Comparison of fire protection standards and test methods

For the use of fabrics, textiles and papers in public buildings and at public events, proof of flame resistance must be provided, and not only in Germany.

But which specific requirements must be met? Which standards apply internationally?

In **Germany**, the legislator prescribes compliance with the fire safety standard in §19 of the Model Building Code (Musterbauordnung), the Accommodation Ordinance (Beherbergungsverordnung) and the state-specific regulations on places of assembly (Versammlungsstättenverordnungen). **Decoration materials must be at least flame-retardant according to DIN 4102-1 or DIN EN 13501-1,** is the common requirement in Germany in the **technical guidelines for theatres, exhibitors, organisers, service companies, stand construction companies, service providers and the like.** Decorative materials also include wall coverings, room dividers, curtains, displays, textile sails, banners, flags and the like.

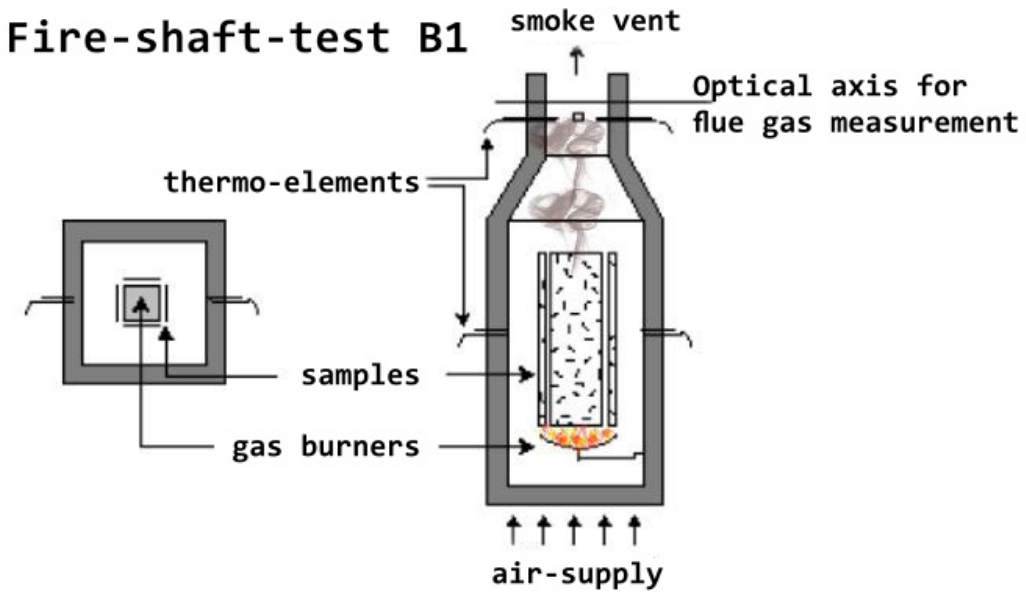
Building material class B1 according to the German standard DIN 4102-1 is also referred to as "flame retardant".

Products of this standard are basically also flammable, but they start burning a little later and are self-extinguishing, i.e. they do not continue to burn on their own.

The DIN 4102-1 standard classifies building materials and components in terms of their fire behaviour. Requirements and tests as well as technical fire protection terms are precisely defined for the building materials. This applies both to the fire behaviour of the material as an individual building material and in combination with other building materials.
Verification is mandatory for all materials. Only institutes with test approval test and classify the building materials according to the applicable standards.

DIN NORM B1 – Germany

For the B1 standard, the tested material must still have a mean residual length (more than 15 cm) after the **"fire shaft test" (Brandschachttest)** and the mean smoke gas temperature (200 degrees Celsius) must not be exceeded.



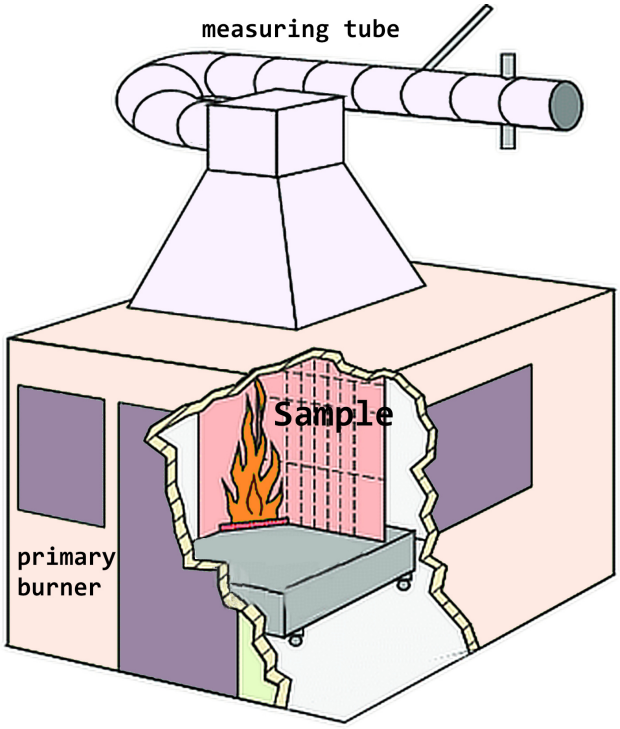
At the moment, you can still choose between the German and the European standard. However, the European standard is to replace the German standard in the future.

