INSULATION SYSTEMS

Short-Term Insulation System Evaluation

Accelerate time to market with UL's 50-day test method.

Overview:

Safety and performance reliability are essential attributes of electrical insulation systems (EIS) used in electric motors. The UL 1004-x Series "Rotating Electrical Machines" require that electrical insulation systems go through a long-term thermal aging program covered under UL 1446 "Systems of Insulating Materials" Standard help ensure that insulating materials perform as intended at elevated temperatures. Although an accelerated aging program, this insulation system evaluation takes over 9 months to demonstrate that the insulation system is appropriate.

As speed to market and the adaptation of new insulating materials often determine success for a manufacturer, UL has developed an alternate insulation system evaluation method that helps motor manufacturers get to market in less than two months.

The ANSI/UL/IEC 60335-1 Annex C test method covers an accelerated aging test on motors and offers agility to manufacturers. This IEC-based method allows manufacturers to quickly and easily test new or alternate insulation systems in less than 2 months through a 1000 hour elevated temperature aging program.

Test Method:

The aging test is conducted on six motors and consists of four cycles. Each cycle is performed by locking the rotors and passing a current to increase the winding temperature 55°C above the desired class rating. After 250 hours of exposure at this elevated temperature, the samples are conditioned in a 93% RH chamber for 48 hrs. Compliance is determined after the fourth cycle by an electric strength test (test voltage reduced to 50%) and a leakage current test (not to exceed 0.5mA). A lower aging temperature can be chosen by the manufacture for testing; however, the elevated conditioning time is increased. Because the test is performed on the actual motors, expensive and time consuming general purpose model (aka motorette) sample preparation is not required.

Certification:

Systems that comply with IEC 60335-1 Annex C will be issued an Insulation System Certification Report that outlines the insulating materials used in the evaluation. The insulation system can be used for other motors within that series provided the insulating materials are similar.

The insulation certification is considered the same as evaluated origianlly. After three years, the insulation systems will need to be re-examined help ensure continued compliance with UL's requirements and the certification will be re-issued for another three years per IEC practices. Re-examination typically involves an abbreviated aging program to help ensure the insulating materials and manufacturing processes are still acceptable.

Primary program benefits:

- **Reduced time-to-market due to an accelerated (two month) evaluation**
- **Less expensive than the traditional UL 1446 program**
- **Reduced sample preparation costs and time due to actual motor testing**

Getting Started:

For additional questions or to get started with a short-term insulation test, please contact your local Customer Service Professional at www.ul.com/contactus or refer to the contacts below:

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Frequently Asked Questions:

Where can I learn more about the test program?

The complete test program is detailed in ANSI/UL/IEC 60335-1 Annex C "Ageing test on motors".

What motors are covered by this short-term test program?

Random-wound electric motors rated at 1,000 volts or less.

What is the UL submission process?

The submittal process is easy and can be completed in 3 simple steps.

1. Submit an order to UL for short-term motor evaluation.
2. Provide UL with manufacturing process details, all applicable insulating materials, and six motors.
3. After successful completion of the test, UL will issue an Insulation System Report Certification.

What if a motor does not comply during the test program?

The UL/IEC 60335-1 Annex C test method allows for failure of one of the six motors during the evaluation, although a fifth aging cycle is typically required.

How is the test temperature determined?

The test temperature is determined by the desired or required class rating needed for the motor, plus 55°C for the shortest evaluation.

Can I test at a lower elevated temperature?

A lower aging temperature can be chosen by the manufacture (a maximum 30°C drop). For each 10°C drop in temperature, the elevated temperature aging time is doubled.

Where is the motor temperature measured during the test?

The temperature is measured at the rotor and stator winding. Both windings need to be at or above the temperature increase defined by the test method.

Can this test method be used for generators?

The test method can be applied to random-wound electric generators rated at 1,000 volts or less.

What is documented in the Certification Report?

The magnet wire (generic type), varnish, insulating materials (e.g. slot liners), tie cords, spaces and any other materials that contract the magnet wire are listed in the UL report.

Can multiple major materials be evaluated within a single motor?

A maximum of two different ground insulation materials can be included in a test motor.

How do I add alternate materials?

Any material(s) can be added by successful completion of a subsequent series of six motors tested to this IEC method.

Materials identified as minor component (see UL 1446, table 4.2) may be added by either conducting a subsequent series of six motors using different materials or via a sealed tube component compatibility test as outlined in UL 1446. Motors evaluated with an impregnating resin or varnish are not eligible for the component compatibility test.

What if I encounter a non-compliance during the IEC-based program?

If your product doesn't meet the IEC test method requirements, you will receive a letter from UL describing the specific requirements your product did not meet. You can submit the materials for evaluation under the traditional UL 1446 program or modify the product and re-submit to the IEC test method requirements.

What are the advantages of using the traditional UL 1446 long term thermal aging program?

Motor manufactures may choose to use the traditional long term aging program as it provides a way to evaluate multiple ground materials (up to 18) and multiple magnet wire types in one test. The traditional program is not application specific and can be used across many different UL standards that require UL 1446 (transformers, ballasts, solenoids, etc.). Thus, the traditional UL 1446 aging program provides more flexibility to the customer and broader end-use applications.