SCM-PDS2
Partial Discharge Sensor

User Manual

Version: 1.10

Revision: 2024.12

Tel: +0086-023-67628702
www.cqbluejay.com
Add: 1802,Building 2,No.88,Jianxin East Road,Chongqing,400020,China
Email:tech@cqbluejay.com

Read me

When you use SCM-PDS2 partial discharge sensor, 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 SCM-PDS2 partial discharge sensor, and help to solve the various problems at the scene.

1. Always keep safe distance between the high voltage part and the instrument, probe and operator.

2. Measurements must not be taken when thunderstorms are nearby.

3. Do not operate the instrument or accessories in explosive atmospheres.

4. After the battery alarm of the instrument, please turn off the power to charge.

5. Do not open the instrument without permission, this will affect the warranty of the product. The factory is not responsible for self-disassembly.

6. When the instrument is transported, it should avoid rain erosion and prevent collision and falling.

7. When storing and keeping the instrument, attention should be paid to the ambient temperature and humidity, and it should be protected from dust, moisture, shock, acid, and corrosive gas.

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

Directory

1.- SUMMARIZE

Partial discharge (PD) is closely related to insulating conditions of electrical apparatus in power systems. When PD occur in insulations, small currents arise. Without any treatment, the discharge currents bridge the electrodes completely which certainly results in large short-circuit current and breaks down the equipment. PD phenomenon is an indication of degradation of insulation materials. Thus, the detection of PD at early stages plays a crucial role in increasing the service life of power equipment.

The PDS2 partial discharge sensor integrates ultrasonic and TEV (Transient Earth Voltage) technologies to detect partial discharges in middle-high voltage equipment. PDS2 can monitoring of transformers, high-voltage switchgear, GIS (Gas-Insulated Switchgear), and cable joints. PDS2 is highly portable, offers fast measurement speeds, and boasts strong anti-interference capabilities, making it suitable for various field applications.

FEATURES

- Rugged, compact design;
- Non-intrusive detection method;
- Transient overvoltage protected;
- Strong magnets to attach sensor;
- RS485, Modbus-RTU, SCADA systems;
- Rapid detection of partial discharge conditions;
- Customizable according to customer needs;
- Suitable for online or offline PD measurements.

APPLICATIONS

- Factory and on-site testing;
- Power transformers;
- Medium and high pressure connections;
- Power coils, motors;
- Gas-insulated integrated circuits (GIS);
- Industrial motor equipment;
- High pressure components: sleeves, insulators, containers, coil terminations, bus wires.

2.- TEST PRINCIPLE

This system monitors the insulation status of the switchgear by simultaneously monitoring transient low voltage (TEV, also known as ground wave) and ultrasonic signals generated by partial discharge. The monitoring mechanism is shown in the following figure:

