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Steinbach AG
Industrial Components

Technical Information

Flammability assessment based on UL 94

UL 94 is a standard from Underwriters Laboratories, Inc. (UL), an American safety science company, which covers tests for flammability of plastic materials for parts in devices and appliances testing. It is applied today primarily where tests need to be carried out on materials for electronic devices and test certificates according to UL 94 are required for all plastic materials, especially when exporting to the USA. Largely identical tests are described in standards such as IEC 60695-11, EN 60695-11 and VDE 0471, which all relate to electrical equipment.

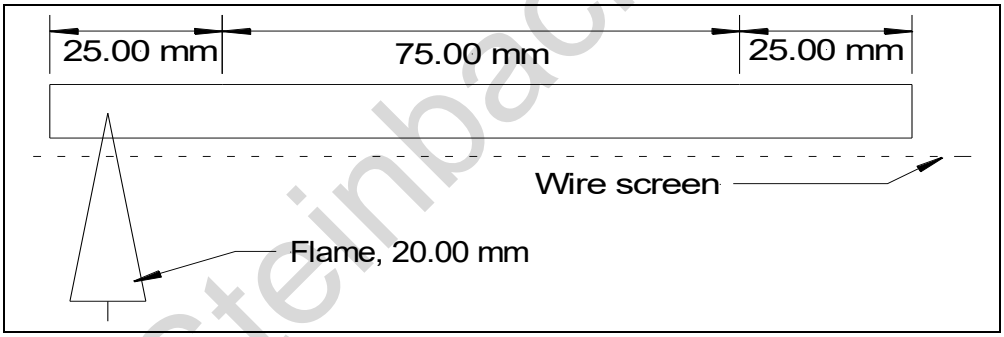
The test is restricted to specimens with a thickness of up to 13 mm, it is not designed for materials of greater thickness.

UL 94 differs between horizontal and vertical arrangement of the specimens in the burning test.

Flammability test UL 94 HB

The specimen rests on a wire screen in horizontal position. A defined flame (20 mm high) of a Bunsen burner is applied to the end of the specimen for 30 seconds. The timing of the burn rate starts when the flame front reaches the first 25 mm of the specimen.

The test is carried out on a set of 6 specimens with the dimensions of 125 x 13 x ≤ 13 mm.



The test is deemed passed if:

for specimen thicknesses ≤ 3 mm the burn rate over 75 mm ≤ 75 mm/min **or**
for specimen thicknesses 3 to 13 mm the burn rate over 75 mm ≤ 40 mm/min **or**
the flame stops burning (self-extinguishing) before reaching the 100 mm mark

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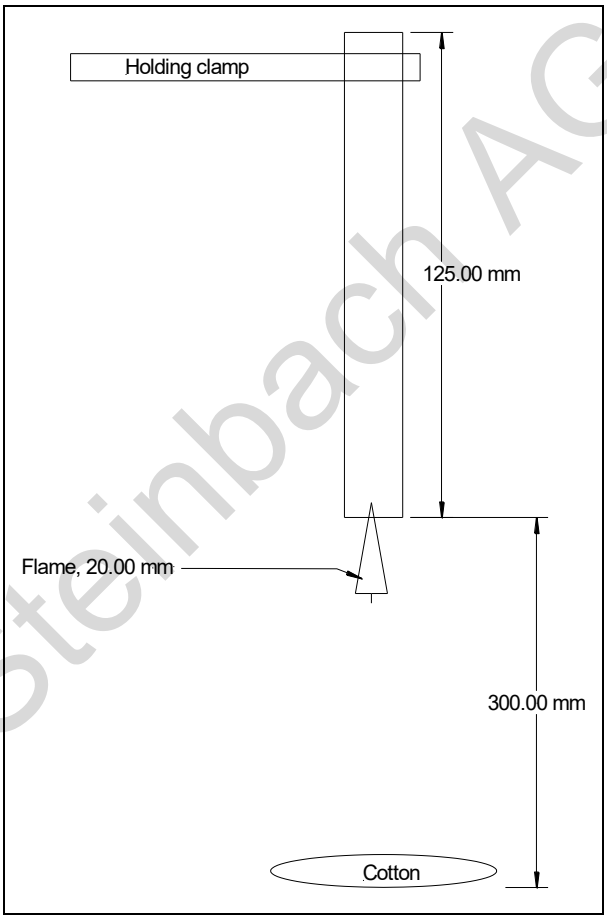
Flammability test UL 94 V

The specimen is clamped in a holder in vertical position. A Bunsen burner flame (20 mm high) is applied to the bottom of the specimen. The flame is applied for 10 seconds and then removed until flaming stops at which time the flame is reapplied for another 10 seconds and then removed. A cotton indicator is placed under the specimen and observed during the test to see whether the specimen drips flaming particles that ignite the cotton.

The test is carried out on two sets of 10 specimens with the dimensions of 125 x 13 x ≤13 mm



The requirements for the individual stages are specified in the following table.

Requirement	**UL94V-0**	**UL94V-1**	**UL94V-2**
Burn time based on flame application	≤ 10 s	≤ 30 s	≤ 30 s
Total burn time per set (10 flame applications)	≤ 50 s	≤ 250 s	≤ 250 s
Burning up to specimen holding clamp	no	no	no
Afterflame and afterglow time after the 2nd flame application	≤ 30 s	≤ 60 s	≤ 60 s
Cotton indicator ignited	no	no	yes

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Flammability assessment based on UL 94

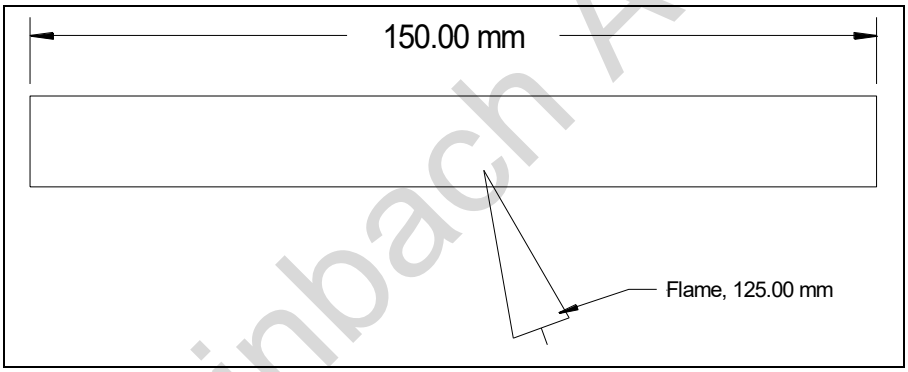
Flammability test UL 94-5V

The specimen is clamped in a holder in vertical position. A Bunsen burner flame (125 mm high) is applied to the bottom of the specimen 5 times for 5 seconds and is removed for 5 seconds in-between each flame application. A cotton indicator is placed under the specimen and observed during the test to see whether the specimen drips flaming particles that ignite the cotton.

The test is carried out on a set of 20 specimens with the dimensions of 125 x 13 x ≤13 mm, test setup as UL 94 V, but with a flame of 125 mm high.

In addition, a Bunsen burner flame (125 mm high) is applied at an angle of 20° to the bottom of flat sheets 5 times for 5 seconds and is removed for 5 seconds in-between each flame application.

The test is carried out on a set of 12 flat sheets with the dimensions of 150 x 150 x ≤13 mm.



The requirements for the individual stages are specified in the following table.

Requirement	**U 94-5VA**	**UL94-5VB**
Burn and afterglow time after the 5th flame application	≤ 60 s	≤ 60 s
Cotton indicator ignited	no	no
Hole formation (sheet)	no	yes