BS EN 12184:2014

BSI Standards Publication

Electrically powered wheelchairs, scooters and their chargers — Requirements and test methods

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National foreword

This British Standard is the UK implementation of EN 12184:2014. It supersedes BS EN 12184:2009 which is withdrawn.

Since the drafting of this standard and its subsequent publication, it has come to the UK committee's attention that the needs of children under 22 kg seated in a wheelchair during road transport are out of the scope of the documents referred to in this standard.

The UK committee therefore wishes to bring the following important information to the attention of readers of this standard.

When a child of mass less than 22 kg is to be transported in a road vehicle, it is recommended that they be transferred from their wheelchair to a UNECE Regulation 44 compliant child restraint system, which may provide a more effective occupant restraint system than a vehicle mounted three-point lap and diagonal restraint system. There are child restraint systems available that include additional postural supports to assist in maintaining the position of the child when seated.

The UK committee recognizes that parents or care providers may consider that the best option for their child is to remain in their wheelchair whilst in transport due to the level of posture control and comfort provided by the support surface of the wheelchair. A risk management process may be required, preferably carried out by a multi-disciplined team including, such as, parent, carer and transport provider, supported by a clinical professional involved in the wheelchair prescription process.

The UK participation in its preparation was entrusted by Technical Committee CH/173, Assistive products for persons with disability, to Subcommittee CH/173/1, Wheelchairs.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Electrically powered wheelchairs, scooters and their chargers - Requirements and test methods

Fauteuils roulants électriques, scooters et leurs chargeurs - Exigences et méthodes d'essai

Elektrorollstühle und -mobile und zugehörige Ladegeräte - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 27 December 2013.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

Foreword

This document (EN 12184:2014) has been prepared by Technical Committee CEN/TC 293 “Assistive products for persons with disability”, the secretariat of which is held by SIS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12184:2009, which is to be withdrawn (dow) three years after the date of availability (dav) of this edition. See CEN/TC 293 resolution 493.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Council Directive 93/42/EEC of 14 June 1993 concerning medical devices.

For relationship with the applicable EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Informative Annex G provides details of significant technical changes between this European Standard and the previous editions of 1999, 2006 and 2009.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This is the fourth edition of this European Standard. The first edition was published in 1999, the second in 2006 (withdrawn in 2007) and the third in 2009.

Where this European Standard does not apply to particular wheelchairs, contracting parties should consider whether appropriate parts of this European Standard can be used. Manufacturers might also wish to consider whether appropriate parts of this European Standard can be used to assess the performance of their products against the Essential Requirements of the Council Directive 93/42/EEC of 14 June 1993 concerning medical devices.

This European Standard contains requirements for ergonomic design related to the ease of wheelchair operation.

1 Scope

This European Standard specifies requirements and test methods for electrically powered wheelchairs, including electrically powered scooters with three or more wheels, with a maximum speed not exceeding 15 km/h intended to carry one person of mass not greater than 300 kg.

It also specifies requirements and test methods for battery chargers for wheelchairs and scooters.

This European Standard does not apply in total to:

— electrically powered wheelchairs intended for special purposes, such as sports, showering or toileting,

— manual wheelchairs with handrim-activated power-assisted propulsion,

— custom-made electrically powered wheelchairs,

— electrically powered stand-up wheelchairs,

— manual wheelchairs with add-on power kits used for propulsion, and

— electrically powered office chairs.

NOTE Requirements for manually propelled wheelchairs are specified in EN 12183.

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.

EN 1021-2:2006, *Furniture — Assessment of the ignitability of upholstered furniture — Part 2: Ignition source match flame equivalent*

EN 12182:2012, *Assistive products for persons with disability — General requirements and test methods*

EN 60335-1:2012, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2010, modified)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60601-1:2006, *Medical electrical equipment — Part 1: General requirements for basic safety and essential performance (IEC 60601-1:2005)*

EN 62304:2006, *Medical device software — Software life-cycle processes (IEC 62304:2006)*

EN ISO 14971:2012, *Medical devices — Application of risk management to medical devices (ISO 14971:2007, Corrected version 2007-10-01)*

ISO 7176-1:1999, *Wheelchairs — Part 1: Determination of static stability*

ISO 7176-2:2001, *Wheelchairs — Part 2: Determination of dynamic stability of electric wheelchairs*

ISO 7176-3:2012, *Wheelchairs — Part 3: Determination of effectiveness of brakes*

ISO 7176-4:2008, *Wheelchairs — Part 4: Energy consumption of electric wheelchairs and scooters for determination of theoretical distance range*

ISO 7176-6:2001, *Wheelchairs — Part 6: Determination of maximum speed, acceleration and deceleration of electric wheelchairs*

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

ISO 7176-9:2009, *Wheelchairs — Part 9: Climatic tests for electric wheelchairs*

ISO 7176-10:2008, *Wheelchairs — Part 10: Determination of obstacle-climbing ability of electrically powered wheelchairs*

ISO 7176-11:2012, *Wheelchairs — Part 11: Test dummies*

ISO 7176-13:1989, *Wheelchairs — Part 13: Determination of coefficient of friction of test surfaces*

ISO 7176-14:1997, *Wheelchairs — Part 14: Power and control systems for electric wheelchairs — Requirements and test methods*

NOTE ISO 7176-14:1997 is used only for requirements and test methods for battery chargers.

ISO 7176-14:2008, *Wheelchairs — Part 14: Power and control systems for electrically powered wheelchairs and scooters — Requirements and test methods*

ISO 7176-15:1996, *Wheelchairs — Part 15: Requirements for information disclosure, documentation and labelling*

ISO 7176-19:2008, *Wheelchairs — Part 19: Wheeled mobility devices for use as seats in motor vehicles*

ISO 7176-21:2009, *Wheelchairs — Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and scooters, and battery chargers*

ISO 7176-22:2000, *Wheelchairs — Part 22: Set-up procedures*

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

ISO 8191-2:1988, *Furniture — Assessment of ignitability of upholstered furniture — Part 2: Ignition source: match-flame equivalent*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7176-26:2007 (with the exception of the definition of wheelchair which is replaced by 3.6 below), ISO 7176-14:2008, EN 12182:2012 and the following apply.

3.1
audible warning device
device for making a warning sound or noise

EXAMPLE A horn.

