SPT1□□□-WC Series Thermocouple Acquisition Module User Manual

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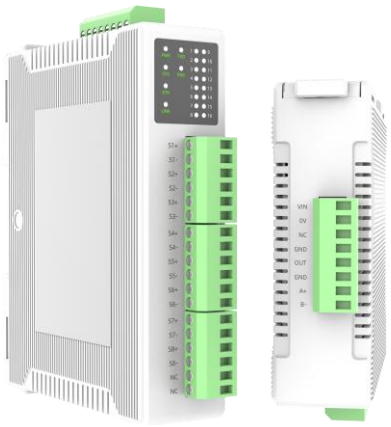
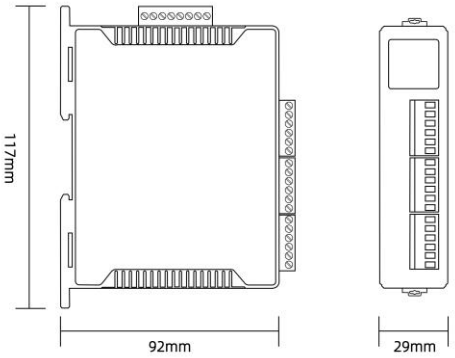
I. Precautions





- 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: **117mm (L) X 92mm (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

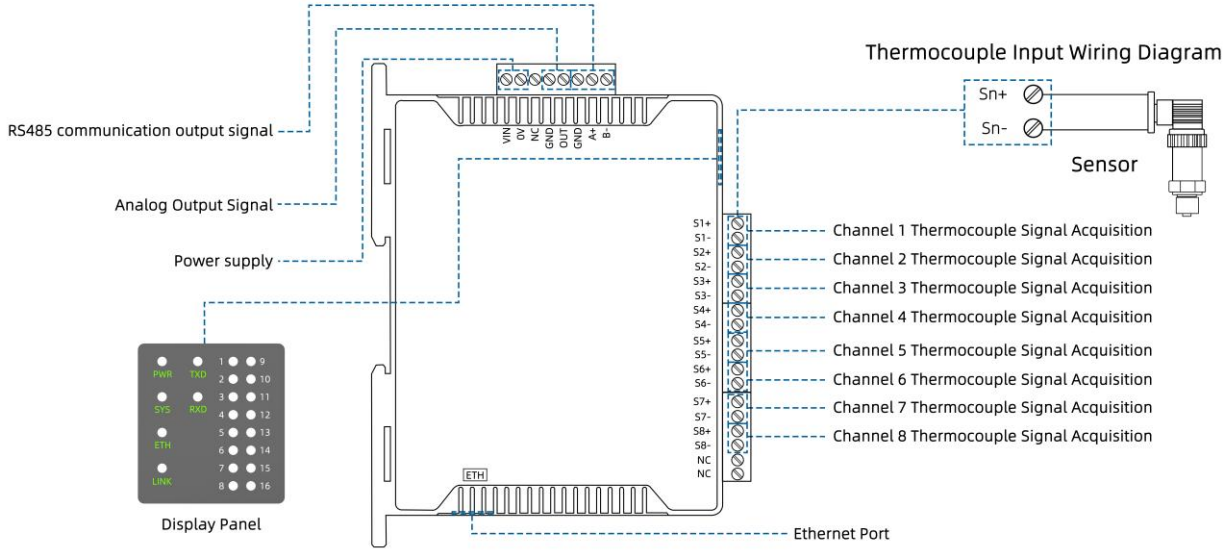
· Product Introduction

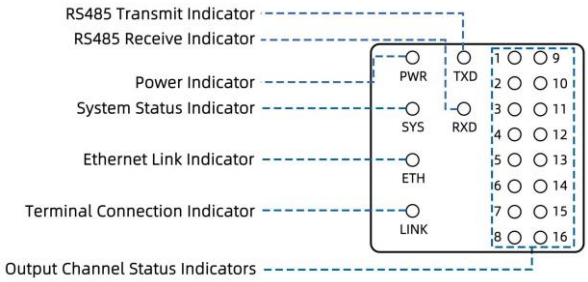
The SPT temperature data acquisition module is meticulously engineered based on a new generation of embedded systems. It features an isolated communication interface, allowing it to communicate individually with a PC or PLC, or to be networked with multiple communication modules. Furthermore, the module is equipped with a transient suppression circuit, which effectively suppresses various surge pulses, ensuring reliable operation in harsh environments.

