INTERNATIONAL STANDARD

ISO 16840-3

Second edition
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Corrected version
2015-09-01

Wheelchair seating —

Part 3: Determination of static, impact and repetitive load strengths for postural support devices

Sièges de fauteuils roulants —

Partie 3: Détermination des efforts statiques, d'impact et cycliques pour les dispositifs de maintien de la posture

Reference number
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Foreword

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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).

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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*.

This second edition cancels and replaces the first edition (ISO 16840-3:2006), which has been technically revised.

ISO 16840 consists of the following parts, under the general title *Wheelchair seating*:

— *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*

This corrected version of ISO 16840-3:2014 incorporates the following correction:

— 4.6 d) has been clarified.

Introduction

Postural support devices (PSD), constructed as additional components to wheelchair seating or as wheelchair seating in its own right, are widely available and used extensively by people with disabilities. The selection or prescription of the most appropriate PSD is intended to be, where appropriate, partially dependent on knowledge of its ability to withstand static, impact, and repeated loads. This part of ISO 16840 is intended to specify test methods to provide this information.

The tests involve mounting the PSD on rigid test fixtures to simulate mounting on a wheelchair. Rigid test fixtures are utilized to provide a worst-case situation, which is repeatable and avoids destroying multiple wheelchairs during testing. Static, impact, and repeated loads are then applied to simulate normal usage. In some of the defined tests, performance criteria have been established. In others, no minimum requirements are currently specified. Tests are repeated at increasing forces or torques until one or more performance limits are reached. Repetitive load tests with a specific load or torque application are intended to induce fatigue-related performance limits.

Tests represented in this part of ISO 16840 were derived from ISO 7176-8. Many of the test principles and much of the test equipment are the same for this part of ISO 16840 and ISO 7176-8.

It is anticipated that parts of this part of ISO 16840 will continue to be developed and that future revisions can include the results of ongoing work in the following areas:

— further development of the test forces based on clinical data is necessary in order to determine actual impact, static, and repetitive forces that PSDs are subjected to;

— further work for the collection of data on the most common failures experienced in actual use of PSDs is ongoing.

Wheelchair seating —

Part 3:
Determination of static, impact and repetitive load strengths for postural support devices

1 Scope

This part of ISO 16840 specifies test methods for the determination of static, impact, and repetitive load strengths as well as disclosure requirements for postural support devices (PSD) with associated attachment hardware intended for use with an undefined wheelchair.

This part of ISO 16840 does not apply to the strength of PSDs under crash conditions in a motor vehicle.

This part of ISO 16840 does not apply to PSDs that are designed to fail under certain static, dynamic, or repetitive loads.

NOTE 1 ISO 16840-4 provides test methods and requirements for some PSDs when used as part of a wheelchair seat in a motor vehicle.

NOTE 2 Performance criteria have been established in some of the defined tests. In others, no minimum requirements are currently specified.

NOTE 3 For masses greater than 150 kg or less than 25 kg, appropriate extrapolation of test apparatus dimensions, mounting point separation, etc. are permitted.

NOTE 4 Rigid surrogate test fixtures are utilized to provide a worst-case situation, and consequently this part of ISO 16840 does not test a PSD on a particular wheelchair.

NOTE 5 If one PSD achieves a higher loading at the point of failure than another, it does not necessarily mean that it is better or worse. The type of failure and flexibility of the PSD can be considered as well. The maximum offset distance to the centre of the PSD from the adjacent attachment point can also be considered.

2 Normative references

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

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

ISO 898-7, *Mechanical properties of fasteners — Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm*

ISO 7176-8:1998, *Wheelchairs — Part 8: Requirements and test methods for static, impact and fatigue strengths*

ISO 7176-15, *Wheelchairs — Part 15: Requirements for information disclosure, documentation and labelling*

ISO 7176-26:2007, *Wheelchairs — Part 26: Vocabulary*

ISO 16840-2, *Wheelchair seating — Part 2: Determination of physical and mechanical characteristics of devices intended to manage tissue integrity — Seat cushions*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 7176-26 and the following apply.

3.1
elastic attachment hardware
hardware that allows a PSD to move when a force is applied and returns to its original position when the force is removed

EXAMPLE A PSD designed with a spring that allows movement.

3.2
deformable support surface
support surface which conforms to the shape of the body part being supported

Note 1 to entry: The surface might or might not return to its original shape but remains conformable over time.

EXAMPLE Foam or fluid seat supports are examples of deformable support surfaces.

