



**International  
Standard**

**ISO 16502-1**

**Furniture — Assessment of the  
ignitability of mattresses and  
upholstered bed bases —**

**Part 1:  
Ignition source: smouldering  
cigarette**

*Ameublement — Évaluation de l'allumabilité des matelas et des  
sommiers rembourrés —*

*Partie 1: Source d'allumage: cigarette en combustion*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 136, *Furniture*.

A list of all parts in the ISO 16502 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document is a part of the ISO 16502 series concerned with the ignitability of mattresses and upholstered bed bases using different ignition sources. The ignition source used in this document is a smouldering cigarette.

When mattresses or bed bases are used or stored on their own, it is desirable to know their ignitability in their own right.

It cannot be assumed that protection against flaming sources automatically gives protection against smouldering ignition. Users of this document should therefore recognize the need to submit test specimens to both cigarette and flaming ignition tests.

**WARNING** — Attention is drawn to the fact that the tests given in the test report (see [Clause 11](#)) are not intended to reproduce the full fire hazards that may be encountered.

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# Furniture — Assessment of the ignitability of mattresses and upholstered bed bases —

## Part 1:

### Ignition source: smouldering cigarette

#### 1 Scope

This document specifies a test method to assess the ignitability of mattresses, upholstered bed bases or mattress pads when subjected to a smouldering cigarette as an ignition source.

This document does not apply to air mattresses and water beds.

#### 2 Normative references

There are no normative references in this document.

#### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

**3.1 progressive smouldering**  
exothermic oxidation, not accompanied by *flaming* (3.2), that is self-propagating, i.e. independent of the *ignition source* (3.4), which may or may not be accompanied by incandescence

**3.2 flaming**  
undergoing combustion in the gaseous phase with the emission of light

**3.3 ignitability**  
measure of the ease with which a material, product or component can be ignited so as to flame or progressively smoulder

**3.4 ignition source**  
source of energy used to ignite combustible materials or products

**3.5 mattress pad**  
upholstered product that is used in conjunction with, and to complement, a *mattress* (3.6) or upholstered *bed base* (3.7)

### 3.6

#### **mattress**

upholstered product intended for sleeping upon

### 3.7

#### **bed base**

structure that supports a *mattress* (3.6) or the surface(s) of a mattress that support(s) a user

### 3.8

#### **upper surface**

surface of a *bed base* (3.7) that supports a *mattress* (3.6) or the surface(s) of a mattress that support(s) a user

## 4 Criteria of ignition

### 4.1 Progressive smouldering ignition

For the purposes of this document, all the following types of behaviour are considered to be progressive smouldering ignitions:

- a) any test assembly that displays escalating combustion behaviour so that it is unsafe to continue the test and active extinction is necessary;
- b) any test assembly that smoulders until it is largely consumed within the test duration;
- c) any test assembly that smoulders to its full thickness, within the test duration;
- d) any test assembly that smoulders after 1 h from the application of the ignition source;
- e) any test assembly that, on final examination (see 10.3), shows evidence of progressive smouldering.

NOTE In practice it has been found that there is usually a clear distinction between materials which can char under the influence of the ignition source but which do not propagate further (non-progressive combustion) and those where smouldering develops in extent and spreads (progressive combustion).

### 4.2 Flaming ignition

For the purposes of this document, a flaming ignition is considered to be the occurrence of any flames initiated by a smouldering source.

## 5 Principle

To subject a full upper surface or upper surface characteristic features of a mattress, the bed base or the mattress pad to the contact of a smouldering ignition source by using smouldering cigarettes so that all the zones having different characteristics are tested.

## 6 Instructions for use

### 6.1 General

The test method specified in this document presents a considerable hazard; suitable precautions shall be taken, which may include the provision of breathing apparatus and protective clothing.

### 6.2 Enclosure

For safety, the test should be conducted in a non-combustible fume cupboard. If such a cupboard is not available, a test enclosure should be constructed (see 7.2) so that the operator is protected from the fumes.

### 6.3 Extinguishers

Adequate means of extinguishing the assembly should be provided bearing in mind that some combinations may produce severe flaming during the test. A hand and/or fixed water spray which can be directed over the burning area can be useful. Other means such as suitable fire extinguishers, fire blankets and a bucket of water can assist.

In some cases smouldering may be difficult to extinguish completely and complete immersion in water may be necessary.

