

IEC 60335-1: Advanced standard for domestic appliances

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1 Introduction

The advanced standard IEC 60335-1 for domestic appliances covers electrical, mechanical, and thermal hazards, as well as fire and radiation hazards from electrical appliances for domestic and similar use. It takes into account hazards that may arise even if the appliance is used properly and in accordance with the operating instructions. The standard is a product-family standard that covers the safety of appliances and takes priority over any generic standards that may apply to the same item.

An appliance that contains materials or components that do not satisfy the requirements of IEC 60335-1 may still be used if equivalent tests have been performed on this appliance that comply with the safety principles of the domestic appliance standard.

IEC 60335-1 covers the safety of devices with a rating of no more than 250 V for single-phase appliances and 480 V for other appliances and which are used in the household or for similar purposes. Appliances that are not intended for normal domestic use and that fall under the scope of this standard include devices that could pose a hazard to the general public, for instance appliances that are used in

shops, businesses and agriculture. These include appliances used in the food-service industry, cleaning appliances for industrial or commercial use, or appliances for hairdressers.

To be in accordance with the standard, plastics that are used in domestic appliances must pass a fire-resistance test. The precise values that need to be achieved depend on the electrical current and whether the appliance is to be operated with or without supervision. The fire-resistance of the insulating material is tested using the glow wire test in accordance with IEC 60695. The various glow wire tests are described briefly below.

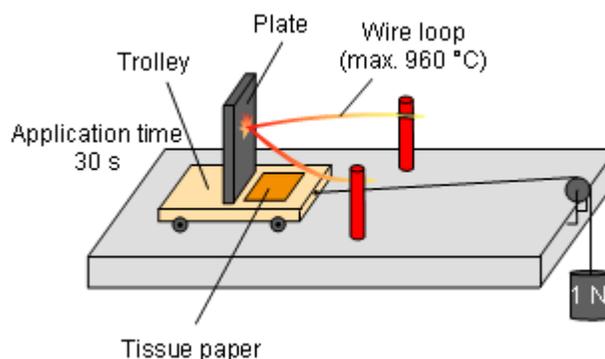


Figure 1 Glow wire test assembly

2 Glow wire tests

2.1 GWIT: Glow Wire Ignition Temperature (IEC 60695-2-13)

The GWIT is measured using a test plate (disc) and is a measure of the ignition of a plastic under the effect of, for example, a glowing wire or an over-heated resistor. In determining the ignition temperature, the test specimen must not ignite for the entire duration of the test. Ignition is defined as the occur-



rence of a flame for more than 5 seconds. The GWIT is then defined as the temperature that is 25 °C above the highest temperature at which no ignition occurs. The GWIT is specified by the manufacturer of flameproof materials and is listed on the yellow card. UL introduced a mandatory change in 2005: if the GWIT for thin walls is higher than for thicker ones, only the lower value is listed on the yellow card.

2.2 GWFI: Glow Wire Flammability Index (IEC 60695-2-12)

The GWFI is also measured using a test plate (disc) and is a measure of the burning behavior of plastics under the effect of, for example, a glowing wire or an overheated resistor. The test specimen is pressed against a heated glow wire at a pressure of 1 Newton for 30 seconds. The depth of penetration of the glow wire is limited to 7 mm. The test is passed if, on removal of the glow wire, the test specimen continues to burn for less than 30 seconds and a piece of tissue paper beneath the test specimen does not ignite. The GWFI is specified by the manufacturer of flame-retardant materials and is listed on the yellow card.

2.3 GWT: Glow Wire Temperature (similar to IEC 60695-2-11)

In IEC 60695-2-11, the GWT test corresponds to a GWFI test that is carried out on the finished component. However, different test criteria apply within the household appliance standard – here the ignition temperature is measured. In determining the ignition temperature the test specimen must not ignite for the entire test. Ignition is defined as the occurrence of a flame for more than 2 seconds. This special variant of the GWT test applies exclusively to IEC 60335-1. Because the GWT is a test of the finished component and therefore dependent on ge-

ometry, material combinations and metallic inserts, it cannot be directly correlated with the GWIT.

