Application – Iso Phase Bus and Switchgear Testing

Application Description

Testing **Iso Phase Bus (IPB)** or the bus work within **Switchgear (SG)** cabinets, often several in series, is normally an **AC Withstand** test, where the test voltage is applied from bus to ground and held for 60 seconds. The insulators holding the bus off of ground are either good or defective. If the test voltage holds for 60 seconds with no arcing, the bus duct and its insulators are deemed to be good. DC voltage testing is sometimes performed but is not the technically proper way to test bus insulators and not preferred by their vendors. DC fails to stress the bus (like motor and transformer coils) similarly to in-service AC voltage conditions, tends to over read surface resistance of dirty or moist insulators, and is influenced by always changing environmental conditions. Also, there are no accepted standards for DC leakage current measurements indicating the health of bus insulators. Generally, DC leakage current readings when testing IPB and SG are not meaningful and can indicate false failures and/or false passes.

IEEE and other standards exist that define the test voltages required and the maintenance manuals from product vendors list the test voltages based on the nameplate voltage rating of the gear. AC field tests after installation and into the future are usually performed at 75% of the factory test voltage. For standard ratings of IPB and SG, the typical voltages are:

Iso Phase Bus Withstand Test Voltages - 75% of factory for 60

Voltage Rating kVac rms	**Field Test Volt.** kVac rms
15.5	37.5
25.8	45.0
38.0	60.0

Selecting an AC Dielectric Tester

The test voltage required should be known. What is often not known is how much AC current will be needed, which is a factor of the capacitance of the load. The charging current must be either calculated from the known pico-farads of the load or check the current draw at a lower voltage and scale it up to the test voltage or get a copy of the vendor's test report indicating the capacitance. Do you need 1 kVA or 10 kVA? **To calculate the current, use the following:** $\mathbf{Amps = 2\pi fCV}$

f = freq. (Hz) C = load capacitance (farads) V = test voltage (volts)

Switchgear Withstand Test Voltages

Table from NETA Acceptance Testing Manual

Type of Switchgear	Rated Maximum Voltage (kV) (rms)	Maximum Test Voltage kV	
		AC	DC
Low-Voltage Power Circuit Breaker Switchgear	.254/.508/.635	1.6	2.3
Metal-Clad Switchgear	4.76	14	20
	8.25	27	37
	15.0	27	37
	27.0	45	†
	38.0	60	†
Station-Type Cubicle Switchgear	15.5	37	†
	38.0	60	†
	72.5	120	†
Metal Enclosed Interrupter Switchgear	4.76	14	20
	8.25	19	27
	15.0	27	37
	15.5	37	52
	25.8	45	†
	38.0	60	†

t - Consult manufacturer. DC voltage testing is not recommended.

HVI Product Solutions

HVI produces many AC hipots from **3 kVac – 300 kVac** with power ratings from **1 kVA to 40 kVA**. Many of these are portable for field use and many are designed for lab or factory use. Some are low in PD, designed to be used for **Tan Delta/Power Factor and Partial Discharge** testing. Numerous control features are available from simple manual controls to full computer interface or front panel mounted PLC controllers. HVI also produces a full line of DC hipot/Megohmmeter combination units.

50 kVac 3 kVA

80 kVdc 10 mA

60 kVac 7 kVA

100 kVac 10 kVA

VLF 65 kVac

Parallel Resonant
250 kVac 250 kVA

60/120 kVac 7 kVA

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