3.2
freewheel device
means for disengaging the parking brake and/or the drive of a wheelchair to allow it to be manoeuvred manually

3.3
loaded wheelchair
wheelchair loaded with a dummy as specified in 4.9 or loaded with a human test occupant

3.4
non-spillable battery
battery from which the electrolyte cannot escape whatever its orientation

3.5
rated slope
maximum slope specified by the manufacturer on which the wheelchair meets the requirements for dynamic stability, static stability, braking performance and slope climbing, traversing and descending

3.6
wheelchair
wheeled personal mobility device incorporating a body support system for a disabled occupant that is propelled by one or more electric motors controlled by the occupant or by an assistant, and that has electronic control of speed and electronic or manual control of direction

Note 1 to entry: Definition is adapted from the definition given in the Global Medical Devices Nomenclature (GMDN).

Note 2 to entry: A disabled occupant is a disabled person or a person not having the full capacity to walk unaided.

Note 3 to entry: The definition includes scooters.

4 Test apparatus

4.1 Adjustable test plane, a flat, rigid plane having an adjustable slope, with a coefficient of friction as specified in ISO 7176-13:1989, of sufficient size to accommodate the wheelchair during the tests specified in 8.1 and 10.2, and such that the whole surface lies between two imaginary parallel planes 5 mm apart per 1 000 mm of extension in any direction and 50 mm apart per 6 000 mm of extension in any direction.

4.2 Horizontal test plane, a flat, rigid plane with a coefficient of friction as specified in ISO 7176-13:1989, of sufficient size to accommodate the wheelchair under test, and such that the whole surface lies between two imaginary horizontal planes 5 mm apart per 1 000 mm of extension in any direction and 50 mm apart per 6 000 mm of extension in any direction.

4.3 Means to apply a force between 25 N and 200 N with an accuracy of ± 5 % and with a rate of application less than 5 N/s.

4.4 Means to measure force with an accuracy of ± 5 % in increments of 1 N in the range of 0 N to 200 N.

4.5 Means to measure speed between 0 km/h and 20 km/h to an accuracy of ± 5 %.

4.6 Means to measure distance in the range of 0 m to 5 m with an accuracy of ± 1 mm or ± 2 %, whichever is the greater.

4.7 Supplementary weights to add to a human test occupant to achieve the maximum occupant mass specified by the manufacturer and to achieve a similar mass distribution to the dummy specified in 4.9.

4.8 Test block, capable of supporting the loaded wheelchair under each of its wheels, with length and width 200 mm ± 10 mm, thickness given in Table 1 'ground unevenness' and corner radii greater than 2,0 mm. For the two large surfaces, the whole of each surface shall lie between two imaginary horizontal planes 1 mm apart. The coefficient of friction shall be as specified in ISO 7176-13:1989.

4.9 Test dummy, of appropriate mass, as specified in ISO 7176-11:2012.

4.10 Means to measure torque with an accuracy of ± 2 % in the range of 0,5 Nm to 10 Nm.

4.11 Means to measure angles to an accuracy of ± 0,1°.

4.12 Means to move a brake lever smoothly for 60 000 cycles at a frequency of not more than 0,5 Hz.

4.13 Means to measure elapsed time in the range 0 s to 30 s with an accuracy of ± 1 s.

5 Type classes

Wheelchairs shall be classified in one or more of the following three classes, dependent upon their intended use:

— Class A: compact, manoeuvrable wheelchairs not necessarily capable of negotiating outdoor obstacles;

— Class B: wheelchairs sufficiently compact and manoeuvrable for some indoor environments and capable of negotiating some outdoor obstacles;

— Class C: wheelchairs, usually large in size, not necessarily intended for indoor use but capable of travelling over longer distances and negotiating outdoor obstacles.

NOTE Scooters are included within the classes above.

6 General requirements

The wheelchair shall conform to the requirements specified in EN 12182 for the following:

— intended performance and technical documentation;

— aids that can be dismantled;

— single-use fasteners;

— biocompatibility and toxicity;

— contaminants and residues;

— infection and microbiological contamination;

— overflow, spillage, leakage and ingress of liquids;

— safety of moving parts;

— prevention of traps for parts of human body;

— folding and adjusting mechanisms;

— surfaces, corners and edges;

— clinical evaluation;

— ergonomics.

A risk analysis shall also be carried out in accordance with EN ISO 14971:2012.

7 Preparation for testing

7.1 General

Unless otherwise specified in Clauses 8, 9, 10, 11 and 12, the wheelchair shall be prepared for testing as specified in ISO 7176-22:2000 with the following modification.

If a test procedure requires the use of a test dummy or human test occupant, they shall be selected and fitted as specified in 7.2 or 7.3.

NOTE This instruction supersedes instructions for loading the wheelchair in the referenced standards.

7.2 Test dummy

Select a test dummy, as specified in ISO 7176-11:2012, of mass equal to the maximum occupant mass specified by the wheelchair manufacturer, with a tolerance of 0 kg to +5 kg.

Fit the test dummy in the wheelchair as specified in ISO 7176-22:2000.

7.3 Human test occupant

Select a human test occupant whose mass, in combination with any supplementary weights as specified in 4.7, is equal to the maximum occupant mass specified by the wheelchair manufacturer, with a tolerance of 0 kg to + 5 kg.

Seat the occupant in the wheelchair and position and secure the supplementary weights to give substantially the same mass distribution as the test dummy when fitted as specified in ISO 7176-22:2000.

WARNING – This testing is potentially hazardous to a human test occupant and other test personnel. Appropriate safety precautions should be taken to avoid injury.

8 Wheelchair performance

8.1 Performance of driving characteristics

8.1.1 General

The loaded wheelchair shall meet the driving performance requirements specified in Table 1 and Table 2 for the type class of the wheelchair as specified in Clause 5.

8.1.2 Ability to climb rated slope

8.1.2.1 Requirements

The wheelchair shall be capable of climbing at a speed not less than 2 km/h:

— the applicable rated slope for the type class of wheelchair specified in Table 1, or

— the rated slope specified by the manufacturer, whichever is greater.

The wheelchair passes the test specified in 8.1.2.2 if it achieves or exceeds a speed of 2 km/h after travelling 5 m up the slope.

8.1.2.2 Test

Adjust the gradient of the adjustable test plane specified in 4.1 to the required angle, ± 0,5°.

Starting on the adjustable test plane, drive the loaded wheelchair up the adjustable test plane using the maximum speed command. Use the means to measure speed specified in 4.5.

When the wheelchair has travelled (5,0 ± 0,1) m up the slope, measure and record the speed to an accuracy of ± 10 %.

