SCM-PDS-HFCT
Cable Partial Discharge Monitoring

User Manual

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Read me

When you use HFCT partial discharge monitoring, 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 HFCT partial discharge monitoring, 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**

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1.- SUMMARIZE

The HFCT partial discharge sensor is designed for real-time monitoring of cable insulation conditions during operation. It adopts high-frequency pulse current detection technology and a Split-core structure, enabling non-intrusive detection of discharge signals on cable grounding lines. Powered by DC 12–24V, it communicates with the host system via RS485 shielded twisted pair using MODBUS protocol.

With features such as real-time pulse monitoring, automatic fault alarms, and flexible terminal expansion, the system enhances early fault detection and improves the safety and reliability of power systems. Additional monitoring terminals can be easily added without affecting existing devices, supporting scalable and efficient partial discharge monitoring solutions.

FEATURES

- DC12-24V wide voltage power supply;
- RS485/ MODBUS RTU communication;
- PD detection range 0-10000 pC;
- 4 seconds PD data sampling cycle;
- 1pC sensitivity high-frequency current detection;
- Split-core type HFCT transformers installation;
- Magnetic mounting adapts to various cable compartments;

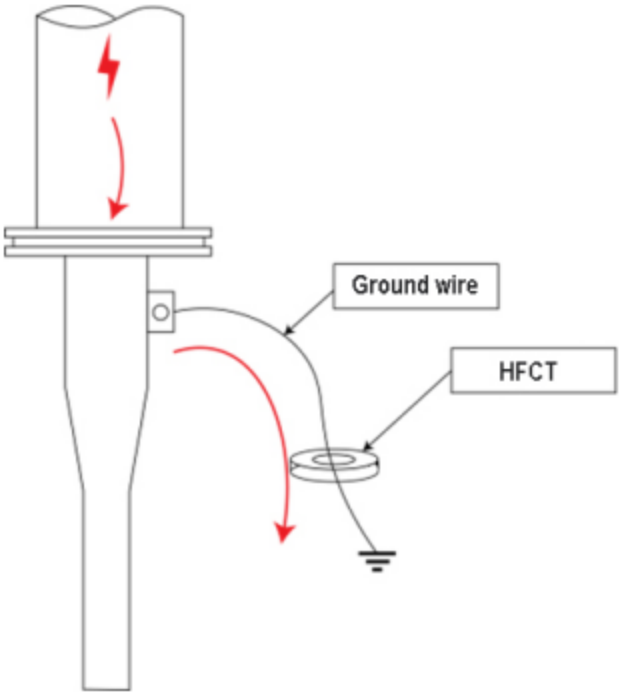
APPLICATIONS

- Power plants cable system status monitoring;
- GIS systems ground wire partial discharge monitoring;
- Substations, power distribution, and MV/HV transmission lines;
- Transportation infrastructure power line status monitoring;
- Petrochemical industry Power supply systems;
- Urban distribution networks and underground cable tunnels;

2.- WORKING PRINCIPLE

The High-Frequency Current Transformer (HFCT) method is a non-invasive technique for detecting partial discharges (PD) in medium- and high-voltage equipment such as cables, transformers, and switchgear. PD events generate high-frequency current pulses (in the MHz range) that propagate along the grounding path.

An HFCT sensor clamped around the grounding conductor captures these pulses and converts them into voltage signals via a high-bandwidth ferrite core. After amplification and filtering, the processed signals are analyzed to determine the type and severity of PD activity.



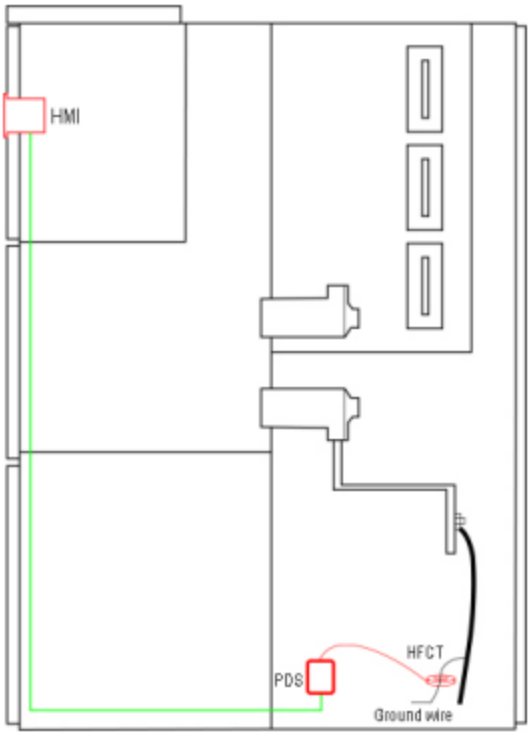
To enable centralized monitoring and remote diagnostics, processed PD data is transmitted via the RS485 interface using the Modbus RTU protocol. This ensures seamless integration with SCADA systems, condition monitoring platforms, or intelligent electronic devices, supporting real-time data access, alarm notifications, and historical trend analysis across multiple points.

