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Data Journal

Material Properties

ELTEK's Material Properties Lab has the capability to perform over 300 tests on a wide variety of Electrical Insulation Materials

Some examples of ASTM methods:

ASTM D-2303
ASTM D-3638-CTI
ASTM D-2132
ASTM D-150
ASTM D-495
ASTM D-570
ASTM D-257
ASTM D-3874

Some examples of UL test methods:

UL 746-A
UL 746-C
UL 94

Some examples of IEC test methods:

IEC 60695-2-13
IEC 60587
IEC 60112
IEC 60695-2-10

What Does the Material Properties Lab Do?

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ELTEK Labs has a broad capability to assist companies in the challenge of problem solving in the often elusive science of electrical insulation. Each problem is approached in a scientific and engineering manner. After materials are chosen and a project is developed, the project proceeds to meet our customer's requirements. Tests are performed under laboratory conditions or simulated field conditions as the case may require, using prescribed industry accepted test methods. Test procedures are documented and test results are reported in a formal test report. All equipment used is listed with model numbers, ranges, calibration dates, etc.

Sampling of Test Methods

ELTEK's Material Properties Lab has the capability to perform over 300 tests on a wide variety of Electrical Insulation Materials (EIM). Testing at the material level is a necessity and can be customized to fit the end product applications. Tests are conducted to International Standards, such as IEC and ISO, and/or domestic standards such as ASTM, NEMA, and UL. ELTEK Labs conducts tests on all types of materials used throughout the electrical industry. Examples of the types of materials are: magnet wire [winding wire], cable, injection molding resins, papers, films, impregnating resins [varnishes], sleeving, tape, oils, gasket materials, and many more.
Listed below are some examples of the tests that are performed in the Material Properties lab.

ASTM D-2303 & IEC 60587 – Liquid Contaminant Inclined Plane Tracking and Erosion of Insulating Materials
The inclined plane test is a severe test to evaluate the tracking performance of insulation materials. A track is defined as an electrically conductive carbon path along the surface of insulating materials or a partially conducting path of localized deterioration on the surface of an insulating material. Tracking is initiated by surface discharges in regions of high electric field strength that is promoted by dampness and pollutants on the insulation surface. There are two methods used to evaluate a material's resistance to tracking and erosion, Time to Track and Initial Tracking Voltage.

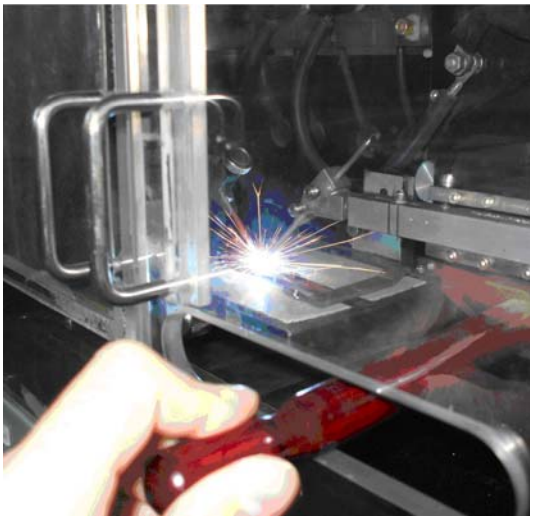
CTI Machine

UL 94 – Flammability of Plastic Materials for Parts in Devices and Appliances
94HF-1 or 94HF-2 Horizontal Burning Foamed Material Tests
This test is conducted on foamed plastics used in devices and appliances. This includes acoustical foams, sealing foams, and filter media. A set of 5 specimens, each measuring 150mm x 50mm, is prepared and subjected to a 38mm flame in accordance with the prescribed test procedures. After the flame is removed from the specimen, afterflame and afterglow times are measured. If flaming particles or drops fall from the specimen to a piece of surgical cotton placed below it, it is noted whether or not the cotton ignites. Also, the length of damaged material for each specimen is measured. The material is classified into categories based upon these characteristics.