8.1.3 Ground unevenness

8.1.3.1 Principle

It is important that a wheelchair is able to drive on uneven terrain without stopping even if one wheel is at a higher level than the others.

8.1.3.2 Requirement

The wheelchair shall be capable of driving when any of its wheels is raised to a height specified in Table 1 for ground unevenness.

8.1.3.3 Test

a) Place the loaded wheelchair on the horizontal test plane.

b) Place the test block specified in 4.8 under one wheel, such that one of its largest faces is flat on the test plane with the centre of the block beneath the point of contact with the wheel.

c) Attempt to drive the loaded wheelchair off the test block.

d) Record the result of the test.

e) Repeat for the remaining wheels, one at a time.

f) The test is passed if the wheelchair is able to drive off the test block for each wheel.

8.1.4 Maximum downhill speed

8.1.4.1 Requirement

The wheelchair shall not exceed 125 % of its maximum speed on the horizontal, when driving down

— the applicable rated slope for the type class of wheelchair specified in Table 1, or

— the rated slope specified by the manufacturer, whichever is greater.

8.1.4.2 Test

a) Drive the loaded wheelchair at maximum speed down a gradient with the required slope, ± 0,5°.

b) Measure the speed achieved using the means specified in 4.5.

c) Record the measured speed and record whether the wheelchair has met the requirement.

8.1.5 Dynamic stability

8.1.5.1 Requirements

The dynamic response score of the wheelchair shall be 2 or 3 as specified in Table A.1 of ISO 7176-2:2001 when tested on

— the applicable rated slope for the type class of wheelchair specified in Table 1, and

— the rated slope specified by the manufacturer.

8.1.5.2 Test

a) Load the wheelchair with the test dummy in accordance with 7.2. Do not use a human test occupant.

b) Test the loaded wheelchair in accordance with ISO 7176-2:2001 with the following modifications:

   1) for tests on slopes the test plane is inclined relative to the horizontal at the angle stated in Table 1 for the type class of the wheelchair;

   2) fixed test ramps or adjustable test ramps may be used;

   3) the test environment specified in Annex F may be used when testing wheelchairs with a maximum speed of 10 km/h or greater, on slopes of 10º or steeper;

   4) if the manufacturer recommends a technique for driving on a slope, test the wheelchair using only the recommended technique; if not, the test methods are unmodified;

   5) apply only the clauses listed below:

      i) for rearwards dynamic stability:

         I) 8.1 Wheelchair preparation;

         II) 8.2 Starting forwards;

         III) 8.3 Stopping after travelling forwards (horizontal only);

         IV) 8.4 Braking when travelling backwards;

      ii) for forward dynamic stability:

         I) 9.1 Wheelchair preparation;

         II) 9.2 Braking when travelling forwards;

      iii) for dynamic stability in lateral directions:

         I) 10.1 Wheelchair preparation;

         II) 10.2 Turning on a slope (does not apply to manually steered wheelchairs).

c) If the rated slope specified by the manufacturer is greater than the applicable rated slope for the type class of wheelchair specified Table 1, repeat b) with the test plane set at the rated slope specified by the manufacturer.

8.1.6 Obstacle climbing and descending

8.1.6.1 Requirements

The wheelchair shall be capable of climbing and descending obstacles of the height specified in Table 1 for the type class of the wheelchair without any part of the wheelchair other than wheels or a kerb climbing device contacting the obstacle or the test plane.

8.1.6.2 Test

Put the wheelchair into the least-stable configuration specified by the manufacturer. If the manufacturer does not specify some or all settings for the least-stable configuration, use settings within the range of adjustment specified in the manufacturer's instructions for use to achieve the least-stable configuration.

Test the wheelchair as specified in ISO 7176-10:2008 for climbing and descending a test obstacle of the height specified in Table 1 for the type class of the wheelchair.

If the manufacturer specifies a method for climbing and descending steps, kerbs or obstacles, test as specified in ISO 7176-10:2008 using only the manufacturer's method. If the manufacturer specifies a run-up distance greater than that specified in ISO 7176-10:2008, limit the run-up distance to the maximum specified in that document.

If the manufacturer of the wheelchair does not specify a method for climbing and descending steps, kerbs or obstacles, test as specified in ISO 7176-10:2008 using the methods specified in that document.

8.1.7 Static stability

8.1.7.1 Requirements

The wheelchair shall meet or exceed the minimum requirements for static stability specified in Table 1 for the type class of the wheelchair.

8.1.7.2 Test

Test the loaded wheelchair in the least-stable configuration for each direction as specified in ISO 7176-1:1999 to determine whether it meets or exceeds the angles in Table 1 for the type class of the wheelchair.

8.1.8 Maximum speed

8.1.8.1 Requirements

The maximum speed of the wheelchair when travelling forwards and travelling in reverse on the horizontal shall not exceed the maximum speed requirements specified in Table 1 for the type class of the wheelchair.

8.1.8.2 Test

Test the loaded wheelchair as specified in ISO 7176-6:2001 for the maximum forward speed and maximum reverse speed on a horizontal surface.

Record the results and determine whether the requirement has been met.

8.1.9 Distance range

8.1.9.1 Requirements

The theoretical continuous driving distance range for the wheelchair shall not be less than the requirement specified in Table 1 for the type class of the wheelchair.

8.1.9.2 Test

Load the wheelchair as specified in ISO 7176-4:2008, except that the mass of the load shall be the maximum occupant mass or 100 kg, whichever is the lower.

Test the loaded wheelchair as specified in ISO 7176-4:2008.

Record the results and determine whether the requirement has been met.

It is recognised the use of shorter test tracks in the range specified by ISO 7176-4:2008 could give smaller values of theoretical distance range. Use of the largest specified track length should be treated as the referee method.

8.2 Static, impact and fatigue strength

8.2.1 Requirements

The wheelchair shall conform to the requirements of ISO 7176-8:1998 with the exception that wheelchairs of Class A are not required to be tested as specified in ISO 7176-8:1998, 10.5, drop test.

Arm supports shall conform to the static loading requirements of ISO 7176-8:1998 in all intended operating positions.

For wheelchairs with a maximum occupant mass greater than 75 kg but not greater than 100 kg, the maximum upward force to be applied to each single push handle shall be (880 ± 26) N.

NOTE This is a correction of an erroneous value stated in Table 8 of ISO 7176-8:1998.

Where the manufacturer specifies a maximum occupant mass greater than 100 kg the forces specified in Table 3 shall apply.