3 Selection and sequence of the tests

The diagram below illustrates the fire-resistance test for plastics in accordance with IEC 60335-1.

Plastics with GWFI values of at least 850 °C must be used as insulating materials in unsupervised appliances with a current of more than 0.2 amps during normal operation. The test specimen must not be thicker than the corresponding finished component. In addition, the material must have a GWIT of at least 775 °C, and the test specimen must not be thicker than the corresponding finished component. The GWIT values of the materials are recorded on the corresponding yellow cards. If the GWIT is not documented by the manufacturer of the plastic, the GWT can be measured on the finished component. In this case, the measuring temperature is 750 °C.

The requirements for insulating materials of components that carry a current of more than 0.2 amps in unsupervised appliances are particularly demanding. Only a few polyamides and polyesters satisfy the required high GWIT values. LANXESS supplies a range of different products that can be used in accordance with IEC 60335-1.

4 Products in accordance with to IEC 60335-1

Semi-crystalline materials such as selected Durethan® and Pocan® grades are in accordance with the domestic appliance standard IEC 60335-1. They are suitable for parts in domestic appliances in unsupervised operation with a current of more than 0.2 amps.

Find [more information](#) about these grades at www.us.durethan.com.



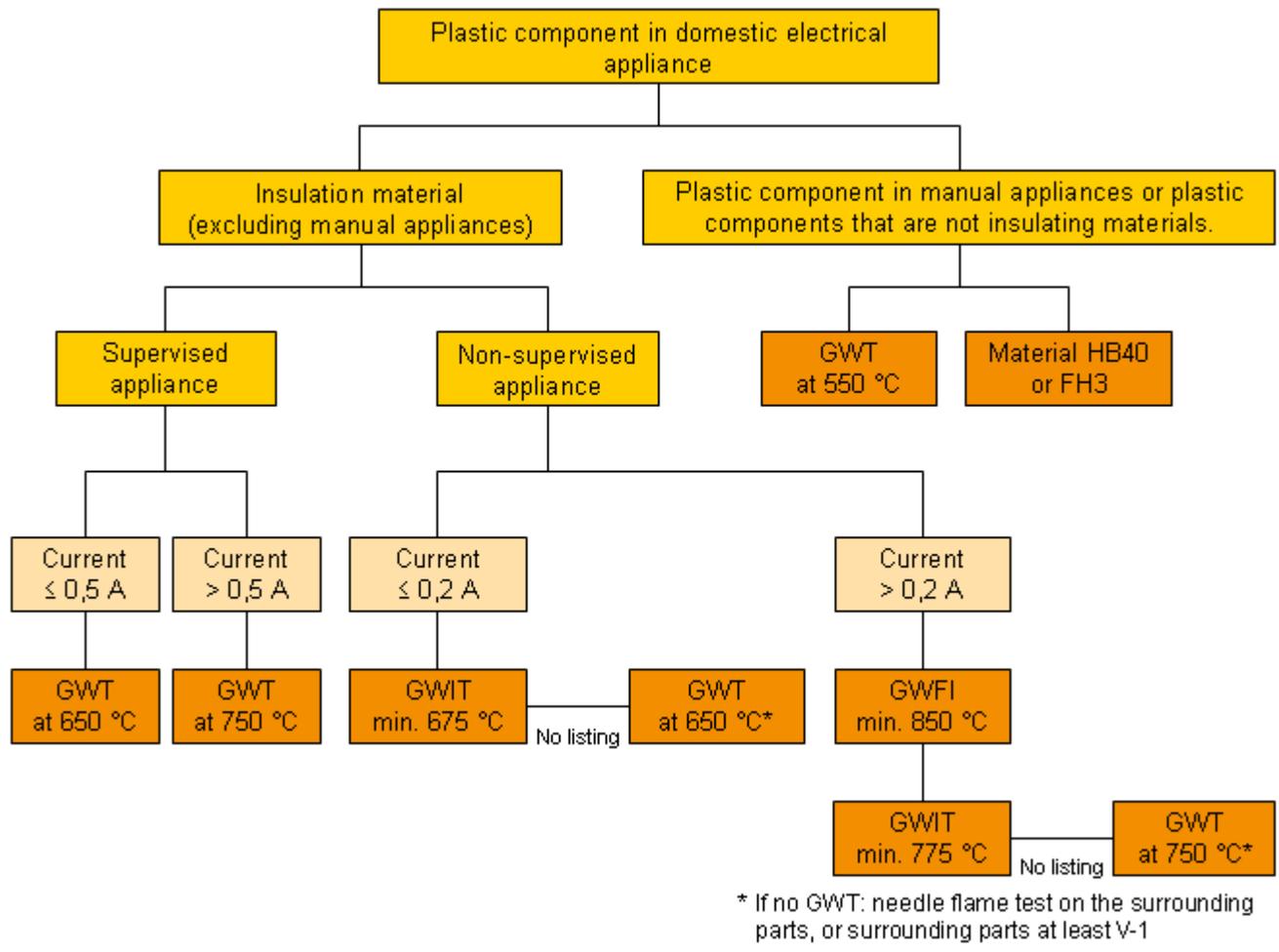


Figure 2 Fire-resistance test for plastics



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The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee, and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under the claims of any patent.

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Any product designated as a developmental product is not considered part of the LANXESS Corporation line of standard commercial products. Complete commercialization and continued supply are not assured. The purchaser/user agrees that LANXESS Corporation reserves the right to discontinue this product without prior notice.

Typical Properties

Property data is provided as general information only. Property values are approximate and are not part of the product specifications.

Flammability

Flammability results are based on small-scale laboratory tests for purposes of relative comparison and are not intended to reflect the hazards presented by this or any other material under actual fire conditions.

Health and Safety