EN NORM 13501 – EU

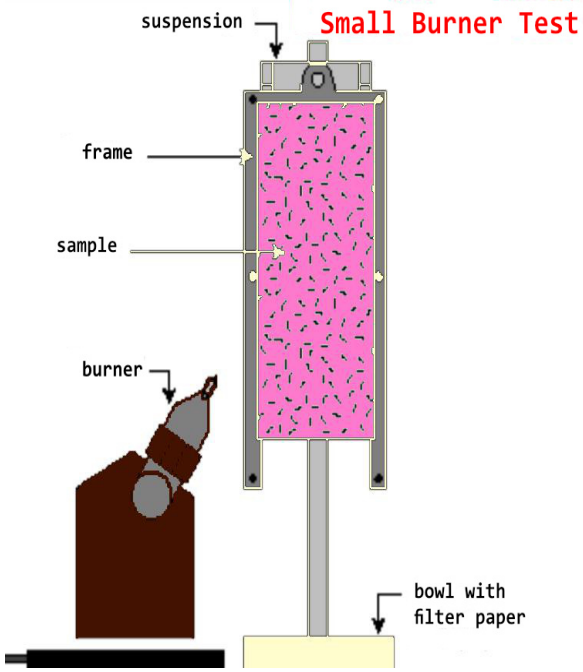
The European standard has more parameters for classifying the fire behaviour and smoke development of building materials.

According to this standard, **B1 building materials (flame-retardant building materials) must at least meet class C s3 d2. The best level in this class is B-s1 d0.** The material must not fall off in flames and must not develop smoke. **The classification is based on the Radiant Panel Test (radiation test).**

As part of the harmonisation of European standards for construction products, the national test methods for the fire behaviour of building materials will also be replaced sooner or later. **At the centre of the new method is the SBI test.**
The **flammability test** assesses the flammability of a building product by exposing it to a small flame.
The SBI test evaluates the potential contribution of a building product to a developing fire in a fire situation that simulates a **single burning item (SBI)** in a corner of a room close to that building product. The test recreates a realistic fire situation, such as one caused by a burning wastebasket in a corner of the room.



The European test procedure also involves a **Small Burner test in addition to the SBI test.**



M1 Norm – F/BE/LUX

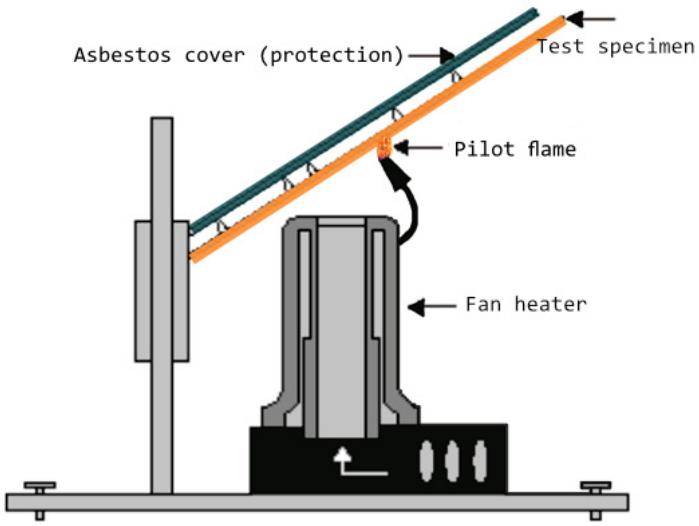
In **France, Belgium and Luxembourg, the "Brûleur Électrique" test procedure** is carried out **according to the NFP 92503 M1 standard.**

The M1 certification is the better test result and has a higher status than the B1 certification in Germany. M1 has the meaning non-flammable, M2 means hardly flammable.

The test setup is similar to the European test. The building material is ignited with a gas flame at an acute angle of 30 degrees to the radiator. One difference in the procedure is that the flame is not directed at the edges but at the surface of the material.