8.2.2 Test

Test the wheelchair in accordance with ISO 7176-8:1998 with modifications as specified in 8.2.1.

8.3 Wheelchairs for use as seats in motor vehicles

If the manufacturer specifies that the intended use of the wheelchair includes use as a seat in a motor vehicle by an occupant of mass 22 kg or greater, the wheelchair shall conform to the performance requirements of ISO 7176-19:2008 with the following modifications.

— *4.1.2 is replaced by the following:*

  If a wheelchair is intended by the manufacturer to also be secured by a docking securement device in public transportation and/or different private vehicles, the securement points on the wheelchair and/or of the wheelchair tiedown adaptors shall conform to the performance requirements in Clause 5.

— *5.2.1 a) is replaced by the following:*

  If the wheelchair has a head restraint, the horizontal excursions of the ATD and the wheelchair, with respect to the impact sled, shall not exceed the limits in Table 7 at any time during the test.

  If the wheelchair does not have a head restraint, the horizontal excursions of the ATD and the wheelchair, with respect to the impact sled, shall not exceed the limits in Table 7 at any time during the test with the exception that the excursion of the back of the head of the ATD, $X_{\text{head, R}}$, shall not be measured.

— *5.2.2 e) is replaced by the following:*

Primary occupant-load-carrying components of the wheelchair shall not show visible signs of failure, unless there is a backup system to provide support.

8.4 Climatic performance

The wheelchair shall conform to the requirements of ISO 7176-9:2009.

NOTE This requirement includes the one stated in ISO 7176-14:2008, 13.1. It is not necessary to duplicate the test.

9 Component properties

9.1 Foot supports, lower leg support assemblies and arm supports

9.1.1 Requirements

The wheelchair shall be fitted with foot supports that have a means of positioning the occupant's feet at the required height and prevent the occupant's feet from sliding backwards.

Any swing away, movable or removable foot support, lower leg support assembly or arm support fitted on the wheelchair shall:

a) incorporate a means to locate it securely in any intended operating position,

b) be adjustable in increments not exceeding 25 mm,

c) be accessible and operable by the occupant or an assistant or both in accordance with the manufacturer's intended use of the wheelchair,

d) be within the reach space shown in Figure 1, and

e) be operable without the use of tools.

NOTE The ability to make adjustments without the use of tools is not required.

Where the wheelchair has separate foot supports which have a gap between them or the possibility of a gap being formed when they are loaded,

f) means to prevent the occupant's feet from sliding into the gap shall be provided, or

g) when the foot supports are tested in accordance with 9.1.2.2, any gap between them shall meet the requirement for safe distances between stationary parts specified in EN 12182.

9.1.2 Test methods

9.1.2.1 Test for general performance

a) Fit foot supports, lower leg support assemblies and arm supports in the operating position(s) specified in the manufacturer's instructions.

b) Adjust the foot supports, lower leg support assemblies and arm supports as specified in the manufacturer's instructions.

c) Record whether the foot supports, lower leg support assemblies and arm supports have met the requirements.

9.1.2.2 Test for foot support gap

a) Simultaneously apply a force $F\ ^{+5}_{0}$ N to the centroid of each foot support, normal to the plane of the unloaded foot support. In cases where the foot support has no identifiable plane, apply the force within 5° of vertical. The force F is calculated from the following equation:

$F = 0{,}125 \times m \times g$

where

F is the force applied to each foot support, expressed in newtons;

m is the maximum occupant mass specified by the manufacturer, expressed in kilograms;

g is the acceleration due to gravity, 9,81 m/s².

b) Apply the force for 5 s to 10 s.

c) While the force is being applied measure the shortest distance between the foot supports.

d) Record whether the foot supports have met the requirements.

9.2 Component mass

If the wheelchair is intended to be dismantled for storage or transportation, any component that requires moving or handling that has a mass greater than 10 kg shall be provided with suitable handling devices (e.g. handles). The manufacturer shall provide information indicating the points where such components can be lifted and describing how they shall be handled during disassembly, lifting, carrying, and assembly to reduce risks to the person or persons moving or handling them.

9.3 Pneumatic tyres

All pneumatic tyres on the wheelchair shall have the same type of valve connection. Valves should be readily accessible when using the intended inflating tool.

The tyres or the rims shall be marked with the maximum pressure in kPa, bar or PSI.

9.4 Anterior pelvic support

The wheelchair shall have provision for an anterior pelvic support to be fitted. The manufacturer of the wheelchair shall have available as an option an anterior pelvic support which can be used with that provision.

NOTE The term 'support' is used in relation to occupant posture, and the term 'restraint' is used in relation to motor vehicle impacts.

9.5 Resistance to ignition

9.5.1 Upholstered composite parts

For upholstered parts which are composites of cover and filling, with or without a support base or interliner, the complete composite shall be tested by the methods specified in EN 1021-2:2006 or ISO 8191-2:1988. Progressive smouldering ignition and flaming ignition as defined in the Standard applied shall not occur.

9.5.2 Foam materials

For foam materials which form all or part of a seat, back support, postural support, arm support or lower leg support and which consist of foam material with or without an integral skin, the material of each part shall be tested with the source applied centrally to the surface intended to support the occupant by the methods specified in EN 1021-2:2006 or ISO 8191-2:1988 (see Figure 2). Progressive smouldering ignition and flaming ignition as defined in the Standard applied shall not occur.

9.5.3 Other parts in contact with the occupant

For sling seats, sling backs, belts, restraint harnesses, foot supports and clothing guards, the material of each item shall be tested with the source applied centrally to the surface intended to contact or support the occupant by the methods specified in EN 1021-2:2006 or ISO 8191-2:1988. Progressive smouldering ignition and flaming ignition as defined in the Standard applied shall not occur.

Belts that are intended for use as restraints in motor vehicles may, as an alternative, meet the requirements of FMVSS 302 or equivalent.

NOTE It is not necessary to test components that are inherently resistant to ignition, e.g. steel frame tube.

9.5.4 Power and control systems

Either of the following options a) or b) shall apply.

a) The manufacturer shall adopt appropriate means to eliminate or reduce as far as reasonably practicable the risk of a hazardous situation developing from the ignition of any part of the power and control system of the wheelchair. The manufacturer shall use the process specified in EN ISO 14971:2012 to manage that risk.

b) The power and control system of the wheelchair shall meet the requirements of ISO 7176-14:2008, 9.7, resistance to ignition.