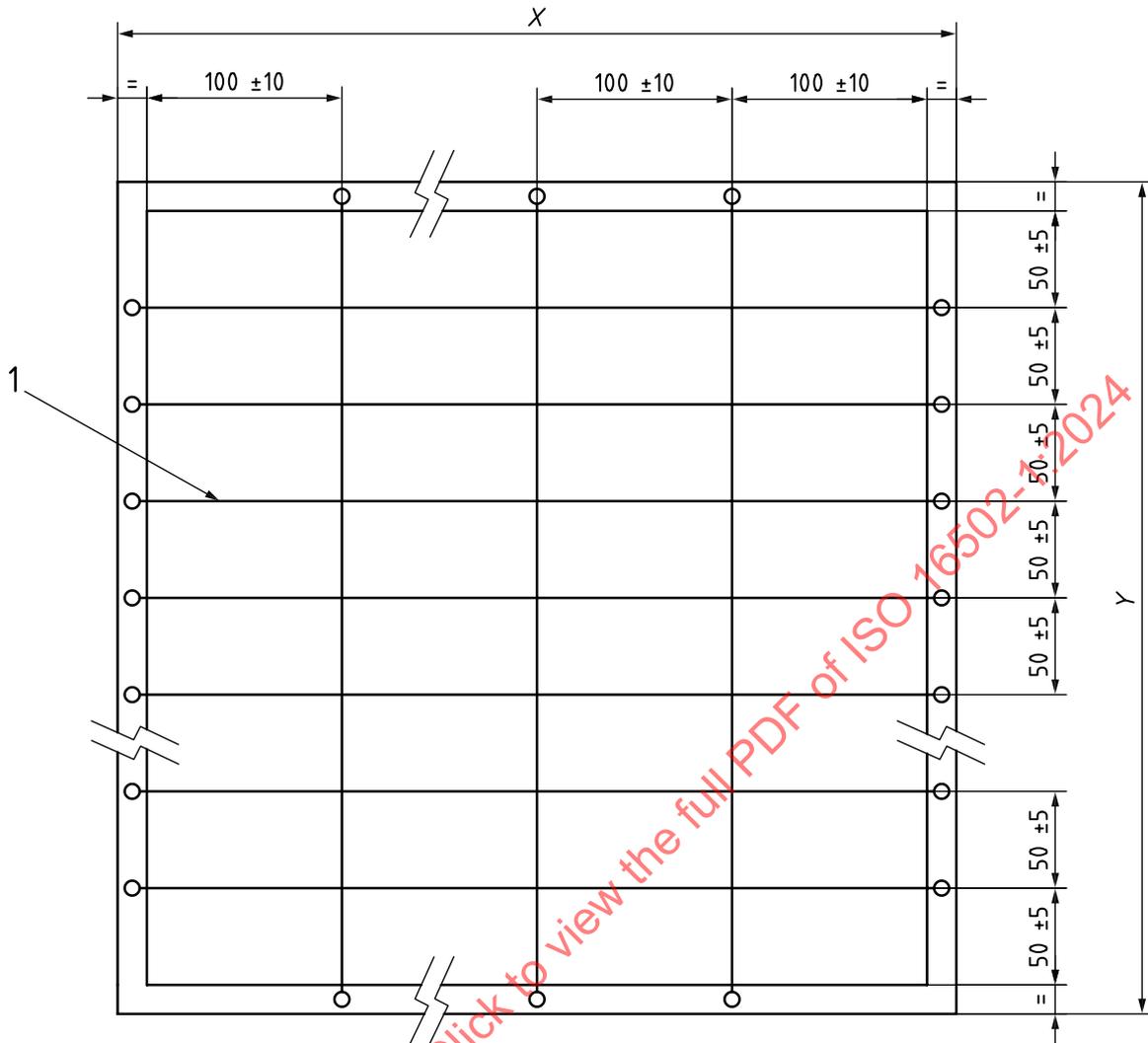
## 7 Apparatus

### 7.1 Test rig

The test rig consists of a platform of expanded steel or open mesh at least 450 mm × 450 mm supported at least 75 mm above a solid base (a suitable test rig mesh is illustrated in [Figure 1](#)). The size of the mesh is not critical.

For the tests, the rigs shall be sited within the enclosure (see [7.2](#)) and the testing shall be performed in a basically draught-free environment permitting an adequate supply of air and removal of smoke from the area of the apparatus.

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**Key**

- X test rig width at least test specimen width
- Y test rig length at least test specimen length
- 1 mesh made from wire approximately 2 mm in diameter

**Figure 1 — Test rig assembly**

**7.2 Test enclosure**

The test enclosure shall consist of either a room with a volume greater than  $20 \text{ m}^3$  (which contains adequate oxygen for testing) or a smaller enclosure with a through flow of air. Inlet and extraction systems providing an air speed rate of less than  $0,2 \text{ m/s}$  in the locality of the rig provide adequate oxygen without disturbing the burning behaviour.

**7.3 Clock**

The clock shall be capable of measuring to at least 1 h with an accuracy of 1 s.

