Application – High Voltage Motor & Generator Coil Testing

Application Overview

AC Withstand testing is one of the more important tests to a motor or generator coil. Only this test, using AC high voltage, can truly verify the integrity of the coils as they are stressed similarly to operating conditions. This test applies an over voltage to the coil from 1.5 Uo – 2.5 Uo, depending on the test standard used, for 60 seconds. It is a simple pass/fail test, where the coil either holds the voltage or fails/arcs should there be a defect. It is a "destructive" test to defects that cannot hold the test voltage but has no harmful effects on the insulation where it is not defective, as only significantly degraded insulation locations will be driven into partial discharge until failure.

Diagnostic testing can also be performed, namely **Tan Delta/Power Factor** and **Partial Discharge** testing. These instruments are connected to the output of the AC hipot to record the test data, while overvoltage testing. A good use of these tests is for **stator bars**, either tested individually, several at a time, or the entire coil at once, depending on how powerful an available AC hipot is. (DC voltage is sometimes used for withstand testing but is less effective on coils than AC, as the DC voltage does not evenly stress all turns and the leakage current readings can be overly interpretive and not an accurate measure of insulation quality.)

When AC voltage testing, the current draw from highly capacitive loads can be very high. The mAac current, or the kVA, required from the test set must be figured. To find out, refer to past similar tests, or test at lower voltages and linearly scale up the mA's, or calculate the capacitance. If the capacitance is known, calculate the amps needed.

Amps = $2\pi fCV$ f = frequency in Hz C = load capacitance in farads V = test voltage in volts

HVI Product Solutions

HVI AC Dielectric Test Sets: The models shown are designed to test motors & generators (and many other types of apparatus) with voltages rated from 2.4 kVac – 25 kVac. Their load capacities are based on capacitive values commonly encountered. Many more models are available in many sizes and control configurations. Various TD and PD accessories are available.

PFT Series
Standard AC Hipots

10 - 100 kVac
1 kVA - 3 kVA

***HPA Series*: Up to 40 kVA - Enhanced Controls - Custom Made - Low PD Output**

Test Coils Rated 15 kV
Corona <5 pc

Bench top controller pictured
0 – 50 kVac @ 150 mA, 7.5 kVA

Traction Motor AC Testing

0-3 kVac, 1 A
0-5 kVac, 1 A

Test Coils Rated 5 kV

0–10 kVac, 1 A
Auto Controls

FPA Series
Stator Hater

Test Stator Coils
rated to 6 kVac

0 – 6.0 kVac @ 1.0 A
0 – 12 kVac @ 0.5 A

HPA Series
Test Coils rated 25 kVac

0 – 30 kVac @ 0.67 A, 20 kVA
0 – 60 kVac @ 0.33 A, 20 kVA
Corona free

Very Low Frequency AC Hipot & Tan Delta
AC Withstand & Tan Delta/Power Factor Testing

VLF Series

Test up to 15 kV coils with VLF

0 - 34 kVac VLF
0.1 Hz @ 1.0 uF
& 0 - 34 kVdc

VLF AC Hipots output 0.1 Hz instead of 50/60 Hz. At 0.1 Hz. it requires 600x less current to test a motor or gen. The use of VLF for high voltage testing rotating machinery is defined by **IEEE433-2012.**

***PTS Series*: DC Voltage Testing**

Hipot/Megohmmeter
37.5 kVdc – 600 kVdc

Product line for DC High Voltage testing

PTS Series: 37.5 - 600 kVdc up to 10 mAdc

Four product line choices available for AC High Voltage testing

PFT Series: 10 – 100 kVac up to 3 kVA **HPA Series:** 5 – 600 kVac up to 45 kVA
FPA Series: 3 – 100 kVac up to 20 kVA **VLF Series:** 30 – 200 kVac @ 0.1 – 0.01 Hz