

AGN 236 – UL - Underwriters Laboratories

INTRODUCTION

UL (Underwriters Laboratories Inc.) is an independent organization that certifies tests, inspects and audits for product compliance. UL is concerned with the safety aspects of products.

Manufacturers submit products to UL for testing and safety certification on a voluntary basis. There are no laws specifying that a UL Mark must be used. However, in the United States there are many municipalities that have laws, codes or regulations that require a product to be tested by a nationally recognized testing laboratory before it can be sold in their area.

Basic UL standards.

UL1446 – System of Insulation Materials. This UL standard concentrates on the evaluation of electrical insulation systems.

UL1004 – Parts 1 & 4 – Rotating Electrical Machines General Requirements. This UL standard applies to electrical rotating machines/Generators.

UL2200 – Stationary Engine Generator Assemblies. This UL standard is specifically for Generating Sets.

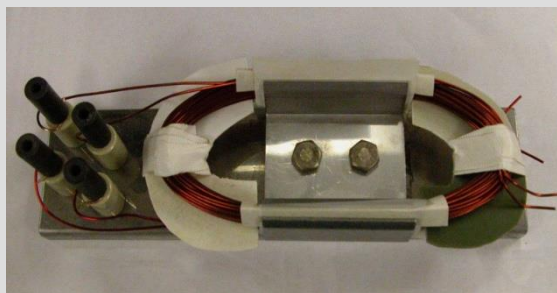
UL1446 SYSTEM OF INSULATION MATERIALS - OVERVIEW

This covers all insulation materials in the wound components (Main Stator, Main Rotor, Exciter Stator, Exciter Rotor and PMG Stator) that confine within the overhangs. These materials are divided into two categories:

Major insulation.

Major Insulation includes materials that are relied upon to prevent a risk of electric shock or fire. These materials are used between the magnet wire and ground or between different phases of the windings.

Materials under this category are evaluated through a long term thermal aging Motorette testing. Test specimens are subjected to a series of environmental conditions (temperature, cold shock, vibration, humidity and electrical test) to simulate an accelerated life cycle and the tests are repeated till the specimens fail. Though the duration of this test is typically one year but the total project time to complete the test is about 18 months.



Minor insulation.

Minor Insulation includes materials that are typically used for mechanical properties and are not relied upon for insulation.

A sealed tube test is conducted after completion of a long term Motorette to add minor insulating material to determine if the gaseous degradation by-products of these materials are detrimental to the performance of major components. Materials are sealed in glass tubes and aged for two weeks. Following the test, dielectric strength testing is conducted on the magnet wire to determine if the materials have caused any additional degradation. The total time to complete a sealed tube test takes several months due to time taken for collecting samples from all plants.



UL1004 PARTS 1 AND 4 ROTATING ELECTRICAL MACHINES GENERAL REQUIREMENTS – OVERVIEW

In conjunction with UL1446 that sets the standards and tests for the electrical machines, UL1004 outlines the capability and performance the machine must reach to work safely and without any degradation of any insulation materials and components within the machine.

This Standard applies to rotating electrical machines and linear motors, both AC and DC, rated 1,000 volts or less.

For generators to be UL 1004 recognized, the insulation system is required to be UL1446 compliant. A product investigation by UL typically involves testing of product samples.

Through a UL witness test data program, performance tests are conducted at the manufactures test facility under the supervision of UL personnel. A product technical file is established to include all the product construction features in accordance with UL1004 requirements.

Components like AVR's, RFI modules, PFC units, fuses, transformers, anti-condensation heaters, RTDs/thermistors, CT's (metering, protection, droop) and plastic components must be **UL Approved or Recognized** to be **UL1004** compliant and are also evaluated separately.

UL2200 STATIONARY ENGINE GENERATOR ASSEMBLIES - OVERVIEW

UL2200 is a standard that outlines the capability and performance of the generating set. These typically include assessment of electrical, mechanical and fire hazards as well as functional performance of generating sets including validation of technical ratings.

The alternator is considered to be a component part of the generating set. As long as the alternator is compliant with the requirements of UL1446 and UL1004, the alternator is considered suitable for installation to a Generating set to comply with UL2200.

SPECIFICATIONS FOR STAMFORD UL ALTERNATORS

On UL compliant alternators, labels are fitted at the manufacturing plants before shipment.

