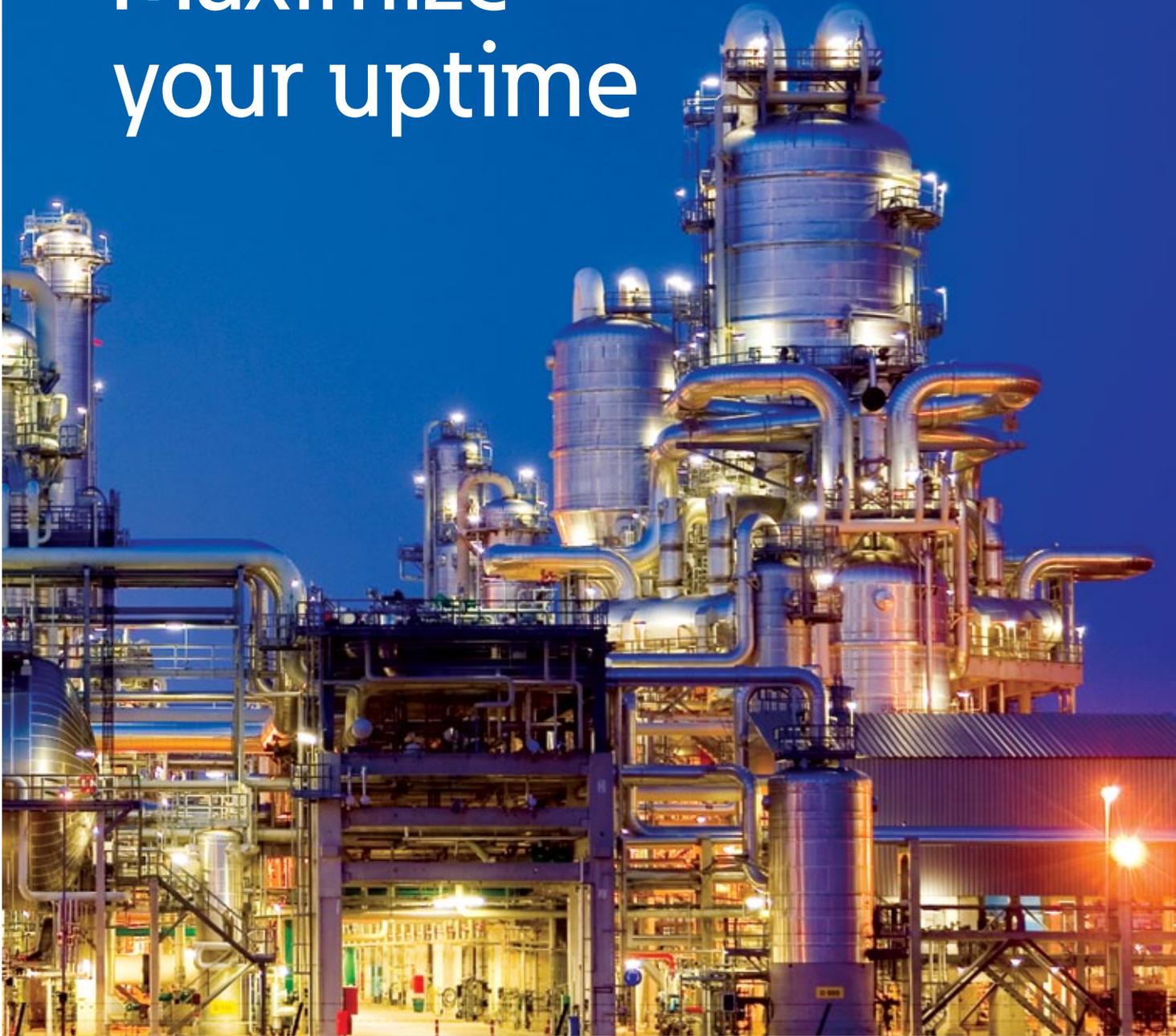


InsulGard

Medium voltage motors
Generators
Switchgear

Bus duct
Cable terminations

Maximize your uptime



EATON

Powering Business Worldwide



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.

