



ELTEK International Laboratories

EIU Course 107, Class 1: Calibration – What does it mean at ELTEK Labs?

Section 1 – General

1.1 Laboratory Calibration

Every laboratory is concerned about calibration. Calibration covers several aspects from calibration methods, calibration validation, calibration procedures and calibration records. Another part of calibration is the selection and use of Reference Standards and Reference Materials.

1.2 ELTEK Labs uses ISO 17025 as our guide for the following terms:

- Reference Standard: Equipment used for the purpose of calibrating test equipment
- Reference Material: Materials which can be used to check the calibration and/or set up of test equipment.

1.3 Reference Standards are used for conducting internal calibration of test equipment. Reference Materials are used to confirm that the equipment plus the set-up of the total apparatus are measuring correctly.

Section 2 – Calibration for Electrical Insulation System (EIS) Testing

2.1 Calibration of Equipment Used for EIS Testing

All test equipment used in the evaluation (testing) of an EIS is conducted in accordance with standard calibration procedures and practices following ISO 17025. All equipment calibration is traceable to NIST.

2.2 Calibration of the EIS Lab

Because of the critical nature of the data and information resulting from an EIS evaluation, ELTEK Labs expands the concept of Reference Materials and integrates this expansion into the total calibration process. The expansion is to build, thermally age, condition, and test an established field-proven EIS on a regular basis. This calibration process requires the building of a complete set of EIS test specimens, aging them at three or more elevated temperatures, and following the full test procedure through to completion.

2.3 In addition; a total of four (4) EIS are tested as part of this process. The four calibration EIS are:

1. Calibration EIS #1 = IEEE 117: Low Voltage EIS for use up to 600 VAC, random wound, using 18 AWG (18 American Wire Gauge {AWG} = 1 mm diameter winding/magnet wire)
2. Calibration EIS #2 = IEEE 117: Low Voltage EIS for use up to 600 VAC, random wound, using 24 AWG (0.4 mm diameter winding/magnet wire)
3. Calibration EIS #3 = IEEE 1776: Medium Voltage EIS for use up to 13,000 VAC, form wound
4. Calibration EIS #4 = Encapsulated EIS; Low voltage for use up to 600 VAC

2.4 By testing these four calibration EIS, the calibration process incorporates all aspects of the EIS test program. The aspects are:

- The aging temperatures cover a wide range of our aging ovens; bringing the actual operation of the ovens and controllers into the calibration process. This evaluates the operation of the aging ovens for functions such as air movement rated, air exchange rates, temperature stability, temperature uniformity, and oven controllers.
- The test specimen performance is influenced while being conditioned; test specimens are exposed to some combination of vibration, exposure to cold, exposure to humidity only or resulting in visibly condensation. The equipment used to apply each of these conditions is incorporated into our calibration process by conducting this full program.
- The human factor is also part of the test process which is another aspect needing to be considered in the calibration process. The handling of the specimens can cause physical damage if the specimens are improperly handled during removal from ovens, when securing to the vibration table, inserting and removing from the humidity chamber, making the electrical connections, placing into the drying oven, and returning to the aging ovens.
- The application of the electrical stresses for the evaluation of the EIS incorporates the function of the test equipment used testing and is part of this calibration process.
- The calibration of the EIS Lab links to our Electrical Insulating Materials (EIM) Laboratories; bringing the EIM evaluation and all of the related lab equipment into the total calibration process. (Refer to the Spectrum of Testing and other EIU 100 level classes.)

Section 3 – Calibration Time and Intervals

3.1 The calibration process of the EIS Lab requires approximately two (2) years from the start of the construction of the test specimens to the completion of the long term thermal aging. The calibration interval is five (5) years. The calibration is valid for a five-year period. The new calibration process begins near the end of the third year of the five-year cycle in order for the new calibration to be completed by the end of the previous calibration period.

Section 4 – Use of the Calibration EIS

4.1 The EIS used for this calibration process is available for our customers to use in their EIS programs as the “Control” or “Reference” or “Known” EIS.

4.2 By utilizing our calibration EIS in customer’s projects, we have the reference data (reference line and correlation time) available at the beginning of the customer’s project. This allows us to make evaluations of the progress of the candidate EIS throughout the thermal aging process.

Also, by our customers utilizing our calibration EIS as part of their candidate EIS project, our customers do not need to pay for the construction and aging of a control/reference EIS – thus saving our customers time and money.

Section 5 – Preferred Calibration EIS by Application

5.1 ELTEK Labs offers two IEEE 117 calibration EIS with the only difference being the size of the winding/magnet wire.

- Calibration EIS #1 is intended for use with all candidate EIS projects for the general market.
- Calibration EIS #2 is intended for use with all candidate EIS projects for the electronic market, or any segment of the market in which the conductor size will be small compared to that of Calibration EIS #1 applications.

5.2 Additional calibration EIS for other types of projects

- Calibration EIS #3 is intended for form-wound designs. This covers candidate EIS evaluated to IEEE 275, IEEE 429 or the new (merged) test procedure IEEE 1776.
- Calibration EIS #4 is intended for all encapsulated EIS projects. Encapsulated is also described as Cast Resin, or Encased. The word “encapsulated” refers to a product which will not be inside of a housing or permanent exterior enclosure. If the design will have a housing, the resin used to fill the space between the housing and the wire is properly described as a Potting Compound. Potting Compound designs are not the same as encapsulated because the housing provides the physical support for the finished product.

Section 6 – Calibration for Electrical Insulation Materials (EIM) Lab for Long Term Thermal Aging (LTTA) Testing

6.1 Calibration of Equipment Used for EIM Testing

All test equipment used in the evaluation (testing) of an EIM is conducted in accordance with standard calibration procedures and practices following ISO 17025. All equipment calibration is traceable to NIST.

6.2 Calibration of the EIM Lab for Long Term Thermal Aging

The explanation of the expanded calibration presented above for our EIS Lab is also followed for our EIM lab. Also included is a reputation of the Long Term Thermal Aging (LTTA) of a film, a polypropylene material and other polymeric materials.

6.3 Calibration Time and Intervals

Because the same concept of lab calibration has not been accepted for LTTA of EIM, the calibration time and intervals are not fixed as are the calibration EIS used and described above. Some of the EIM are under continual repeat LTTA and others are less frequent.

6.4 Use of the Calibration EIM

ELTEK Labs tries to coordinate our internal evaluations to match with customer projects. When possible, the material used for our lab calibration process can be offered as the “control” or “reference” material for our customer’s LTTA project.

6.5 Preferred Calibration EIS by Application

As presented in 3.4, the industry has not accepted the same approach to EIM LTTA projects. Because of this, ELTEK Labs cannot offer the same total benefit to our customers.

Section 7 – Summary

7.1 ELTEK Labs

- Expands the level of calibration beyond the basic requirements of any Quality Control or Quality Assurance program.
- Conducts full LTTA of established EIS and EIM on an ongoing basis
- The ELTEK Labs approach to full calibration is focused on inclusion of all aspects of the lab; from calibration of the equipment, to Reference Standards and Reference Materials as well as the influence of our lab personnel and all related test equipment.

7.2 ELTEK Labs Management believes that no other lab offers a stronger commitment to total calibration.