Sampling of Test Methods

ASTM D-2132 - Dust Fog Tracking and Erosion Test
This test is intended to show the characteristics of solid electrical insulating materials with respect to their resistance by using the application of electric arcs and exposing the material to a specified contaminant containing moisture over a specified period of time.
Electrical insulation in service may fail as a result of tracking, erosion, or a combination of both if it is exposed to high relative humidity and contaminated environments. Outdoor applications may have to perform in a variety of weather and climate related conditions. This test has the ability to simulate those conditions in a controlled laboratory setting.

ASTM D-495 & UL 746-A - High Voltage-Low Current-Dry Arc Resistance
This test measures the resistance of test samples to surface tracking by a high voltage arc intermittently established between two electrodes contacting the material surface. The frequency and the current intensity of the arc are increased every 60 seconds until the arc is uninterrupted or failure occurs. The value reported is the average number of seconds required.


UL 746 A High Voltage Arc Tracking

ASTM D-3638 & IEC 60112 & UL 746-A - (CTI) Comparative Tracking Index and Comparative Tracking Performance Level Categories of Electrical Insulation Materials
This test method is used for determining the comparative tracking index of electrical insulating materials – which is the voltage as determined under the conditions specified in the standard tests method(s) for comparative tracking index ASTM D-3638 and IEC 60112 that causes a permanent electrically conductive carbon path within the application of 50 drops of electrolyte solution that is applied at a rate of one drop every 30 seconds to the surface of the specimen between the electrodes. This method is used to assess the relative resistance of insulating materials to tracking.

ASTM D-257 & UL 746-A – DC Resistance or Conductance of Insulating Materials
Testing Resistivity or Conductivity is used to indirectly predict the low-frequency dielectric breakdown and dissipation factors of insulating materials.
Volume Resistivity – can be used in obtaining necessary preproduction characteristics of insulating materials for use in various applications.
Surface Resistivity - Surface Resistivity could be defined as the material's inherent surface resistance to current flow multiplied by that ratio of specimen surface dimensions (width of electrodes divided by the distance between electrodes). It is a measure of the material's surface inherent resistance to current flow.

UL 94 – Flammability of Plastic Materials for Parts in Devices and Appliances

94VTM-0, 94VTM-1, 94VTM-2 Thin Material Burning Test
Like the 20 mm flame test, the Thin Material Burning Test is conducted on solid plastics. The specimen is prepared in a different manner; by wrapping it around a mandrel. The same 20mm flame is used as the Vertical Burning Test, and specimens are treated and the procedures are followed in a similar manner. The times for the same criteria are recorded, and the material is classified into categories based upon these characteristics.

(HB) Horizontal Burn Testing
A specimen is supported in a horizontal position and is tilted at 45°. A flame is applied to the end of the specimen for 30 seconds or until the flame reaches the 1-inch mark. If the specimen continues to burn after the removal of the flame, the time for the specimen to burn between the 1 and 4-inch marks are recorded. If the specimen stops burning before the flame spreads to the 4-inch mark, the time of combustion and damaged length between the two marks are recorded. If flaming particles or drops fall from the specimen, it is noted whether or not the gauze ignites. The material is classified into categories based upon these characteristics.

Vertical Testing (5V, 5V-A, 5V-B)
Testing is done on both bar and plaque specimens.
Procedure for bars: A bar specimen is supported in a vertical position and a flame is applied to one of the lower corners of the specimen at a 20° angle. The flame is applied for 5 seconds and is removed for 5 seconds. The flame application and removal is repeated five times. After the fifth application, the afterflame and afterglow times are observed and recorded as well as if any particles dripped from the specimen that ignited the cotton indicator.
Procedure for plaques: The procedure for plaques is the same as for bars except that the plaque specimen is mounted horizontally and a flame is applied to the center of the lower surface of the plaque. After all flaming or glowing has ceased, note whether the flame burned through the plaque material. For this test "Burn Through" is defined by any visible flame observed during the test on the surface opposite of the flame application or an opening larger than 3mm after the sample has cooled for 3 seconds.