The SPT1□□□-WC series thermocouple data acquisition module collects 4 or 8 channels of thermocouple signals and is equipped with an RS485 communication interface. Utilizing an advanced 24-bit Delta-Sigma high-precision analog-to-digital converter, the module achieves a measurement accuracy better than 0.1% and a temperature display resolution of 0.1°C. It features triple isolation between the power supply, inputs, and communication output. It is suitable for acquiring various temperature signals in industrial settings and meets the requirements for high-precision measurement applications, including industrial sites, medical electronics, security monitoring, intelligent buildings, smart homes, power monitoring, and process control.

This product requires independent power supply and adopts DIN 35mm standard rail mounting, enabling simple field installation and flexible deployment for various application environments.

· Wiring and Indication





Indicator Mark	Function Description
PWR	Power indicator
SYS	System status indicator, flashes when abnormal
ETH	Ethernet link indicator
LINK	Terminal connection indicator
TXD	RS485 Transmit indicator, flashes when sending data
RXD	RS485 Receive indicator, flashes when receiving data
1–16	Channel 1-16 signal indicator, lights up when a signal is received

Note:

1. This module is available in three communication versions: RS485/Ethernet (ETH)/ 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	＜1.5W
Measurement Accuracy	±0.1%F.S（+25℃）
Temperature Drift	≤200ppm/℃
Sampling Rate	≤8Hz
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	Devices supporting MODBUS-RTU protocol: Configuration software, PLC, HMI, PC, etc.
Input Terminal	
Number of Channels	8 channels
Input Range	As shown in the Sensor Range Table
Sampling Resolution	24-bit TI-specific ADC
Line-Drop Compensation Range	＜50 Ω
Output Terminal	
Output Signal	RS485/ Ethernet
Communication Protocol	Standard MODBUS-RTU protocol
Communication Distance	1200m (RS485 typical)
Temperature Type	
Thermocouple	B Type, E Type, J Type, K Type, N Type, R Type, S Type, T Type
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
OV	Power supply negative terminal
NC	No Connection (Empty pin)
GND	Analog Output Common
OUT	Analog Output Positive
GND	RS-485 communication signal ground
A+	RS-485 communication signal positive
B-	RS-485 communication signal negative
S1+	Sensor Channel 1 Input Positive
S1-	Sensor Channel 1 Input Negative
S2+	Sensor Channel 2 Input Positive
S2-	Sensor Channel 2 Input Negative
S3+	Sensor Channel 3 Input Positive
S3-	Sensor Channel 3 Input Negative
S4+	Sensor Channel 4 Input Positive
S4-	Sensor Channel 4 Input Negative
S5+	Sensor Channel 5 Input Positive
S5-	Sensor Channel 5 Input Negative
S6+	Sensor Channel 6 Input Positive
S6-	Sensor Channel 6 Input Negative
S7+	Sensor Channel 7 Input Positive
S7-	Sensor Channel 7 Input Negative
S8+	Sensor Channel 8 Input Positive
S8-	Sensor Channel 8 Input Negative
NC	No Connection (Empty pin)
NC	No Connection (Empty pin)
ETH	Ethernet port（optional）

