

Iris Power PDA-IV



Periodic On-line Partial Discharge Monitoring Instrument for Hydro Generators

DEVELOPMENT OF IRIS POWER PARTIAL DISCHARGE MONITORING

The development of Iris Power partial discharge test instruments in the 1990s was funded by the North American utility industry (CEA and EPRI) to provide machine owners a method of detecting stator insulation problems and obtaining adequate data to make maintenance decisions independent of equipment manufacturers.

The PDA-IV was designed specifically for monitoring partial discharges under normal electrical, mechanical and thermal machine operating stresses without interference from external noise such as power system corona, output bus arcing or other common electrical disturbances. There are now over 70,000 Iris Power partial discharge Epoxy Mica Capacitive Sensors installed across thousands of motors, generators and metal glad switchgear globally that are monitored by Iris Power portable and continuous monitoring instruments.

PARTIAL DISCHARGE IS A LEADING SYMPTOM OF FAILURES ON GENERATOR STATOR WINDINGS

Insulation problems are one of the principal causes of forced outages for generators, motors switchgear and dry type transformers which result in considerable damage and lost revenues. Periodic on-line monitoring of partial discharge provides a cost effective and proven technique to minimize the risk of unexpected failures.

FEATURES

The Iris Power PDA-IV instrument provides the most reliable and accurate portable partial discharge monitoring solution on the market and is designed specifically for Hydro Generators:

- > Advanced noise separation based on pulse shape and time of arrival methods to consistently quantify and isolate partial discharges from system disturbances
- > Test frequency range from 40 MHz to 350MHz while working with 80 pF Epoxy Mica Capacitors (EMCs) and from 2 MHz to 350MHz with 1 - 2 nF capacitors
- > Optional capability for offline partial discharge testing of individual stator bars, coils and windings
- > Ability to operate instrument from 12V battery pack

Data Collection Method

The on-line partial discharge test takes less than 30 minutes per machine with data collected in a simple, safe and non-destructive manner based on sound principles that are recommended by manufacturers and industry standards such as IEEE Std. 1434-2014 and IEC60034-27-2: 2012.

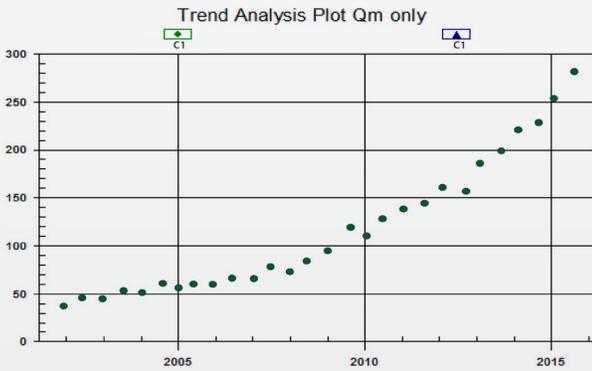
The operator connects low voltage coaxial cable from the Iris Power PDA-IV portable instrument to a coupler termination box. The PDA-IV instrument is then connected to a control computer that runs the PDLitePro and PDView software using a USB or Ethernet cable.

The test is initiated through the PDLitePro software which automatically collects the partial discharge data while the machine is running and without any interference to normal operation of the generator.

WHY TEST?

The PDA-IV instrument has been designed to collect partial discharge data and output the relevant information needed to provide a decisive means of:

- Identifying Partial Discharge Severity
- Identifying Probable Causes of Winding Deterioration
- Comparing Relative Health Across Machines



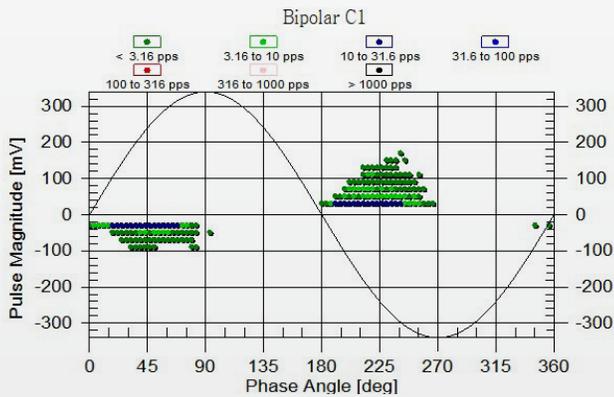
PEAK PARTIAL DISCHARGE MAGNITUDE (Qm) TREND GRAPH SHOWING INCREASING RATE OF PARTIAL DISCHARGE SEVERITY

PEAK PARTIAL DISCHARGE MAGNITUDE

Peak pulse magnitude (Qm) values are automatically calculated by the PDA-IV instrument and output to help understand the relative health of each asset. The Qm value is defined in IEEE 1434 and IEC 60032-27-2 to allow several means of comparison including the following:

Trending of Qm to show any major change in the rate deterioration of the stator winding insulation.