Mitigate your risk

Eaton's InsulGard™ system predicts insulation failures before they occur.



InsulGard Front



InsulGard Back

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 that 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.

Eliminate periodic scheduling of downtime to perform tests and time-based maintenance leading 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 off-line tests.

InsulGard also reduces the level of expertise required to analyze PD data with user-friendly software.

InsulGard technology works for you 24 hours a day, 7 days a week, 365 days a year—reliable support you can count on

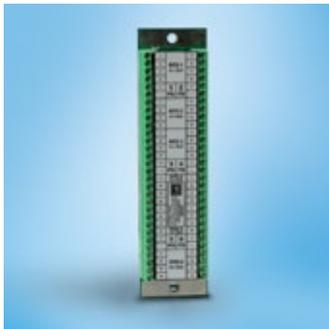
The InsulGard system detects partial discharge activity online, with the entire electrical system energized—no off-line testing necessary. It analyzes radio frequency

(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.



1



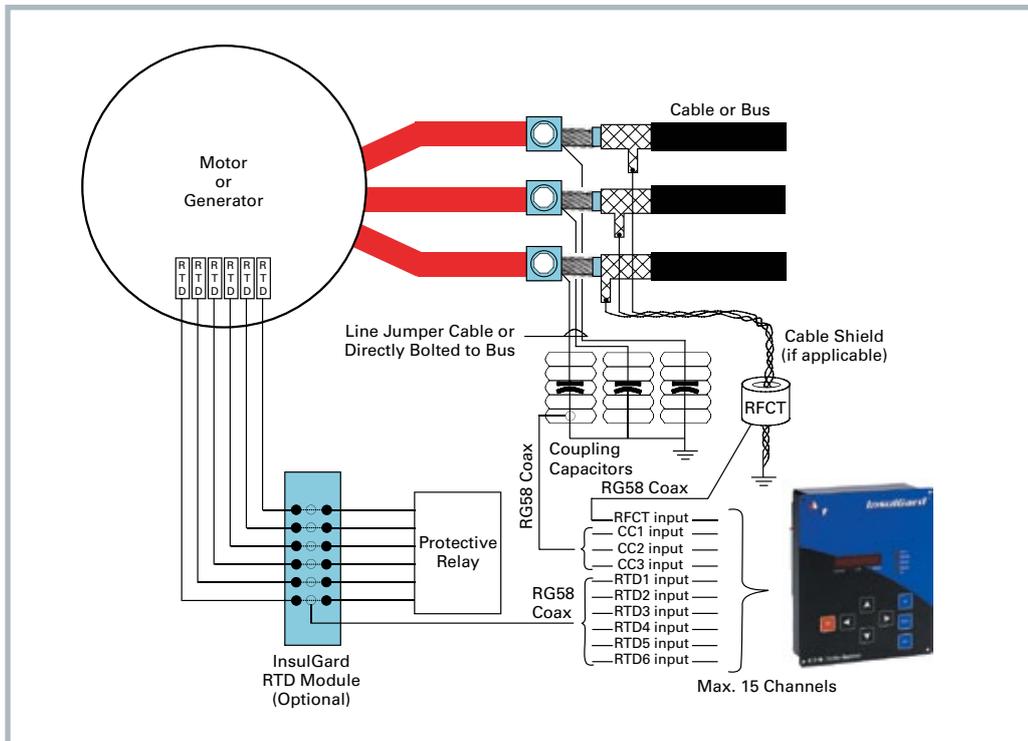
2



3

InsulGard 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 completely miss



Typical Rotating Machine Application

1. Resistive Temperature Device Sensor for Rotating Equipment
2. 95 kV BIL Rated Partial Discharge Sensing Coupling Capacitors Available from 5 to 38 kV
3. Radio Frequency Current Transformer for Partial Discharge Detection



1



2

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.

