



The Switchgear and Cable Monitor (SCM) is a continuous partial discharge (PD) monitor which monitors, stores and correlates operating dynamics. The SCM will provide information as to the health of the medium voltage insulation systems of switchgear, cables, bus duct and unit substations.

Industry data shows that switchgear has one of the industry's highest failure rates, creating a need for inspection and continuous monitoring. Unlike insulation systems used in motors and generators, the insulation systems in switchgear are not resistant to insulation deterioration caused by partial discharges.

Design Advantages

The SCM is industry's partial discharge monitor of choice. It can be configured to have up to 60 PD inputs (four PD modules). Each module features fifteen independent (concurrently monitored), highly sensitive, user configurable input channels; delivering the industry's best signal-to-noise ratio and allowing connection to a wide variety of PD sensors!

Features & Benefits

Continuous monitoring of PD versus performing periodic measurements provide the following benefits:

- PD occurs on an erratic basis and major defects can be missed if not monitored
- Remote viewing of data via standard communication protocols
- More sensitive and comprehensive than TEV, acoustic or other methods
- Commonly monitored operating parameters include ambient temperature and humidity.
- The SCM's design allows for independent operation (without a connected PC), yet features a wide variety of built-in communication capabilities.
- Communications ports include Ethernet, USB and RS-485 with a standard communication protocol using ModBus. Dry relay contacts are also available to indicate monitor health and alarm conditions.
- SCM's design supports harsh ambient conditions including a wide temperature range, without the need for additional heaters or coolers.
- The SCM provides a full range of advanced noise cancellation capabilities including the elimination of cross coupled signals.
- The included Microsoft Windows™ based software application allows for SCM configuration, the uploading of stored data and analysis.
- By centrally locating the SCM, multiple switchgear sections can be monitored with one SCM.

Industries Served

- Industrial
- Data Centers
- Power Plants



Preventing Outages

The SCM monitors switchgear. Switchgear failures are usually catastrophic. When switchgear fails, the outage is usually for an extended period. On older equipment, spare parts are limited and many times custom manufacturing is required, which adds to the outage time. Based on IEEE data, simple payback for a system is usually less than one year.

IEEE Standard 493-2007 All Industry Equipment Type	Failure Rate/Year	Average Hours/ Outage	Average Downtime Hours/Year
Switchgear - Bus Only 7 Sections	0.0119	261	21.7413
Large Power Transformers	0.013	1076	13.988
MV Synchronous Motors	0.0318	175	5.565
MV Induction Motors	0.0404	76	3.0704
Cables (Below Grade) - 3000 ft.	0.00613	53	0.97467
Cable Terminations (3)	0.000814	284	0.693528
Small Power Transformers	0.0025	217	0.5425
MV Circuit Breakers	0.0064	89.3	0.57152
Bus Duct - 30 ft.	0.0038	128	0.4864

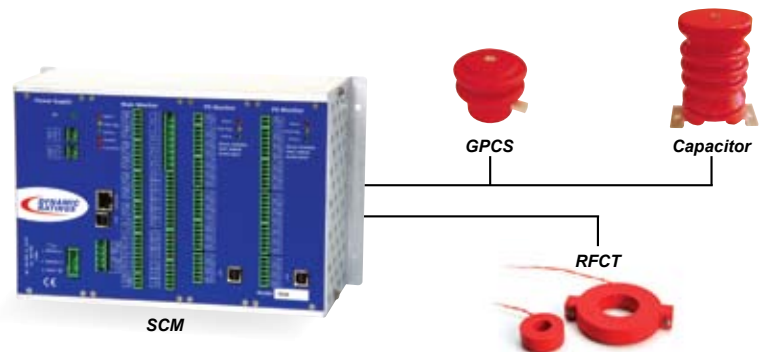


SCM monitors Switchgear, Cables and Bus Duct

Cables

The SCM monitors cables and 90% of cable failures occur at splices and terminations. As these accessories breakdown, they generally produce partial discharges prior to failure. To monitor cables, radio frequency current transformers (RFCTs) are placed around the cable termination shields. If the shields are ungrounded then a GPCS sensor is used. The condition of the cable, type of insulation, type of shield construction will determine how far one can 'see' down the cable. Common distances range from (91m / 300 ft.) for ethylene-propylene rubber (EPR) and (305m / 1000 ft.) for cross linked polyethylene (XLPE) cable.

Compatible with Partial Discharge Sensors





Software Package

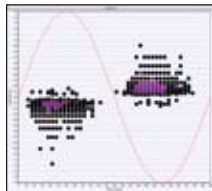
The supplied application software is intended to run on PC's with Microsoft Windows™ software. Our application software is a versatile product supporting Dynamic Ratings portable and continuous insulation monitoring systems that may be found on generators, motors, switchgear, cables, bus duct, and transformers. The software allows the user to configure the instrumentation, download and store the data and provides tools for data presentation and analysis.



