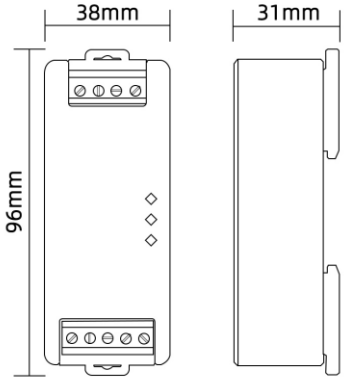
SPE6□□□- NA Frequency Signal Acquisition Module

User Manual

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: **96mm (L) X 38mm (W) X 31mm (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°C ~ +80°C 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 electrical energy signal data acquisition module is meticulously designed based on a new generation of embedded systems. Equipped with an isolated communication interface, it can communicate independently with a PC or PLC, or be networked with multiple communication modules. It also features a transient suppression circuit that effectively suppresses various surge pulses, ensuring reliable operation in harsh environments.

The SPE6□□□-NA series frequency signal acquisition module acquires frequency signals through a single channel and is equipped with an RS485 communication interface. The module uses an internal high-precision timer to acquire data, achieving a resolution of up to 16 bits and a measurement accuracy of better than 0.1%. The power supply, input, and communication output are isolated, making it suitable for collecting a variety of electrical energy signals in industrial settings and meeting the high measurement requirements of industrial sites, medical electronics, security monitoring, smart buildings, smart homes, power monitoring, and process control.

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.

· Technical Parameters

Basic Parameters	
Power Supply	DC12～36V(DC24V recommended)
Power Consumption	＜1.5W
Measurement Accuracy	±0.02%F.S（+25℃）
Temperature Drift	≤200ppm/℃
Response Time	≤0.5s
ESD Protection	±15KV
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	
Input Signal	Sine Wave, Square Wave
Input Method	Three-wire NPN/PNP sensor, active frequency signal, dry contact signal, two-wire proximity switch
Number of Channels	1 Channels
Frequency Range	1-100 kHz. Input range refers to the product name
Input Amplitude	0.5~100 Vpp
Power Supply Voltage	+24V ±10%
Output Terminal	
Output Signal	RS-485 communication signal
Communication Protocol	Standard MODBUS-RTU protocol
Communication Distance	1200m (typical)
Environmental Conditions	
Operating Temperature	-40℃～+80℃
Storage Temperature	-40℃～+85℃
Relative Humidity	10%～90%RH (non-condensing)
Atmospheric Pressure	80kPa～106kPa

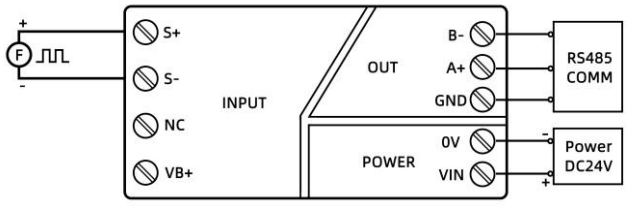
· Terminal Description

Terminal Mark	Function Description
VIN	Power supply positive terminal, DC12-36V input
0V	Power supply negative terminal
GND	RS-485 communication signal ground
A+	RS-485 communication signal positive terminal
B-	RS-485 communication signal negative terminal
S1+	Frequency signal input positive terminal
S2+	Frequency signal input negative terminal
RC	Built-in pull-up resistor 33K connection terminal
VB+	Power distribution output, external power supply <30mA

· Indicator Description

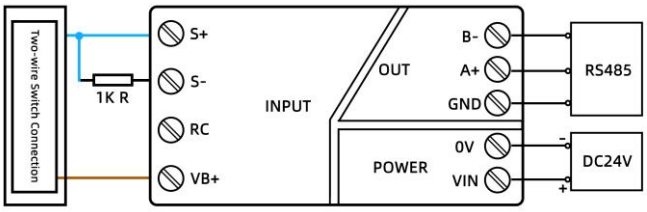
Indicator Mark	Function Description
PWR	Power indicator
SYS	Input Signal Status Indicator: Flashes when there is no signal
COMM	RS485 Communication Indicator: Flashes during data transmission

