

# Iris Power HydroTracII™

Continuous On-Line Partial Discharge Monitoring for Hydro Generators



IRIS POWER ON-LINE PRODUCTS

# IRIS POWER HydroTracII

## IRIS POWER HydroTracII SYSTEM

The Iris Power HydroTracII system consists of permanently installed capacitive couplers, minimum of 2 per phase, a dedicated Iris Power HydroTracII monitor, plus digital communications for configuring the monitor and downloading the stored PD data. The system is an economical means of providing automated, continuous partial discharge (PD) measurement and trending.

Plants that have previous PDA coupler installations can install the Iris Power HydroTracII monitor by connecting the monitor to the existing coupler termination box. This does not require an outage, and the installation effort is limited to providing power to the monitor, connecting the alarm output, and running a communications link to a local control room computer if remote configuration and downloading of data is desired.

New users of the Iris Power HydroTracII monitor technology

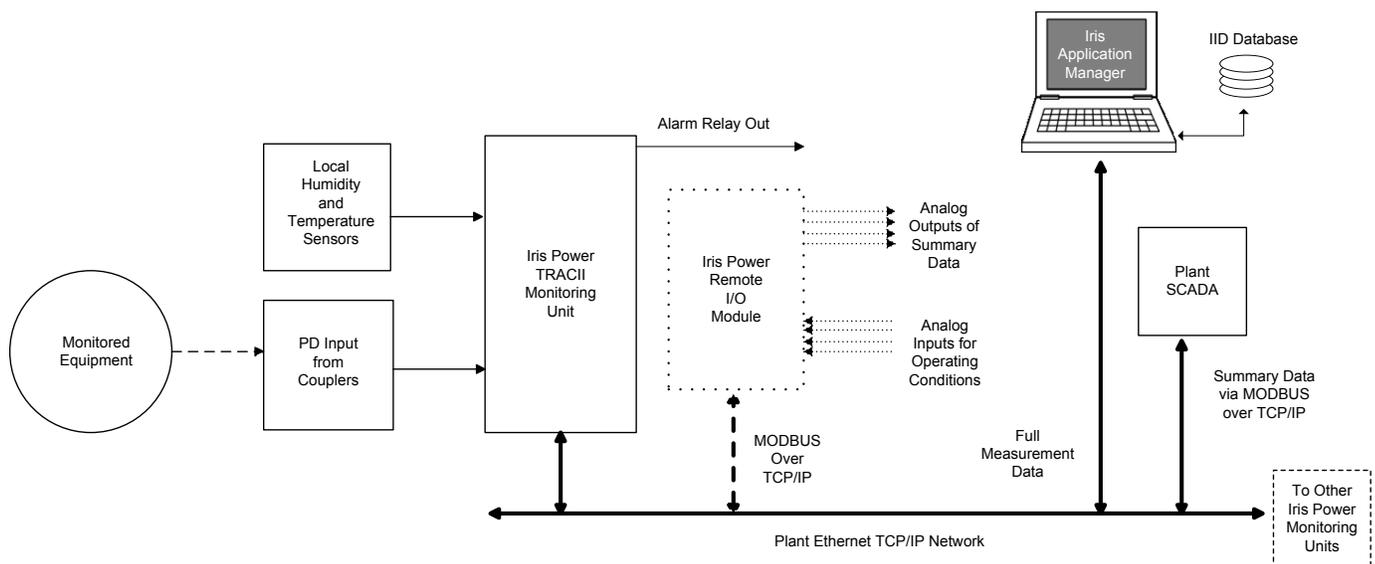
must first permanently install 80pF capacitive couplers on the stator windings during a suitable machine outage.

The Iris Power HydroTracII monitor is supplied with a termination panel that contains a multiplexor allowing the sequential monitoring of up to 6 pairs of couplers. The Iris Power HydroTracII is a second generation continuous on-line monitor that provides maintenance professionals with an opportunity to automate PD testing. The Iris Power HydroTracII monitor also allows for the possibility of integrating important operating conditions needed for trending PD activity, and will trigger a remote alarm, indicating the need for a more detailed analysis.

The Iris Power HydroTracII monitor is the product of Qualitrol-Iris Power's many years of experience developing on-line PD measuring systems for hydro generators, high voltage motors, and turbine

generators. Like its predecessors, the Iris Power HydroTracII monitor includes the unique methods specifically designed to overcome the electrical interference that is typical of most power plant environments. This ensures reliable and repeatable test results with a low risk of false indications.

The test data can be easily interpreted by maintenance professionals after participating in a two-day training seminar, offered by our experienced staff. Since the monitor is fully compatible with all previous generations of the PDA technology, maintenance personnel can use the historical data to make a seamless comparison of similar machines. This assessment is enhanced through the use of the growing Qualitrol-Iris Power database of over 272,000 test results.



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## FEATURES

- Sophisticated monitoring and analysis system prevents false indications by digitally separating partial discharges from electrical noise, on a pulse-by-pulse basis.
- Proven filtering and pattern recognition enhances noise separation, allowing for a reliable and objective detection of stator winding problems such as poor impregnation, overheated windings, coil movement in the slot, ineffective or deteriorating grading/semiconductive material problems, and contamination.
- The system's compatibility with the PDA technology allows users with existing sensor installations to commission the system without an additional outage. Data can be easily confirmed and further analyzed with Iris Power's PDA-IV™ portable monitor.
- Ensures a consistent testing interval, thereby improving the quality of the trends. The alarm features permit maintenance personnel to focus on machines that exhibit unusual or high levels of partial discharge activity. This is attained by increasing testing frequency and using 24-window phase-resolved PD plots that help to identify the prevailing failure mechanism of stator winding insulation. Important operating conditions such as humidity, stator winding temperature, stator voltage, real and reactive power can be recorded and stored with the archived PD data. These parameters are useful for in-depth analysis and trending of the partial discharge activity.
- The Alert testing range ensures minimal intervention by maintenance personnel. In response to a PD alert, users can review the pulse height analysis plots, and the 24-window phase resolved PD plots using basic interpretation to confirm the cause of the alert. Alert levels are preset based on the Iris Power database of over 272,000 test results.
- Alert Output is a dedicated relay fitted within the monitor enclosure that can activate a remote indicator of high PD alert conditions. The alert conditions are configurable through the operating software. The alert output may be connected to a plant monitoring system.
- Qualitrol-Iris Power has extensive experience with continuous on-line PD monitoring. Over 2,000 continuous PD monitors have been installed.
- Networking with an Ethernet port port for remote diagnostics, downloading, configuration with Iris Power software.
- Modbus over Ethernet protocol included for interfacing to third party applications to obtain machine operating state and provide summary PD data.



