AS/NZS ISO 7176.14:2013
ISO 7176-14:2008

AS/NZS ISO 7176.14:2013

Australian/New Zealand Standard™

Wheelchairs

Part 14: Power and control systems for electrically powered wheelchairs and scooters—Requirements and test methods

STANDARDS Australia

STANDARDS NEW ZEALAND
PAEREWA AOTEAROA

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee ME-067, Assistive Technology Products for Persons with Disability. It was approved on behalf of the Council of Standards Australia on 23 July 2013 and on behalf of the Council of Standards New Zealand on 5 August 2013.
This Standard was published on 30 August 2013.

The following are represented on Committee ME-067:

Assistive Technology Suppliers Australia
Association of Consultants in Access Australia
Australian Rehabilitation on Assistive Technology
Bus and Coach Association of New Zealand
Consumer Federation Australia
Department of Family and Communities (SA)
Engineers Australia
Independent Living Centres Australia
Medical Aids Subsidy Scheme
New Zealand Transport Agency
Novita Children's Services
Occupational Therapy Australia
Physical Disability Australia
Queensland Health
Royal Perth Hospital
TAD Australia
The Commercial Vehicle Industry Association of Australia
Therapeutic Goods Administration

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.saiglobal.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS ISO 7176.14.

Australian/New Zealand Standard™

Wheelchairs

Part 14: Power and control systems for electrically powered wheelchairs and scooters—Requirements and test methods

Originated in Australia as AS 3696.14(Int)—1991.
Jointly revised and designated as AS/NZS 3696.14:1998.
Jointly revised and redesignated as AS/NZS ISO 7176.14:2013.

COPYRIGHT

© Standards Australia Limited/Standards New Zealand

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 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, Private Bag 2439, Wellington 6140.

ISBN 978 1 74342 562 6

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-067, Assistive Technology Products for Persons with Disability, to supersede AS/NZS 3696.14:1998, *Wheelchairs*, Part 14: *Power and control systems for electric wheelchairs—Requirements and test methods*.

The objective of this Standard is to specify requirements and associated test methods for the power and control systems of electrically powered wheelchairs and scooters. It sets safety and performance requirements that apply during normal use and some conditions of abuse and failure. It also specifies methods of measurement of the forces necessary to operate controls and sets limits on the forces needed for some operations.

This Standard is identical with, and has been reproduced from ISO 7176-14:2008, *Wheelchairs*, Part 14: *Power and control systems for electrically powered wheelchairs and scooters—Requirements and test methods*.

As this Standard is reproduced from an International Standard, the following applies:

(a) In the source text 'this part of ISO 7176' should read 'this Australian/New Zealand Standard'.

(b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard		*Australian/New Zealand Standard*	
ISO		AS	
3287	Powered industrial trucks—Symbols for operator controls and other displays	2359	Powered industrial trucks
		2359.5	Part 5: Symbols for operator controls and other displays
		AS/NZS	
7176	Wheelchairs	3696	Wheelchairs
7176-3	Part 3: Determination of effectiveness of brakes	3696.3	Part 3: Determination of effectiveness of brakes
7176-13	Part 13: Determination of coefficient of friction of test surfaces	3696.13	Part 13: Determination of coefficient of friction of test surfaces
7176-22	Part 22: Set-up procedures	3696.22	Part 22: Set-up procedures
		AS/NZS ISO	
		7176	Wheelchairs
7176-9	Part 9: Climatic tests for electric wheelchairs	7176.9	Part 9: Climatic tests for electric wheelchairs
7176-11	Part 11: Test dummies	7176.11	Part 11: Test dummies
7176-26	Part 26: Vocabulary	7176.26	Part 26: Vocabulary
EN		AS EN	
12182	Technical aids for disabled persons—General requirements and test methods	12182	Technical aids for disabled persons—General requirements and test methods
IEC		AS	
60529	Degrees of protection provided by enclosures (IP Code)	60529	Degrees of protection provided by enclosures (IP Code)

Only international references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

