



Flammability of KUBE IR Plastics

Concerns KUBE IR plastics, namely:

- **Series 2000** "IR 5 to 20 microns transparent" films for PIR window and cover applications,
- **Series 20000, 30000 and 40000** "IR 5 to 20 microns transparent" injection granulates for PIR windows and lenses,
- **Type 12600** near infrared injection granulate for LED remote control applications and sunlight suppression in phototransistor applications.

These materials are, due to their basis of Polyethylene or Polystyrene (12600), rated as flammable according to **UL 94 HB**.

However, the **white** KUBE films 2018, 2027 and the new **beige** materials 2024 and 2035, as well as injection granulate 22400a pure or diluted max. 1:2 with 22300, containing the KUBE "superwhite" pigment in quantities of more than 1.2%, **have passed flammability test IEC 695-2-1** for thick (1.5 mm) as well as for thin sections.

(Glow wire test for electrical equipment, Test 97.1.10060 performed by the Swiss Electrical Association, copy of approval available on request).

This test corresponds roughly to UL 94 V-2.

UL 94 V-2 is difficult to apply as it relates to bars of 3 mm thickness or more, a dimension never used in PIR application.

When a normal lens or cover window of 50x50 mm is used, inserted in a housing made of flame retarding material, it will generally meet the criterion of UL94 V-2 (flames to extinct in less than 30 seconds).

All common **flame retarding additives**, such as:

- halogen containing additives (ammonium bromide, PBB-MA, DECA, brominated epoxies, etc),
- magnesium or aluminum hydroxide and other anorganic oxides,
- zinc borate ("Firebrake")

have been tested by KUBE and all have a very **detrimental effect to infrared transmission**, due to the obvious reason of molecular absorption, and cannot be used for this reason. Some of these have, in addition, substantially decreased long term stability and UV stability. The use of such additives must be discouraged.

A Layman's guide to **Flame Testing**

By: ICC New Product Development Center

UNDERWRITERS LABORATORIES 94HB:

Test is run with bars one half inch wide by five inches long. These are held horizontally and exposed to a laboratory burner flame three quarters of an inch high. Ignition is forced until one inch of the sample has burned, the flame removed, and the burning rate measured.

To Pass ULHB: A sample over one eighth inch thick must burn slower than one and one half inches per minute and a sample one eighth inch thick or less must not burn faster than three inches per minute. This is very similar to DOT MVSS 302.

UNDERWRITERS LABORATORIES 94-V:

Test is run with bars one half inch wide by five inches long. These are held horizontally and exposed to a laboratory burner flame three quarters of an inch high. Each sample is ignited for ten seconds, the flame allowed to go out, and ignited again for a second time of ten seconds. The time taken for the flame to go out is measured and the technician watches for burning char or liquid droplets falling.

To Pass UL94V-0 flame must be out in ten seconds or less, no glow beyond thirty seconds, and no burning material can fall.

To Pass UL94V-1 flame must be out in thirty seconds or less, no glow beyond sixty seconds, and no burning material can fall.

To Pass UL94V-2 flame must be out in thirty seconds or less, no glow beyond sixty seconds, and burning material can fall.

UNDERWRITERS LABORATORIES 94-5V:

This is a newer and tougher version of the UL 94 V test. The sample size stays the same for the first part of the test, but the flame size increases to five inches from three quarters of an inch and the number of ignitions increases from two to five but the duration is decreased from ten to five seconds.

Along with bars a test piece six inches by eight inches is mounted horizontally and the bottom center is exposed to five, five-second flame exposures five seconds apart.

To Pass UL94-5VA, the flame and glow must be out in sixty seconds or less, no burning material must fall, and the flame must not penetrate the six by eight inch panel.

To Pass UL94-5VB, the flame and glow must be out in sixty seconds or less, no burning material must fall, but the six by eight inch panel may be penetrated.