if the reading is 1043, the corresponding current is 10.43A
40009	8	Total-phase AC current value	Read Only	Unit: 0.01A. For example, if the reading is 1043, the corresponding current is 10.43A
40010	9	Phase A Active Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40011	A	Phase A Active Power High 16 Bits Data	Read Only	
40012	B	Phase B Active Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40013	C	Phase B Active Power High 16 Bits Data	Read Only	
40014	D	Phase C Active Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40015	E	Phase C Active Power High 16 Bits Data	Read Only	
40016	FF	Total Active Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40017	10	Total Active Power High 16 Bits Data	Read Only	
40018	11	Phase A Reactive Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40019	12	Phase A Reactive Power High 16 Bits Data	Read Only	
40020	13	Phase B Reactive Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40021	14	Phase B Reactive Power High 16 Bits Data	Read Only	
40022	15	Phase C Reactive Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40023	16	Phase C Reactive Power High 16 Bits Data	Read Only	
40024	17	Total Reactive Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40025	18	Total Reactive Power High 16 Bits Data	Read Only	
40026	19	Phase A Apparent Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40027	1A	Phase A Apparent Power High 16 Bits Data	Read Only	
40028	1B	Phase B Apparent Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40029	1C	Phase B Apparent Power High 16 Bits Data	Read Only	
40030	1D	Phase C Apparent Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40031	1E	Phase C Apparent Power High 16 Bits Data	Read Only	
40032	1F	Total Apparent Power Low 16 Bits Data	Read Only	Unit: W, composed of 2 registers, forming a signed 32-bit value
40033	20	Total Apparent Power High 16 Bits Data	Read Only	
40034	21	Phase A Power Factor	Read Only	Value amplified by 10000 times. For example, a reading of 9000 corresponds to 0.9
40035	22	Phase B Power Factor	Read Only	Value amplified by 10000 times. For example, a reading of 9000 corresponds to 0.9

40036	23	Phase C Power Factor	Read Only	Value amplified by 10000 times. For example, a reading of 9000 corresponds to 0.9
40037	24	Total Power Factor	Read Only	Value amplified by 10000 times. For example, a reading of 9000 corresponds to 0.9
40038	25	Phase A Phase Angle	Read Only	Unit: 0.1 degree
40039	26	Phase B Phase Angle	Read Only	Unit: 0.1 degree
40040	27	Phase C Phase Angle	Read Only	Unit: 0.1 degree
40041	28	Voltage Phase Angle between Phase A and B	Read Only	Unit: 0.1 degree
40042	29	Voltage Phase Angle between Phase A and C	Read Only	Unit: 0.1 degree
40043	2A	Voltage Phase Angle between Phase B and C	Read Only	Unit: 0.1 degree
40044	2B	Phase A Energy Value Low 16 Bits	Read Only	The energy value is composed of 2 registers, with a unit of 0.01 kWh. For example, if the low 16-bit reading is 1000 and the high 16-bit reading is 1, the electricity consumption is (1 × 65536 + 1000) × 0.01 = 665.36 kWh
40045	2C	Phase A Energy Value High 16 Bits	Read Only	
40046	2D	Phase B Energy Value Low 16 Bits	Read Only	The energy value is composed of 2 registers, with a unit of 0.01 kWh. For example, if the low 16-bit reading is 1000 and the high 16-bit reading is 1, the electricity consumption is (1 × 65536 + 1000) × 0.01 = 665.36 kWh
40047	2E	Phase B Energy Value High 16 Bits	Read Only	
40048	2F	Phase C Energy Value Low 16 Bits	Read Only	The energy value is composed of 2 registers, with a unit of 0.01 kWh. For example, if the low 16-bit reading is 1000 and the high 16-bit reading is 1, the electricity consumption is (1 × 65536 + 1000) × 0.01 = 665.36 kWh
40049	30	Phase C Energy Value High 16 Bits	Read Only	
40050	31	Operating Frequency	Read Only	Unit: 0.1Hz
40051	32	Range Upper Limit Low 16 Bits Set Value	Read-write	The set value is determined by the value configured in "Output Parameter Selection". Please refer to the description of the corresponding data for details
40052	33	Range Upper Limit High 16 Bits Set Value	Read-write	
40053	34	Range Lower Limit Low 16 Bits Set Value	Read-write	The set value is determined by the value configured in "Output Parameter Selection". Please refer to the description of the corresponding data for details
40054	35	Range Lower Limit High 16 Bits Set Value	Read-write	
40055	36	Output Selection	Read-write	0: Voltage 1: Current 2: Active Power 3: Reactive Power 4: Apparent Power 5: Power Factor 6: Phase Angle 7: Frequency
40056	37	Output Type	Read-write	0: 4～20mA 1: 0～20mA 2: 0～5V 3: 0～10V

40083	52	Communication Address	Read-write	1-247
40084	53	Baud Rate	Read-write	0：1200bps 1：2400bps 2：4800bps 3：9600bps 4：14400bps 5：19200bps 6：38400bps 7：56000bps 8：57600bps 9：115200bps
40085	54	Parity	Read-write	0: No parity, 1: Even parity, 2: Odd parity
40086	55	Stop bit	Read-write	0: 1 stop bit, 1: 0.5 stop bit, 2: 2 stop bits
40087	56	Device number 1	Read Only	0～65536
40088	57	Device number 1	Read Only	0～65536
40089	58	Firmware version	Read Only	0～65536
40090	59	Device type	Read Only	0～65536