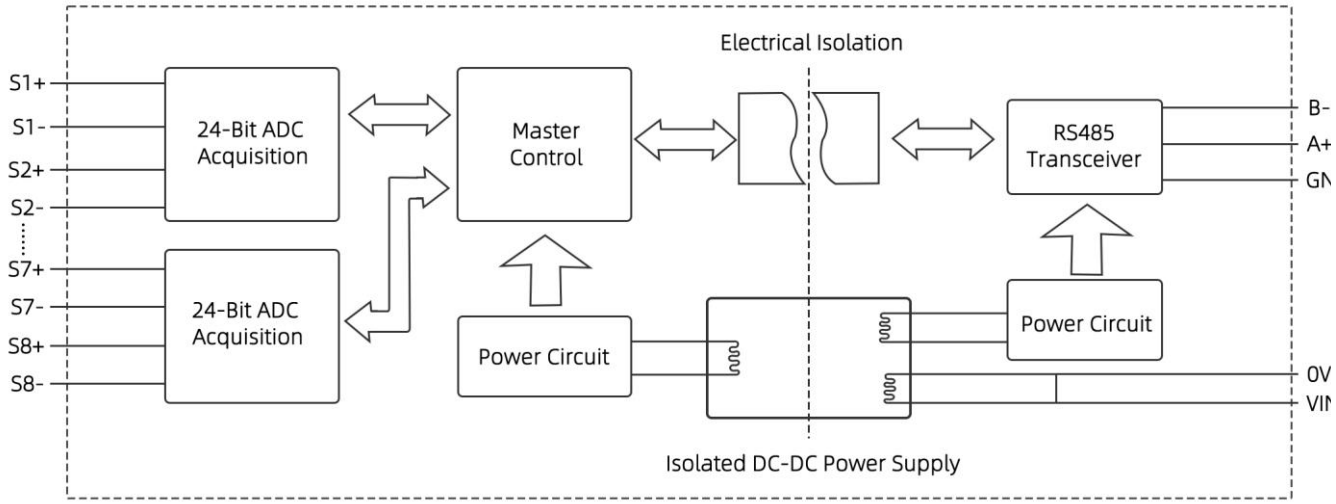
· Analog Output

Analog Output Terminal	
Output Signal	0-5V/0-10V/0-20mA/4-20mA
Output Signal	Voltage Output: RL ≥ 2 kΩ
	Current Output: RL ≤ 500 Ω
Output Ripple	≤10mV (with 250Ω load)
Output Resolution	16-bitDAC

· Sensor Range Table

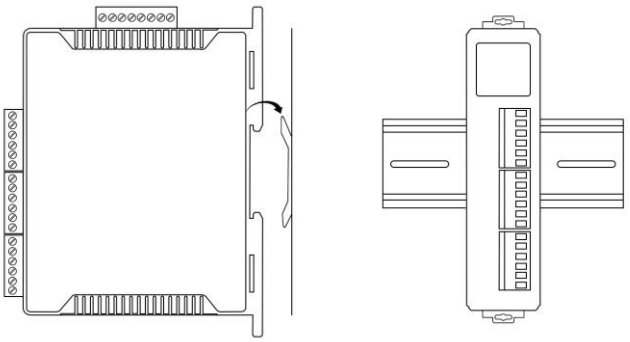
Type Designation	Temperature Range	Type Designation	Temperature Range	Type Designation	Temperature Range	Type Designation	Temperature Range
Type B	300℃～1800℃	Type N	-200℃～1300℃	PT100	-200℃～850℃	Cu100	-50℃～150℃
Type E	-200℃～950℃	Type R	-20℃～1750℃	PT500	-200℃～250℃	Ni100	-60℃～180℃
Type J	-200℃～1200℃	Type S	-20℃～1750℃	PT1000	-200℃～250℃	Ni500	-60℃～180℃
Type K	-200℃～1370℃	Type T	-200℃～400℃	Cu50	-50℃～150℃	Ni1000	-60℃～150℃

· Module Operating Principle

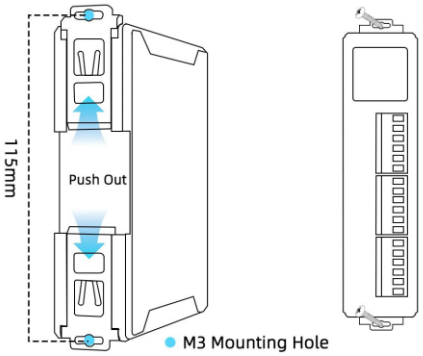


· Installation Instructions

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

SPT1080-WC01L as an example: Eight-channel thermocouple acquisition module; 24-bit acquisition resolution; no analog output; RS485 communication; DC 12-36V power supply; form factor W.

