SCM-TP1000
Temp & PD Monitoring System

User Manual



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Read me

When you use the product, be sure to read this user manual carefully, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use of the product, and help to solve the various problems at the scene.

1. Before the meter turning on the power supply, be sure that the power supply within the provisions of the instrument;

2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;

3. Communication terminal (RS232/RS485) is strictly prohibited to impose on high pressure;

4. Be sure the instrument wiring consistent with the internal system settings;

5. When communicating with the PC, instrument communication parameters must be consistent with the PC.



- **Please read this user manual carefully**
- **Please save this document**

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1.- SUMMARIZE

The SCM-TP1000 is an integrated monitoring device combining partial discharge (PD) detection and wireless temperature sensing, developed for medium and high voltage switchgear. It provides real-time monitoring of switchgear partial discharge, ambient temperature/ humidity/ noise and busbar thermal conditions to enhance equipment reliability and safety. High-precision sensors and advanced algorithms ensure accurate detection of PD events and busbar temperature anomalies, with support for historical data logging, fault SOE records, and waveform analysis.

Its modular design supports two display modes: by switchgear or by sensor group. Built-in alarm logic and relay output allow flexible deployment. RS485 with Modbus RTU protocol enables reliable long-distance communication and seamless SCADA integration.

FEATURE

- Integrated wired/ wireless PD and busbar temperature monitoring;
- Supports RS485 Modbus-RTU communication;
- Switchgear or sensor group display modes;
- Real-time and historical waveform display;
- Max 99 lists fault SOE recording with waveforms;
- Switchgear ambient condition monitoring
- Up to 24 groups temperature sensor;
- Up to 6 groups PD sensor (AA, TEV, UHF);
- Up to 6 switchgear busbar temp & PD status monitoring
- Configurable alarm logic and thresholds;

APPLICATION

- Medium-voltage switchgear monitoring;
- Distribution transformer compartments;
- Industrial power distribution systems;
- Smart substation environments;
- New energy power stations;
- Remote or unmanned substations;
- Commercial building power distribution;

2.- TECHNICAL PARAMETERS

HMI electrical specification	
Auxiliary power	85-265Vac/dc, optional 20-60Vdc, 45-65Hz
Power consumption	Max<6W
Communication	RS-485, MODBUS-RTU
Digital output	**SPST:** 6 channels standard for individual alarm, optional 6 additional channels. **SPDT:** 2 channels standard, for common alarm and trip outputs
DO load capacity	5A@250VAC, passive node
Digital input	Optional 8 channels
Dimensions (W × H × D)	148*148*78mm
Open install hole	139±0.5*139±0.5 mm
Working environment	-10 ~ +60°C; 20% ~ 95% RH (No condensation)

Temperature related parameters

Receiver of Temperature data	
Power supply	5VDC
Wireless communication frequency	433MHZ
Wireless temperature sensor unit	Standard type 3-12
Sampling period	5min
Distance of receiver and HMI	Up to 80m (260 feet)
Wireless temperature sensor (SCM-BAT-S)	
Measure range	-40°C~125°C (at 125°C for short-term only); continuous measurement: -20°C~65°C
Transmit power	Less than 10mW
Power supply	Battery powered, 1200mAh for 2-4 years
Working environment	-10°C ~ +60°C; 20%~95% RH (No condensation)
Storage environment	-25°C ~ +70°C; 20%~95%RH (No condensation)

PD related parameters

Wired PD sensor	
Power supply	12VDC
Static power consumption	<10mW
Installation method	4* strong magnet, wall mount
Sampling period	5s
Communication	RS485/ Modbus RTU
Dimension	134mm*100*42mm
Operating temperature	-40~85°C

Receiver of PD data	
Power supply	5VDC
Networking mode	LORA self-organizing network
Uplink communication protocol	RS485/Modbus-RTU
Distance of receiver and HMI	Up to 80m (260 foot)
Wireless PD sensor	
Power supply	7.2V 3000mAh build in battery
Wireless band	433MHz ~2.4GHz optional
Signal transmission distance	Up to 80m (260 feet)
Static power consumption	<10mW
Installation method	4* strong magnet, wall mount
Sampling period	2 hours
Data upload cycle	2 hours

Wired and wireless PD sensor common parameters

Ultrasonic data (AA)	
Detect range	0 ~ 60dBμV
Pass band	Center frequency 40 kHz, ±1 kHz
TEV data	
Detect range	0~60dBmV
Pass band	3~100MHz
UHF data	
Detect range	-70~10dBm
Pass band	300~1500MHz
Average effective height	≥10mm
Switchgear ambient data	
Noise detection range	30~80dB (Class C)
Temp. measurement range	-40~85°C; Accuracy±0.5°C
Humidity measurement range	5~95%RH; Accuracy ±2%RH

3.- FUNCTION DESCRIPTION

3.1.- Partial discharge monitoring

The PD sensor has wired/ wireless version, it integrates ultrasonic (AA), transient earth voltage (TEV), and ultra-high frequency (UHF) detection to monitor diverse partial discharge (PD) phenomena. Each sensor targets specific discharge types: surface, internal, or corona by capturing acoustic, electromagnetic, or UHF signals. Data is locally digitized and transmitted via RS-485 using the Modbus RTU protocol, ensuring reliable, low-latency communication even in high-interference environments.

-. Wired PD sensor optional model: default SCM-PDS3

	• **SCM-PDS2:** Any two of AA/TEV/UHF can be selected • **SCM-PDS3**: AA / TEV / UHF Three-in-one PD sensor

-. Wireless PD sensor data transmission via LoRa

The wireless PD sensor communicates with the data receiver through the LoRa double encrypted wireless receiver to monitor the partial discharge signal of the switchgear. The data uploaded includes: partial discharge peak value, partial discharge average value, discharge times, alarm signal and battery power of the device.



	• **SCM-PDS2W:** Any two of AA/TEV/UHF can be selected • **SCM-PDS3W**: AA / TEV / UHF Three-in-one PD sensor

3.2.- Partial discharge monitoring method

-. Ultrasonic measurement (AA)

Partial discharges generate acoustic signals (20-200kHz) through mechanical stress oscillations in dielectrics. This sensor employs piezoelectric ceramic elements to detect vibrations via surface coupling with switchgear structures. Maintaining intimate contact with the switchgear surface is essential for optimal acoustic wave transmission efficiency, making it suitable for surface discharge monitoring in switchgear.

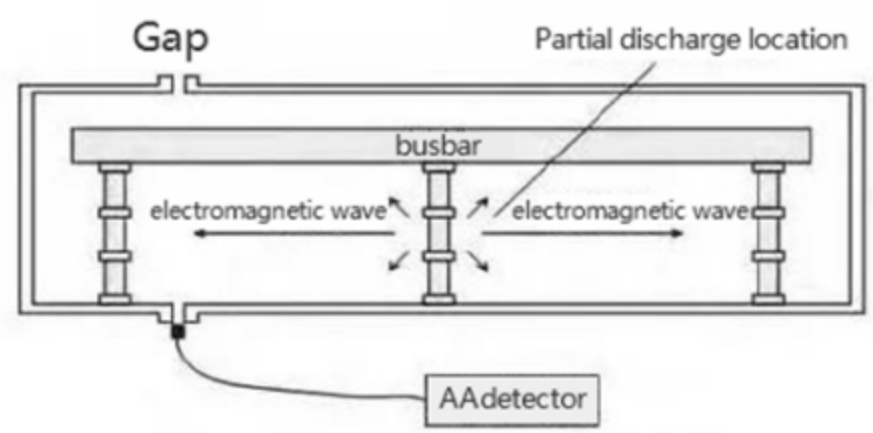


Figure 1. Ultrasonic detection mechanism

Insulation condition of switchgear:

Data	Definition
-6~0dBuV, no discharge sound	No partial discharge.
0 ~ 60dBuV, short discharge sound	Slight discharge, and attention should be paid to it later.
Above 60dBuV, have discharge sound	Obvious discharge, should be judged in combination with TEV.

Note:

The demarcation point (60dBuV) is slightly different in different regions, so it is recommended to use 60dBuV as the demarcation point, so that the operating status of the switchgear can be warned in advance.

-. TEV measurement

Partial discharges excite 3-100MHz electromagnetic waves on metal switchgear surfaces, which convert to Transient Earth Voltage (TEV) at insulation discontinuities. Utilizing capacitive coupling sensors for non-intrusive signal acquisition, TEV amplitude correlates with discharge magnitude and attenuation along the propagation path. This method is specifically designed for surface discharge detection in metal-enclosed equipment.

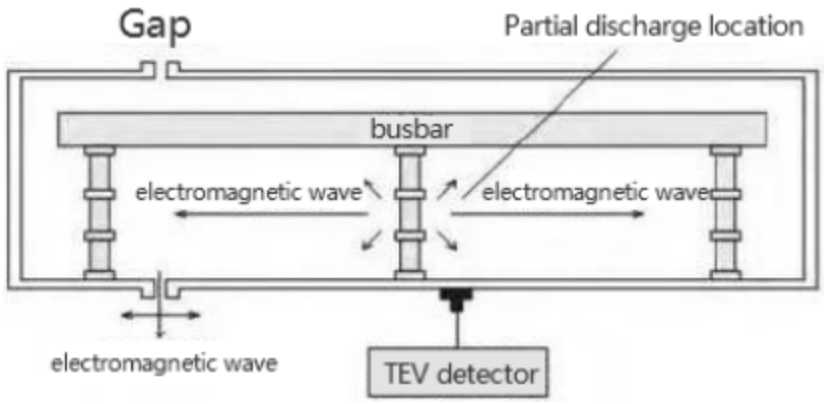


Figure 2. TEV detection mechanism

Insulation condition of switchgear:

Data	Definition
The reading is <20dB.	No partial discharge,
The reading is 20-29dB.	Slight discharge.
The reading is 29-40dB.	Moderate partial discharge should report and shorten the inspection cycle.
The reading is 40-50dB.	Serious partial discharge should report and shorten the inspection cycle and be checked when power failure.
The reading is 50-60dB.	Severe partial discharge, power outage and maintenance as soon as possible.

