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**Wheelchairs — Resistance to ignition  
of non-integrated seat and back  
support cushions —**

**Part 10:  
Requirements and test methods**

*Fauteuils roulants — Résistance à l'inflammation des coussins de  
sièges et de dossiers non intégrés —*

*Partie 10: Exigences et méthodes d'essai*



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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 documents 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)).

Attention is drawn to the possibility that some of the elements of this document can be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/TC 173, *Assistive products for persons with disability*, Subcommittee SC 1, *Wheelchairs*.

ISO 16840 consists of the following parts, under the general title *Wheelchairs — Resistance to ignition of non-integrated seat and back support cushions*:

- *Part 1: Vocabulary, reference axis convention and measures for body segments, posture and postural support surfaces*
- *Part 2: Determination of physical and mechanical characteristics of devices intended to manage tissue integrity — Seat cushions*
- *Part 3: Determination of static, impact and repetitive load strengths for postural support devices*
- *Part 4: Seating systems for use in motor vehicles*
- *Part 6: Simulated use and determination of the changes in properties — Seat cushions*
- *Part 10: Resistance to ignition of non-integrated seat and back support cushions — Requirements and test methods*
- *Part 11: Determination of perspiration dissipation characteristics of seat cushions intended to manage tissue integrity [Technical Specification]*

The following parts are under preparation:

- *Part 9: Clinical interface pressure mapping guidelines for seating [Technical Report]*
- *Part 12: Apparatus and method for cushion envelopment testing*

## Introduction

The ignition and subsequent burning of wheelchairs is very rare, but can occur as a result of

- being close to a burning object such as a fire beside the wheelchair,
- overheating of any electrical or electronic device on the wheelchair, and
- contact from sparks or flames (such as welding sparks, cigarettes, or matches).

Wheelchair occupants are at particular risk of injury or death from these fires and resulting fumes because they may not have the ability to move away from the wheelchair.

Wheelchairs can be considered to be comprised of the following components:

- a) structural components such as the frame, wheels, etc. which are essential to the mechanical integrity of the wheelchair;
- b) postural support devices, such as sling seats, sling back supports, arm supports, foot supports, etc., which are attached to the wheelchair and are primarily intended to give postural support to the wheelchair occupant (these can also be intended to aid in pressure redistribution);
- c) devices to manage tissue integrity, such as seat and back support cushions which are intended to have primarily a clinical function to minimize the risks of skin damage (these can also be intended to control or accommodate posture);
- d) power-related components such as motors, energy sources, controllers etc., which are required for the functioning of powered devices on wheelchairs.

Each of the above components has a different severity of risk associated with its likelihood of igniting and its resulting harm to the wheelchair occupant. ISO standards have been published or are in preparation to specify requirements and test methods for the above categories of components to help manufacturers and purchasers of wheelchairs to design and procure wheelchairs and their components which are appropriate for the risk of ignition balanced against the functional needs of the wheelchair occupant. The aim of these ISO standards is to provide appropriate alternatives to using furniture-based flammability standards, to reflect the uses and purposes of wheelchairs and their accessories.

The development of an ISO standard on the resistance to ignition of structural components [see list item a) above] has not yet commenced. The most likely sources of ignition are proximity to a heat source such as an electric radiator or domestic fire or a heat source such as a lighted match or cigarette falling onto the structure.

ISO 7176-16 is primarily concerned with the resistance to ignition of postural support device components of a wheelchair [see list item b) above]. These typically include arm supports, sling seats, sling back supports, lower leg supports, foot supports, lateral supports, head supports, etc. The most likely source of ignition is an open flame source falling onto the component's surface or into gaps between surfaces. Consequently that standard is written around resistance to a heat source equivalent to a lighted match in contact with a test sample of an assembly of the upholstered part's composite materials in both a vertical and horizontal orientation.

The power related components [see list item d) above] are the subject of ISO 7176-14 which specifies requirements to prevent overheating in electrical components that could lead to a fire.

The tissue integrity devices [see list item c) above] are the subject of this part of ISO 16840, and permit a less stringent resistance to ignition than in ISO 7176-16, based upon the priority of these components for their clinical function, which might override the need for a high resistance to ignitability.

The requirements of this part of ISO 16840 have been set at a basic minimum level and are less severe than mandatory requirements in some countries. This part of ISO 16840 has been produced to allow for the use of materials that would not meet the requirements of ISO 7176-16, but the manufacturer is required to make the case as to why ISO 7176-16 could not be employed. Good practice is also to use

materials which minimize the risk of release of toxic substances as a result of ignition. Materials chosen are to comply also with biocompatibility requirements (ISO 10993-1 and ISO 10993-10).

The day to day usage of a wheelchair may affect its materials' resistance to ignition through cyclic loading, movement of materials, washing, cleaning, etc. Manufacturers will often take this effect into account as part of their risk assessment when selecting materials for their products to minimize the effects of this normal use. However, although this part of ISO 16840 can be used on parts that have been used, etc., the test samples specify new or unused parts.

Different environments commonly encountered by some wheelchair occupants may also affect the flammability of materials. For example, home oxygen systems, delivery systems for drugs carried in an inflammable medium, etc., can turn an inert material into a flammable one. Dust and other materials accumulated within the chair have also been found to be a source of readily ignitable material. Wheelchair manufacturers and occupants should be aware of these risks, and design and use wheelchairs accordingly as covered by ISO 14971.

This part of ISO 16840 describes testing an assembly of the composite of materials as used in the wheelchair component, because the resistance to ignition of these materials individually can be quite different from those when assembled as a composite. Hence, the results of this part of ISO 16840 do not give any indication of the resistance to ignition of any of the separate individual materials of the test sample.

# Wheelchairs — Resistance to ignition of non-integrated seat and back support cushions —

## Part 10: Requirements and test methods

### 1 Scope

This part of ISO 16840 specifies requirements and test methods to assess the resistance to ignition by smouldering cigarette equivalent of non-integrated components of a wheelchair intended to protect tissue integrity.

The test measures only the resistance to ignition by smouldering cigarette equivalent of the items tested and not the ignitability of the complete wheelchair. It gives an indication, but cannot guarantee, the ignition behaviour of the assembled non-integrated devices of a complete wheelchair.

This part of ISO 16840 does not apply to resistance to ignition of structural parts of a wheelchair, nor does it cover postural support devices. This part of ISO 16840 does not cover changes in resistance to ignition as a result of regular washing or use.

This part of ISO 16840 allows for the separate testing of removable non-integrated components of a wheelchair which are normally used in the horizontal plane (e.g. a seat cushion) from those normally used in the vertical plane (e.g. a back support).

This part of ISO 16840 describes testing an assembly of the composite of materials as used in the removable non-integrated component. The results of this part of ISO 16840 do not give any indication of the resistance to ignition of any of the separate individual materials of the test sample.

NOTE 1 The intent of this part of ISO 16840 is primarily to cover removable cushions whose described purpose is that of protecting skin tissue against pressure, shear, and maceration related damage.

NOTE 2 The requirements of this part of ISO 16840 have been set at a basic minimal level and are less severe than mandatory requirements in some countries.

Where practical, it is advisable that manufacturers use materials with superior resistance to ignition. The manufacturer is required to make the case as to why ISO 7176-16 could not be employed rather than this part of ISO 16840.

NOTE 3 Requirements for the control of risks from sources of fire created by electrical and electronic components are included in ISO 7176-14

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14971, *Medical devices — Application of risk management to medical devices*

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

EN 1021-1:2006, *Furniture — Assessment of the ignitability of upholstered furniture — Part 1: Ignition source smouldering cigarette*