

Dielectric Absorption Test

The Dielectric Absorption (or Time-Resistance) test is an extension of the [insulation resistance test](#) where instead of a spot test, the testing device is applied to the insulation for up to 10 minutes. The idea is that the insulation resistance should increase over time as the atoms in the insulation are polarised by the IR tester's applied DC voltage (i.e. they line up with the applied electric field).

When the testing device is applied to an insulation system, there are generally three types of current flow:

- **Leakage current** is the resistive current that flows through the insulation and is what is being measured by the IR tester. Obviously, a lower leakage current implies an insulation system in better condition. The leakage current should stay more or less constant over the test period.
- **Capacitive charging current** is the current that flows upon application of the DC voltage to charge the capacitance between insulation system under test and earth. This will draw a high current in the first instance before dropping off quickly to zero as the capacitor is charged (i.e. within 1s)
- **Dielectric absorption current** is the polarising current that is drawn by the insulation system (dielectric) to align the dipoles within the dielectric with the applied electric field. This current draws a high current initially but then gradually drops off as the dipoles in the dipole become increasingly polarised (i.e. in the order of 5 to 10 minutes).

There are two commonly used tests:

Dielectric Absorption Ratio (DAR)

In this test, the testing device is applied and IR measurements are taken after 30 seconds and 60 seconds. The dielectric absorption ratio (DAR) is calculated as:

$$DAR = \frac{R_{60}}{R_{30}}$$

where R_{30} and R_{60} are the IR test measurements at 30 and 60 seconds respectively (Ω)

A general guide to interpreting the DAR test results are as follows:

DAR	Insulation Condition
<1.25	Questionable

≤ 1.6	Adequate
>1.6	Good

Polarisation Index (PI)

In this test, the testing device is applied and IR measurements are taken at 1 minute and 10 minutes. The polarisation index (PI) is calculated as:

$$PI = \frac{R_{600}}{R_{60}}$$

where R_{60} and R_{600} are the IR test measurements at 1 and 10 minutes respectively (Ω)

A general guide to interpreting the PI test results are as follows:

PI	Insulation Condition
<1	Dangerous
<2	Questionable
<4	Good
>4	Excellent

References

- 1. IEC 60364-6, "Low voltage electrical installations - Part 6: Verification", 2006
- 2. ANSI/NETA ATS, "Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems", 2009
- 3. NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance", 2010

- 4. Megger, "[A stitch in time - The Complete Guide to Electrical Insulation Testing](#)", a free book which is an excellent resource on IR testing
- 5. IEEE Std 43-2000, "Recommended Practice for Testing Insulation Resistance of Rotating Machines"

Source:

http://www.openelectrical.org/wiki/index.php?title=Dielectric_Absorption_Test