Comparison of generator condition against similar machines using the freely available Iris Partial Discharge Severity Tables which are composed of over 700,000 test results collected across most makes and sizes of machines.

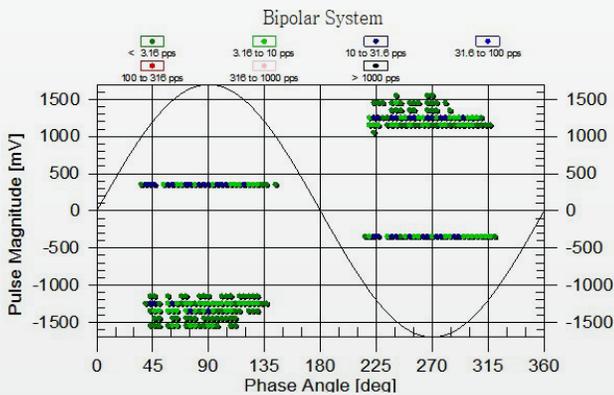


PHASE RESOLVED PARTIAL DISCHARGE PLOT SHOWING PULSE MAGNITUDE (mV) AND FREQUENCY (PULSES PER SECOND) BY PHASE ANGLE IN THE MACHINE

MACHINE PARTIAL DISCHARGE

Electrical disturbances including partial discharges in the transmission lines (corona) or transformer as well as sparking of overhead cranes or onsite welding can create pulses similar to partial discharges. It is important to be able to understand the difference between system noise and machine partial discharges to avoid false positive indications, to prevent unnecessary shutdowns and to avoid in-service failures.

The Iris Power PDA-IV is designed specifically for Hydro Generators and ensures generator partial discharges are viewed and analyzed separately from system noises.



PHASE RESOLVED PARTIAL DISCHARGE PLOT SHOWING PULSE MAGNITUDE (mV) AND FREQUENCY (PULSES PER SECOND) BY PHASE ANGLE FROM THE SYSTEM

SEPARATION OF SYSTEM NOISE

Installation of two couplers per phase allows the PDA-IV instrument to automatically distinguish between power system noise by evaluating pulse shape and the time of arrival of pulses.

Pulses originating outside the generator which arrive to the instrument through each of the sensors at the same time and are automatically separated and classified as disturbances.

Other pulses that are classified as machine partial discharges and are attributed to the sensors are associated region of the generator covered by the sensor that detects the pulse first.

AVOID IN SERVICE FAILURES WITH EARLY DETECTION OF FAILURE MECHANISMS

Partial Discharge monitoring has become an important tool for condition-based maintenance on generators by identifying risks of failure caused by abrasion of insulation, loose stator windings, thermal degradation of insulation and manufacturing defects.

Iris Power on-line partial discharge monitoring instruments have accurately identified problems on many hundreds of generators with hundreds of case studies and dozens of published papers by Iris Power customers that confirm Iris Power partial discharge monitoring instruments can help:

- > Prioritize assets needing immediate maintenance
- > Identify and repair damage at an earlier stage
- > Avoid in-service failures
- > Reduce outage frequency when results are good
- > Obtain information regarding the type and location of maintenance required prior to outages
- > Reduce overall cost of maintenance

SPECIFICATIONS	
Frequency Bandwidth	0.1 MHz - 350 MHz
Phase Windows	100 phase windows per cycle
Pulse Amplitude Range	2 mV - 34,000 mV 10 Sensitivity Range Settings
Data Acquisition Time	1s or 5s per magnitude window
Ambient Sensors	Built in Ambient Temperature Sensor and Ambient Humidity Sensor
Sensor Compatibility	80 pF EMC (6.9kV to 35 kV) 12 Sensor Inputs
Operating Temperature	-15° C to 45° C (5° F to 113° F)
Relative Humidity	Up to 95% non-condensing
Carrying Case Dimensions	41 x 31 x 21 cm (16" x 12" x 8")
Carrying Case Weight	10 kg (22 lbs)
Vibration Test	IEC 60068-2-6
Shock Test	IEC 60068-2-27
Transit Vibration	MIL-STD 810G, Method 514
Electrical	CE, UL

SOFTWARE & MANUAL

- PDLITEPRO
- PDVIEW Standard Edition
- User & Installation Manuals

OPTIONS

- PDVIEW Advanced Edition
- Controlling Computer (Details Available on Request)
- Sensor Compatibility
 - Stator Slot Coupler (TGA-SP)
 - BUS Couplers (TGA-BP)
- VFD Motor Operation
 - 20 Hz - 100 Hz
 - Reference Circuit
 - Capacitive Divider (TGA-BP)
- Low Frequency Test
 - Offline Testing
 - 80pF EMC
 - 25kV or 28 kV
 - 50 kHz- 5 MHz

Iris Power PDA IV is a trademark of Qualitrol-Iris Power.

GET IN TOUCH

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