## 7.4 Ignition source: smouldering cigarette

An un-tipped cylindrical cigarette complying with the following requirements shall be used:

- length:  $(68 \pm 2)$  mm;
- diameter:  $(8 \pm 0,5)$  mm;
- mass:  $(0,85 \pm 0,15)$  g.

The smouldering rate shall be  $(7,5 \pm 2)$  min/40 mm, when tested as follows.

Mark the cigarette, conditioned as described in 8.1 at 10 mm and 50 mm from the end to be lit. Light it as described in 10.2.1 and impale it horizontally in air (air speed rate less than 0,2 m/s) on a horizontal wire spike inserted not more than 13 mm into the unlit end.

Record the time taken to smoulder from the 10 mm to the 50 mm mark.

The smouldering rate shall be measured on one cigarette from a batch of 20 cigarettes. The smouldering rate may be measured on two cigarettes at the same time. The distance between cigarettes and between each cigarette and any nearby surface such as the wall or floor of the test enclosure shall be at least 150 mm.

If the cigarette ceases smouldering before reaching the 50 mm mark, the measurement of smouldering rate shall be repeated.

## 8 Atmospheres for conditioning and testing

### 8.1 Conditioning

The materials to be tested and the cigarettes shall be conditioned for at least 24 h immediately before the tests in the following atmosphere:

- temperature:  $(23 \pm 2)$  °C;
- relative humidity:  $(50 \pm 5)$  %.

### 8.2 Testing

The test shall be carried out in an atmosphere having a temperature between 10 °C and 30 °C and a relative humidity between 15 % and 80 %.

## 9 Test specimen

### 9.1 General

The test assembly materials shall be representative of the components and make-up of the finished mattress, mattress pad or upholstered bed base.

### 9.2 Small scale

For small scale tests, the test specimen shall be rectangular in shape and have a minimum size of 450 mm × 450 mm × nominal thickness of the finished mattress, mattress pad or upholstered bed base.

The type of proposed edge finishing system shall be incorporated, e.g. plain, piped or taped edge.

Representative tension shall be maintained in the cover. The proposed mattress, mattress pad or upholstered bed base finish shall be represented in the specimen, e.g. tufted or quilted.

NOTE Representative tension can be maintained in the cover by means of suitable clips if the section is produced by cutting.

### 9.3 Full size

For full size tests 1:1, the actual product shall form the test specimen.

## 10 Test procedure

### 10.1 Preparation

**10.1.1** The application of the ignition source can be within 20 min of removing the test materials from the conditioning atmosphere (8.1). If there is a significant distance between the conditioning room and the room where testing is carried out, the materials can be protected against de-conditioning during transfer between rooms. If possible, the assembly can be prepared inside the conditioning room.

**10.1.2** Ensure that means of extinguishing are close to hand (see 6.3).

**10.1.3** For a small scale test, place the test specimen in the test rig (see 7.1).

For full size tests:

- upholstered bed bases are tested on a horizontal surface (feet of the bed bases may have to be fitted if they exist on the actual product);
- mattresses or mattress pads are tested on a horizontal surface.

### 10.2 Ignition source application

**10.2.1** Within 20 min of removing the materials from the conditioning atmosphere, light two cigarettes and draw air through it until the tip glows brightly. Not less than 5 mm and not more than 8 mm of the cigarette shall be consumed in this operation.

**10.2.2** Position the smouldering cigarettes in position on a flat portion of the upper surface of the test specimen so that the cigarette is not less than 50 mm from the nearest edge or marks left by any previous tests, and simultaneously start the clock. Where the test specimen has a piped or taped-edge finish, or is quilted or tufted, position two cigarettes on each feature such as on the taped-edge, in the groove of the quilt-line and on the tufts.

**10.2.3** Observe the progress of combustion and record any evidence of progressive smouldering ignition [see 4.1 a), b), c) or d)] or flaming ignition (see 4.2) of the test specimen.

**NOTE** The detection of smouldering can be difficult and is eased by watching for smoke emerging at points at a distance from the cigarette. Smoke is most easily viewed by looking down a rising column by means of a mirror.

**10.2.4** If progressive smouldering ignition or flaming ignition of the test specimen is observed, extinguish the test specimen and record this, together with the time elapsed between placing and extinguishing. In these circumstances discontinue testing and complete the test report (see Clause 11).

If progressive smouldering ignition or flaming ignition of the test specimen is not observed and the cigarette smoulders its complete length, record this and carry out the final examination (see 10.3).

If one of the cigarettes fail to smoulder its complete length, record this and repeat the test with a new cigarette placed in a fresh position not less than 50 mm from any previous test damage.

If the progressive smouldering ignition or flaming ignition of the test specimen is observed in this repeat test, extinguish the test specimen and record this, together with the time elapsed between placing and extinguishing. In these circumstances discontinue testing and complete the test report (see Clause 11).