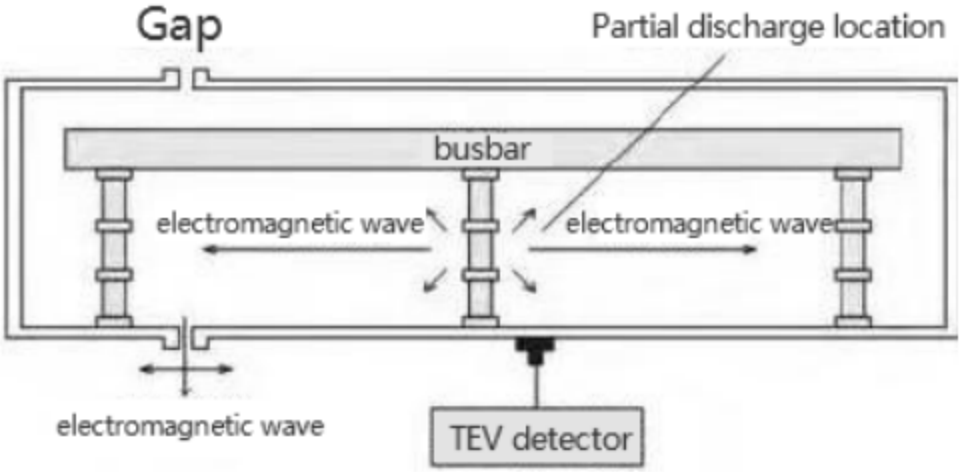

Figure 1. TEV detection mechanism

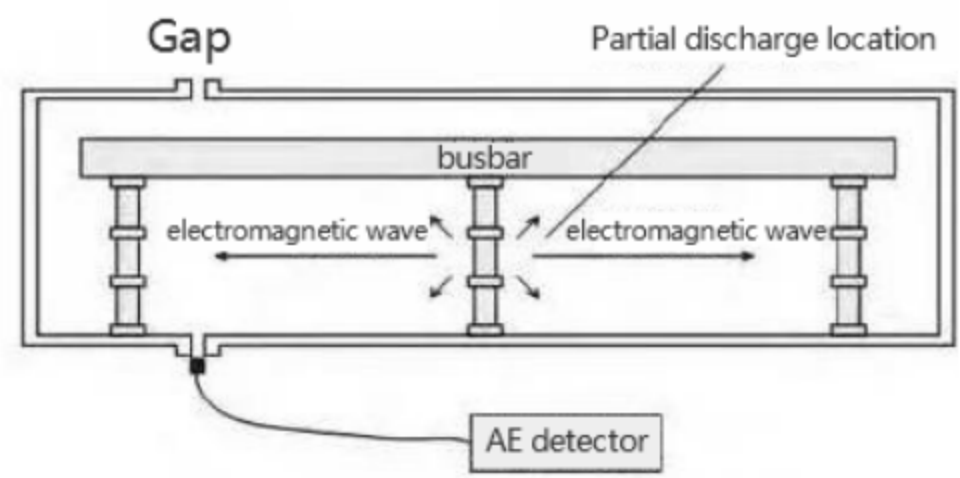

Figure 2. Ultrasonic detection mechanism

3. - SENSOR INTRODUCTION

3.1. - Ultrasonic measurement

If you choose the external ultrasonic sensor to measure the partial discharge of the switchgear, you hardly need to do other operations or settings after starting up, Because the external ultrasonic sensor is selected by default after the product is turned on, the upper left of the screen will display which sensor is currently connected.

In the ultrasonic measurement mode, the measurement data is dBuv, because dBuV is a logarithmic function value based on 1uV, therefore, the measured data in the ultrasonic mode can be positive or negative. According to the processing capacity of the ultrasonic amplifier of this product, it can reach -6dBuV The test ranges to 68dBuV, the larger the negative value, the smaller the ultrasonic signal, the closer to Ouv, not negative! Usually the measured data in an interference-free environment is between -6dBuV and odBuV.

Insulation condition of switchgear:

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

Note:

The demarcation point (6dBuV) is slightly different in different regions, so it is recommended to use 6dBuV as the demarcation point, so that the operating status of the switchgear can be warned in advance.

3.2. - TEV measurement

In the TEV measurement mode, the reference pulse count value P/Cycle is also required, and the pulse number and amplitude comprehensively measure the health of the switchgear.

When the environmental value is large, it is necessary to find out the interference source. The interference source of TEV is different from that of ultrasonic. Ultrasonic interference is generally limited to a limited space, while TEV interference affects the entire space through radio frequency, such as electric welding machines, frequency converters, walkie-talkies, Wireless broadcasting stations, etc. Compared with ultrasonic interference, such interference signals are sometimes difficult to avoid or clear, so it is recommended to use ultrasonic measurement when the environment (interference) value is detected to be large.

Insulation condition of switchgear:

Data	Definition
The reading is <20dB.	No partial discharge, Recheck once a year.
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.

4.- TECHNICAL SPECIFICATION

Sensor common	
Power supply	12VDC
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	4S
TEV sensor	
Detect range	0~60 dBmV
Pass band	3~100MHz
Resolution / Accuracy	1dBmV / ±1dBmV
Ultrasonic sensor	
Detect range	-7dBμV ~ 68dBμV
Resolution / Accuracy	1dBμV
Sensitivity	-65 dB (0 dB=1 volt/μbar rms SPL)
Sensor center frequency	40 KHz

5.- INSTALLATION AND START-UP

5.1.- Installation dimensions (unit: mm)

5.2.- Terminal definition

Marked	Notes
+12V	Power supply
GND	Grounding
RS485+	Communication Interface
RS485-	

6.- COMMUNICATION INTERFACE

This document defines the communication protocol specification of SCM-PDS2, please strictly follow this communication protocol to connect with the device.