3.3
passive support surface
PSD that moves with minimal resistance to follow the body part being supported

Note 1 to entry: Passive support surfaces do not necessarily move back to a specific position.

EXAMPLE A mobile arm support is a passive support surface that allows movement with minimal resistance.

3.4
active support surface
PSD that is powered to change its position or support surface shape

EXAMPLE An alternating pressure seat support or an electronically operated back support surface that reclines.

3.5
continuous lateral support
support surface which has a depth that projects a minimum of 75 mm as measured perpendicular to its uncompressed adjacent support surface and has an angle between the adjacent support surface and the lateral support which is less than or equal to 120°

Note 1 to entry: See Figure 1.

Note 2 to entry: Figure 2 shows a support with a contoured surface that is not considered to be a lateral support.

Note 3 to entry: If there are difficulties in establishing the location of the adjacent support surface, use the reference planes as specified in ISO 7176-26.

Dimensions in millimetres

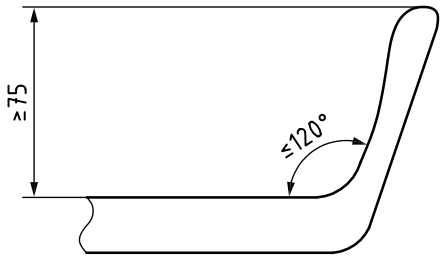


Figure 1 — Cross section of a support surface with continuous lateral support

Dimensions in millimetres

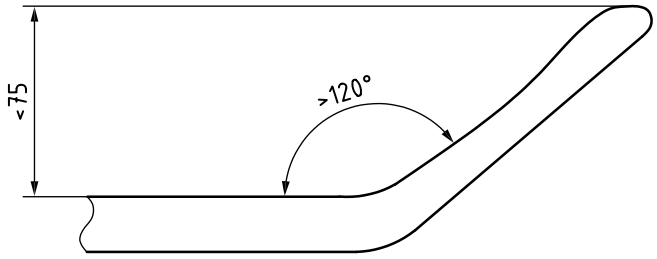


Figure 2 — Cross section of a support surface with a contour not considered a lateral support

3.6
discontinuous lateral support
lateral support which is separate from the adjacent support surface

Note 1 to entry: See Figure 3.

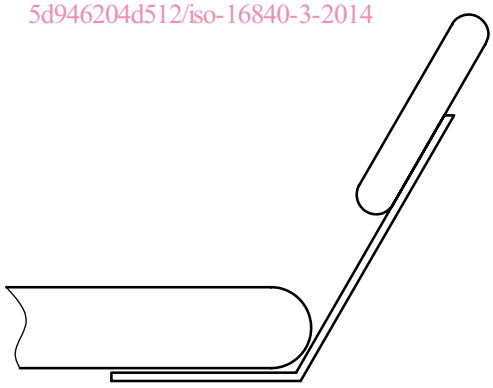


Figure 3 — Example of a lateral support discontinuous with the adjacent support surface

3.7
pivot axis
axis about which a pivoted arm rotates

3.8
mounting point
intended attachment point or points of any PSD

4 Test apparatus

4.1 Rigid test fixtures, fixtures used for securing or positioning PSDs during testing, as specified below. The fixtures shall be rigid when subjected to the forces required in Clauses 7, 8, and 9 for the user mass specified by the manufacturer of the PSD.

4.1.1 Adjustable rigid test frame, for simulating a wheelchair frame, typically used to attach the sling seat or sling back, which allows the full range of angle adjustment of PSD attachment hardware.

NOTE The testing of one piece shells with a combination of two rigid frames can be used.

The outside dimensions between the adjustable rigid components of the test frame should be adjustable from 280 mm ± 30 mm to 580 mm ± 30 mm. An informative example of an adjustable rigid test frame is shown in Figure 4.