The building material must not burn for more than five seconds and nothing must fall off the fabric. In addition, the initial size of the test substance must be maintained. **Only in this case does a substance receive the coveted M1 test result,** which has a very high reputation worldwide.

The sample is attached to a test fixture, at an angle of 30° above an electric heater from which heat flows. After 20 seconds of the test, a small butane gas pilot flame is held directly to the fabric surface, remains there for 5 seconds and is removed. This is repeated at 45 seconds and every 30 seconds thereafter until the test ends after 5 minutes. If a flame is still visible on the fabric after these 5 minutes, the test continues until the sample is completely extinguished.



The following aspects are recorded during the test:

- Flame duration
- Occurrence of dripping flame residue
- Length/width of the damaged sample

The requirements regarding classification are as follows:

Classification		M1	M2	M3	>M3
Duration of the burn	Time in sec.	≤5	>5	>5	>5
Damage	length mm	-	<350	<600	600
	width mm	-	-	<90	>90
Drop		none	none	none	

ÖNORM B 3822 / A 3800-1 – AU

In Austria, a distinction is made between building products (building materials and components; this includes e.g. floor, wall and ceiling coverings that are firmly connected to walls or ceilings), and other equipment materials such as decorations and materials at events.

The term decorations includes:

- Event furnishings, such as seating, exhibition stands, desks, other additional fixtures.
- Fabric coverings & curtains
- Carpets, floor coverings
- Roll-ups, aerial columns, displays
- Pin boards, screens
- Vehicle superstructures
- Table linen, plants etc.

Due to the publication of ÖNORM EN 13501-1 "Fire classification of construction products and building elements - Part 1: Classification using the results of fire behaviour tests of construction products" **and ÖNORM EN 13773** "Classification scheme of textiles - Curtains and drapes - Fire behaviour", **it has become necessary to withdraw ÖNORM B3800.**

Based on this, the following standards are currently applied:

Table 1: Applicable classification/testing standards for interior furnishing materials

	Fire behaviour	Smoke behaviour	Drip behaviour
Building products[1)]	EN 13501-1	EN 13501-1	EN 13501-1[2)]
Curtains and curtain-like products	EN 13773	ÖNORM A 3800-1	EN 13772
Upholstery fabrics	ÖNORM B 3825	ÖNORM A 3800-1	not applicable
Decoration materials	ÖNORM B 3822	ÖNORM A 3800-1	ÖNORM B 3822
Other materials	ÖNORM A 3800-1[3)]	ÖNORM A 3800-1	ÖNORM A 3800-1[3)]

1) This also includes all floor, wall and ceiling coverings. 2) Not applicable to floor coverings. 3) Excluding construction products and product types for which there are specific standards for testing reaction to fire.

Both the **SBI TEST PROCEDURE** (see p. 4) and **flaming with the Schlyter burner tube** are used as test methods in Austria.
The ignition source according to ÖNORM represents a massive ignition with increased flame impact with the Schlyter burner.

A detailed description of the ÖNORMEN can be found in our information sheet ***Fire protection requirements for interior design Austria.***

UNI 8456/8457 / UNI 9174 – I

According to the test standard **UNI 9174**, the test specimens are exposed to a source of radiation and ignition. The flame propagation and the dripping behaviour of the sample are determined. Comparable to the so-called small burner test from Germany, the **UNI 8457 test method** tests the flammability of materials. **Based on these two test results**, the **classification of the products is then determined** with the intended evaluation matrix according to **UNI 9177.**

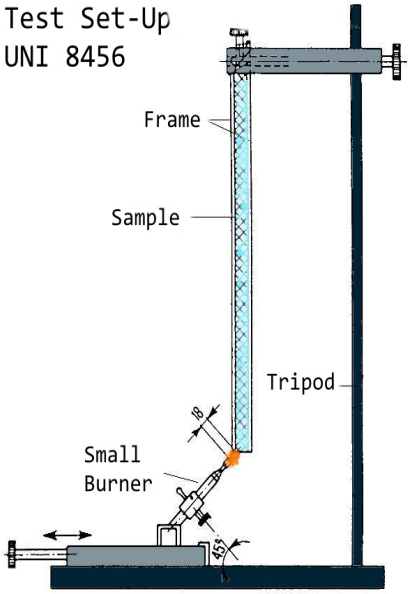
The Italian specifications **UNI 9174** for testing the fire behaviour of materials under the influence of radiant heat supplement the globally valid type certification **according to IEC 61730** as a country-specific requirement.