Customers can take advantage of the RTD circuits, using them as PD antennae, with the InsulGard technology. There is no additional cost to install RTDs, and they connect to the InsulGard predictive relay through the RTD module. The RTD module is fully compatible

with makes and models of protective relays, so no RTDs are sacrificed for their normal purpose. 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.

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.

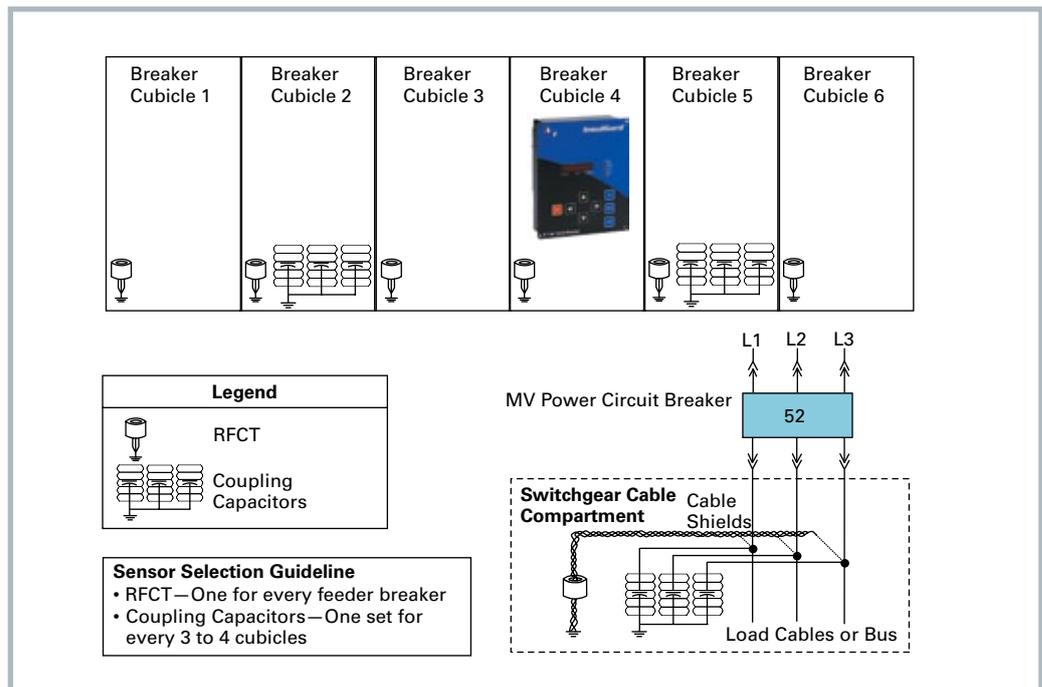
Coupling capacitors detect partial discharges within cubicles and typically connect to the load side of the feeder breakers or on the main bus.

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 duct.

