

# IEC 60335-1 Ed. 4.0

## Safety of Household and Similar Electrical Appliances

This Standard deals with the safety of electrical appliances for household and similar purposes; the rated voltage of the appliances being not more than 250 V for single-phase appliances and 480 V for other appliances.

Recently the Standard has been modified and requirements are reportedly much stricter than those previously used, in order to avoid fire risks and provide further guarantees of safety in electrical appliances.

Such modifications involve, above all, components made of an insulating material that support electrical connections carrying a current >0.2A, including components at a distance of less than 3 mm from the connection.

The flowchart for the material and / or part evaluation according to IEC 60335-1, is schematically illustrated in Figure 1.

### Paragraph 30 - Resistance to heat and fire

**30.1 - Heat resistance:** the parts must comply with the Ball Pressure Test of IEC 60695-10-2. The test is carried out at a temperature of  $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$  plus the maximum temperature rise determined during the test of clause 11, but it shall be at least  $75^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for external components and  $125^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for components supporting live parts.

### 30.2 - Fire resistance

**30.2.2 - Attended Appliances:** according to the Standard parts ought to be subjected to the Glow-Wire Test of IEC 60695-2-11, which is carried out at  $750^{\circ}\text{C}$  for connections that carry a current >0.5A and  $650^{\circ}\text{C}$  for other connections.

### 30.2.3 - Unattended Appliances

**30.2.3.1:** parts that carry a current >0.2A shall have a Glow-Wire Flammability Index of  $\geq 850^{\circ}\text{C}$  (IEC 60695-2-12).

**30.2.3.2:** parts supporting current-carrying connections, shall always be subjected to the Glow-Wire Test according to IEC 60695-2-11. However, the GWT is not carried out on parts of material classified as having a Glow-Wire Ignition Temperature, according to IEC 60695-2-13, of  $\geq 775^{\circ}\text{C}$  for connections that carry a current >0.2A and  $\geq 675^{\circ}\text{C}$  for other connections.

Test samples ought to be no thicker than the relevant part. The maximum flame-persistence-time admitted during the test is of 5 seconds.

When the Glow-Wire Test of IEC 60695-2-11 is carried out on the parts, the temperatures are of  $750^{\circ}\text{C}$  for connections which carry a current >0.2A and  $650^{\circ}\text{C}$  for other connections. If during the test a flame that persists for longer than 2 seconds is produced, the Needle-Flame Test must be carried out for all parts above the connection within the envelope of a vertical cylinder having a diameter of 20 mm and a height of 50 mm. However, the latter test is not needed if between the connections and the other parts there is a "protection" that meets the Needle-Flame Test.

The Needle-Flame Test is not carried out on parts of material classified as V-0 or V-1, according to IEC 60695-11-10, provided that the test sample was no thicker than the relevant part.

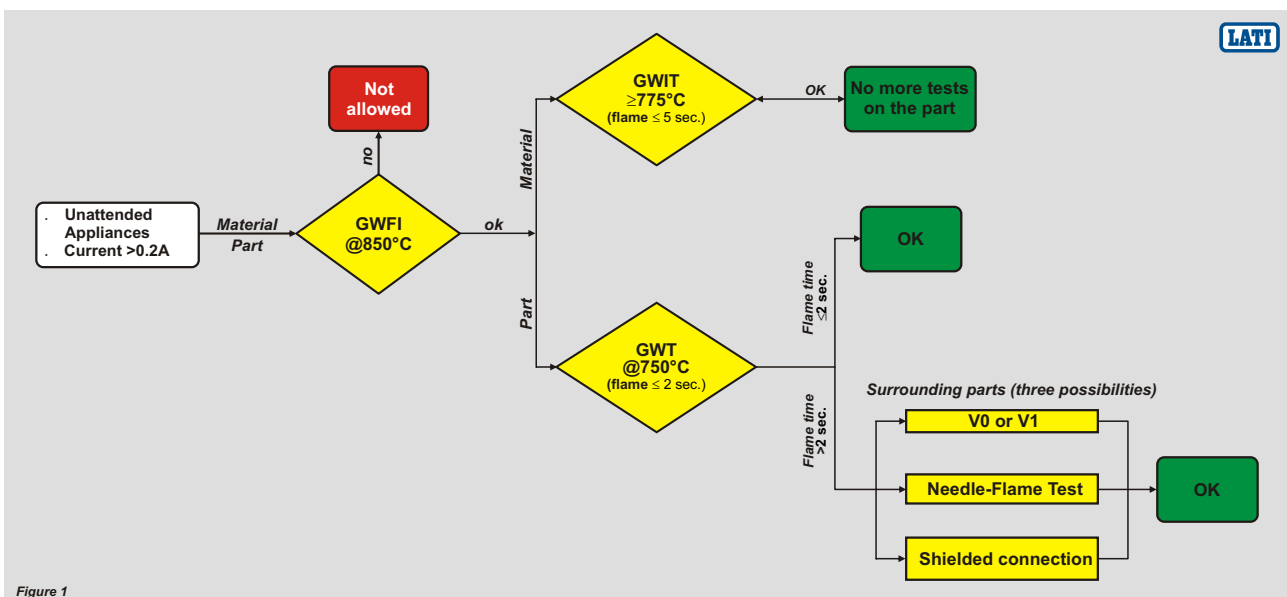
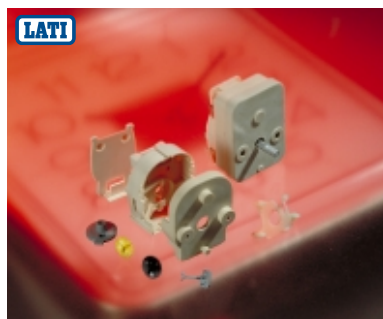