SPT	1	08	0	W	C	0	1	L
Product Type	Sensor Type	Number of Channels	Type Designation	Product Form Factor	Acquisition Resolution	Analog Output	Comm Method	Power Supply
Temperature Data Acquisition Module	1Thermocouple 2 RTD 3 NTC 4 Other	1-32	0 Type B 1 Type E 2 Type J 3 Type K 4 Type N 5 Type R 6 Type S 7 Type T	N Form Factor K Form Factor M Form Factor W Form Factor F Form Factor R Form Factor Y Form Factor Q Form Factor	A 12-bit ADC B 16-bit ADC C 24-bit ADC D 32-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

SPT1080-WC01L-BLE: Module with built-in Bluetooth function for terminal connection (default version)

SPT1080-WC01L-4G: Module with 4G function for terminal connection

SPT1080-WC01L-WIFI: Module with Wi-Fi function for terminal connection

SPT1080-WC01L: 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	Sensor Channel 1 Temperature Value	Read Only	-32768 to 32768, representing 10 times the temperature value, e.g., 100 corresponds to 10.0°C.
40003	2	Sensor Channel 2 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40004	3	Sensor Channel 3 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40005	4	Sensor Channel 4 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40006	5	Sensor Channel 5 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40007	6	Sensor Channel 6 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40008	7	Sensor Channel 7 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40009	8	Sensor Channel 8 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40010	9	Sensor Channel 9 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40011	A	Sensor Channel 10 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40012	B	Sensor Channel 11 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40013	C	Sensor Channel 12 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40014	D	Sensor Channel 13 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40015	E	Sensor Channel 14 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40016	F	Sensor Channel 15 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40017	10	Sensor Channel 16 Temperature Value	Read Only	Same Parameters as Sensor Channel 1 Temperature Value
40018	11	Sensor Channel 1 Status	Read Only	0: Normal 1: Sensor Disconnected 2: Sensor Miswired
40019	12	Sensor Channel 2 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40020	13	Sensor Channel 3 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40021	14	Sensor Channel 4 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40022	15	Sensor Channel 5 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40023	16	Sensor Channel 6 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40024	17	Sensor Channel 7 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40025	18	Sensor Channel 8 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status

40026	19	Sensor Channel 9 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40027	1A	Sensor Channel 10 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40028	1B	Sensor Channel 11 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40029	1C	Sensor Channel 12 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40030	1D	Sensor Channel 13 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40031	1E	Sensor Channel 14 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40032	1F	Sensor Channel 15 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40033	20	Sensor Channel 16 Status	Read Only	Same Value Parameters as Sensor Channel 1 Status
40034	21	Channel 1 Cold Junction Temperature	Read Only	Module Internal Temperature Sensor Value, unit: 0.1°C
40035	22	Channel 2 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40036	23	Channel 3 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40037	24	Channel 4 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40038	25	Channel 5 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40039	26	Channel 6 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40040	27	Channel 7 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40041	28	Channel 8 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40042	29	Channel 9 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40043	2A	Channel 10 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40044	2B	Channel 11 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40045	2C	Channel 12 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40046	2D	Channel 13 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40047	2E	Channel 14 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40048	2F	Channel 15 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature
40049	30	Channel 16 Cold Junction Temperature	Read Only	Same Parameters as Channel 1 Cold Junction Temperature

PLC add	Register add (HEX)	Function Definition	R/W Attribute	Value Range and Description
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 Bit	Read/Write	0: No Parity 1: Even Parity 2: Odd Parity
40086	55	Stop Bit	Read/Write	0: 1 Stop Bit 1: 1.5 Stop Bits 2: 2 Stop Bits
40087	56	Device No. 1	Read Only	0～65536
40088	57	Device No. 2	Read Only	0～65536
40089	58	Firmware Version	Read Only	0～65536
40090	59	Device Category	Read Only	0～65536