CONTENTS

1 Scope ... 1
2 Normative references ... 1
3 Terms and definitions ... 2
4 Apparatus ... 5
5 Preparation of test wheelchair ... 8
5.1 Wheelchair set-up ... 8
5.2 Loading the wheelchair ... 8
5.3 Wheelchair attributes ... 8
5.4 Wheelchair documentation ... 8
5.5 Preparation records ... 9
6 Guidance for tests ... 9
6.1 Test order ... 9
6.2 Batteries ... 9
6.3 Test conditions ... 9
7 Single fault safety ... 9
7.1 Single fault conditions ... 9
7.2 Controller command signal processing failure ... 10
7.3 Controller output device failure ... 12
7.4 Ability to stop when power is removed ... 15
8 Design ... 17
8.1 On/off switch ... 17
8.2 Current consumption while switched off ... 17
8.3 Control signal at switch on ... 18
8.4 Safe operation as the battery set becomes depleted ... 18
8.5 Over-discharge protection ... 20
8.6 Controller over-voltage protection ... 21
8.7 Switch-off while driving ... 22
8.8 Measuring devices ... 22
8.9 Drive inhibit during charging ... 23
8.10 Charging connection voltage drop ... 23
8.11 Non-powered mobility ... 24
8.12 Brakes ... 26
8.13 Battery enclosures ... 27
8.14 Symbols ... 28
8.15 Safety of moving parts ... 28
8.16 Use in combination with other devices ... 28
9 Protection against electric shock, burns, fire and explosion ... 28
9.1 Electrical insulation ... 28
9.2 Protection from non-insulated electrical parts ... 29
9.3 Circuit protection ... 29
9.4 Stalled condition protection ... 34
9.5 Surface temperatures ... 36
9.6 Disconnection of battery system ... 37
9.7 Resistance to ignition ... 37

Page

10 Ergonomics **37**
10.1 User interface **37**
10.2 Operating forces **38**
10.3 Display position **40**
10.4 On/off indicator **40**
10.5 Connectors **40**
10.6 Audible noise **40**
10.7 Acoustic warning device **42**

11 Durability **43**
11.1 Control devices **43**
11.2 Switches **44**
11.3 Connectors **44**

12 Electrical connections **44**
12.1 Interchangeability **44**
12.2 Wire routing **45**
12.3 Wire colours **45**
12.4 Intermediate battery connection power drains **45**

13 Environmental **46**
13.1 Substance/liquid ingress (in) **46**
13.2 Leakage of substances (out) **46**
13.3 Electromagnetic compatibility **46**

14 Misuse and abuse **46**
14.1 Reversed polarity at the battery set **46**
14.2 Integrity of enclosures **47**

15 Information provided with the wheelchair related to control systems **48**
15.1 General **48**
15.2 Battery connection and circuit protection diagram **48**
15.3 Operation of wheelchair **48**
15.4 Safety information provided to operators **49**
15.5 Removable parts **49**
15.6 Residual risks **49**

16 Test report **49**

17 Disclosure **50**

Annex A (informative) **Guidance on wheelchair wire sizing and protection** **51**

Bibliography **53**

INTRODUCTION

This part of ISO 7176 specifies some wheelchair tests that are conducted on an inclined test plane. The intention of these tests is not to evaluate the performance of a wheelchair at the maximum gradient on which it is capable of operating. Instead, the objective is to reveal any changes in the wheelchair's behaviour that might occur under fault conditions, and these changes are more readily discovered when it is operated on a slope. For convenience, the inclined test plane has a fixed gradient, representative of those on which the wheelchair might be used.

The range of ambient temperatures under which testing is carried out is limited to allow comparison between the performance of a wheelchair in normal operation and performance when faults are introduced.

AUSTRALIAN/NEW ZEALAND STANDARD

Wheelchairs

Part 14:
Power and control systems for electrically powered wheelchairs and scooters—Requirements and test methods

WARNING — This part of ISO 7176 calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve those carrying out or commissioning the tests from legal obligations relating to health and safety. For tests that could cause the wheelchair to exhibit dangerous behaviour, it is recommended that prior to carrying out those tests, the likely outcome is assessed to establish appropriate arrangements to minimize any risks.

1 Scope

This part of ISO 7176 specifies requirements and associated test methods for the power and control systems of electrically powered wheelchairs and scooters. It sets safety and performance requirements that apply during normal use and some conditions of abuse and failure. It also specifies methods of measurement of the forces necessary to operate controls and sets limits on the forces needed for some operations.

This part of ISO 7176 is applicable to electrically powered wheelchairs and scooters with a maximum speed no greater than 15 km/h intended to provide indoor and/or outdoor mobility for one disabled person whose mass lies in the range specified in ISO 7176-11.

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 3287, *Powered industrial trucks — Symbols for operator controls and other displays*

ISO 7176-3, *Wheelchairs — Part 3: Determination of effectiveness of brakes*

ISO 7176-4, *Wheelchairs — Part 4: Energy consumption of electric wheelchairs and scooters for determination of theoretical distance range*

ISO 7176-6, *Wheelchairs — Part 6: Determination of maximum speed, acceleration and deceleration of electric wheelchairs*

ISO 7176-9, *Wheelchairs — Part 9: Climatic tests for electric wheelchairs*

ISO 7176-11, *Wheelchairs — Part 11: Test dummies*

SO 7176-13, *Wheelchairs — Part 13: Determination of coefficient of friction of test surfaces*

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

COPYRIGHT