

VACUUM BOTTLE TESTING



HIGH VOLTAGE DIELECTRIC TESTING - USE AC VOLTAGE

High voltage testing of vacuum bottles should be performed using AC voltage. DC voltage testing is not recommended by most bottle manufacturers and forbidden by some. Like on most high voltage electrical apparatus in a substation, AC testing should be performed to verify if the object can withstand the AC stress when in service. Depending on the item tested, usually the test voltage is 2 - 4 times over the utilization voltage and for perhaps a minute. The test object either holds the voltage or fails. There is nothing in-between. DC leakage currents are meaningless. In a bottle, there is no acceptable partial vacuum. It is either there or not. An AC stress test will determine that immediately.

Another reason: The DC output voltage from various hipots is not predictable. Depending on the rectifier circuit, the peak DC voltage may be significantly higher than the average voltage read on the voltmeter and the ripple output is not known. This possibly excessive over voltage can result in the creation of x-rays and falsely failed bottles. Some manufacturers also worry about the DC voltage degrading the bellows and other parts within the bottle. Also, switchgear manufacturers worry that DC voltage degrades the insulators used between the bus and ground. Use AC.

The following paragraph is taken from the maintenance book of a large vacuum bottle maker. Others also recommend

HIGH POTENTIAL TESTING

Loss of vacuum results in complete breakdown across an open vacuum contact at voltages below 30kV RMS. Only AC high potential testing is meaningful. DC testing cannot be used. Apply 30kV RMS across each individual contact for 15 seconds with the switch open. To avoid possible generation of X-rays, do not apply more than 30kV RMS.

There are vendors that offer DC output vacuum bottle testers that offer a go/no-go test with good or bad indicator lights. Not only are these DC devices, but they are single application devices not useful for any other testing. The hipots of HVI have fully variable outputs and can be used for testing many substation items. Get the most for your money spent. There are also vendors that offer AC hipots marketed for bottle testing. Most offer only 10mA or 20mA of current. This may be sufficient to test a bottle but not much else. HVI hipots offer far higher current and power ratings, enabling them to test most equipment in a substation. Don't get caught short with a hipot unable to test bushings, reclosures, hot sticks, etc.

For 15 kV switchgear, testing is performed at either 27kVac or 37kVac depending on the type of gear: metal clad or station type. 38kV gear is usually tested at 60kVac. Consult your manufacturer's maintenance manual. Below are the two models from HVI commonly used for testing bottles and other apparatus. HVI AC test equipment is available up to 300kV.



Model PFT-301CM
0 – 30 kVac @ 1 kVA
45lbs/20kg



Shielded HV output cable Guard/Ground circuit
Rugged anti-static meters Portable - Durable - Affordable



Model PFT-503CM
0 – 50 kVac @ 3 kVA
75lbs/34kg

Most substation apparatus should be tested with AC voltage. There is no better way to verify the AC integrity of your equipment. The item either holds the AC voltage or doesn't.

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