



**KINECTRICS**

# HV Rotating Machines

Field and Lab Testing/Consulting Services



Kinectrics services for HV rotating machines (generators and motors) identify insulation system conditions at an early stage, that can extend asset life, and improve system reliability.

### Qualification Testing

Qualification testing of stator bars / coils on hydro and turbo generators; to assist clients in obtaining quality products, and to assess aging.

### Thermal Cycling - IEEE 1310

Winding insulation failures are often attributed to partial discharge activity occurring in main ground wall insulation in voids or cavities located near the copper conductors. Often, the presence of these voids is the result of load cycling, which causes shearing of the bond between insulation layers.

For almost 20 years, Kinectrics has used Thermal Cycling as an accelerated aging test to assess the impact of thermo mechanical stresses on stator winding insulation systems.

### Coil and Bar Dissection

Stator bars and coils are often dissected after a pre-qualification Voltage Endurance and Thermal Cycling test to enable additional assessment of insulation system performance.

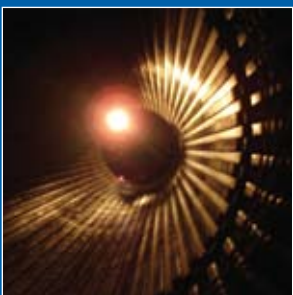
Dissection of samples may reveal manufacturing-related issues on new coils / bars that need to be addressed. For windings subjected to an in-service failure, dissection can provide useful insight into the root cause. Kinectrics can perform both peel dissections and microscopic examination of winding cross-sections.

### Voltage Endurance Tests - IEEE 1043 & 1553

For decades, Voltage Endurance Testing has been a powerful tool for identifying manufacturing and design issues. Our experts, working in Kinectrics' specialized laboratory facilities, assess the quality and life expectancy of clients' stator bars and coils using accelerated electrical aging tests.

### Impulse & Surge Testing to IEEE 522 & API 541

Kinectrics can test up to 100 kV with a rise time of 1.1/50 $\mu$ s for groundwall insulation and 0.1 - 0.2 $\mu$ s to assess the turn capability, and determine if it is adequate to meet the machine design and operating requirements.



## LAB & FIELD DIAGNOSTIC TESTING & CONDITION ASSESSMENT

**Kinectrics provides a complete array of over voltage off-line diagnostic tests to assess the condition of stator winding insulation. Tests include:**

### Insulation Resistance/Polarization Index (IEEE 43)

Kinectrics uses this test as a prerequisite to ensure safe HV diagnostic testing of equipment. This test also aids interpretation of results.

### Capacitance and Power Factor Tip Up (IEEE 286)

Kinectrics uses state-of-the-art Omicron bridge equipment, combined with traditional measuring techniques such as the multi amp bridge.

This technique is used to assess the capacitance tip up and dissipation factor tests of insulation systems and monitor how this changes with aging.

### DC Ramp Test (IEEE 95)

The DC Ramp Test is a viable alternative to Hi-Pot testing and gives a measure of the leakage current-to-ground of the insulation system. When plotted with voltage, this characteristic aids interpretation of end winding leakage effects and aging.

### Partial Discharge Testing

Kinectrics performs both on-line and off-line PD tests on HV stator windings. Off-line tests include the inception / extinction voltage of discharge activity to international standards, including IEEE 1434. Our experts can provide in-depth analysis of the acquired and supplied data to provide an informed assessment of how aging mechanisms impact individual stator windings.

### TVA (Corona) Probe Tests (IEEE 1434)

The Kinectrics team is one of the few that offer this comprehensive test to aid in establishing the location of partial discharge activity within the ground wall section (slot section) of a complete stator winding or, on individual stator bars.

### Generator Stator Core - EL CID

This proactive off-line test for stator cores of turbogenerators and large motors is used to identify potentially shorted laminations present in stator cores. The presence of such incipient defects may place the machine at risk of premature failure.

### Generator Rotor Testing

Kinectrics offers on-line and off-line test options to appraise the condition of rotor windings. The Rotor Flux Test for turbo-generators provides the means to establish, locate and monitor the presence of current carrying inter-turn faults, normally only detected by open testing and / or visual inspection.

## CONSULTING SERVICES

### Field or Visual Inspections

It is generally recognized that a well-balanced maintenance program for generators requires both testing and visual inspection. Information from inspections allows evaluation of a generator to determine if there are any demonstrated failure modes or known problems. Certain types of failure modes can only be detected through visual inspection of the generator.

### Technical Specifications Review

A good technical specification ensures the integrity and operational longevity of your new, updated, or refurbished machine.

### Independent Reviews

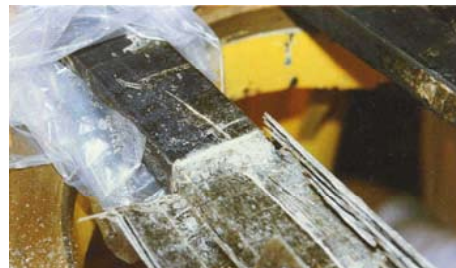
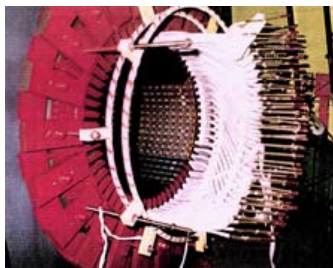
Kinectrics interprets plant data, and on-line / off-line condition assessment information from the client or 3rd parties, and combines them with reviews of operational and maintenance records to determine machine condition.

### Independent Factory Inspections and Quality Conformance

Kinectrics offers independent 3rd party technical, audit and consulting to help ensure bars, coils, motors, and both hydro and turbo generators are manufactured and assembled to the highest quality standards.

### Forensic Analysis

Machine failure can be attributed to a number of different causes. Kinectrics specialists can help you identify the cause of machine or component failure.





[www.kinectrics.com](http://www.kinectrics.com)

**Head Office**

800 Kipling Ave., Unit 2  
Toronto, ON M8Z 5G5  
Canada  
416-207-6000

**Canada**

393 University Ave. 4th Floor  
Toronto, ON M5G 1E6

**USA**

2135 City Gate Lane, Suite 100  
Naperville, IL 60563

**United Kingdom**

17-18 Frederick Sanger Road  
Surrey Research Park  
Guildford, Surrey GU2 7YD

**Germany**

Hertha-Lindner-Strasse 10-12  
01067 Dresden

**Denmark**

c/o 360 Law Firm  
Gl.Kongevej 60  
DK- 1850  
Frederiksberg C

**Romania**

59 Grigore Alexandrescu Street.,  
2nd Floor Bucharest 010623

**India**

Sy No.125,  
Banda Mailaram Village,  
Mulugu Mandal, Siddipet District  
Telangana – 502 336