-. UHF measurement

This technique detects nanosecond-scale discharge pulses (<1ns rise time) by capturing 300MHz-3GHz electromagnetic waves, effectively avoiding corona interference below 300MHz. With high sensitivity and anti-interference capabilities, UHF enables discharge source localization and insulation defect classification. It is particularly effective for internal discharge detection in power transformers and other dielectric media, mitigating the bandwidth constraints of acoustic and TEV methods.

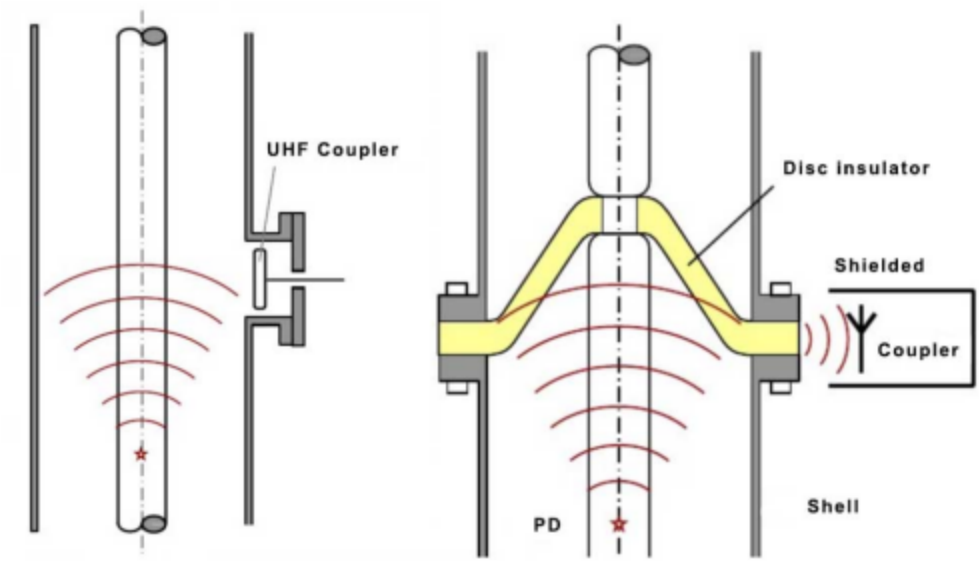


Figure 3. UHF detection mechanism

PD sensor mounting method

The sensor is equipped with a highly sensitive microphone on top to collect ultrasonic signals from the switchgear. Depending on the application scenario, the microphone's orientation can be adjusted for optimal detection results, by default, the sensor is factory-set to face forward.

Method-1: Mounting on switchgear surface



When sensor is mounted on switchgear surface, the microphone must be rotated close to the cabinet, ensuring closely contact. that can enable the microphone to effectively capture ultrasonic signals.

Method-2: Mounting on switchgear inside



When sensor is mounted inside the switchgear, the microphone must face the switchgear interior to directly receive the ultrasonic signals.

3.3.- Wireless temperature monitoring

The wireless temperature module is designed to monitor up to 24 sensor groups, each consisting of three-phase points (A, B, and C), enabling comprehensive thermal profiling across electrical switchgear or distributed cable systems. SCM-TP1000 provides real-time temperature visualization by switchgear or sensor group, with intuitive red highlighting for over-threshold values.



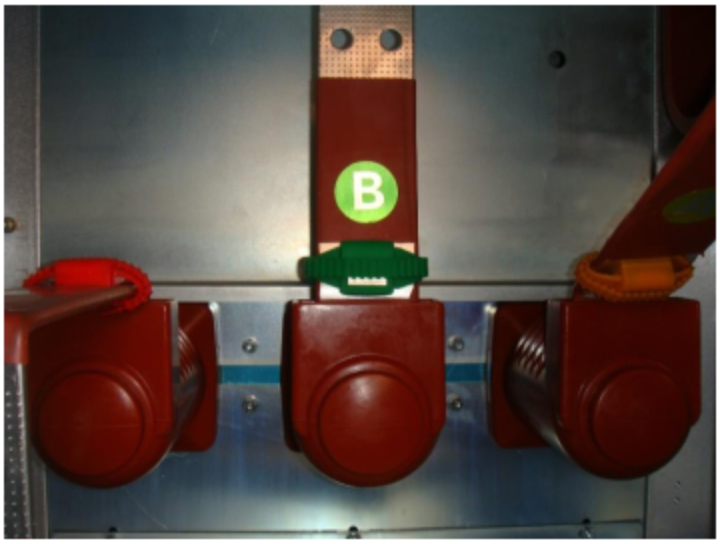
Note: Before use, please ensure the side power switch is turned to the "ON" position.

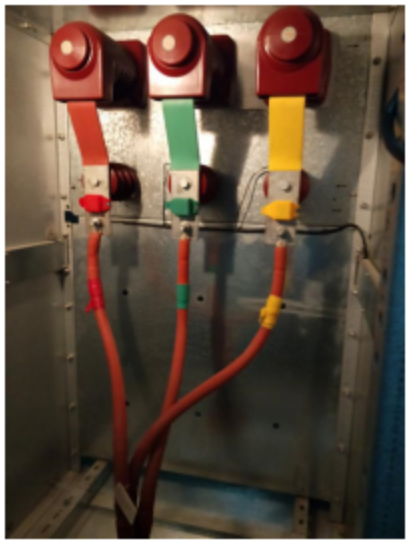
Data logging capabilities allow up to 6 days of continuous temperature records to be stored and displayed in dynamic line graph format. Alarming can be configured via rising-edge or falling-edge trigger modes, and each sensor point can be independently mapped to relay outputs for flexible thermal protection schemes. The wireless design simplifies installation and enhances monitoring coverage in complex or space-constrained environments.

Temp sensor optional model: default SCM-BAT-S

	**SCM-BAT-S Remote wireless node** ● Battery powered, 1200mAh for 2~4 years ● Temp. measure range: -40°C~125°C (at 125°C for short-term only); continuous measurement: -20°C~65°C ● Green/Yellow/Red for three phases ● Suitable for flat surfaces or VCB contacts (test under 2min data transmit interval)
	**SCM-SAW-S Remote wireless node** ● Temp. measure range: -40°C~125°C (at 125°C for short-term only); continuous measurement: -20°C~65°C ● Maintenance free during life cycle ● Suitable for flat surfaces or VCB contacts
	**SCM-SAW-W Remote wireless node** ● Temp. measure range: -40°C~125°C (at 125°C for short-term only); continuous measurement: -20°C~65°C ● Surface acoustic wave (SAW) ● Maintenance free during life cycle ● External wiring probe for irregular surface

Installation Example





4.- INSTALLATION AND START-UP

The manual you hold in your hand contains information and warnings that the user should respect in order to guarantee a proper operation of all the instrument functions and keep it in safety conditions. The instrument must not be powered on and used until its definitive assembly is on the switchgear's door.

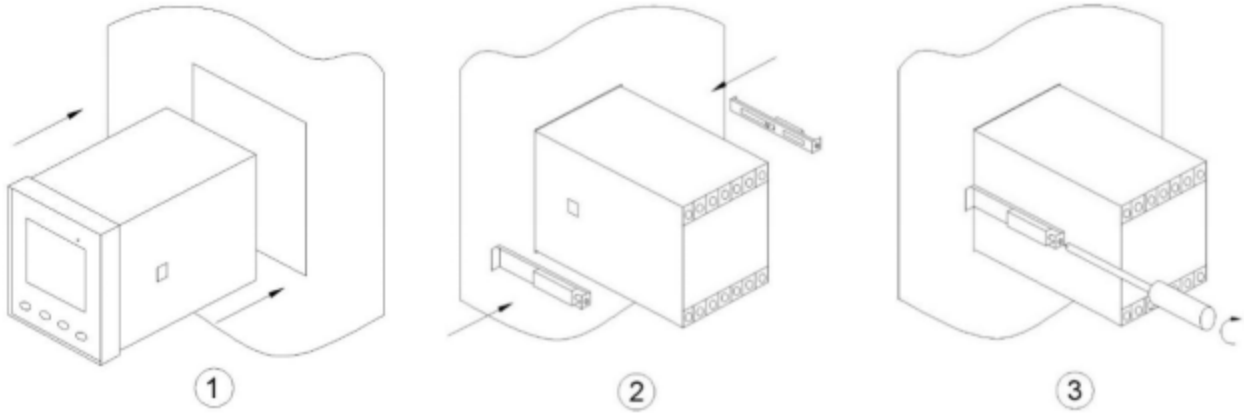
If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

4.1.- Installation

Panel mounting

Instrument is to be mounted on panel (cut-out *139±0.5 x 139±0.5mm*). All connections keep inside the switchgear.

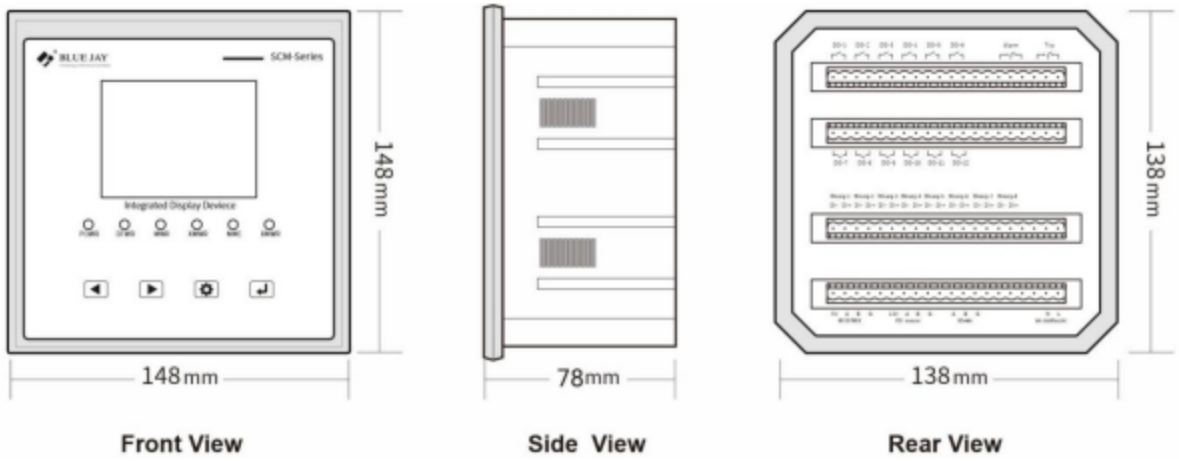


Note:

When the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. Therefore, the instrument must not be used until this is completely installed.