3.- SPECIFICATION

Partial discharge sensor	
Power supply	12-24VDC
Monitoring type	High-frequency pulse current
Detection range	1-10000pC
Sensitivity	1pC
Acquisition frequency band	1MHz-100MHz
Communication protocol	RS485/ MODBUS RTU; baud rate: 9600 bit/s
Operating temperature	-30-70°C
Sampling cycle	4S
Dimensions	134mm*100mm*42mm (W*H*D)
Mounting method	Magnetic mounting
High-frequency pulse CT	
Monitoring principle	Rogowski Coil
Monitoring frequency band	3-80MHz
Sensitivity	1pC
Matching impedance	50Ω
Protection level	IP68
Inner diameter	82*82*32mm (W*H*D), hole size: 30mm
Mounting method	Split-core current sensor
Mounting location	Cable Ground Wire
Operating temperature	-55°C to +85°C

4.- INSTALLATION AND START-UP

4.1.- PD sensor Installation method



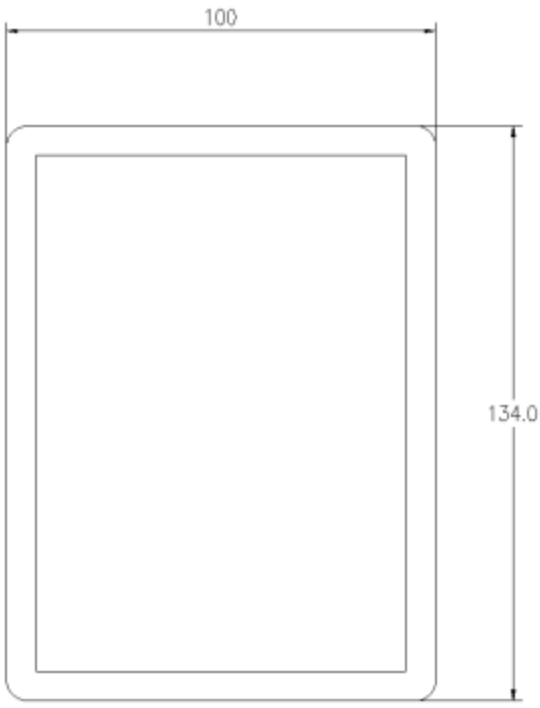
Step 1: Magnetically mount the PD sensor in the cable compartment.

Step 2: Clamp the HFCT on the grounding wire with correct orientation.

Step 3: Connect HFCT to the PD sensor via coaxial cable.

Step 4: Connect power and communication lines between PDS and HMI.

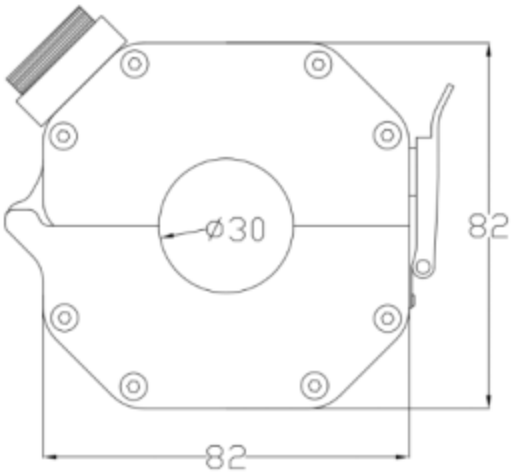
4.2.- PD sensor dimension: 134*100*42mm (W*H*D)



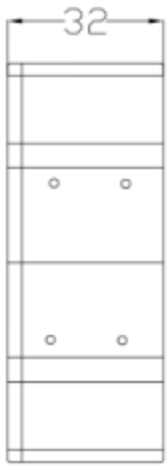
Front view

Side view

4.3.- HFCT dimension: 82*82*32mm (W*H*D), hole size: 30mm

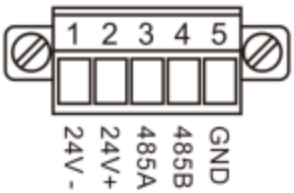


Front view



Side view

4.4.- Terminal definition



No.	Marked	Notes
1-2	**24V +/ -**	Power supply
3-4	**RS485 +/ -**	Communication interface
5	**GND**	Grounding

5.- COMMUNICATION INTERFACE

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

5.1.- MODBUS © protocol

Modbus RTU Frame Format:

Host inquiry:

Address code	**1 BYTE**	Slave device address
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
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 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 multiple holding registers
FUNCTION 64	**Read PD pattern**	Read PD pattern data

Note:

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

5.2.- Register Map

5.2.1.- Reading the setting value, read only, Fun 03 to read.