10 Propulsion and braking systems

10.1 Means for operating brakes

10.1.1 Requirement

a) Means for operating brakes shall:

   1) be accessible and operable by the occupant or an assistant or both in accordance with the manufacturer's intended use of the wheelchair;

   2) be within the reach space shown in Figure 1, if the wheelchair is intended to be operated by the occupant;

   3) be within the reach space shown in Figure 3, if the wheelchair is intended to be operated solely by an assistant;

   4) have operating forces for engaging and disengaging that do not exceed those stated in Table 1 when tested in accordance with 10.1.2;

NOTE The brake lever type shown in Figure 4 has a whole hand operation.

b) If one or more brake levers are fitted to a wheelchair in the form used on bicycles and mopeds:

1) for wheelchairs with a maximum occupant mass not greater than 150 kg, the force applied to each lever to hold the loaded wheelchair stationary on the rated slope shall not exceed 60 N;

2) for wheelchairs with a maximum occupant mass greater than 150 kg, the force applied to each lever to hold the loaded wheelchair stationary on the rated slope should not exceed 60 N;

3) the handgrip width of such brake levers when no force is applied, measured 15 mm from the end of the brake lever, shall not be greater than 100 mm and should not be greater than 80 mm (see Figure 4).

c) Means for releasing parking brakes shall be protected against activation caused by accidental contact.

EXAMPLE A suitable shape and location for the means for disengagement.

10.1.2 Test for determination of brake operating forces

a) Adjust the brakes as specified by the manufacturer.

b) Select the part of the lever through which the force is to be applied as shown in Figure 5.

1) If the lever is fitted with a generally spherical knob, apply the force through the centre of the knob.

2) If the lever is tapered, apply the force through the point where the largest cross section intersects the centre line of the lever.

3) If the lever is parallel or any shape other than those above, apply the force through a point on the centre line of the lever 15 mm from the end.

4) If the form of the lever is such that the lever is gripped by the whole hand apply the force through the centre line of the lever 15 mm from the end.

5) If the brake is operated by pushing or pulling a bar or pad, apply the force to the centroid of the bar or pad.

c) Apply the brakes while measuring the force with the device specified in 4.4 aligned in the direction of travel of the point of application of the force in order to measure the maximum application force required.

d) Release the brakes while measuring the force with the device specified in 4.4 aligned in the direction of travel of the point of application of the force in order to measure the maximum releasing force required.

e) Perform c) and d) three times in total and record the measurements.

f) Calculate and record the arithmetic mean value of the application and the release forces measured separately.

g) Determine whether or not the requirements for operating forces stated in Table 1 have been met.

10.2 Braking functions

10.2.1 Requirements

a) The wheelchair shall have a running brake which operates independently of tyre wear and tyre inflation pressure and which does not exceed the maximum stopping distance specified in Table 2 when tested in accordance with 10.2.2.1.

EXAMPLE Running brake operated by manual brake control or by the control device.

b) The wheelchair shall have a running brake which, when operated after the wheelchair has been put into freewheel mode, shall bring the wheelchair to a stop.

NOTE 1 This requirement could be met by a brake which operates when freewheel mode is ended, if that brake provides the required function. The accessibility requirements in 10.3 would apply. See also NOTE 3.

NOTE 2 The maximum stopping distances of Table 2 do not apply for a running brake operated after the wheelchair has been put into freewheel mode.

c) The wheelchair shall have an automatic brake, which operates independently of tyre wear and tyre inflation pressure and which is operated by releasing the control device to achieve a zero speed command (e.g. spring loaded disc brake).

d) The wheelchair shall have a parking brake which operates independently of tyre wear and tyre inflation pressure (e.g. drum brake in wheels, spring loaded disc brake).

e) Parking brakes shall meet the parking brake effectiveness requirement in Table 1 when tested in accordance with 10.2.2.2.

f) Parking brakes shall be operable when there is no power from the battery supplying the drive system.

g) Parking brakes shall be operable when the wheelchair is in freewheel mode (see NOTE 1).

h) If they are subject to wear, parking brakes shall have provision for adjustment and/or replacement as specified by the manufacturer.

i) If the wheelchair is fitted with arm supports that can be moved or removed to enable transfer, when tested in accordance with 10.2.2.3, engaged parking brakes shall not have parts that protrude above the level of the occupied seat.

j) When parking brakes are tested in accordance with 10.2.2.4, no parking brake mechanism shall move from the pre-set position and no component or assembly of parts shall show visible signs of cracks, breakages, gross deformations, free play, loss of adjustment or any other damage that adversely affects the function of the wheelchair.

k) Following testing of the parking brake in accordance with 10.2.2.4, parking brakes shall meet the parking brake effectiveness requirement in Table 1 when tested again in accordance with 10.2.2.2.

NOTE 3 Braking functions can be combined in one device, for example a spring-loaded disc brake could combine automatic brake and parking brake, and could also act as a running brake when exiting freewheel mode.

NOTE 4 The wheelchair might be subject to national requirements for brakes.

10.2.2 Test methods

10.2.2.1 Test for determination of the effectiveness of running brakes

Perform the tests for normal, reverse command and emergency operation specified in 7.3, 7.4 and 7.5 of ISO 7176-3:2012 using the loaded wheelchair on the horizontal and on the steepest slope specified in ISO 7176-3:2012 less than or equal to the rated slope. The wheelchair fails the requirement if the maximum stopping distance specified in Table 2 of this European Standard is exceeded on the horizontal, or if the wheelchair fails to stop on the test slope.

10.2.2.2 Test for determination of effectiveness of parking brakes

a) Adjust the parking brake in accordance with the manufacturer's instructions without exceeding the operating force requirements stated in Table 1.

b) Test the loaded wheelchair facing uphill in accordance with ISO 7176-3:2012, with the test plane inclined to the horizontal at the applicable angle stated in Table 1 for the type class of the wheelchair or at the rated slope specified by the manufacturer, whichever is greater.

c) Repeat b) with the wheelchair facing downhill.

d) Determine whether the parking brake holds the loaded wheelchair stationary on the slope.

10.2.2.3 Test for protrusion of parts of the parking brakes

a) Engage the parking brake.

b) Move or remove the arm support to enable transfer.

c) Check whether any part of the parking brake protrudes above the level of the occupied seat.