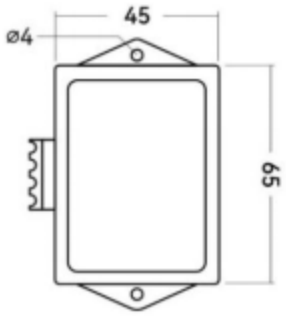
4.2.- Dimension (unit: mm)

HMI dimension W*H*D

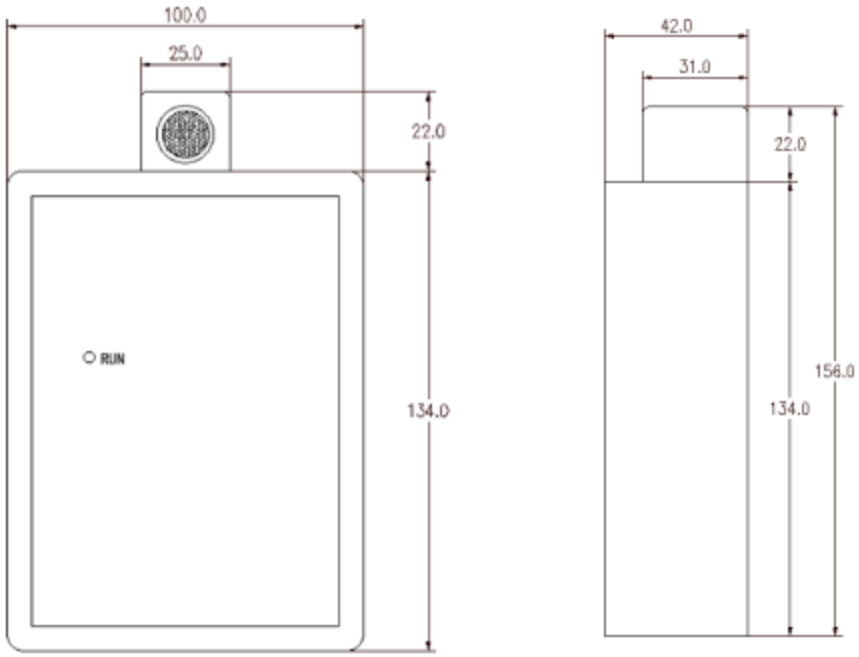


Front View Side View Rear View

PD / Temperature wireless data receiver dimension:



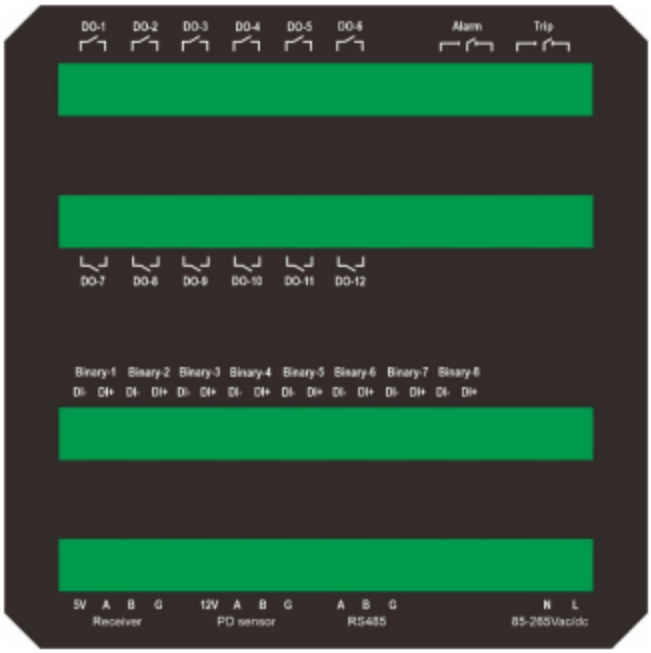
Wired/ wireless PD Sensor dimension:



Front view Side view

4.3.- Connection terminal

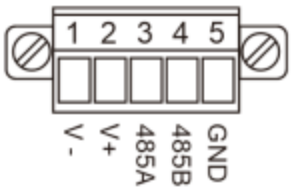
HMI terminal:



Marked	Notes
DO 1-6	Standard 6 SPST digital output
Alarm	1* SPDT relay contact for alarm output
Trip	1* SPDT relay contact for trip output
DO 7-12	Optional 6 SPST digital output
Binary 1-8	Optional digital input channel 1-8
Receiver (5V)	**5V:** Power supply, +5V (positive pole) **A:** RS485 A terminal **B:** RS485 B terminal **G:** Grounding, 0V (negative pole) **Note: used for receiver of temperature & wireless PD**
PD senser (12V)	**12V:** Power supply, +12V (positive pole) **A:** RS485 A terminal **B:** RS485 B terminal **G:** Grounding, 0V (negative pole) **Note: used for wired PD sensor**
RS485	RS485 communication interface A, B, and Ground.
L/N	Power supply 85-265Vac/dc

⚠Warning: Wired PD sensor and Wireless receiver use different supply voltages, receiver: 5V/ wired PD sensor: 12 V, Incorrect connection may cause permanent damage to the device or sensors.

PD sensor terminal:



No.	Marked	Notes
1-2	**V+/ V-**	Power supply 12Vdc
3-4	**RS485**	Communication interface A B
5	**GND**	Grounding

Wireless PD sensor and temperature receiver terminal:



Marked	Notes
485 +/ -	Communication interface A B
GND	Grounding, 0V (negative pole)
+5V	Power supply, (positive pole), +5V

Note:

The terminal pin definition may change depends on customer order; for correct wiring, please follow the label on the device and only refer to the instructions for your purchased model.

5.- OPERATION MODE



LED Indicator:



Power indicator
Off: Device not powered;
Green: Device powered on and operating normally;



Temp sensor communication status
Off: Temp sensor not in communicating;
Red: Temp sensor is in communicating;



PD sensor communication status
Off: PD sensor not in communicating;
Red: PD sensor is in communicating;



Self-test status (Reserve)



Alarm status indicator
Off: No alarm
Red: Alarm activated (e.g. threshold exceeded)



Relay output status indicator
Off: Relay not trip
Red: Relay trip out

Buttons:

Menu	▲	▼	⚙	↵
Real time	Switch sensor group NO. /Switchgear NO.		/	Switch to wireless PD sensor data in SG mode
Waveform [SG mode]	Switch time period: Temp: 6 hours per page. PD: 10 minutes per page.		Exit & roll back to up level menu	Select switchgear 01-06 to enter its waveform; then sequentially switch between temp sensors 01–04 and PD sensors;
Waveform [Group mode]				Select temp or PD sensor group to enter its waveform; then switch sensor group number;
SOE	Switch to view event logs.			View details SOE info, then press again to view its fault waveform;
Config	Select items			Call out password screen, then Press again to enter the item settings;
	Move setting cursor to left	Scroll to select number 0 ~ 9		
Data	/			Enter this menu
Help	/			

Note:

In config. menu, if change the setting value, ⚙ for exit menu, device will prompt "SAVE yes or no", press ⚙ again will return to configuration page, select "yes or no", then press ↵ for save/ not save and exit configuration menu.

6.- SCREEN DISPLAY

6.1.- Overall menu screen



Menu	Description
Realtime	Display real time measurements of busbar temperature, partial discharge, and ambient parameters (temperature, humidity, and noise). Data can be displayed in two modes: switchgear or sensor group.
Waveform	Record historical temperature trend curves for up to 15 days and partial discharge trend curves for up to 3 days.
SOE	99 lists Alarm/DI/DO fault event records, including fault occur time, fault type, fault location, fault value, and fault waveform.
Data	Record historical temperature data for up to 15 days and historical partial discharge data for up to 3 days.
Config	Configuration of system parameters, communication, alarms, sensors, and DI/DO functions. Note: DI is reserved function, not enabled now.
Help	Product version information and support email for technical inquiries.

Note 1:

After power-on, user need first to configure the RTC and following two parameters in **[Config menu]** to ensure correct real-time parameter display, details see **chapter 6.2.4**:

1.- In **[System]- [RTC]**: to set the Real-Time Clock.
2.- In **[System]- [Display mode]**: to select **Switchgear**/ **Group** display mode.
3.- In **[Sensor]**: to set quantities of sensors in the switchgears or the quantities of sensor groups.

Note 2:

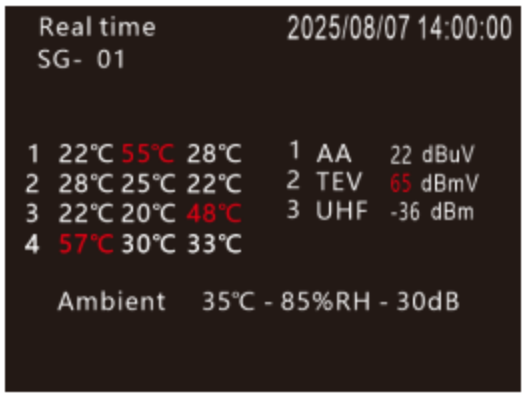
The wireless PD sensor currently only support view real-time measurements value via the HMI or RS485. Details see **Chapter 7.2.2**. It not provides alarm function, DO output, SOE record, and historical waveforms, and not requires sensor quantity configuration. Once the HMI is paired with a wireless PD sensor, its data will be displayed automatically. then press ↵ to view.

