

AS/NZS ISO 16840.12:2024
ISO 16840-12:2021



Australian/New Zealand Standard™

Wheelchair seating

Part 12: Envelopment and immersion characterization of seat cushions using a dual semispherical indenter



AS/NZS ISO 16840.12:2024

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee ME-067, Assistive Technology. It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on 08 January 2024 and by the New Zealand Standards Approval Board on 01 November 2023.

This Standard was published on 9 February 2024.

The following are represented on Committee ME-067:

- Assistive Technology Suppliers Australia
- Assistive Technology Suppliers New Zealand
- Australian Nursing and Midwifery Federation
- Australian Rehabilitation & Assistive Technology Association
- East Metropolitan Health Service — WA Health
- Medical Aids Subsidy Scheme Queensland Health
- Medifab
- National Disability Insurance Agency (Australia)
- Novitatech Children's Services (Australia)
- Occupational Therapy Australia

This Standard was issued in draft form for comment as DR AS/NZS ISO 16840.12:2023.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

www.standards.govt.nz

ISBN 978 1 76139 496 6

Australian/New Zealand Standard™

Wheelchair seating

Part 12: Envelopment and immersion characterization of seat cushions using a dual semispherical indenter

Originated as SA/SNZ TS ISO 16840.12:2015.
Second edition 2024.

COPYRIGHT

© ISO 2024 — All rights reserved

© Standards Australia Limited/the Crown in right of New Zealand, administered by the New Zealand Standards Executive 2024

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth) or the Copyright Act 1994 (New Zealand).

Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-067, Assistive Technology, to supersede SA/SNZ TS ISO 16840.12:2015, *Wheelchair seating, Part 12: Apparatus and method for cushion envelopment testing*.

The objective of this document is to specify apparatus, test methods, and disclosure requirements for characterization of wheelchair seat cushion immersion and envelopment properties using indenters instrumented with pressure sensors.

This document expands the characterization of products intended to manage tissue integrity (ISO 16840-2) and provides a standardized indenter for other wheelchair seating tests.

It does not provide information specific to cushion performance for a particular individual user, nor is it intended to characterize envelopment or immersion under higher loading conditions, nor to assess the weight capacity of a cushion.

This document includes a method that is specific to 220 mm and 255 mm indenters. Dimensions are provided for a 380 mm indenter to allow for extension of the method to larger patient simulation.

This document is identical with, and has been reproduced from, ISO 16840-12:2021, *Wheelchair seating — Part 12: Envelopment and immersion characterization of seat cushions using a dual semispherical indenter*.

As this document has been reproduced from an international document, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

Contents

Preface	ii
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Indenter construction	2
4.1 Materials	2
4.2 Tolerances and finishes	2
4.3 Indenter elements	2
4.3.1 Trochanter bar	2
4.3.2 Trochanter blocks	3
4.3.3 Semispherical indenter half	4
4.4 Indenter assembly	5
4.5 Sensor locations	6
4.5.1 General	6
4.5.2 Elevation a	7
4.5.3 Elevation b	7
4.5.4 Elevation c	7
4.5.5 Elevation d	7
5 Instrumentation hardware	8
5.1 Sensors	8
5.2 Timer	8
5.3 Loading equipment	8
5.4 Rigid board	8
6 Preparation of test cushion	8
6.1 Cushion set up	8
6.2 Preconditioning the cushion to the test environment	9
7 Envelopment test method	9
7.1 Rationale	9
7.2 Method	9
7.2.1 Setting the datum height for the indenter	9
7.2.2 Pre-conditioning the cushion	9
7.2.3 Seat cushion thickness measurement	9
7.2.4 Load application and data collection	10
7.3 Calculations	11
7.3.1 Envelopment	11
7.3.2 Immersion	12
8 Test report	12
Annex A (informative) Estimate of measurement uncertainty	14
Bibliography	15

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).

Attention is drawn to the possibility that some of the elements of this document may 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).

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

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.

This document was prepared by Technical Committee ISO/TC 173, *Assistive products*, Subcommittee SC 1, *Wheelchairs*.

This first edition of ISO 16840-12 cancels and replaces ISO/TS 16840-12:2015, which has been technically revised.

The main changes are as follows:

- clarification of technical ambiguities;
- the removal of a gel cap to protect the pressure sensors;
- removal of former Annex A (which addressed method adaptations for cushions that utilize offloading);
- addition of a new [Annex A](#) giving guidance on the estimation of uncertainty.

A list of all parts in the ISO 16840 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.

Introduction

This document provides details of test equipment (an ‘indenter’), and a method, for the measurement of ‘performance’ of a wheelchair cushion intended to use immersion and envelopment to reduce local areas of pressure (by effectively supporting more tissue). Envelopment is maximized when the contact area between the support surface and the body part increases which thereby reduces the pressure across the weight bearing surface. The method as presented in this document is intended to quantify envelopment and immersion of the body by the cushion. Alternatively, the test method and resulting data can provide an indication of other cushion construction and seating and positioning strategies, such as strategic pressure offloading.

Issues related to the use of devices that measure interface pressure between the body and a support surface (e.g. a pressure mapping system) have led to the use of an instrumented indenter, which has fewer sensors, but sensors that are high quality and exhibit repeatability and accuracy and thus reliability.

In this test, the distribution of pressure across the surface of the indenter is evaluated with multiple indenter sizes and loads. The pressure sensors within the indenter are positioned at multiple elevations along the buttock form, to simulate and record the pressures experienced at the ischial tuberosities of the pelvis, the greater trochanters, and at positions along the curve of the buttocks between those anatomical markers. The review of the values at these various positions, and the variation, or lack of variation, in the readings, is an indication of the mechanics of the cushion’s interaction with the body and ability to envelop and protect the tissues.

EXAMPLE A fluid filled cushion with the ability to transfer material between cells can have the potential to distribute the load to maintain consistent interface pressure regardless of the depth at which the measurement is taken, as opposed to a foam or other homogeneous surface that behaves more like a spring, in that the greater the depth of immersion, the greater the interface pressure.

The accommodation of the cushion to the changes in indenter size and load are representative of the changes in size and mass of the occupant that can occur in the life of a user or between different users. The indenters are sized to represent changes in size and shape as a user of an approximately 410 mm width cushion gains weight, and the size of the buttocks increases. The overall width of the indenters stays the same, but the size of the semi spheres changes. The loads used in this document are approximate to the 50th percentile user and are not intended to characterize envelopment or immersion under higher loading conditions, nor to assess the weight capacity of a cushion.

This document describes test methods that might not be appropriate for all cushions, and therefore the tester is responsible for determining which, if any, are appropriate for their cushion construction and use.

NOTES