10.2.2.4 Test method for fatigue strength of parking brakes

a) Carry out the test with the parking brake mounted on the wheelchair or mounted on a suitable test fixture that simulates mounting on the wheelchair. If the wheelchair is fitted with two identical brakes (left and right), test only one of the brakes.

b) Adjust the parking brake in accordance with the manufacturer's instructions without exceeding the operating force requirements stated in Table 1.

c) Move the lever operating the brake smoothly from the non-braking position to the braking position for 60 000 cycles at a frequency not greater than 0,5 Hz (4.12). Carry out maintenance during testing only in accordance with the manufacturer's instructions.

d) Inspect the brake mechanism and determine whether it has met the requirement.

e) If a test fixture was used, return the brake mechanism to the wheelchair.

10.3 Freewheel device

The wheelchair shall be fitted with a freewheel device that shall

— be accessible and operable by the occupant or an assistant or both in accordance with the manufacturer's intended use of the wheelchair,

— be within the reach space shown in Figure 1, if the wheelchair is intended to be operated by the occupant,

— be within the reach space shown in Figure 3, if the wheelchair is intended to be operated solely by an assistant;

— have operating forces for engaging and disengaging that do not exceed those stated in Table 1,

— be operable without detaching any parts,

— not depend on the battery power supplying the motor drive system,

— have two defined positions including clear indication of freewheel mode and drive mode,

— prevent use of the wheelchair's drive system, if the freewheel device is activated.

A battery independent from the motor drive battery may be used to supply energy to enable freewheel mode.

NOTE 1 An audible alarm activated when the freewheel device is in operation and deactivated when the drive and braking systems are fully operational would assist the occupant and/or assistant.

NOTE 2 These requirements apply in addition to those concerning non-powered mobility stated in ISO 7176-14:2008.

Freewheel devices shall be protected against activation caused by accidental contact.

EXAMPLE A suitable shape and location for the means for disengagement.

11 Operations

11.1 Operations intended to be carried out by the occupant and/or assistant

Wheelchairs shall be designed to facilitate ease of operation by the occupant and/or assistant as specified in the manufacturer's instructions.

Examples include:

— operation of adjustable seating and adjustment of postural supports,

— use of detachable components, including removable arm supports, lower leg support assemblies, etc., to facilitate safe transfers into and out of the wheelchair,

— use of folding mechanisms, including folding frames, etc., to facilitate storage and transportation of unoccupied wheelchairs,

— carrying out maintenance, including use of tools, etc.,

— use of manual steering controls,

— use of braking systems and freewheel devices,

— use of assistant controls,

— use of control devices.

11.2 Controls intended for operation by the occupant

Controls intended to be operated by the occupant while seated shall be within the occupant reach space shown in Figure 1.

The following controls, if fitted, are included:

— on/off switch or key,

— speed regulator,

— speed pre-setting,

— running brake,

— parking brake,

— audible warning device,

— direction indicator,

— direction switch,

— control device,

— manual steering controls,

— lighting controls,

— seating adjustments,

— detachable components, including removable arm supports, lower leg support assemblies, etc., to facilitate safe transfers into and out of the wheelchair,

— steering controls,

— freewheel device.

11.3 Controls intended for operation by an assistant

Controls intended to be operated by an assistant shall be within the reach space shown in Figure 3.

Examples include:

— brakes,

— control devices,

— push handles, and

— electrical ancillary equipment.

11.4 Assistant control unit, push handles and handgrips

11.4.1 Requirements

Switches intended to be operated by an assistant while driving the wheelchair shall be attached to an assistant control unit.

When an assistant control unit is fitted,

— the unit shall be positioned behind the wheelchair's back support, between 900 mm and 1 200 mm from the floor to the centre of the operating means for the control device (e.g. joystick handle), and

— there shall be a means to support the assistant’s hand or hands used to operate the control device.

When push handles are fitted, no part of the wheelchair shall lie within a space to the rear of the wheelchair bounded by the following:

— a plane at 85° to the horizontal, that touches the rearmost points of the push handles as shown in Figure 6;

— two planes not less than 350 mm apart equidistant from a vertical plane parallel to the forward direction of travel that bisects the wheelchair, unless the intended occupant is a child;

— the horizontal test plane.

When the wheelchair is fitted with steering and/or manoeuvring handgrips for use by an assistant, the handgrips shall be at least 75 mm in length and between 20 mm and 50 mm in diameter.

When manoeuvring handgrips are fitted with controls that are intended to be used by being gripped by one hand, the handgrip width when no force is applied shall not be greater than 100 mm and should not be greater than 80 mm (see Figure 4).

11.4.2 Test method

a) Place the wheelchair on the horizontal test plane.

b) If an assistant control device is fitted, note its position and measure the height of its operating means above the test plane.

c) Project the planes specified in 11.4.1 and determine whether any part of the wheelchair lies within the enclosed space.

d) Measure the dimensions of the steering and/or manoeuvring handgrips.

e) Where applicable, measure the handgrip width of the controls fitted to the manoeuvring handgrips that are intended to be used by being gripped by one hand.

f) Inspect the wheelchair for means to support the assistant's hand or hands used to operate the control device while the wheelchair is being driven.

g) Record whether the wheelchair has met the requirements.

11.5 Operating forces

11.5.1 Requirements

All controls, except for means to operate brakes, shall have operating forces for engaging and releasing that do not exceed those stated in Table 1 when tested in accordance with 11.5.2.

NOTE Requirements and test methods for means to operate brakes are given in 10.1.

In addition, to achieve the intended function of the system or device being operated, for knobs intended to be gripped and turned by one hand

— where the diameter of the knob is greater than or equal to 25 mm and the force is transmitted by friction, the numerical value of the torque, expressed in Nm, shall not be greater than 0,05 times the numerical value of the diameter of the knob, expressed in mm, and

— where the diameter of the knob is less than 25 mm diameter, the numerical value of the torque, expressed in Nm, shall not be greater than 0,025 times the numerical value of the diameter of knob, expressed in mm.

11.5.2 Test method

a) Position a means to apply force or torque as applicable:

   1) where the operation is performed by pushing or pulling, position the means to apply force parallel to the direction of operation and in the middle of the knob or button;

   2) in the case of a lever of length 30 mm or greater, position the means to apply force at a distance of 15 mm from the end of the operating lever;

3) in the case of a lever of length less than 30 mm, position the means to apply force at the midpoint of the lever;

4) for a turning knob, use a suitable means (e.g. a force gauge) to measure torque concentrically on the knob.

b) Gradually increase the force or torque until the intended function of the system or device as specified by the manufacturer's instructions is achieved.

c) Measure and record the maximum operating force.

d) Perform b) to c) three times in total.

e) Calculate and record the arithmetic mean of the three recorded measurements.