6.2.- Detail parameter screen

6.2.1.- Detail information of menu “Realtime”

SCM-TP1000 supports two display modes: Switchgear / Sensor group.

[In switchgear mode]



Shows temp& PD real time status of one switchgear

Busbar temperature: max 4 group* 3 phase, total 12 sensors

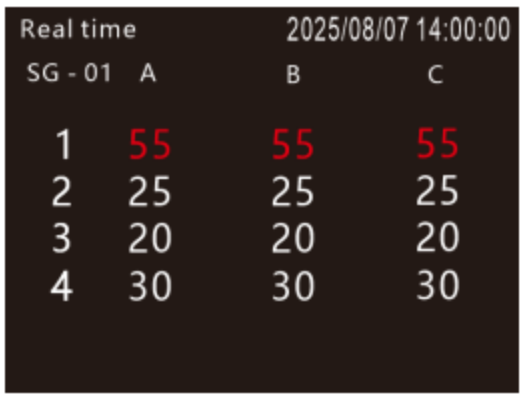
Partial discharge value: 1 group AA, TEV, UHF (three in one) sensor

Ambient temperature, humidity and noise

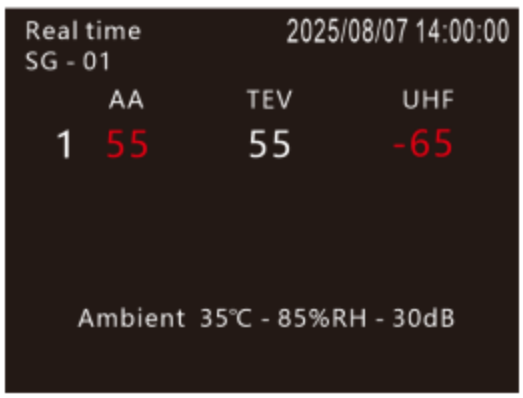
Press  to switch between switchgear NO., Max 6 switchgears.

In switchgear mode, when order only temperature or only PD monitoring function, the display adapts accordingly, as shown below.

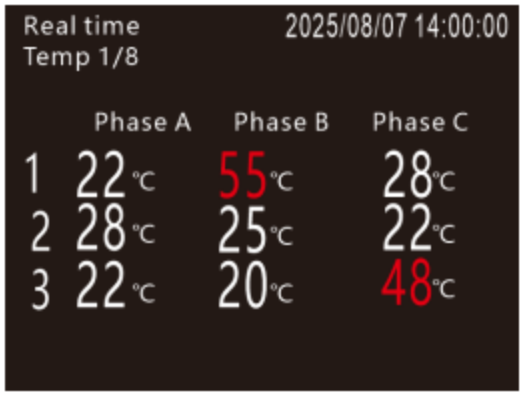
Only temperature sensor



Only Wired Partial discharge sensor

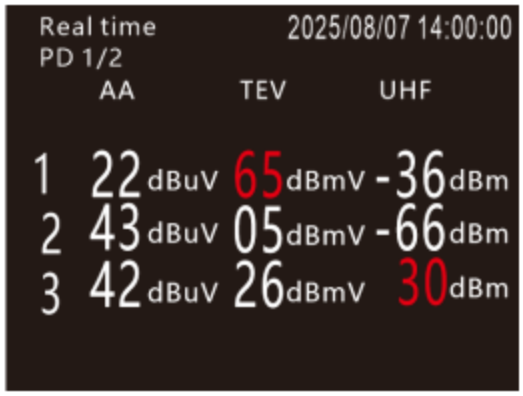


[In sensor group mode]



Temp& PD sensor group real time status

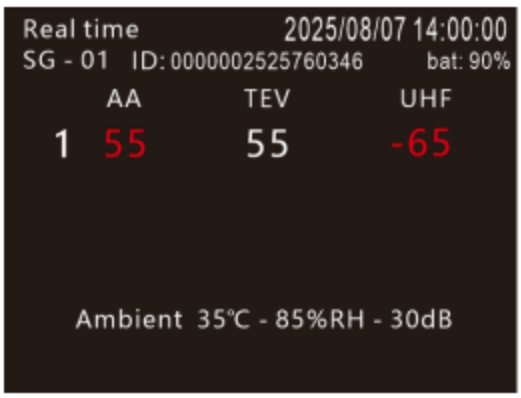
Press ↵ to switch temp /PD sensor group



Press ▲▼ to switch sensor group NO., Temp sensor max 24 groups, PD sensor max 6 groups.

When order wireless PD sensors, user can only view real time measuring data by pressing **[Enter]**, switchgear assignment via the configuration menu, SOE record, waveform, data, alarm, and DO functions are not supported.

Wireless Partial discharge sensor



Note:

In above 2 display modes:

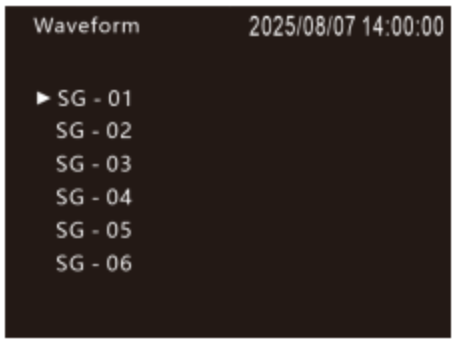
Red color font: means measured value has reached the alarm threshold.

---: means no sensor connected.

00: means data abnormality (abnormally high/low value)

6.2.2.- Detail information of menu "Waveform"

[In switchgear mode]

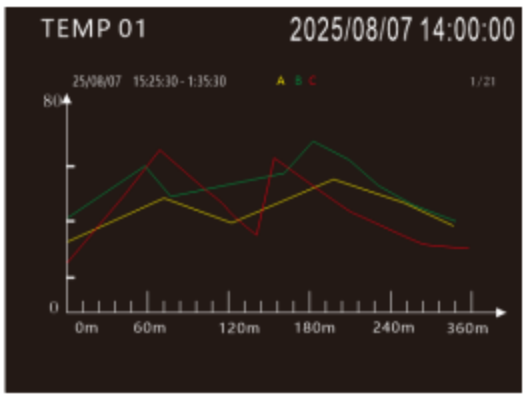


Press ▲▼ to select switchgear NO

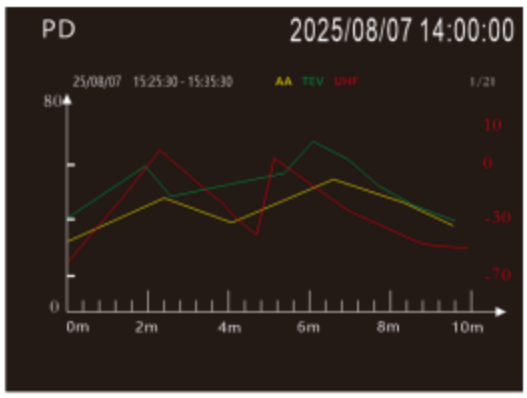
Press ↵ enter its waveform.

Short press ↵ to switch between temp/ PD sensors, Press ▲▼ to switch time period. Each switchgear supports up to 4 groups temp sensor and 1 group PD sensor

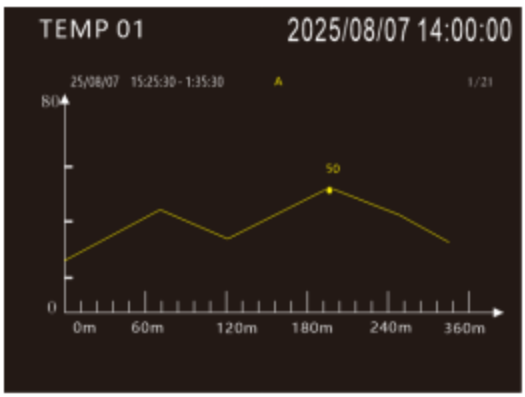
-. Temp waveform: 6 hours per page;

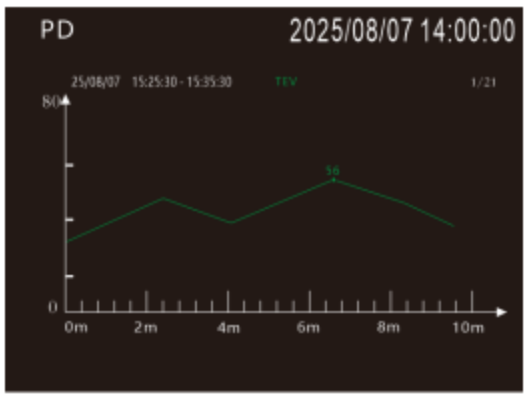


-. PD waveform:10 minutes per page;

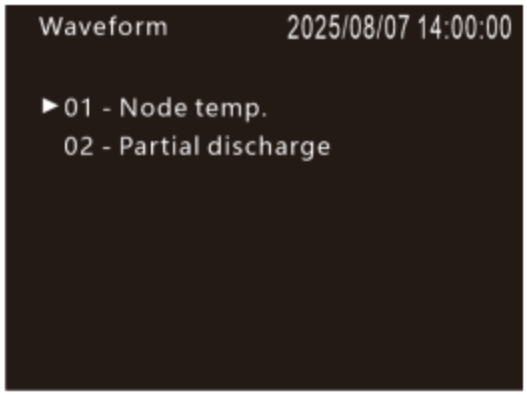


Press and hold ↵ for 3 seconds to view individual sensor waveforms (Temperature A/B/C, PD AA/TEV/UHF). Peak values are marked with dots and numerical labels. The same applies to sensor group mode.