*Couplers installed on a hydro generator stator*

## BENEFITS OF CONTINUOUS MONITORING

Generators are highly reliable. However, studies indicate that approximately 40% of all generator failures can be attributed to the gradual aging and deterioration of the stator winding insulation. On-line, periodic partial discharge testing has been successfully employed since 1951 in diagnosing accumulated winding related problems in generators. Unlike periodic on-line PD testing, the Iris Power HydroTracII monitor provides maintenance professionals with the opportunity to:

- automate the measurement (on site or remotely)
- integrate the key trending parameters within the plant SCADA
- trigger a remote alarm indicating the need for a more detailed review of the collected data
- maximize collection of PD activity
- maximize warning of pending problems
- create a smoother trend curve
- lower testing cost.

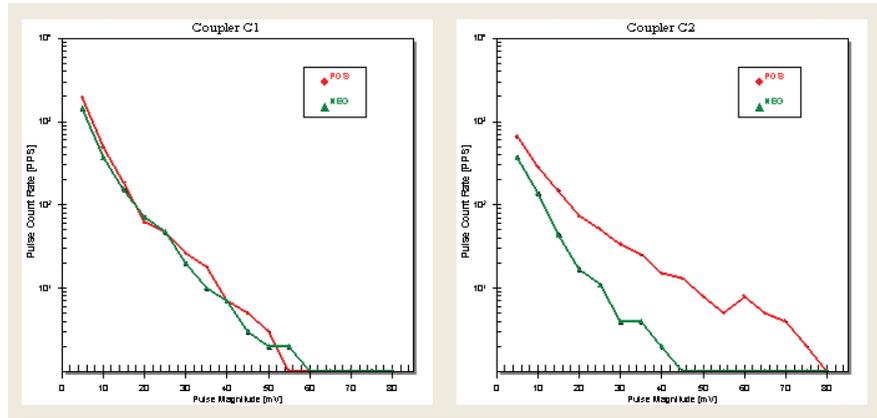
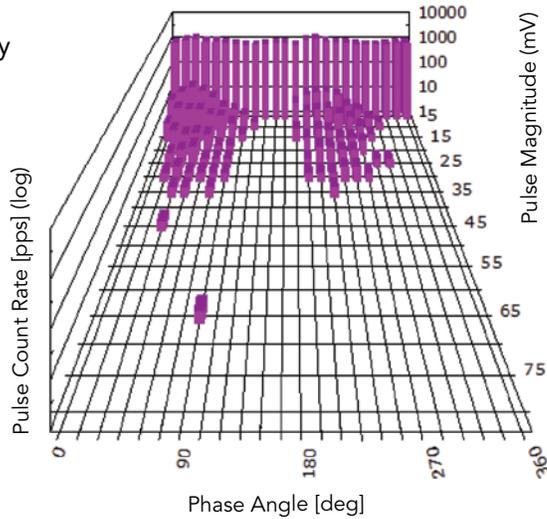
The monitor uses the same sensors that have been permanently installed on over 12,000 motors and generators around the world over the last three decades; and provides the reliability that comes with over 2000 installed continuous PD monitors.

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## OPTIONS - REMOTE I/O OVER ETHERNET CONNECTION

- Remote inputs with up to 8 analog points proportional to operating conditions such as stator winding temperature, voltage, current, or power. These conditions are recorded for trending and analysis.
- Remote outputs with 6 analog outputs proportional to the level of PD activity (+Qm and -Qm) of the machine couplers. This is applicable in situations where the user is interested in having the real-time PD activity from their machine acquired by their DCS or control system.

Phase-resolved PD output



PD Pulse Magnitude Output

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## WHAT IS PARTIAL DISCHARGE?

Partial discharges (PD) are small electrical sparks that occur within the high voltage electrical insulation in stator windings. PD occurs whenever there are small air gaps or voids in or on the surface of the insulation. Normally, well made stator windings that are in good condition display very little PD activity. However, over 60 years' experience has shown that as a stator winding deteriorates from winding vibration, operation at high temperatures, or contamination from oil, moisture and other chemicals, the PD activity will increase by a factor of ten or more. Thus, on-line PD monitoring detects the main root causes of stator winding failure. Since PD monitoring can be performed during normal generator operation, and generally gives two or more years of warning indicating a risk of failure, on-line PD monitoring has become a very powerful tool for predictive maintenance.

Some benefits of PD monitoring of the stator winding are::

- increased availability of machines
- plan maintenance based on actual conditions
- significant reduction of in-service failures.

QUALITROL-IRIS POWER HAS BEEN THE WORLD LEADER IN MOTOR AND GENERATOR WINDING DIAGNOSTICS SINCE 1990, PROVIDING A FULL LINE OF ON-LINE AND OFF-LINE TOOLS, AS WELL AS COMMISSIONING AND CONSULTING SERVICES.



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