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling LANXESS products mentioned in this publication. Before working with these products, you must read and become familiar with the available information on their hazards, proper use, and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets (MSDS) and product labels. Consult your LANXESS Corporation representative or contact the Product Safety and Regulatory Affairs Department at LANXESS. For materials that are not LANXESS products, appropriate industrial hygiene and other safety precautions recommended by their manufacturer(s) must be followed.

Regulatory Compliance

Some of the end uses of the products described in this brochure must comply with applicable regulations, such as the FDA, NSF, USDA and CPSC. If you have any questions on the regulatory status of any LANXESS engineering thermoplastic, consult your LANXESS Corporation representative or contact the LANXESS Regulatory Affairs Manager.

Regrind

Where end-use requirements permit, regrind may be used with virgin material in quantities specified in individual product information bulletins, provided that the material is kept free of contamination and is properly dried (see maximum permissible quantities and drying conditions in product information bulletins). Any regrind used must be generated from properly molded/extruded parts, sprues, runners, trimmings and/or film. All regrind used must be clean, uncontaminated, and thoroughly blended with virgin resin prior to drying and processing. Under no circumstances should degraded, discolored, or contaminated material be used for regrind. Materials of this type should be discarded. Improperly mixed and/or dried regrind may diminish the desired properties of a particular LANXESS product. It is critical that you test finished parts produced with any amount of regrind to ensure that your end-use performance requirements are fully met. Regulatory or testing organizations (e.g., UL) may have specific requirements limiting the allowable amount of regrind. Because third party regrind generally does not have a traceable heat history or offer any assurance that proper temperatures, conditions, and/or materials were used in processing, extreme caution must be exercised in buying and using regrind from third parties. The use of regrind material should be avoided entirely in those applications where resin properties equivalent to virgin material are required, including but not limited to color quality, impact strength, resin purity, and/or load-bearing performance.

Note:

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