11.6 Seating adjustments for tilt and recline systems

11.6.1 Requirements

If the manufacturer specifies that the seating can be adjusted by an assistant or the occupant or both while the occupant is seated, the assistant and/or the occupant shall not have to lift a mass (e.g. the combined mass of the occupant and the seating) which presents a moving and handling safety hazard to the assistant and/or the occupant.

Controls for seating adjustments intended to be operated by the occupant shall be accessible to the occupant from all seating positions.

NOTE The lighter shaded region of Figure 1 shows the reach space for the occupant in relation to the position of the back support reference plane and the seat reference plane (see ISO 7176-7:1998).

11.6.2 Test method

a) Adjust the seating as specified in the manufacturer's instructions.

b) Record whether the wheelchair has met the requirements.

12 Electrical systems

12.1 General requirements

The wheelchair shall conform to the requirements of ISO 7176-14:2008, except as specified in 9.5.4.

The wheelchair and battery charger shall conform to the requirements of ISO 7176-21:2009.

In addition, wheelchairs that include an on-board battery charger shall conform to the applicable electrical requirements of EN 60601-1:2006.

12.2 Circuit protection

The driving, braking and steering functions shall not be affected by the operation of the means of protection of any other circuit.

Lights, direction indicators and hazard warning flasher functions shall not be affected by the operation of the means of protection of any other circuit.

Circuit protection devices that carry the total current of the battery set may be used.

12.3 Battery chargers

Battery chargers for wheelchairs shall conform to the requirements of ISO 7176-14:1997 that apply to battery chargers, together with the following provisions:

a) battery chargers shall indicate when charging is in progress and when charging is complete;

b) battery chargers shall have the capability of charging batteries discharged to 70 % of their nominal voltage;

c) battery chargers shall operate without the need for intervention or supervision apart from connecting and turning on at the start of charging and turning off and disconnecting at the end of charging;

d) carry-on and on-board battery chargers shall meet the environmental protection requirements of IPX4 when tested in accordance with EN 60529:1991 and shall meet the Class II Test Voltage requirements of EN 60335-1:2012 following the test.

12.4 Charging connector

The wheelchair shall have a charging connector that is readily accessible and operable by the occupant or an assistant or both in accordance with the manufacturer's intended use of the wheelchair.

NOTE The shape and position of the charging connector are important factors contributing to the ease and safety of operation.

The requirement is verified by inspection.

12.5 Battery enclosures and containers

Battery enclosures and containers shall provide protection so that it should not be possible for liquids dropping from above to enter into them and onto any cell or battery they contain.

EXAMPLE Rainwater, urine.

12.6 Emergency stop

The wheelchair shall be fitted with one or more emergency stop devices to enable actual or impending danger to be averted.

EXAMPLE An on-off switch. See ISO 7176-14:2008, 8.7, switch-off while driving.

Each emergency stop device shall:

— be clearly identifiable, clearly visible and quickly accessible by the intended operator, and

— stop the hazardous process as quickly as practicable, without creating additional risks.

Once active operation of the emergency stop device has ceased following a stop command, that command shall be sustained by the wheelchair until that engagement is specifically overridden. It shall not be possible to engage the device without triggering a stop command. It shall be possible to disengage the device only by an appropriate operation, and disengaging the device shall not restart the wheelchair but only permit restarting.

The emergency stop function shall be available and operational at all times, regardless of the operating mode.

Emergency stop devices shall be a back-up to other safeguarding measures and not a substitute for them.

NOTE An on/off switch establishes an emergency stop device for all related input devices located nearby (within the same enclosure), e.g. joystick and on/off button located on the same control module.

Additional emergency stop devices may be attached to a wheelchair to be operated by an assistant. Where the intended occupant has an impairment which restricts their ability to operate an emergency stop device, the risk assessment should take this into account.

12.7 Lighting

Wheelchairs intended by the manufacturer for outdoor use shall be supplied with integral lighting suitable for the operations concerned where the absence thereof is likely to cause a risk despite ambient lighting of normal intensity.

EXAMPLE Headlights, rear lights, illuminated controls.

NOTE 1 This requirement is derived from Directive 2006/42/EC on machinery.

Wheelchairs might be subject to national requirements for lighting and reflectors.

If there are no national requirements, the manufacturer should conform to applicable automotive Directives of the European Union (76/756/EEC [12], 97/28/EC [13]).

NOTE 2 Annex C contains recommendations for wheelchair lighting.

12.8 Switching off while driving

If the wheelchair is switched off while driving on the horizontal, it shall come to a stop within the maximum stopping distances specified in Table 2.

NOTE See also ISO 7176-14:2008, 8.7.

12.9 Software

Software that is embedded in the wheelchair or is an integral part of the wheelchair, and the malfunction of which could give rise to a hazardous situation, shall be developed and maintained in accordance with EN 62304:2006.

This requirement does not apply to software produced before the date of withdrawal of EN 12184:2009, but it does apply to software modifications that are made after that date.

13 Information supplied by the manufacturer

13.1 General

Each wheelchair shall be provided with documentation and labelling that conform to the requirements in EN 12182 and ISO 7176-15:1996.

In addition, the manufacturer shall provide the documentation in three separate sections: pre-sale, user and service information as specified in 13.2, 13.3 and 13.4. These may be provided as separate printed documents or in other forms of media to meet the needs of individual occupants or their assistants.

For the requirements in 13.2 and 13.3, unless otherwise specified, all linear dimensions shall be expressed in millimetres and all masses shall be expressed in kilograms.