[In sensor group mode]

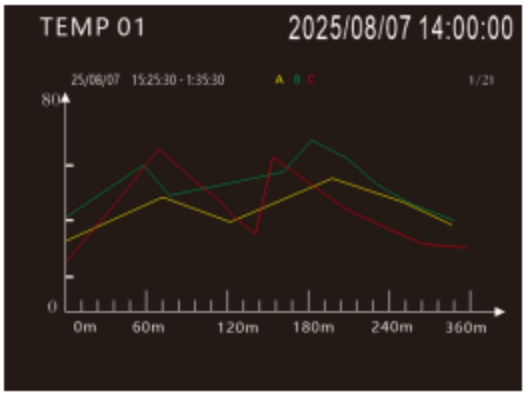


Press ▲▼ to select temp/ PD sensor group

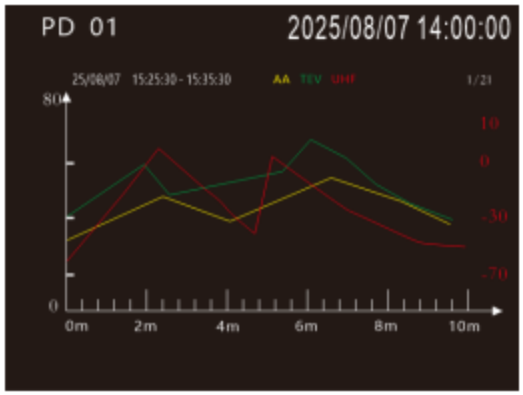
Press ↵ enter its waveform

Short press ↵ to switch between temp sensor 01-24/ PD sensor 01-06, Press ▲▼ to switch time period:, Press and hold ↵ for 3 seconds to view individual sensor waveforms.

-. Temp waveform: 6 hours per page;



-. PD waveform:10 minutes per page;

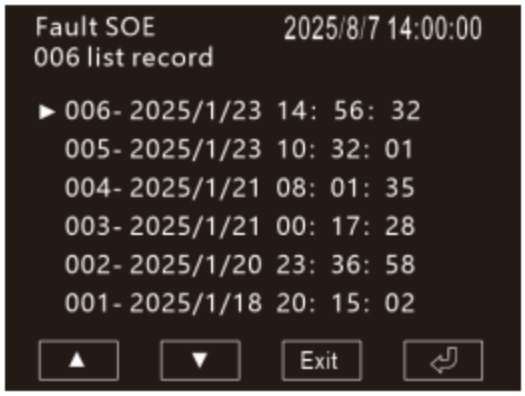


Notes:

-. The Y-axis range adjusts dynamically according to the measured values and is not fixed.

-. Because PD UHF measurement range is –70 to 10 dBm, negative values may occur. so, the UHF range is indicated in red on the right side of Y-axis, while AA and TEV reference the Y-axis in white.

6.2.3.- Detail information of menu "SOE"



Up to 99 lists fault sequence of event records.

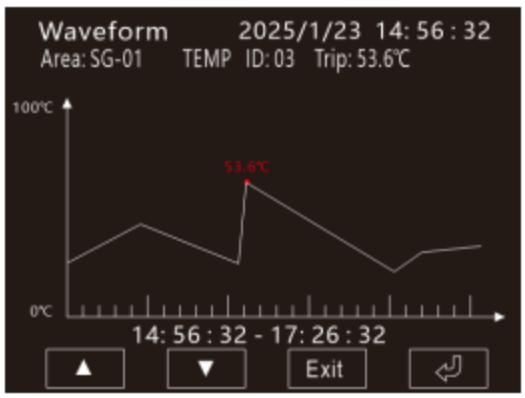
Press ▲▼ to select event NO.

Press ↵ to view its fault details info. and waveform.



Show the fault occurs time, fault type, fault area and fault values.

Press ↵ to view its fault waveform.



Waveform displays the status before and after the event occurs.

Temp waveform: capture every 5 minutes as a point, total capture 30 points, total capture 150 min data, fault occur at point 14 (at 70min), that is data covers 70 min before and 80 min after the fault.

PD waveform: capture every 5 seconds as a point, total capture 30 points, total capture 150 second data, fault occur at point 14 (at 70s), that is data covers 70s before and 80s after the fault.

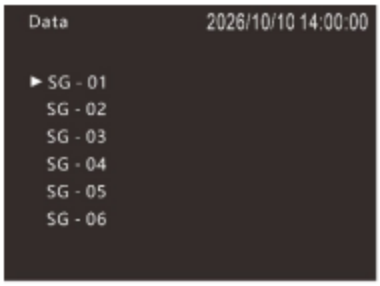
Note:

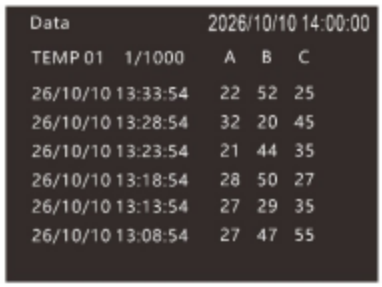
The largest number is the most recent event, and 001 is the oldest event, the oldest event will be discarded when the SOE records > 99.

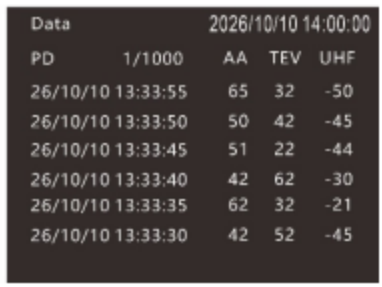
6.2.4.- Detail information of menu “Data”

This menu records historical temperature and PD data. Temperature data is recorded every 5 minutes and retained for up to 15 days, while PD data is recorded every 5 seconds and retained for up to 3 days.

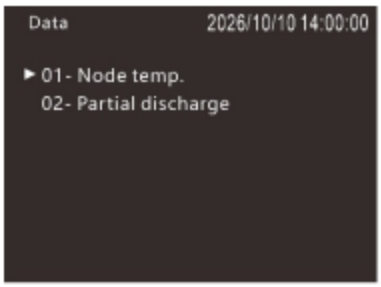
[In switchgear mode]

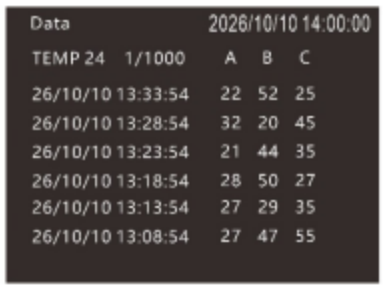


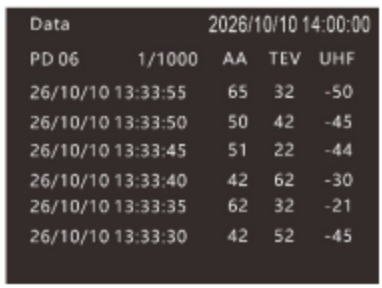




[In sensor group mode]





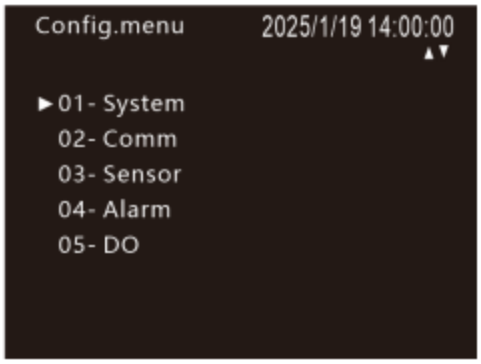


Note: Due to the large number of pages, press and hold the  button for 5 seconds to activate accelerated page scrolling. The scrolling speed gradually increases, reaching a maximum of 50 pages per second.

6.2.5.- Detail information of menu "Config"

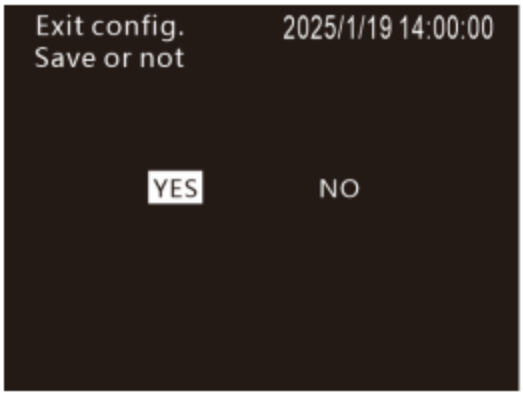
In this menu, enter default password **0001** can enter the parameter configuration:





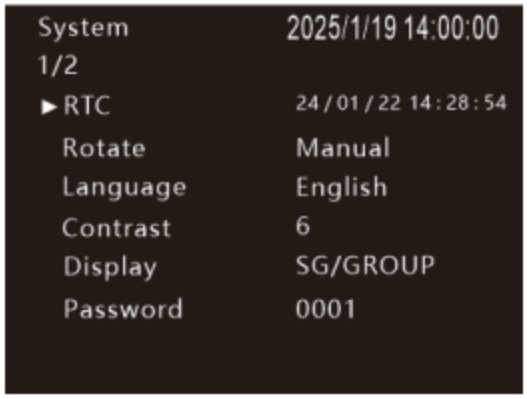
01-System: Device overall system parameter settings.
02-Comm: Communication parameter settings.
03-Sensor: Sensors quantity settings.
04-Alarm: Sensor alarm modes and threshold settings.
05-DO: Digital output settings.

Exit the settings need to select save or not:

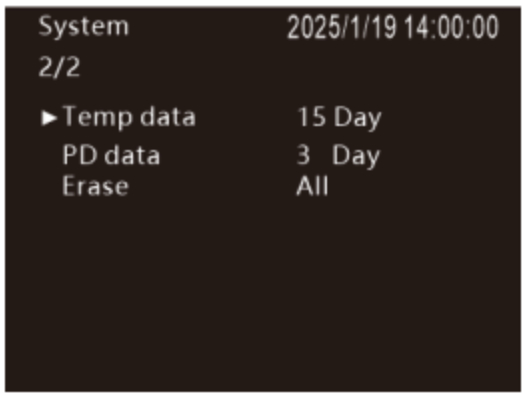


Press  again will return to configuration page, Press  select "yes or no", then press  for save/ not save and exit configuration menu.

