ELTEK International Laboratories
Data Journal

Tests run in the EIS Lab

IEEE 99
IEEE 117
IEEE 259
IEEE 275/429
IEC 61857
IEC 61857
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IEC 61858
UL 1446

A Commitment to the Industry

Shaping test methods used around the world through involvement in the following Technical Panels and Working Groups:

IEC
TC -112 Working Group 6
IEEE
275/429

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How do you know that you need EIS-Systems Testing?

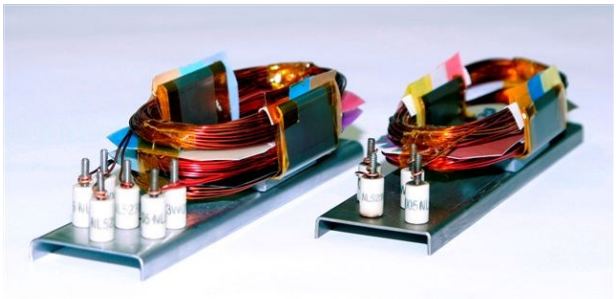
There are six key points to consider in determining whether Electrical Insulation Systems testing is the appropriate method of evaluation:

#1: EIS (Electrical Insulation Systems) testing rates a group of materials as a single set. The specimens are tested as a single entity. When a specimen passes a specific test cycle, the cause of the retained electrical insulation is due to the total insulation capability of the group. It is impossible to assign a level of retained insulation to any one or any portion of the group. Because of this simple fact, the group of materials is evaluated as a system.

The system is a unique set of materials and the results of the testing relate only to the specific group under test.

#2: No individual material (EIM) is rated by EIS testing. Since each EIS is tested as a group and since no individual material can be assigned a proportion of the total insulation resistance, individual materials are not rated through EIS testing.

Even when the test is turn-to-turn for an unvarnished specimen, the evaluation is testing the interaction between the conductor and the insulation and the retained insulation of the coating on the conductor. If the coating on the conductor loses adhesion due to oxidations, the specimen will reflect some level of reduced life.



The standard Sealed Tube Vessel loaded with twisted pairs of copper wire and electrical insulation materials

Because of this aspect in the testing, the selection of the categories of EIMs to include in the test specimen is extremely important (see Point #1 above) The entire purpose of EIS programs are to evaluate the life of a group of materials. If a test specimen is constructed with coated conductor(s), ground insulation materials, and an insulation varnish, the varnish cannot be removed from the package because the test data is related to the full set of materials and there is no information about the possible performance of the set with any material excluded.

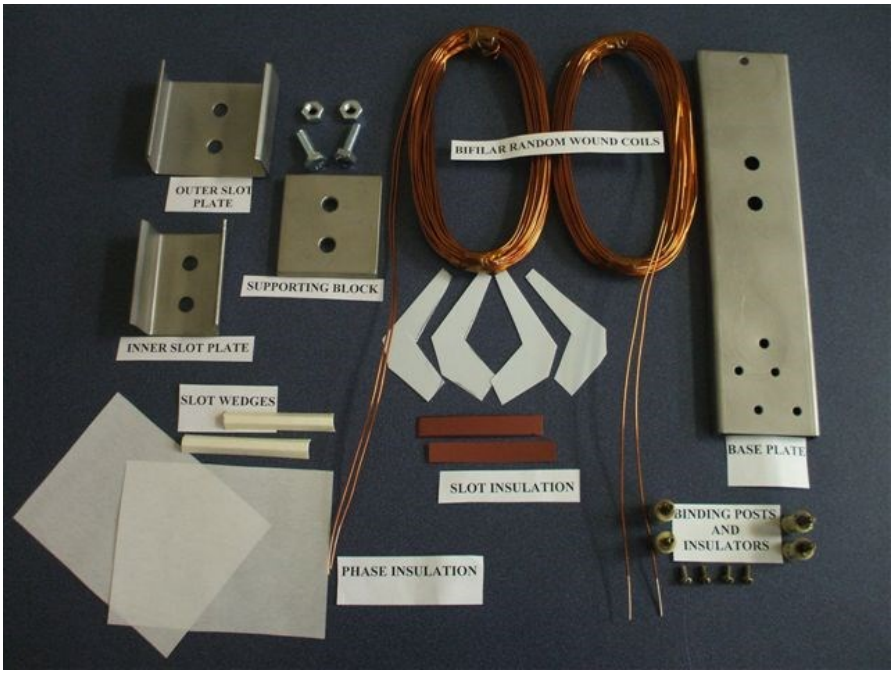
#3 The performance of an EIS is not directly related to the ratings of the EIMs selected to be in the EIS. Since EIM ratings are based on different criteria than are EIS ratings, the rating of an EIM cannot be directly used to project the performance of the EIS. If a system is varnished, the varnish may retard the oxygen migration to another material in the group. This may result in extended life of the material, which may have had a lower rating when evaluated as a single material.

Likewise, one material may produce a 'by-product' due to decomposition which is harmful to the other materials in the set. This by-product could reduce the life of the group.

Material testing cannot indicate the possible effects of interactions of the materials. Only EIS or CCT testing can evaluate that feature.

#4 Only electrical properties are evaluated in EIS testing. - The mechanical properties of a final unit may still need to be evaluated. The evaluation of the physical properties is related to design and application. EIS testing is not intended to evaluate design properties. This testing is conducted with final unit testing.

EIS testing is not intended to replace end unit evaluation. Yet, EIS testing is intended to help manufacturers in several other ways. First, it helps in selecting a system of materials that have the thermal capabilities to perform; second, it helps eliminate the need of building a functional unit prior to testing; and third, it helps reduce cost by eliminating systems that have a compatibility problem.



When an end unit is used as the test specimen, the electrical and design properties do come directly under test. However, the physical stresses of an operating unit may be simulated by the conditions of EIS testing. If the intent of a test program is to simulate the full stresses of a final unit – both electrical and physical – the test program must be modified to properly represent the actual environment.

#5 EIS testing can evaluate interactions between EIMs.- The two types of test program, EIM and EIS, are designed to evaluate different situations. EIM testing is designed to preset conditions to allow for comparisons between materials of the same type. With EIS testing, the user has important insight into the expected life of the electrical side of the device.

#6 EIS testing addresses one very simple and direct question.- The #1 question is: WHAT IS THE MAXIMUM THERMAL CLASS APPLICATION RATING FOR THIS SYSTEM (group of EIMs)?

As explained above, since only electrical properties are evaluated, the EIS testing can only provide the rating of the electrical performance of the group.

What is the value of EIS testing if the results are limited?

The value is that the data has the technical information of select materials to move directly to the more important part of the design work – designing a product for sale. The reduced time to reach the design stage of manufacturing is the benefit of EIS testing.

As stated above, EIS testing evaluates the performance of a group, or set, of materials as a single entity. No individual material is rated as a result of the EIS testing of the group. The rating of the EIS is not a direct reflection of the rating of any individual EIMs. These statements can be illustrated by taking a look into one of the earliest EIS programs developed by a supplier to the E/E industry.

Long term thermal aging is not considered to be a significant cause of unit failure at operating temperatures at or below the 105 class. This means that the technical data is of significant value for units operating at or above the 130 class. Using the internationally accepted classifications, this offers six classes for which this type of testing is needed: 130 degrees, 155 degrees, 180 degrees, 200 degrees, 220 degrees, and 240 degrees.

View future editions of the Data Journal to learn more about EIS testing. Also, visit ELTEKlabs.com and register for ELTEK University for an in-depth look at this and other topics.

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