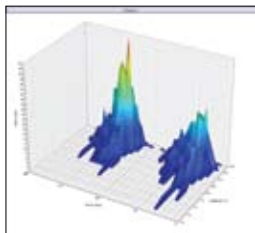
Graphic Results

Test results can be presented in all industry accepted formats:

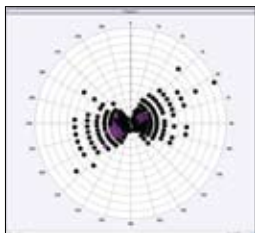
- **2D Phase Resolved**
- **3D Phase Resolved**
- **Polar Phase Resolved**
- **Trend**
- **Pulse Height Distribution** *2D Phase Resolved*



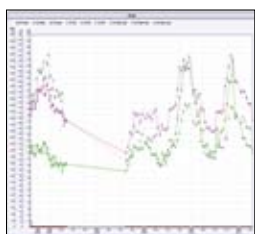
The software allows for the trending of all standard quantities of magnitudes, pulse counts, PD Intensity as well as operating dynamics. Multiple channels can be presented on the same screen for easy comparison and analysis.



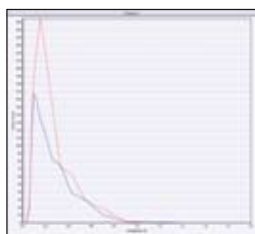
3D Phase Resolved



Polar Phase Resolved



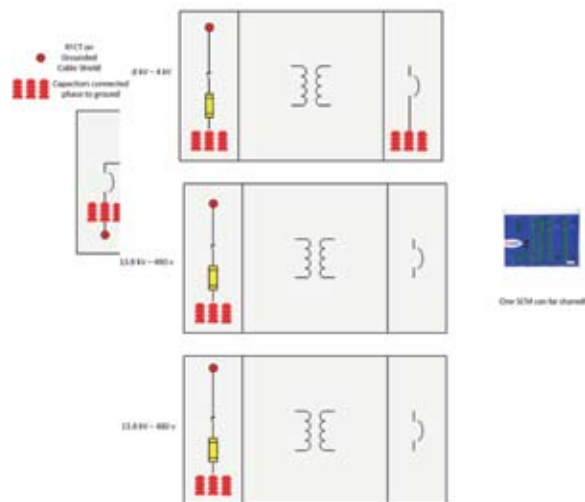
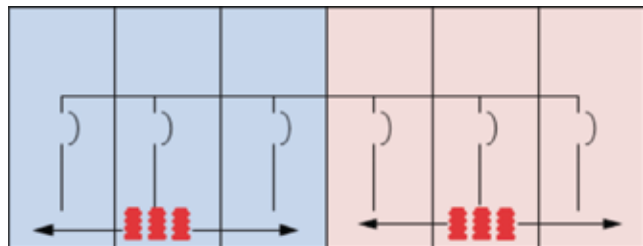
Trend



Pulse Height Distribution

Sensors

The most common sensor used to monitor partial discharges in switchgear are coupling capacitors (CC). The CCs are distributed throughout the switchgear structure, typically one set of CCs are installed per three sections.



Optimized Packaging

Each SCM can be assembled, configured, wired and tested in a variety of packaging options to provide the most cost effective and efficient manner for field installation.

SPECIFICATIONS

PD Channels:	15 channels per module, up to 60 total channels using 4 modules
Dynamic Range:	70 dB, 3 mV to 10 V, with no gain adjustment
Power Frequency Phase Resolution:	7.5°
Power Requirement:	90 - 264 VAC line voltage (47 to 63Hz), 120 to 300 VDC
Internal Memory:	8 MB
Magnitude Windows:	32
Measurement Frequency Bandwidth:	1 MHz to 20 MHz
Temperature Range:	- 40° C to 70° C / - 40° F to 158° F
User Interface:	PC

SCM — ORDERING INFORMATION

Base System¹

Base System: 1, 2, 3, or 4 (select one of the following)

- 1 = (15) PD Channels, (1 module).....
- 2 = (30) PD Channels, (2 modules).....
- 3 = (45) PD Channels, (3 modules).....
- 4 = (60) PD Channels, (4 modules).....

Packaging Options^{2,3,4}

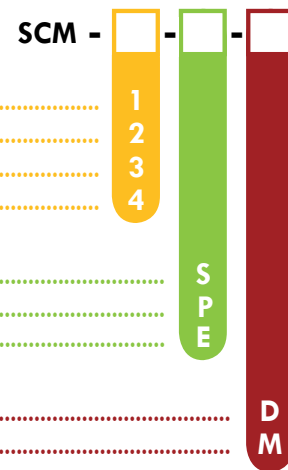
Packaging Options: S, P, or E (select one of the following)

- S = Stand-alone Monitor.....
- P = Panel Mounted Monitor^{2,4}.....
- E = Monitor is Mounted in a NEMA 4x Enclosure^{3,4}.....

Communication Protocols

Communication Options: D or M (select one of the following)

- D = DNP 3.0 Communications.....
- M = Modbus Communications.....



Notes

- ¹ All base systems include (1) AuxCT current transformer, (1) AmbH ambient humidity sensor and (1) AmbT ambient temperature sensor.
- ² Panel size may vary to accommodate base system selection. Consult the factory with questions.
- ³ Enclosure size may vary to accommodate base system options and enclosure type.
- ⁴ Packaging options P and E include the monitor mounted with all terminals wired out to terminal blocks.



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SENSORS and ACCESSORIES

The products above are compatible with industry sensors, including Dynamic Ratings; Coupling Capacitors, Ground Path Current and Radio-Frequency Current Transformer Sensors.

Contact us for a “Sensors & Accessories for Partial Discharge (PD) Monitoring Systems” product catalog.



Contact your sales representative for application assistance or pricing.

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