6.2.5.1.- System settings:



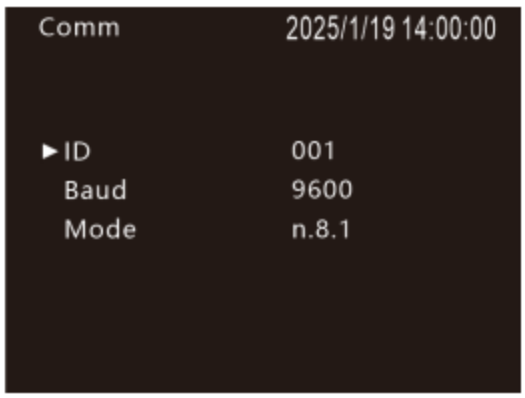
. *Real-time clock settings
. Screen scroll interval: manual, 3-30s adjustable
. Language: English (not adjustable)
. Screen contrast:1-6 adjustable
. Display mode: switchgear or sensor group mode
. Password: default 0001, 0-9999 adjustable



. Historical temp. data record: 15 days (can't adjust)
. Historical PD data record: 3 days (can't adjust)
. *Erase record: All, SOE, DATA

Note: RTC and Erase settings are saved immediately when  is pressed. Press  to exit without saving.

6.2.5.2.- Communication settings:



. RS485 address: 001-254 adjustable
. RS485 baud rate: default 9600, optional 4800
. RS485 frame format default n.8.1, optional e.8.1, n.8.2

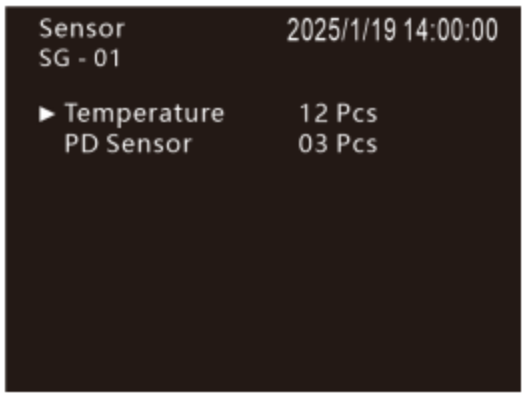
6.2.5.3.- sensor quantity settings:

[Switchgear mode]



Select switchgear NO. and configure this switchgear's sensors number.

Max support 6 switchgear



Temp. sensor options: 0, 3, 6, 9, 12

PD. sensor options: 0, 3

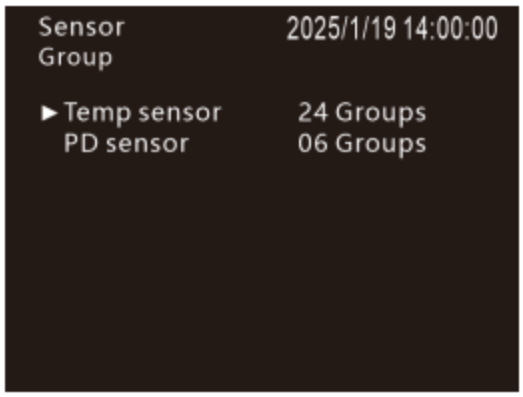
Notes:

-. When configure the sensor quantities for each switchgear. The switchgears must be configured in sequence. Example: Support SG-01, SG-02, SG-03; Not support SG-01 enabled, SG-02 disabled, SG-03 enabled.

-. Temp sensor: because busbar has A, B, C phases, three sensors form one set (ABC). So, options are 0, 3, 6, 9, 12, meaning 0-4 sets.
PD sensor: because our PD sensors are 3-in-1 type (AA, TEV, UHF), so options are 0, 3, meaning 0-1 set.

-. Each switchgear can be configured up to 4 sets of ABC temperature sensors and 1 set of AA, TEV, UHF three in one PD sensors.

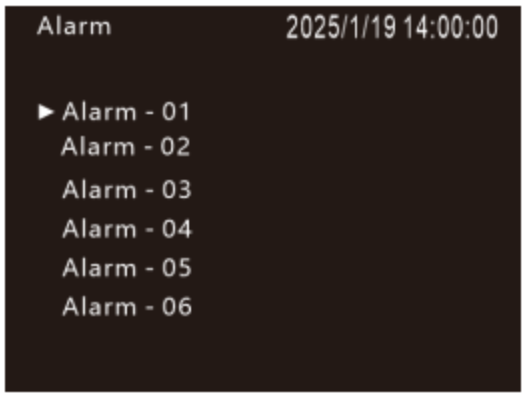
[Sensor group mode]



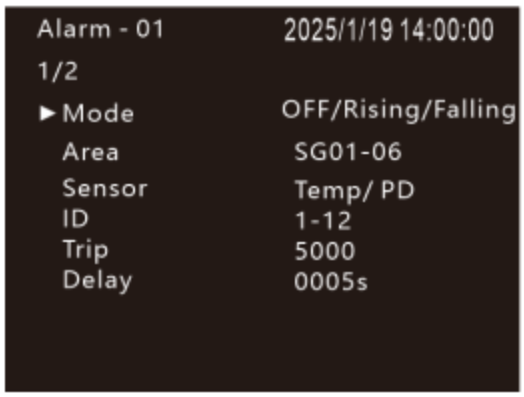
Temp. sensor options: 0-24 groups, each group has 3 sensors for busbar A, B, C phases.

PD sensor options: 0-6 groups, each group being a 3-in-1 type (AA, TEV, UHF).

6.2.5.4.- Sensor alarm setting



Up to 6 alarms can be configured, the same sensor can be selected multiple times with different alarm values, can flexibly configure as user needed.



. Mode: OFF, Rising (upper limit), Falling (lower limit)
. Area: option switchgear 1-6/ sensor group 1-24
. Sensor: select sensor type -temp or PD
. ID: select the alarm sensor serial number
. Trip value: range 0-9999
. Trip delay time: range 0-9999
. Hysteresis value: range 0-9999

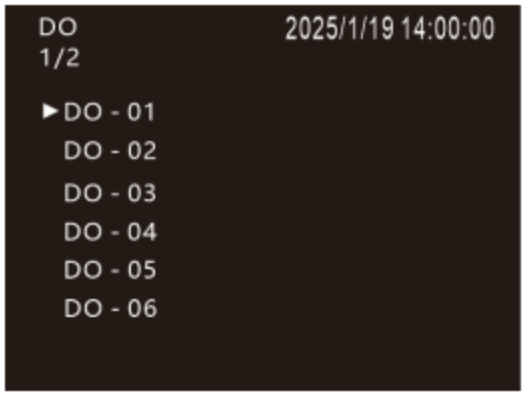
Note:

-. [In switchgear mode] – Temp sensors alarm ID range: 1-12, corresponding to sensors 1-12 within the switchgear. PD sensors ID range: 1-3, corresponding to: 1: AA sensor; 2: TEV sensor; 3: UHF sensor.

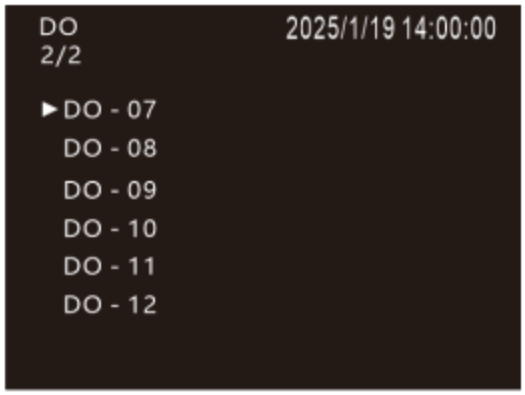
-. Setting Alarm Values for UHF Sensor (PD ID: 03): The UHF sensor measurement range is −70 to 10 dBm. Since the device cannot accept negative input values, so need set the alarm by adding 70 to the desired value (e.g., −60 dBm → input 10). This adjustment applies only to UHF; AA and TEV sensors do not require it.

6.2.5.5.- Digital output settings

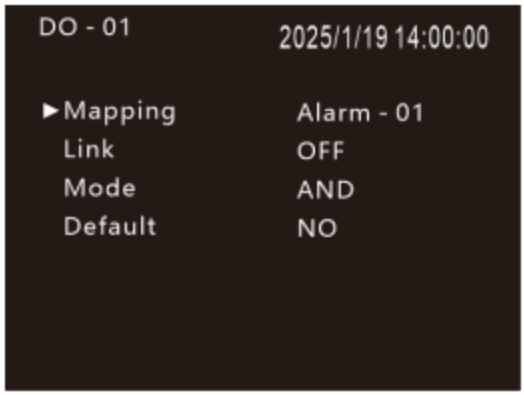
Device provides 6 standards + 6 optional SPST outputs for individual switchgear alarms, plus 2 SPDT outputs for common alarm and trip. Activation of any SPST output triggers both SPDT outputs.



DO1–DO6 are standard equipment.



DO7–DO12 are optional and can only be configured when the optional DO7–DO12 module is installed; otherwise, these settings are invalid.



DO settings

. DO action mapping data: OFF,Alarm 01-06

. DO action link data: OFF,Alarm 01-06

. DO action association logic mode: AND, OR, NOT

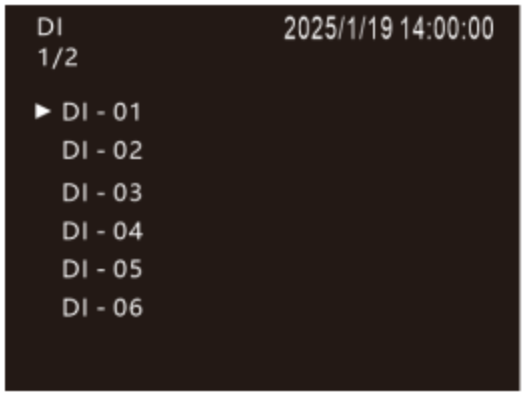
. DO default status: 0-NC (normally close)
1-NO (normally open)

Notes:

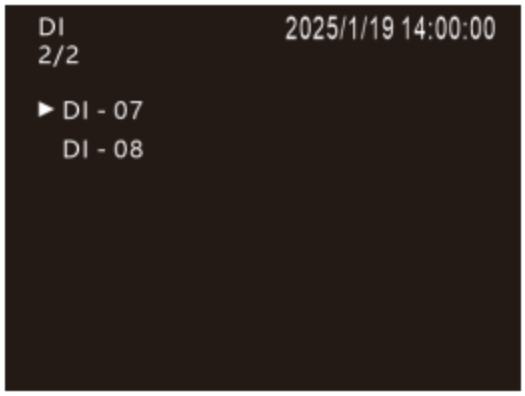
Mapping data: the selected data reaches to set threshold, DO action will be triggered.

