Maximize your uptime
Why InsulGard?

Economics and safety

Insulation failures cost time and money. What’s even more damaging is that insulation failures lead to arc flash events, equipment failure, unscheduled outages or, worst of all, accidents involving personnel.
How does it work?
By measuring partial discharge activity in medium voltage equipment, InsulGard provides intelligence about the wellness of electrical insulation, enabling better decision-making for managing electrical assets and increasing safety for plant personnel.

What is the payback?
The average cost of motors, generators and switchgear can range from $100k to many millions, and if a station is shut down, that loss can be catastrophic. In addition, buying equipment is only part of the expense of replacing it.

Protect your investment
In many circumstances, InsulGard can double the equipment’s life span.

InsulGard can maximize your uptime
InsulGard is a more economical alternative for maintaining electrical power equipment.

Proven history
Thousands of InsulGards are protecting assets all over the world.

Eliminate periodic scheduling of downtime to perform tests and time-based maintenance that lead to customer inconvenience
The InsulGard predictive relay revolutionized predictive maintenance practices by introducing one continuous, online partial discharge (PD) monitoring system designed for the following medium voltage applications:
• Generators
• Motors
• Switchgear
• Unit substation dry-type transformers
• Bus duct
• Cable connections

Continuous eliminates the chances of failures occurring between periodic test events.
Online eliminates the inaccuracies of offline tests.
InsulGard also reduces the level of expertise required to analyze PD data with user-friendly software.

Mitigate your risk
Eaton’s InsulGard™ system predicts insulation failures before they occur.
InsulGard technology works for you 24 hours a day, 7 days a week, 365 days a year—reliable support you can count on.

The InsulGard system detects partial discharge activity online, with the entire electrical system energized—no offline testing necessary. It analyzes radio frequency (RF) signals emitted by the partial discharge pulses and measures pulse quantity and magnitude, then correlates the data to temperature, humidity and various other electrical system dynamics. If PD levels exceed programmable set points, alerts are initiated. With or without alerts, you can quickly view or analyze trends using InsulGard software.

The predictive relay works as a single, local device or in a communication network with multiple devices.

The most commonly used sensors include coupling capacitors and radio frequency current transformers (RFCTs). For rotating machinery, such as generators and motors, additional sensing technologies are available.

For sites with pre-existing sensors, the InsulGard predictive relay is fully compatible and can be instantaneously commissioned.

**Typical rotating machine application**

**Features and benefits**

- Advanced filters and three noise algorithms provide clarity in the PD signal, which leads to quicker and easier diagnostics.
- InsulGard can operate in a lower RF bandwidth of 1–20 MHz. This bandwidth provides a broader sensing range for identification of more partial discharge activity that higher bandwidths can miss completely.
InsulGard is the ideal advanced-warning solution

Where can the InsulGard system be used?

Generators and motors
Available sensors for rotating machinery include coupling capacitors and RFCTs. The traditional sensor of choice is the coupling capacitor; with this sensor alone, InsulGard technology provides much broader coverage of the stator winding when compared with the competition. An optional RTD module takes advantage of a third PD sensing technology that dramatically increases the coverage of the stator winding for maximum coverage.

Used alone or in combination, the PD sensors, along with sensors for humidity, load and temperature, connect to the InsulGard predictive relay for monitoring, data collection and analysis.
InsulGard is also compatible with variable frequency drives and can be used on motors running between 3 and 400 Hz.

Problems that partial discharge analysis can detect within rotating equipment include:
• Early stages of insulation deterioration
• Sparks in voids and between windings
• Corona on end windings

Switchgear and unit substation dry-type transformers
Available sensors for switchgear include coupling capacitors and RFCTs.
Coupling capacitors detect partial discharges within cubicles and typically connect to the load side of the feeder breakers or on the main bus.
RFCTs identify partial discharges related to the feeder cables and connect around the cable shields. The same sensors apply to power center transformers, cable terminations and bus ducts.
Problems that partial discharge analysis can detect within switchgear apparatus include:
• Discharges in air gaps (between bus and support window, for example)
• Surface tracking (on supporting isolator or bus insulation surface)
• Sparks within insulation voids
• Insulation problems in cable terminations and connected equipment
• Poor electrical connections (floating potentials)
• Defective current transformers and potential transformers
• Incoming bus ducts

Sensor Selection Guideline
• RFCT—One for Every Feeder Breaker
• Coupling Capacitors—One Set for Every 3 to 4 Cubicles

Typical switchgear application
InsulGard software allows for extensive data analysis from simple automated reporting to in-depth analysis by experts. This image shows the history and outcome of maintenance efforts, which resulted in a not very successful rewinding of a 13.8 kV motor. PD activity in two locations grew higher than before rewinding.

Very aggressive PD was found as a result of several InsulGard alarms triggered on 11/14–11/16, 2011. PD grew rapidly in the 6 weeks between October 19 and November 16 when it was discovered. It could have had dramatic consequences if it had been left undetected.
Simplified PD remote monitoring process

Eaton’s Remote Monitoring and Diagnostic services add considerable value to continuous online monitoring investment at a remarkably low cost. Traditionally, data collection and data analysis for partial discharge has been cumbersome and extremely difficult for untrained professionals. Eaton’s Remote Monitoring service eliminates these concerns by communicating directly to PD monitors using Ethernet or cellular modems. Data encryption, VPN connection and secure tunnels provide reliable, safe and secure connection to the monitors. The data is collected daily from the units and screened for alarms.

The accumulated data is summarized for viewing using Eaton’s Online Viewing Portal where customers may access data trends and monthly reports. Report format is single page with stop light (red, yellow or green) designations to quickly assess the monitored equipment’s health. Behind the scene is a team of world-renowned PD expert engineers reviewing any anomalies. A designated engineer will contact the customer directly with recommendations before the PD leads to a catastrophic event. If there are ever any concerns or questions regarding the InsulGard PD detection system, experts are available with instantaneous access to all current data.

Communications and connectivity

There are three communication ports available.

RS-485
RS-485 optically isolated interface based on Modbus® RTU protocol allows remote device configuration and data downloading. InsulGard can be networked with an existing Modbus network, allowing for up to 231 addressable devices.

Direct USB connection
The device USB port is used for local communications between the InsulGard and a computer through a USB A/B cable.

Ethernet connection
There are several functions available through the Ethernet port, including webpage display, FTP upload or download and operation as a virtual serial port.
InsulGard’s onboard webpage provides a quick overview of status and PD levels. It is accessed using a standard Web browser over Ethernet.