

The scope

A dielectric withstand test or "high potential" or "hipot" test is an electrical test performed on a component or product to determine the effectiveness of its insulation. The test may be between mutually insulated sections of a part or energised parts and electrical ground.

The test is a means to qualify a device's ability to operate safely during rated electrical conditions. If the current through a device under test is less than a specified limit at the required test potential and time duration, the device meets the dielectric withstand requirement.

The Direct Current Hi-Potential test is phasing out although is currently widely available and widely used test method. However, this method is slowly becoming less popular.

The DC Hi-Pot is considered a withstand test. An elevated voltage is applied to the cable for a prescribed duration. If the cable "withstands" the voltage as evidenced by a stable leakage current, then the cable passes the test.

This test is categorized as a Pass/Fail Test.

Does repeating the Hipot test damage your cable?

Rerunning a failed hipot test over and over is not considered a good industry practice. This is the case of a bad cable possibly being made worse each time a hipot arc occurs.

It may be necessary to rerun a hipot test to diagnose an error. While it is extremely unlikely that a repeated low current arc of the tester could do permanent damage, the reason for the hipot failure should be investigated.

When a component part is faulty, application of the test voltage will result in either disruptive discharge or deterioration due to excessive leakage currents, that may change electrical parameters or physical characteristics.

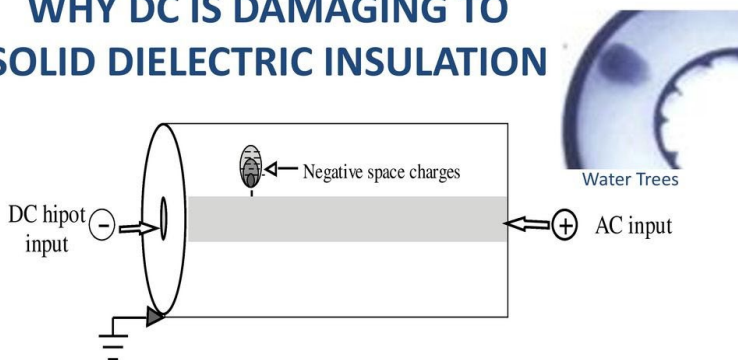
Advantages

- The test equipment is relatively lightweight and portable.
- The test procedure is simple to administer. The outcome is either "cable fail" or "cable pass" so very little interpretation is required.
- The power supply requirements are low.
- This test is widely available through multiple test companies.
- There is an extensive history of successfully testing laminated dielectric cable.
- The test is useful in acceptance testing of cables.

Disadvantages

- It is a pass/fail test. It does not give any diagnostic information about the cable. A cable with voids or other developing defects could pass a high pot.
- Failure could occur weeks or months later.
- **A DC Hipot may create space charges that polarize water trees and lead to failure long after the test.**
- These space charges are the reason many extruded cables failed during the 1980s and -90s after DC Hi-Pot testing.
- IEEE warns about using DC Hi-Pot testing for aged underground, extruded cable.
- IEEE 400.1, the current IEEE standard on DC testing covers testing of laminated cable only. Previous versions endorsed DC testing extruded and laminated cable.
- The cable must be taken out of service to test it.

WHY DC IS DAMAGING TO SOLID DIELECTRIC INSULATION



The 4 – 5 U_0 negative output of a DC hipot test polarizes water tree areas.

Unlike oil insulated cable, in solid dielectric insulation like XLPE, these "trapped space charges" remain in place after the test.

When AC is reapplied, a high difference of potential exists across the remaining insulation. Leads to electrical trees, PD, & cable failure