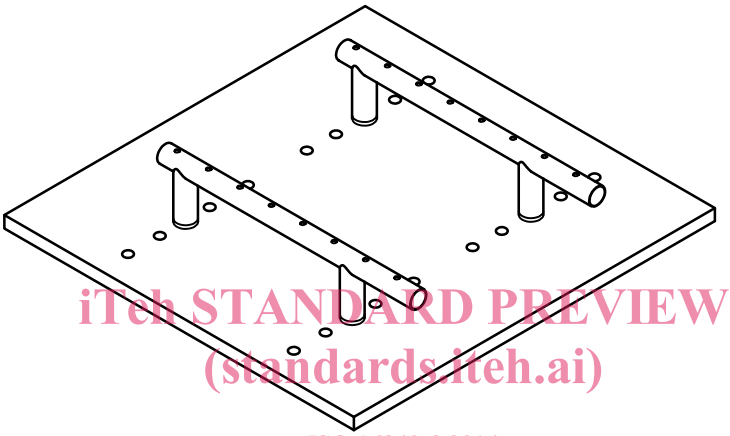
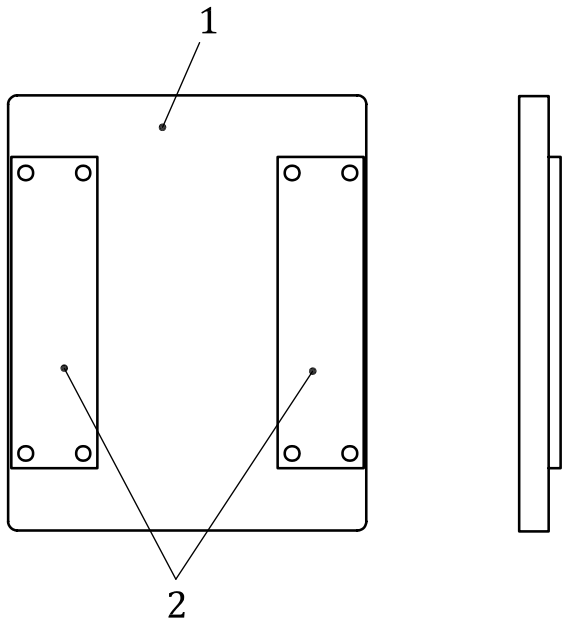


Figure 4 — Example of an adjustable rigid test frame

4.1.2 Rigid surrogate support surface, for PSDs intended for use with a rigid support surface and where a support surface is not supplied, a surrogate rigid support surface will be required. An example is shown in Figure 5.

Holes can be drilled or other modifications made to accommodate the mounting of a variety of attachment hardware.



Key

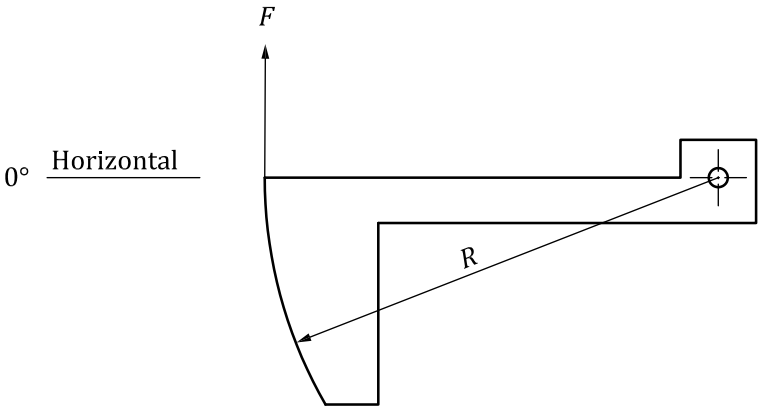
1 plywood

2 steel

Figure 5 — Example of rigid surrogate support surface for testing attachment hardware

4.1.3 Pivoting test frame, for applying a torque [of up to 50 Nm (±3 %) for a duration of no less than 5 s applied at a rate not to exceed 50 Nm (±3 %) per second] to a loading pad in order to simulate forward leaning of a seated user of postural support devices.

EXAMPLE An informative example of a pivoting test frame is shown in Figures 6 and 7.



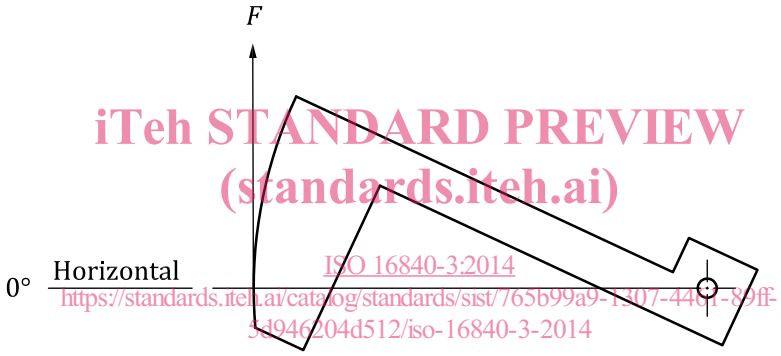


Figure 6 — Example of a pivoting test frame