Figure 1

### Main Products in LATI's Range as applicable to the IEC 60335-1 Ed. 4.0

Within the LATI's Product Range there are several flame retardant compounds with **Glow-Wire Flammability Index**  $\geq 850^{\circ}\text{C}$  (IEC 60695-2-12) and **Glow-Wire Ignition Temperature**  $\geq 775^{\circ}\text{C}$  (IEC 60965-2-13). Such materials also exhibit a very good Thermal Resistance (Ball Pressure Test) and an excellent Resistance to Tracking (CTI) able to satisfy specific application's requirements. All such formulations are free from bromine halogens such as PBB and PBDE.

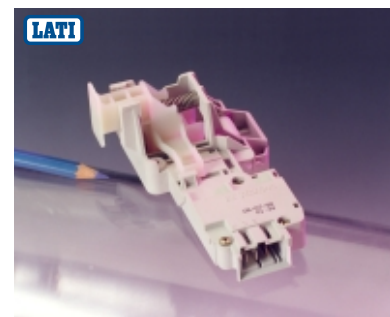
Resin	Product	UL94	Ball test	CTI	Product Description
PA 66	LATAMID 66 H2PX-V0	UL94-V0	>165°C	$\geq 250\text{V}$	Unfilled, with halogens, PBB & PBDE free
PA 66	LATAMID 66 H2PX-V2	UL94-V2	>165°C	$\geq 250\text{V}$	Unfilled, with halogens, PBB & PBDE free
PA 6	LATAMID 6 H2PX-V0	UL94-V0	>165°C	$\geq 250\text{V}$	Unfilled, with halogens, PBB & PBDE free
PA 6	LATAMID 6 H2PX-V2	UL94-V2	>165°C	$\geq 250\text{V}$	Unfilled, with halogens, PBB & PBDE free
PPh	LATENE 7 H2W-V0	UL94-V0	>125°C	$\geq 400\text{V}$	Unfilled, halogens & red phosphorous free
PPh	LATENE 7 H2-V2HF	UL94-V2	>125°C	$\geq 400\text{V}$	Unfilled, halogens & red phosphorous free
PBT	LATER 4E61-V0	UL94-V0	>165°C	$\geq 250\text{V}$	Unfilled, with halogens, PBB & PBDE free
PA 66	LATAMID 66 H2 G/25-V0KB4	UL94-V0	>165°C	$\geq 400\text{V}$	25% GF, with red phosphorous, halogen-free
PA 66	LATAMID 66 H2 G/50-V0KB1	UL94-V0	>165°C	$\geq 400\text{V}$	50% GF, with red phosphorous, halogen-free
PA 66	LATAMID 66 H2 G/25-V0HF1	UL94-V0	>165°C	$\geq 400\text{V}$	25% GF, halogens & red phosphorous free
PA 66	LATAMID 66 H2 G/25-V0CT1	UL94-V0	>165°C	$\geq 400\text{V}$	25% GF, with halogens, PBB & PBDE free
PA 66	LATAMID 66 H2 G/25-V0AF	UL94-V0	>165°C	$\geq 400\text{V}$	25% GF, with halogens, PBB/PBDE & $\text{Sb}_2\text{O}_3$ free
PA 66	LATAMID 66 H2 G/20-V2	UL94-V2	>165°C	$\geq 250\text{V}$	20% GF, with halogens, PBB & PBDE free
PA 66	KELON A FR H2 CETG/300-V0	UL94-V0	>165°C	$\geq 400\text{V}$	30% MF-GF, with halogens, PBB & PBDE free
PA 66	KELON A FR H2 CET/35-V2	UL94-V2	>165°C	$\geq 400\text{V}$	35% MF, with halogens, PBB & PBDE free
PA 6	LATAMID 6 H2 G/30-V0HF1	UL94-V0	>165°C	$\geq 400\text{V}$	30% GF, halogens & red phosphorous free
PA 6	LATAMID 6 H2 G/30-V0CT1	UL94-V0	>165°C	$\geq 400\text{V}$	30% GF, with halogens, PBB & PBDE free
PA 6	LATAMID 6 H2 G/30-V0AF	UL94-V0	>165°C	$\geq 400\text{V}$	30% GF, with halogens, PBB/PBDE & $\text{Sb}_2\text{O}_3$ free
PA 6	KELON B FR H2 CEG/300-V0HF1	UL94-V0	>165°C	$\geq 400\text{V}$	30% MF-GF, halogens & red phosphorous free
PA 6	KELON B FR H CET/30-V0	UL94-V0	>165°C	$\geq 400\text{V}$	30% MF, with halogens, PBB & PBDE free
PBT	LATER 4 G/30-V0GW	UL94-V0	>165°C	$\geq 250\text{V}$	30% GV, with halogens, PBB & PBDE free
PPA	LARAMID D G/35-V0HF	UL94-V0	>165°C	$\geq 400\text{V}$	35% GF, halogens & red phosphorous free



LATAMID 66 H2 G/25-V0CT1  
Timer (for small household appliances)



LATAMID 66 H2 G/25-V0CT1  
Micro-switches



KELON A FR H2 CETG/300-V0  
LATAMID 66 H2 G/25-V0  
Door lock for washing machine

LATI is willing to share with you its expertise in this field, and its T.S. and R&D Teams are at your complete disposal to analyse your requirements and collaborate on project developments.