Criterion	Grade 1	Grade 2	Grade 3	Rating factor
Afterburn time	≤ 5s	> 5 bis 60s	>60 s	2
Afterglow time	≤ 10 s	> 10 bis 60s	> 60 s	1
Damage	≤ 150 mm	> 150 bis 200 mm	> 200 mm	2
Drop	Not burning	burning	burning	1

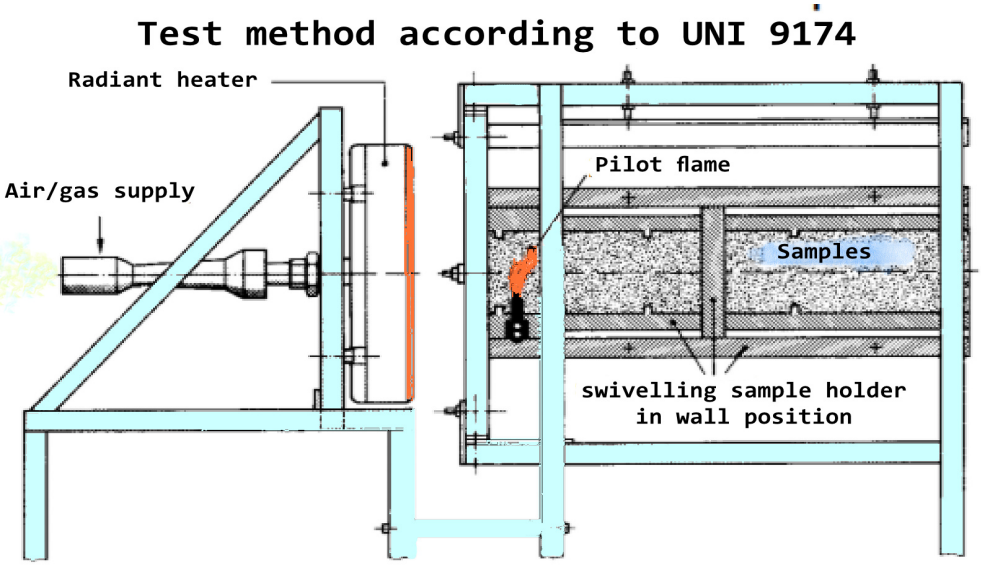
Category	Sum of the individual criteria
I	6 bis 8
II	9 bis 12
III	13 bis 15
IV	16 bis 18

Accordingly, flame-retardant products must be classified at least in category 2 or better according to UNI 8457 and UNI 9174.

Test set-up according to UNI 8456/8457



Test set-up according to UNI 9174



Switzerland- CH

Building materials are classified according to their fire behaviour into classes A1, A2, B, C, D and E. The decisive factors are flammability, flame spread and heat release. The flammability increases from class A1 to class E.

Flammability rating	Fire behaviour in the event of a room fire
F, F_L	Construction products for which the fire behaviour is not determined or which cannot be classified in one of the classes A1, A2, B, C, D, E, A1L, A2L, BL, CL, DL, EL.
E, E_L	Construction products capable of withstanding attack by a small flame for a short time without significant flame spread.
D, D_L	Construction products which fulfil the criteria of class E or EL and are capable of withstanding attack by a small flame for a prolonged period without significant flame spread. In addition, they are also capable of withstanding exposure to a single burning object with sufficiently delayed and limited heat release.
C, C_L	As class D or DL, but with more stringent requirements. In addition, these building products show limited lateral flame spread when exposed to a single burning object.
B, B_L	As class C or CL, but with more stringent requirements.
A2, $A2_L$	**Meet the same criteria as class B or BL in the SBI test method according to EN 13823. In addition, these building products do not make a significant contribution to the fire load and fire rise under fully developed fire conditions.**

A1, $A1_L$	Class A1 or A1L construction products do not contribute at any stage of the fire, including fully developed fire. For this reason, it is assumed that they are able to automatically fulfil all the requirements of the lower classes.

Combustion behaviour:

Building materials are classified into flammability grades 3 to 6 according to their burning behaviour.

Flammability grade 5: hardly flammable - Building materials that are hardly flammable and only continue to burn slowly or char when additional heat is added. After the heat source has disappeared, the flames must extinguish after a short time and the afterglow must cease.

Flammability grade 5 (200 °C): hardly flammable at 200 °C - Building materials that meet the requirements of flammability grade 5 even at an increased ambient temperature of 200 °C.

Flammability grade 6q: quasi non-combustible building materials that have a small proportion of combustible components but are not flammable and are assessed as non-combustible for practical purposes.
Combustibility grade 6: non-combustible building materials without a combustible component that are not flammable and also do not char or ash.

Since 2015, testing has also been carried out in Switzerland according to the SBI test method in accordance with EN 13823.(see page 4).