Register	Byte mode		Definition
0x00	INT	1	Device address
0x01	INT	1	**Baud rate:** 1: 4800; 2:9600 (Default) 3:19200; 4:38400; 5:115200
0x02	INT	1	HFCT alarm amplitude threshold, unit: pC
0x03	INT	1	HFCT alarm times threshold

5.2.2.- Reading the device collected data, read only, Fun 04 to read.

Register	Byte mode		Data
0x00	INT	1	HFCT discharge times
0x01	INT	1	HFCT discharge amplitude value, unit: pC
0x02	INT	1	HFCT discharge average value, unit: pC
0x03	INT	1	HFCT alarm status: 0-normal/ 1-alarm

Command example:

Example 1: Read the setting value (By function 03)

Host inquiry 01 03 00 00 00 02 CRC CRC

Slave response 01 03 04 00 01 00 02 CRC CRC

This means the slave address set to 001, baud rate set to 9600.

Example 2: Read the HFCT discharge amplitude value (By function 04)

Host inquiry 01 04 00 01 00 01 CRC CRC

Slave response 01 03 02 00 64 CRC CRC

This means the HFCT discharge amplitude value is 100pC

5.2.3.- Reading the PD pattern data, read only, Fun 64 to read.

Each power frequency cycle (20ms) stores 10 sampling points. A total of 1 second of data is stored, comprising 500 (phase, amplitude) point pairs.

Phase angle range: 0-200, with a phase resolution of 1.8°, it must be converted to 0–360°, and the amplitude value range: 0 to 10000.

Each data point is stored in one register: the high 8 bits (H8) represent the phase angle (which should be multiplied by 1.8° to get the actual value), and the low 8 bits (L8) represent the discharge amplitude.

Command format:

Host inquiry	**Slave address**	**Function code**	**Start register addr.**	**Register quantity**	**CRC check**
	0x01	0x64	0x01F4	0x03EC	CRC CRC
Slave response	**Slave address**	**Function code**	**Bytes quantity**	**Register value**	**CRC check**
	0x01	0x64	0x07D8	...	CRC CRC

Note: Register address range is 0x01F4~0x05E0.

Register value:

Phase angle 1	**UINT16**
PD discharge amplitude 1	
Phase angle 2	
PD discharge amplitude 2	
...	
...	
Phase angle 500	
PD discharge amplitude 500	
PD discharge times	
PD discharge amplitude	
PD discharge average value	
Alarm status: 0-normal/ 1-alarm	

Command example:

Host inquiry 01 64 01 F4 03 EC CRC CRC

Slave response 01 64 07 D8 00 00 00 00 00 00 00 00 ... ... CRC CRC

5.2.4.- Writing the single setting value, write only, Fun 06 to write.

Register	Byte mode		Definition
0x00	INT	1	Device address
0x01	INT	1	**Baud rate:** 1: 4800; 2:9600 (Default) 3:19200; 4:38400; 5:115200
0x02	INT	1	HFCT alarm amplitude threshold, unit: pC
0x03	INT	1	HFCT alarm times threshold

5.2.5.- Writing the multiple setting value, write only, Fun 10 to write.

Register	Byte mode		Definition
0x00	INT	1	Device address
0x01	INT	1	**Baud rate:** 1: 4800; 2:9600 (Default) 3:19200; 4:38400; 5:115200
0x02	INT	1	HFCT alarm amplitude threshold, unit: pC
0x03	INT	1	HFCT alarm times threshold

Command example:

Example 1: Write the HFCT alarm amplitude threshold to 2000pC (By function 06)

Host inquiry 01 06 00 02 07 D0 CRC CRC

Slave response 01 06 00 02 07 D0 CRC CRC

Example 2: Write the HFCT alarm amplitude threshold to 2000 pC and alarm times threshold to 30 (By function 10)

Host inquiry 01 10 00 02 00 02 04 07 D0 00 1E CRC CRC

Slave response 01 10 00 02 00 02 CRC CRC

6.- 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.

7.- 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

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