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

1. Corona Damage on the Motor Windings
2. Damage to Bus Caused by Air Gaps Within Bus Support



Typical Switchgear Application

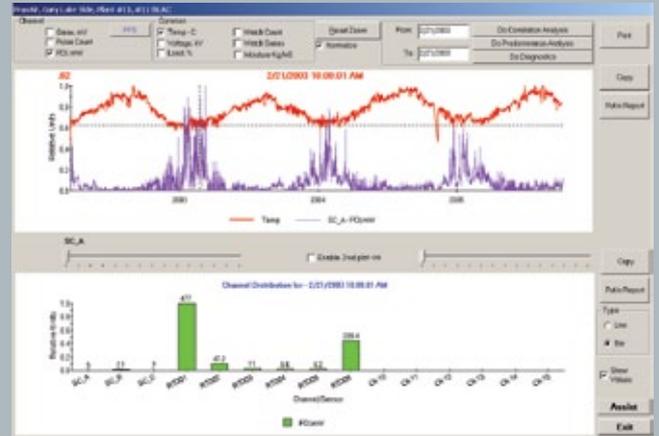


Software and remote monitoring

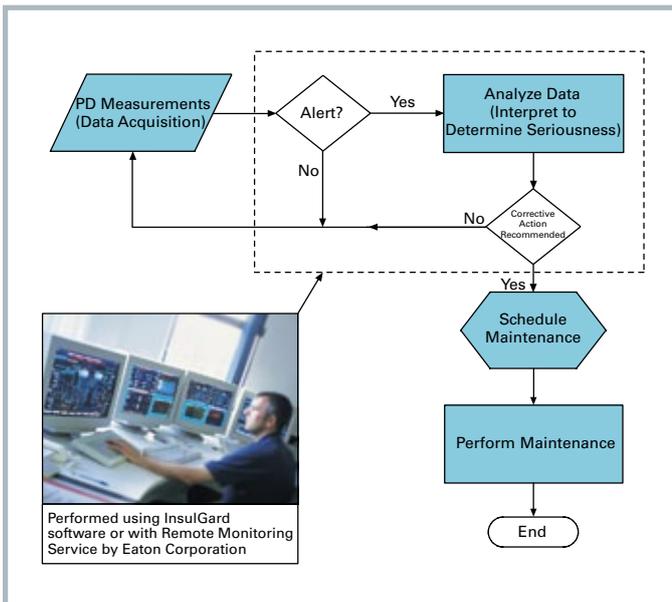
InsulGuard software provides remarkably easy viewing, charting, analyzing and reporting of all PD-related data and trends.

Customers can independently analyze their data; Eaton also offers remote monitoring service contracts.

PD training for customers who want to understand more detail is available through Eaton.

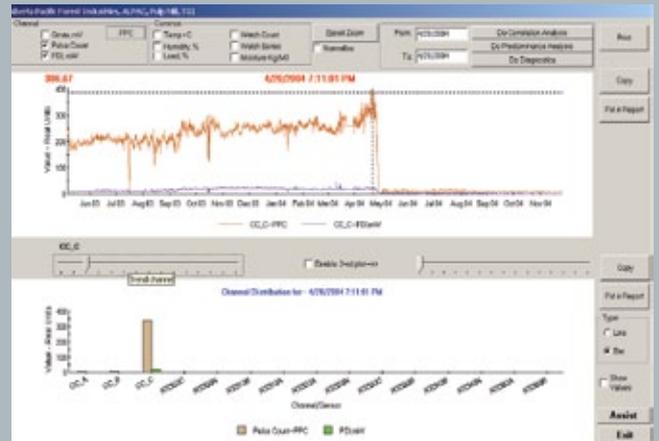


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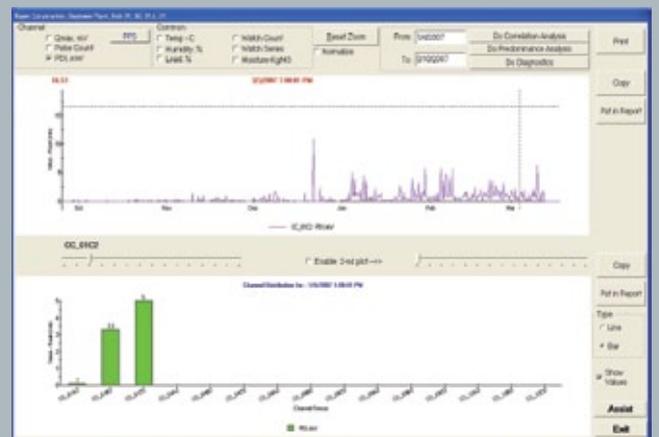