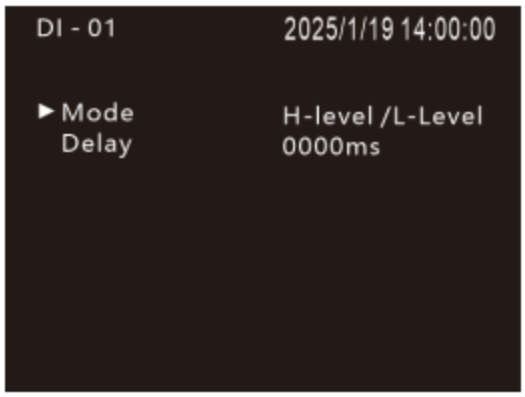
Link data: means the selected data is link with the mapping data, whether to trigger the DO action need consider the two data with the association logic mode.

6.2.5.6.- Digital input settings (optional function)



Up to 8 Digital inputs can be configured.





. **DI action mode:** OFF, High-level, Low-level, Pulse output.

. **DI action delay time**:0000ms

Note:

For High/Low-Level mode: 0000 means no delay; 1–9999 means trip delay time.
For Pulse mode: 0000 means no delay; 1–9999 means the pulse width.

DI is optional function and can only be configured when the DI function is enabled; otherwise, these settings are invalid.

7.- COMMUNICATION INTERFACE

This document defines the communication protocol specification of SCM-TP1000, please strictly follow this communication protocol to connect with the device. Initial address: 001, baud rate: 9600; data bits: 8; parity bit N; stop bit: 1.

7.1.- MODBUS protocol

Modbus RTU Frame Format:

Host inquiry:

Address code	**1 BYTE**	Slave device address **1-254**
Function code	**1 BYTE**	Function codes
Data code	**4 BYTES**	Starting address, high byte Starting address, low byte Number of registers, high byte Number of registers, low byte
Error Check code	**2 BYTES**	Cyclical Redundancy Check (**CRC**)

Slave response:

Address code	**1 BYTE**	Slave device address **1-254**
Function code	**1 BYTE**	Function codes
Data length	**N**	Total data length
Data range	**-**	Data Area
Error Check code	**2 BYTES**	Cyclical Redundancy Check (**CRC**)

Modbus function code:

Code	**Meaning**	**Description**
FUNCTION 03	**Read holding register**	Read holding registers
FUNCTION 06	**Write single register**	Writes a value into a single holding register.

Note: Starting address:0X0000, the first byte is the high bit, and the second byte is the low bit.

7.2.- Register Map

7.2.1.- Read temperature sensor data, read only, Fun 03 to read.

Switchgear mode:

Reg.	Data	Byte mode		Instruction
0x0000-000B	SG01 Temp sensor 1-12	INT	1	Temperature sensor 1-12 data of switchgear 01
0x000C-000F	Reserved	/	/	/
0x0010-001B	SG02 Temp sensor 1-12	INT	1	Temperature sensor 1-12 data of switchgear 02
0x001C-001F	Reserved	/	/	/
0x0020-002B	SG03 Temp sensor 1-12	INT	1	Temperature sensor 1-12 data of switchgear 03
0x002C-002F	Reserved	/	/	/
0x0030-003B	SG04 Temp sensor 1-12	INT	1	Temperature sensor 1-12 data of switchgear 04
0x003C-003F	Reserved	/	/	/
0x0040-004B	SG05 Temp sensor 1-12	INT	1	Temperature sensor 1-12 data of switchgear 05
0x004C-004F	Reserved	/	/	/
0x0050-005B	SG06 Temp sensor 1-12	INT	1	Temperature sensor 1-12 data of switchgear 06
0x005C-005F	Reserved	/	/	/

Sensor group mode:

Reg.	Data	Byte mode		Instruction
0x00A0-00A2	Group 01 Temp ABC	INT	1	Group 01 temperature sensors data–phase A/B/C
0x00A3-00A5	Group 02 Temp ABC	INT	1	Group 02 temperature sensors data–phase A/B/C
0x00A6-00A8	Group 03 Temp ABC	INT	1	Group 03 temperature sensors data–phase A/B/C
0x00A9-00AB	Group 04 Temp ABC	INT	1	Group 04 temperature sensors data–phase A/B/C
0x00AC-00AE	Group 05 Temp ABC	INT	1	Group 05 temperature sensors data–phase A/B/C
0x00AF	Reserved	/	/	/
0x00B0-00B2	Group 06 Temp ABC	INT	1	Group 06 temperature sensors data–phase A/B/C

0x00B3-00B5	Group 07 Temp ABC	INT	1	Group 07 temperature sensors data– phase A/B/C
0x00B6-00B8	Group 08 Temp ABC	INT	1	Group 08 temperature sensors data– phase A/B/C
0x00B9-00BB	Group 09 Temp ABC	INT	1	Group 09 temperature sensors data– phase A/B/C
0x00BC-00BE	Group 10 Temp ABC	INT	1	Group 10 temperature sensors data– phase A/B/C
0x00BF	Reserved	/	/	/
0x00C0-00C2	Group 11 Temp ABC	INT	1	Group 11 temperature sensors data– phase A/B/C
0x00C3-00C5	Group 12 Temp ABC	INT	1	Group 12 temperature sensors data– phase A/B/C
0x00C6-00C8	Group 13 Temp ABC	INT	1	Group 13 temperature sensors data– phase A/B/C
0x00C9-00CB	Group 14 Temp ABC	INT	1	Group 14 temperature sensors data– phase A/B/C
0x00CC-00CE	Group 15 Temp ABC	INT	1	Group 15 temperature sensors data– phase A/B/C
0x00CF	Reserved	/	/	/
0x00D0-00D2	Group 16 Temp ABC	INT	1	Group 16 temperature sensors data– phase A/B/C
0x00D3-00D5	Group 17 Temp ABC	INT	1	Group 17 temperature sensors data– phase A/B/C
0x00D6-00D8	Group 18 Temp ABC	INT	1	Group 18 temperature sensors data– phase A/B/C
0x00D9-00DB	Group 19 Temp ABC	INT	1	Group 19 temperature sensors data– phase A/B/C
0x00DD-00DE	Group 20 Temp ABC	INT	1	Group 20 temperature sensors data– phase A/B/C
0x00DF	Reserved	/	/	/
0x00E0-00E2	Group 21 Temp ABC	INT	1	Group 21 temperature sensors data– phase A/B/C
0x00E3-00E5	Group 22 Temp ABC	INT	1	Group 22 temperature sensors data– phase A/B/C
0x00E6-00E8	Group 23 Temp ABC	INT	1	Group 23 temperature sensors data– phase A/B/C
0x00E9-00EB	Group 24 Temp ABC	INT	1	Group 24 temperature sensors data– phase A/B/C
0x00EC-00EF	Reserved	/	/	/

7.2.2.- Read partial discharge sensor data, read only, Fun 03 to read.

Wired PD sensor data

Reg.	Data	Byte mode		Instruction
0x0060-0062	SG01/ Group01 PD sensor data	INT	1	PD sensor AA TEV UHF data of switchgear 01 or Group 01
0x0063-0067	Reserved	/	/	/
0x0068-006A	SSG02/ Group02 PD sensor data	INT	1	PD sensor AA TEV UHF data of switchgear 02 or Group 02
0x006B-006F	Reserved	/	/	/
0x0070-0072	SG03/ Group03 PD sensor data	INT	1	PD sensor AA TEV UHF data of switchgear 03 or Group 03
0x0073-0077	Reserved	/	/	/
0x0078-007A	SSG04/ Group04 PD sensor data	INT	1	PD sensor AA TEV UHF data of switchgear 04 or Group 04
0x007B-007F	Reserved	/	/	/
0x0080-0082	SG05/ Group05 PD sensor data	INT	1	PD sensor AA TEV UHF data of switchgear 05 or Group 05
0x0083-0087	Reserved	/	/	/
0x0088-008A	SG06/ Group06 PD sensor data	INT	1	PD sensor AA TEV UHF data of switchgear 06 or Group 06
0x008B-008F	Reserved	/	/	/

Wireless PD sensor data

Reg.	Data	Byte mode		Instruction
0x0300-0303	Device ID	INT	4	Device ID of PD sensor
0x0304	Battery power	INT	1	Battery power of PD sensor
0x0305	AA discharge times	INT	1	0-4095
0x0306	AA discharge amplitude	INT	1	0~60, unit: dBuV
0x0307	AA discharge average value	INT	1	0~60, unit: dBuV
0x0308	TEV discharge times	INT	1	0-4095
0x0309	TEV discharge amplitude	INT	1	0~60, unit: dBmV
0x030A	Environmental noise value	INT	1	0~60, unit: dBmV

0x030B	UHF discharge times	INT	1	0-4095
0x030C	UHF discharge amplitude	INT	1	-70~10, unit: dBm
0x030D	UHF discharge average value	INT	1	-70~10, unit: dBm
0x030E	Noise value	INT	1	30~80, unit: dB
0x030F	Temperature	INT	1	-40~85, unit: °C
0x0310	Humidity	INT	1	5~95, unit: %RH

Note:

UHF related values read from register are stored in 16-bit two's complement format; positive numbers represent themselves, while negative numbers must be converted from two's complement to signed decimal to obtain the actual value.

7.2.3.- Read/ write system setting values, Fun 03 to read, Fun 06 to write.