· Wiring Method

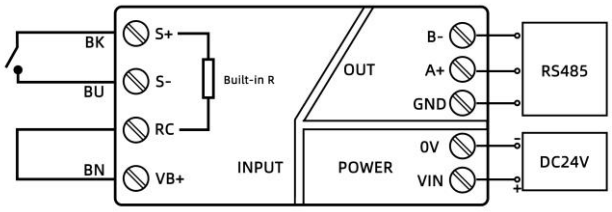


Active signal wiring diagram

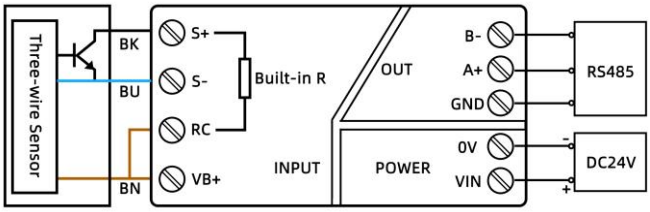
· Wiring Method



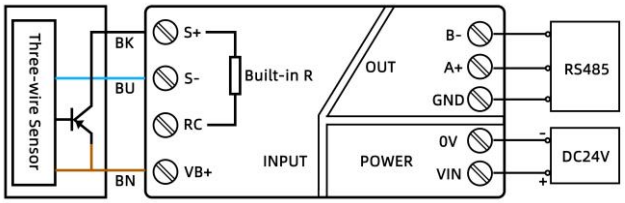
Two-wire proximity switch wiring diagram



Dry contact switch wiring diagram



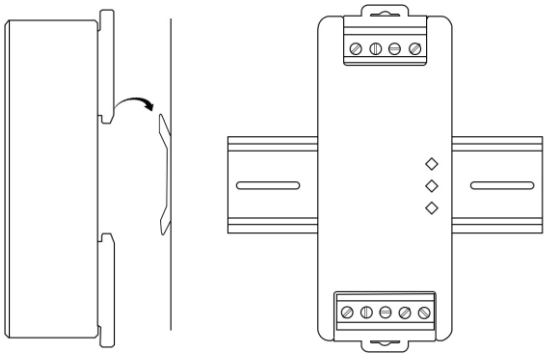
Three-wire NPN sensor wiring diagram



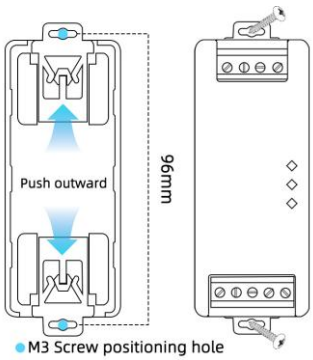
Three-wire PNP sensor wiring diagram

· 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

SPE6012-NA11L as an example: Single channel frequency signal acquisition module, 16 bit timer acquisition, analog output, RS485 communication function module, DC12-36V power supply, M appearance

SPE	6	01	2	N	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	0 1-100Hz 1 1-1KHz 2 1-10KHz 3 1-100KHz 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 16-bit timing B 32-bit timing	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

· 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	Channel 1 High Frequency 16-bit	Read Only	Two sets of data combined to form a 32-bit frequency value, unit: Hz
40003	2	Channel 1 Low Frequency 16-bit	Read Only	
40004	3	Channel 2 High Frequency 16-bit	Read Only	Two sets of data combined to form a 32-bit frequency value, unit: Hz
40005	4	Channel 2 Low Frequency 16-bit	Read Only	
40006	5	Channel 3 High Frequency 16-bit	Read Only	Two sets of data combined to form a 32-bit frequency value, unit: Hz
40007	6	Channel 3 Low Frequency 16-bit	Read Only	
40008	7	Channel 4 High Frequency 16-bit	Read Only	Two sets of data combined to form a 32-bit frequency value, unit: Hz
40009	8	Channel 4 Low Frequency 16-bit	Read Only	
40018	11	Channel 1 Frequency Signal Duty Cycle	Read Only	0-65536, magnification 1000x
40019	12	Channel 2 Frequency Signal Duty Cycle	Read Only	0-65536, magnification 1000x
40020	13	Channel 3 Frequency Signal Duty Cycle	Read Only	0-65536, magnification 1000x
40021	14	Channel 4 Frequency Signal Duty Cycle	Read Only	0-65536, magnification 1000x
40055	36	Upper Range Limit (16-bit setting value)	Read-write	Two sets of data combined to form a 32-bit frequency value, unit: Hz
40056	37	Lower Range Limit (16-bit setting value)	Read-write	
40057	38	Upper Range Limit (16-bit setting value)	Read-write	Two sets of data combined to form a 32-bit frequency value, unit: Hz
40058	39	Lower Range Limit (16-bit setting value)	Read-write	
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