Simplified PD Process

- 1. InsulGuard Software**
Screen shot showing the seasonal affects of PD measurements on a motor application
- 2. InsulGuard Software**
Screen shot showing the PD before and after a generator stator repair
- 3. InsulGuard Software**
Screen shot for identification of early-stage corona damage occurring to bus in 15 kV switchgear. InsulGuard software automatically combines both pulse magnitude and pulse repetition rate to display PD intensity (PDI), expressed in mW of lost energy



2

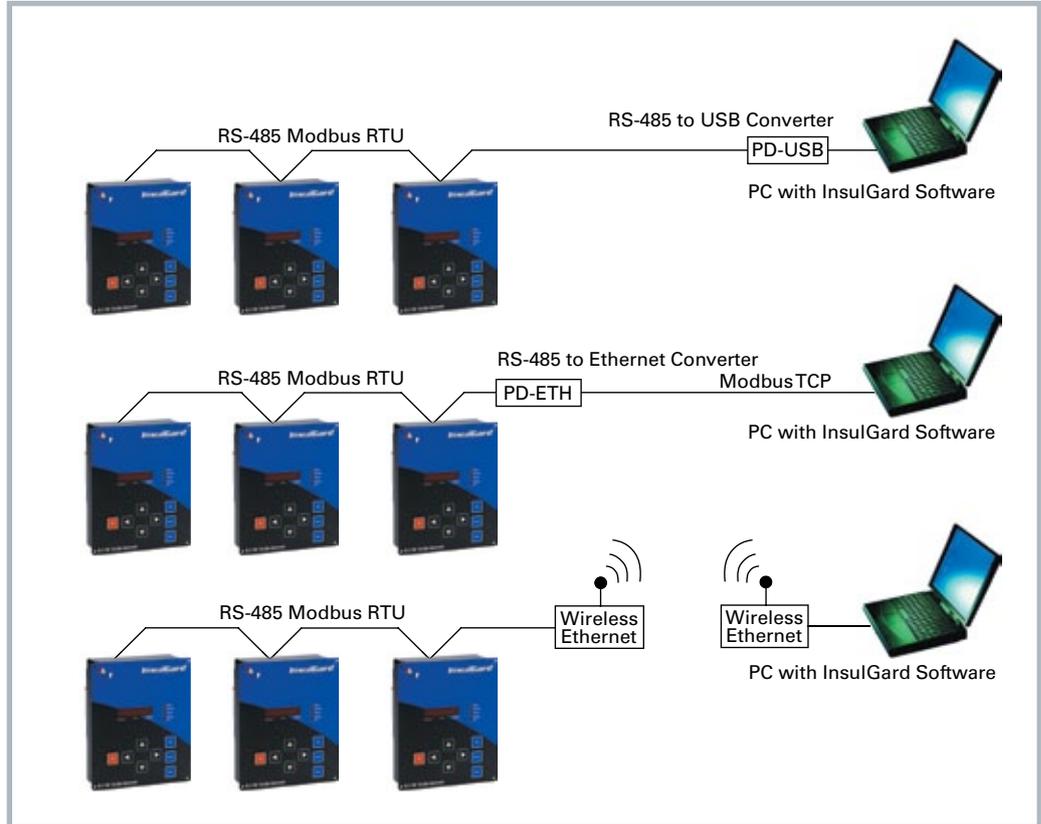


3



Communications and connectivity

InsulGard connects to a local PC using an RS-485 to USB adapter. Standard features include an isolated RS-485 port with Modbus® RTU protocol for local or remote communications. An isolated 4–20 mA output provides a signal proportional to whichever channel contains the largest amount of PD. Event monitoring warnings are provided with standard dry-contact relay outputs. Communication options include industrial modems, Ethernet and 802.11 wireless Ethernet.



Communications via Modbus RTU

For technical specifications and additional information

Please contact your local Eaton representative or visit our Web site at

<http://www.partialdischarge.com/>



Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it's needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customized, integrated solutions to solve our customers' most critical challenges.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, visit www.eaton.eu.



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