System setting

Reg.	Data	Byte mode		Instruction
0x0100	RTC. year	INT	1	Range: 0-99 Only need set last two digits of year
0x0101	RTC. month	INT	1	Range: 1-12
0x0102	RTC. date	INT	1	Range: 0-31
0x0103	RTC. hour	INT	1	Range: 0-23
0x0104	RTC. minute	INT	1	Range: 0-59
0x0105	RTC. second	INT	1	Range: 0-59
0x0106	Rotate	INT	1	Screen scroll interval, range: manual, 3-30s default manual
0x0107	Language	INT	1	Default English, not adjustable
0x0108	Backlight	INT	1	Screen backlight duration, range: 0-10min (default: 5min)
0x0109	Display	INT	1	Parameter display mode, range: **0:** SG;**1:** Group Default: SG (switchgear)
0x010A	Password	INT	1	Device password, range: 0000-9999 Default: 0001
0x010B	Temp log	INT	1	Historical temperature data record Default 15 days, read only, not adjustable
0x010C	PD log	INT	1	Historical PD data record Default 3 hours, read only, not adjustable

Communication setting

Reg.	Data	Byte mode		Instruction
0x0110	ID	INT	1	RS485 address, range: 001-254 Default 001
0x0111	Baud	INT	1	Baud rate, range: **0:**4800 **1:**9600 Default 9600
0x0112	Mode	INT	1	Data format, range: **0:** n.8.1; **1:** e.8.1; **2:** n.8.2 Default n.8.1

Sensor setting

Reg.	Data	Byte mode		Instruction
0x0120	SG 01 Temp	INT	1	Switchgear 01 temperature sensor quantity settings, range: **0, 3, 6, 9, 12**
0x0121	SG 02 Temp	INT	1	Switchgear 02 temperature sensor quantity settings, range: **0, 3, 6, 9, 12**
0x0122	SG 03 Temp	INT	1	Switchgear 03 temperature sensor quantity settings, range: **0, 3, 6, 9, 12**
0x0123	SG 04 Temp	INT	1	Switchgear 04 temperature sensor quantity settings, range: **0, 3, 6, 9, 12**
0x0124	SG 05 Temp	INT	1	Switchgear 05 temperature sensor quantity settings, range: **0, 3, 6, 9, 12**
0x0125	SG 06 Temp	INT	1	Switchgear 06 temperature sensor quantity settings, range: **0, 3, 6, 9, 12**
0x0126	SG 01 PD	INT	1	Switchgear 01 PD sensor quantity settings, range: **0, 3**
0x0127	SG 02 PD	INT	1	Switchgear 02 PD sensor quantity settings, range: **0, 3**
0x0128	SG 03 PD	INT	1	Switchgear 03 PD sensor quantity settings, range: **0, 3**
0x0129	SG 04 PD	INT	1	Switchgear 04 PD sensor quantity settings, range: **0, 3**
0x012A	SG 05 PD	INT	1	Switchgear 05 PD sensor quantity settings, range: **0, 3**
0x012B	SG 06 PD	INT	1	Switchgear 06 PD sensor quantity settings, range: **0, 3**
0x012C	Group Temp	INT	1	Temperature sensor group quantity settings, range: **0-24**
0x012D	Group PD	INT	1	PD sensor group quantity settings, range: **0-6**

Note:

Temp sensor: because busbar has A, B, C phases, three sensors form one set (ABC). So, options are 0, 3, 6, 9, 12, meaning 0-4 sets.

PD sensor: because our PD sensors are 3-in-1 type (AA, TEV, UHF), so options are 0, 3, meaning 0-1 set.

Each switchgear can be configured up to 4 sets of ABC temperature sensors and 1 set of AA, TEV, UHF three in one PD sensors.

Alarm setting

Reg.	Data	Byte mode		Instruction
0x0130	Alarm 01_Mode	INT	1	Alarm mode, range: **0:** OFF; **1:** Rising; **2:** Falling Default: OFF
0x0131	Alarm 01_Area	INT	1	In SG mode range: 1 -6 In Group mode range: 1-24 Default: 1
0x0132	Alarm 01_Sensor	INT	1	Sensor type, range: **0:** temp; **1:** PD Default: temp
0x0133	Alarm 01_ID	INT	1	**Alarm sensor ID** In SG mode: temp sensor range 1-12, PD sensor range 1-3 In Group mode: all range 1-3 Default: 1
0x0134	Alarm 01_Trip	INT	1	Trip value: range 0-9999 Default: 0
0x0135	Alarm 01_Delay	INT	1	Trip delay time: range 0-9999s Default: 0s
0x0136	Alarm 01_Hysteresis	INT	1	Hysteresis value: range 0-9999 Default: 0
0x0140-0146	Alarm 02	INT	1	The same as Alarm 01
0x0150-0156	Alarm 03	INT	1	The same as Alarm 01
0x0160-0166	Alarm 04	INT	1	The same as Alarm 01
0x0170-0176	Alarm 05	INT	1	The same as Alarm 01
0x0180-0186	Alarm 06	INT	1	The same as Alarm 01

Notes:

-. [In switchgear mode] – Temp sensors alarm ID range: 1-12, corresponding to temp sensors 1-12 within the switchgear. PD sensors ID range: 1-3, corresponding to: 1: AA sensor; 2: TEV sensor; 3: UHF sensor.

-. UHF negative threshold values (e.g., –30 dBm) must be converted to 16-bit two's complement format before writing to the register.

DO setting

Reg.	Data	Byte mode		Instruction
0x0190	DO 01_Mapping	INT	1	DO action mapping data, **0:** OFF, **1-6:** Alarm 01-06 Default: 1 (Alarm 01)
0x0191	DO 01_Link	INT	1	DO action link data, **0:** OFF, **1-6:** Alarm 01-06 Default: 2 (Alarm 02)
0x0192	DO 01_Mode	INT	1	DO action association logic mode, **0:** NOT; **1:** OR; **2:** AND **(default)**
0x0193	DO 01_Default	INT	1	DO default status, 0: NC **(default)**; 1: NO
0x0194	DO 02_Mapping	INT	1	The same as DO 01
0x0195	DO 02_Link	INT	1	
0x0196	DO 02_Mode	INT	1	
0x0197	DO 02_Default	INT	1	
0x0198-019B	DO 03	INT	1	
0x019C-019F	DO 04	INT	1	
0x01A0-01A3	DO 05	INT	1	
0x01A4-01A7	DO 06	INT	1	
0x01A8-01AB	DO 07	INT	1	
0x01AC-01AF	DO 08	INT	1	
0x01B0-01B3	DO 09	INT	1	
0x01B4-01B7	DO 10	INT	1	
0x01B8-01BB	DO 11	INT	1	
0x01BC-01BF	DO 12	INT	1	
0x01C0-01CF	Reserved	INT	1	
0x01D0-01DF	Reserved	INT	1	
0x01E0-01E3	Alarm output	INT	1	
0x01E4-01EF	Reserved	INT	1	
0x01F0-01F3	Trip output	INT	1	
0x01F4-01FF	Reserved	INT	1	

DI setting

Reg.	Data	Byte mode		Instruction
0x0210	DI-1 Mode	INT	1	**0**: OFF **1**: Active high; **2**: Active low
0x0211	DI-1 Delay	INT	1	Range: 10ms-10s
0x0212-0216	Reserved			
0x0217	DI-2 Mode	INT	1	The same as DI 01
0x0218	DI-2 Delay	INT	1	
0x0219-021F	Reserved			
0x0220-0221	DI-3			
0x0222-0226	Reserved			
0x0227-0228	DI-4			
0x0229-022F	Reserved			
0x0230-0231	DI-5			
0x0232-0236	Reserved			
0x0237-0238	DI-6			
0x0239-023F	Reserved			
0x0240-0241	DI-7			
0x0242-0246	Reserved			
0x0247-0248	DI-8			
0x0249-024F	Reserved			

Factory information query, read only, function 03 to read

Register	Data	Description
0XF000	Manufacturer	BLUE JAY
0XF010	Device model	SCM-TP1000
0XF020	Product number	
0XF030	Firmware version	
0XF040	Firmware date	
0XF050	Hardware version	
0XF060	Production week	
0XF070	SN code	
0XF080	MAC address (Reserved)	
0XF090	Reserved	
0XF0A0	Reserved	
0XF0B0-0XFFFF	Reserved	

Note: The above specifications may be updated due to product revisions. Please refer to the actual device query for final information.

7.3.- Command Example

Function 03 example: Read group 04 PD sensor data

Host inquiry: 01 03 00 78 00 03 CRC CRC

Slave response: 01 03 00 06 00 3C 00 2D FF C6 CRC CRC

Means: PD AA value is 60dBμV; TEV value is 45dBmV; UHF value is -58 dBm.

Function 06 example: Write switchgear 03 temp sensors quantity to 12

Host inquiry: 01 06 01 22 00 0C CRC CRC

Slave response: 01 06 01 22 00 0C CRC CRC

8.- MAINTENANCE

The SCM-TP1000 does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument is open and powered on, should those actions be essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allows a quick replacement in case of any failure.

9.- Ordering Information

Model	Function description
SCM-TP1000	● PD monitoring ● Temperature monitoring
SCM-PD3000	● Only PD monitoring (option wired/ wireless sensor)
SCM-W3000	● Only temperature monitoring

Model	Parts list
SCM-TP1000	1. HMI 2. PD sensor (wired PD sensor or wireless PD sensor with receiver) 3. Wireless temperature sensor with receiver
SCM-PD3000	1. HMI 2. PD sensor (wired PD sensor or wireless PD sensor with receiver)
SCM-W3000	1. HMI 2. Wireless temperature sensor with receiver

10.- Attachment Contents

Document
HMI Firmware Upgrade Guide and Tools
Temperature Sensor RS485 Configuration Guide and Tools
PD Sensor RS485 Configuration Guide and Tools

Note: The above documents are not distributed with this manual. Please contact our sales team if needed.

For any inquiry about the instrument performance or any failure,
contact to Blue Jay's technical service.

Blue Jay - After-sales service

E-mail: tech@cqbluejay.com