

## 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 and fire and radiation hazards from electrical appliances used for domestic and similar purposes. It takes account of 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 by lay people in shops, businesses and agriculture. These include appliances used in canteen kitchens, cleaning appliances for industrial or commercial use, or appliances for hairdressers.

Plastics that are used in the field of domestic appliances or for similar purposes in accordance with the standard 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.

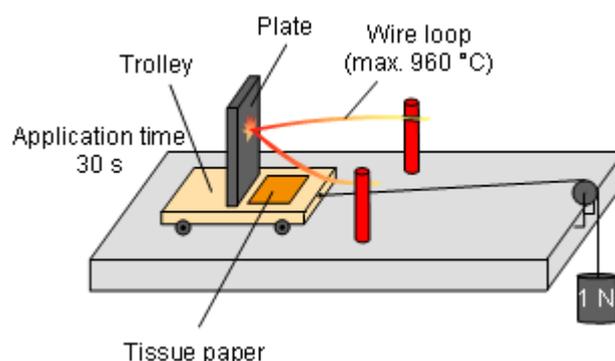


Figure 1 Glow wire test assembly

### 2 Glow wire tests

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

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



this is not evaluated for the yellow card. Instead only the lower value counts.

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

The GWFI is also measured using the 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)**

The GWT is measured on the finished component. In contrast to IEC 60695-2-11, 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 fire for more than 2 seconds. This special feature of the GWT test applies exclusively to IEC 60335-1. In IEC 60695-2-11 the GWT test corresponds to a GWFI test that is carried out on the finished component. Because the GWT is a test of the finished component and therefore dependent on geometry, 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 when deploying insulating materials in unsu-

pervised appliances with a current of more than 0.2 amps during normal operation and the test specimen must not be thicker than the corresponding finished component. Further, 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. The measuring temperature here is 750 °C.

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

## **4 Products according to IEC 60335-1**

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

Find [more information](#) about these grades at [www.durethan.com](http://www.durethan.com) or [www.pocan.com](http://www.pocan.com).



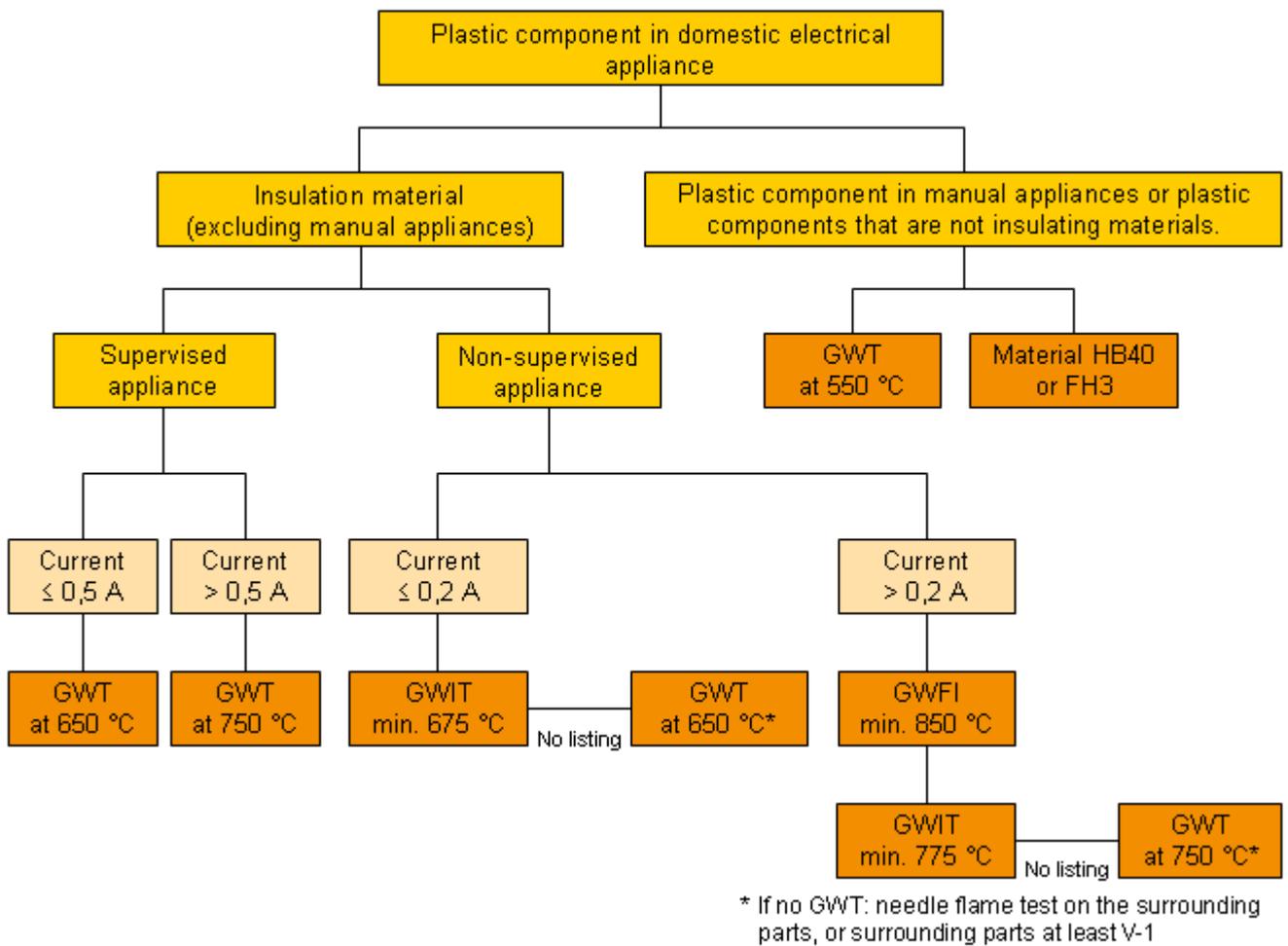


Figure 2 Fire-resistance test for plastics

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