6.1.- MODBUS © protocol

Modbus RTU Frame Format:

Address code	**1 BYTE**	*Slave device address **1-247***
Function code	**1 BYTE**	*Indicates the function codes like read coils / inputs*
Data code	**4 BYTE**	*Starting address, high byte* *Starting address, low byte* *Number of registers, high byte* *Number of registers, low byte*
Error Check code	**2 BYTE**	*Cyclical Redundancy Check (**CRC**)*

MODBUS FUNCTIONS

Code	Meaning	Description
FUNCTION 03	**Read holding register**	*Read device setting data*
FUNCTION 04	**Read input register**	*Read device measurement data*
FUNCTION 06	**Write Single Register**	*Writes a value into a single holding register.*
FUNCTION 10	**Write Multiple Register**	*Writes values into a sequence of holding registers*

Note:

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

6.2.- Register Map

SCM-PDS2 use 12VDC power supply, please refer to panel terminal definition to wiring. Default MODBUS parameter:

6.2.1.- Reading the setting value (Funx03)

Register	Definition
0	Device address
1	Baud rate： 1: 4800 2:9600 **(Default)** 3:19200 4:38400 5:115200
2	AE setting value
3	TEV setting value
4	UHF setting value

6.2.2.- Reading the setting value(Funx04)

Register	Byte mode		Data	Value range
0000H	INT	1	AE discharge times	0-4095
0001H	INT	1	AE discharge peak value	0~60,unit: dBuV
0002H	INT	1	AE discharge average value	0~60,unit: dBuV
0003H	INT	1	AE alarm: 0-normal/1-alarm	0~1
0004H	INT	1	TEV discharge times	0-4095
0005H	INT	1	TEV discharge peak value	0~60,unit: dBmV
0006H	INT	1	TEV discharge average value	0~60,unit: dBmV
0007H	INT	1	TEV alarm: 0-normal/1-alarm	0-1
0008H	INT	1	UHF discharge times	0-4095
0009H	INT	1	UHF discharge peak value	-70~10,unit: dBm
000AH	INT	1	UHF discharge average value	-70~10,unit: dBm
000BH	INT	1	UHF alarm: 0-normal/1-alarm	0~1
000CH	INT	1	Noise value*	30~130, unit: dB

Notes:

-. Initial alarm is judged as 10 discharge times, When AE setting value is 30 dBmV and simultaneously discharge times exceed 10 times; When TEV setting value is 30 dBmV and simultaneously discharge times exceed 10 times; When UHF setting value is -30 dBm and simultaneously discharge times exceed 10 times, then alarm is triggered.

-. Noise value refers to the environmental noise value, only for user reference, not participate in the calculation of AE and TEV measurement value.

6.2.3.- Writing the single setting value (Funx06)

Register	Definition
0	Device address
1	Baud rate： 1: 4800 2:9600 (Default) 3:19200 4:38400 5:115200
2	AE setting value
3	TEV setting value
4	UHF setting value

6.2.4.- Writing the single setting value (Funx10)

Register	Definition
0	Device address
1	Baud rate： 1: 4800 2:9600 (Default) 3:19200 4:38400 5:115200
2	AE setting value
3	TEV setting value
4	UHF setting value

7.- SAFETY CONSIDERATIONS

All installation specification described at the previous chapters named: **INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.**

Please note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

- The device must have a professional installation and maintenance.
- Any operation of the device, you must cut off the input signal and power.

8.- TECHNICAL SERVICE

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

Blue Jay - After-sales service

1802, Building 2, No.88, Jianxin East Road,
Chongqing,400020, China

Tel - + 0086 023 67628702
E-mail: tech@cqbluejay.com