UL Identification.

Each component will carry a **UL** identification number and will be listed in the UL website in the links below.

<https://iq.ulprospector.com/en/profile?e=60970>

<https://iq.ulprospector.com/en/profile?e=99865>

An UL initial production inspection is conducted at the manufacturing location, following succession completion of product investigation. UL then provides an authorization to apply the UL mark on products.

UL carries out follow-up services (typically quarterly audits in each manufacturing plant) over the lifetime of UL certification of the products. If the auditor records any non-compliance during this audit, UL will issue a variation notice, which must be addressed.

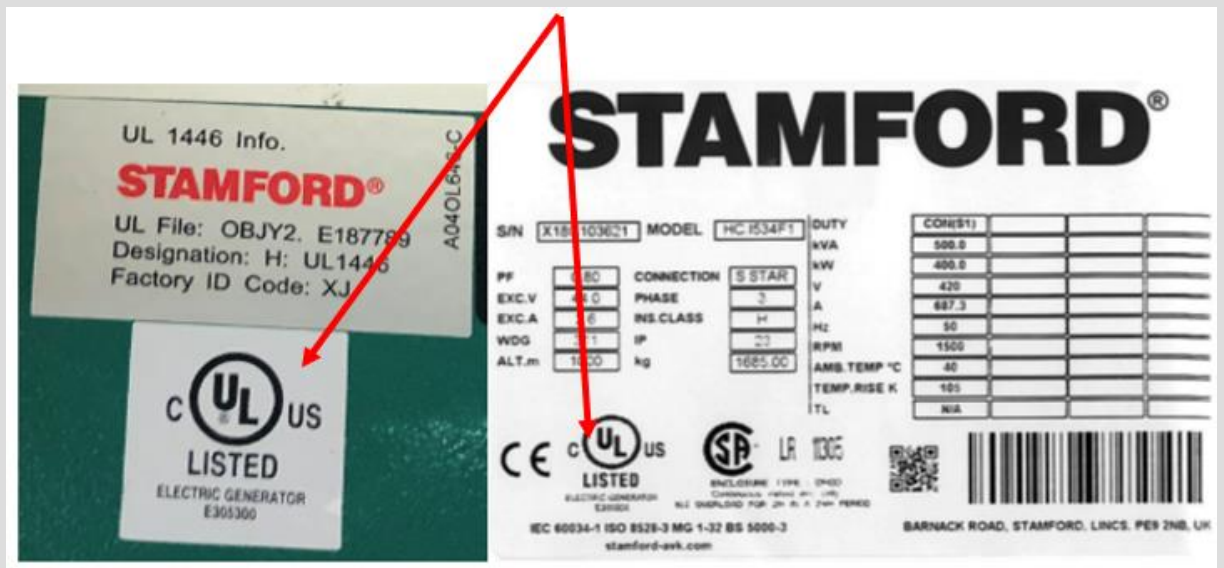
UL 1446

A manufacturing plant specific label is fitted on the alternator, next to the Nameplate, to indicate compliance with UL1446 System of Insulation Materials:



UL1004

A label common to all manufacturing plants is fitted to indicate that all relevant components in the alternator, comply with UL1004 requirements:



UL 1004 – AVR Protection.

One UL1004 requirement was the introduction of in-line fuses for enhanced AVR protection. This requirement is written into the material specification engineering document and UL1004

File E305300. The wiring harness will have in-line fuses to protect the AVR in the event of a problem.

The fuse holders are of UL recognized design, to UL Category Code IZLT2 and are positioned within 305mm of the AVR power source.

For MX range AVR's, the in-line fuses are fitted in the PMG supply harness.

For SX and AS AVR's, the in-line fuses are fitted in the power source harness.

For the AS540, used in S0/S1 alternators, the in-line fuses are fitted in the Auxiliary harness when used with an Auxiliary power supply.

Accessories – UL Compliance.

There are a number of accessories available for installation on STAMFORD and AvK alternators. Measures have been taken to ensure all accessory components are UL **Approved** and UL **Recognised** parts, when fitted to an alternator that is UL1004 compliant. If one component on the alternator is not a UL **Approved** or **Recognised** part, the alternator cannot be classed under **UL1004**.

The dimensions and fit of UL **Approved** and UL **Recognised** accessory component parts may differ to those that are fitted to a standard non-UL alternator.