13.2 Pre-sale information

In addition to the requirements of 13.1, pre-sale information shall include the following:

a) information on how to obtain the user information in a format appropriate for use by visually impaired people;

b) a description of the intended occupant of the wheelchair, including the occupant's mass and any specific requirements for the occupant's functional capability, visual ability and cognitive ability suitable for operating the wheelchair safely in its intended environment;

c) the intended operator (occupant, assistant or both);

d) a description of the intended use and the intended environment;

e) the type class of the wheelchair: Class A, Class B or Class C;

f) the overall dimensions (width, length and height) of the wheelchair and its mass when it is ready for use and, if applicable, when it is folded or dismantled;

g) if the overall dimensions of the wheelchair when it is ready for use exceed the values recommended in A.1.1, a clear statement that the wheelchair is larger than the recommended dimensions;

h) the minimum width of corridor in which the wheelchair can be turned to face the opposite direction;

NOTE The applicable measurement for wheelchairs with full differential steering is the pivot width, while for wheelchairs with limited differential steering or direct steering, it is the reversing width. See A.2.2.

i) the rated slope, expressed in degrees;

j) the standard options that are available for the wheelchair;

k) the type(s) of tyres that can be used on the wheelchair;

l) operator adjustments;

m) if the wheelchair can be dismantled or has any removable parts, the mass of the heaviest part;

n) information concerning whether the removal of parts or accessories intended by the manufacturer to be removed without the use of tools will have adverse or beneficial effects on the wheelchair;

o) information on whether or not the wheelchair is intended to be used as a seat in a motor vehicle, and whether and how this depends on the standard options referred to in j);

p) information on whether the unoccupied wheelchair is suitable for land and/or air transport;

q) the theoretical continuous driving distance range, expressed in kilometres, that the wheelchair can travel under its own power on the horizontal when tested in accordance with ISO 7176-4:2008, with the addition of a note explaining that the distance will be reduced if the wheelchair is used frequently on slopes, rough ground or to climb kerbs, etc.;

   This additional requirement may be reduced to some degree if an accurate charge level indicator is fitted.

r) the maximum height of kerb which the wheelchair can descend safely;

s) if a programmable controller is fitted, information on the method of programming, the competency required to carry out the programming and the effects it can have on driving performance.

13.3 User information

User information shall be provided by the manufacturer with each wheelchair. Further copies shall also be available for any subsequent user of the wheelchair. User information shall contain all pre-sale information and the following:

a) the unique identification number of the wheelchair or information on the location of the unique identification number on the wheelchair;

b) any adjustment or settings required before the wheelchair can be used and warnings of how adjustments or settings affect stability;

c) where applicable, information on any adjustments that can be made and the competency required to carry out these adjustments;

d) instructions on operation of all controls, including brakes;

e) instructions on how to engage and disengage the drive system;

f) the wheelchair manufacturer's recommended tyre pressure(s), expressed in kPa, bar or PSI;

g) instructions for dealing with tyre punctures, where pneumatic tyres are fitted;

h) the battery type and nominal voltage;

i) instructions for battery maintenance;

j) instructions for operating the battery charger, including warnings regarding any potential safety hazards (e.g. a possibility of gas accumulating in the charging area, use of the wrong type of battery charger);

k) if required by the risk analysis, instructions for fitting an additional emergency stop device where the intended occupant has an impairment which could restrict their ability to operate one;

l) instructions on whether and how the wheelchair can be folded to assist in storage or transport;

m) instructions on dismantling and re-assembly of the wheelchair or any removable parts;

n) instructions regarding transport of the wheelchair when it is unoccupied (e.g. in a car or aeroplane);

o) the masses of parts of the wheelchair that are expected to be handled during dismantling, reassembly, or carrying;

p) the positions of points where the component parts can be gripped for safe moving and handling and/or a method for handling during dismantling, assembly or carrying;

q) if the manufacturer specifies that the wheelchair is intended for use as a seat in a motor vehicle, the method of attaching wheelchair tiedown and occupant restraints, and recommendations about suitable tiedown and restraint systems;

r) if the manufacturer specifies that the wheelchair is not intended for use in the motor vehicle, a warning to that effect, together with the symbol shown in Figure 7;

s) instructions on how to obtain and fit the optional anterior pelvic support (see 9.4) if it is not supplied with the wheelchair;

t) the positions of points intended to carry additional loads;

EXAMPLE Grocery basket, backpack hook.

u) instructions for preparing the wheelchair for long-term storage (e.g. longer than four months) and for preparing it for use afterward;

v) a warning that the wheelchair might disturb the operation of devices in its environment that emit electromagnetic fields (e.g. alarm systems of shops, automatic doors, etc.);

w) a warning that the driving performance of the wheelchair can be influenced by electromagnetic fields (e.g. those emitted by portable telephones, electricity generators or high power sources);

x) a warning that the stopping distance on slopes can be significantly greater than on level ground;

y) a warning that surface temperatures can increase when exposed to external sources of heat (e.g. sunlight);

z) a warning for trapping hazards (e.g. pinch points);

aa) a warning if driving characteristics can be adjusted outside the limits specified in Table 1 and Table 2;

bb) a warning if the adjustments of seating or wheel positions can be set outside safe limits;

cc) if the overall width or overall length of the wheelchair when it is ready for use exceed the applicable values recommended in A.1.1, a warning concerning access to emergency escape routes;

dd) the level of resistance to ignition of materials and assemblies;

ee) information on the recycling of used batteries and of the wheelchair;

ff) if the characteristics of the wheelchair (including occupant as applicable) exceed the limits specified in Annex M of the Technical Specification for Interoperability relating to Accessibility for Persons with Reduced Mobility (PRM-TSI), a statement to that effect (see Annex D);

gg) information on how to find out about product safety notices and product recalls, for example by ensuring the supplier has up-to-date contact information;

hh) the expected service life of the wheelchair;

ii) the name and address of the manufacturer;

jj) the name and address of the authorised representative, where the manufacturer does not have a registered place of business in the European Union.

13.4 Service information

The service information shall contain all the pre-sale information, user information and instructions necessary for the maintenance, adjustment and repair of the wheelchair and for the replacement of parts.

13.5 Labelling

In addition to the requirements of 13.1, the manufacturer shall apply permanent labelling for the following:

a) devices for disengagement of the drive system, showing engaged and disengaged positions, including a warning that the drive system should be re-engaged before an occupant is left unattended or attempts to operate the wheelchair;

b) for wheelchairs where the intended use includes use as a seat in a motor vehicle, the position of attachment points for wheelchair tie-down and occupant restraint systems (WTORS);

c) for wheelchairs not intended to be used as a seat in a motor vehicle, a warning to that effect, including the symbol shown in Figure 7 with a diameter not less than 15 mm, in the same location as the labelling required by ISO 7176-15:1996;

d) for battery chargers that are not on-board chargers, information and connection details specified in Clause 9 of ISO 7176-14:1997;

e) for Class A wheelchairs not intended for use outdoors, a warning to that effect.

14 Test report

The test report shall contain the following information:

a) a unique report number;

b) the name and address of the testing institution;

c) the date of issue of the test report;

d) a reference to this edition of this European Standard, i.e. EN 12184:2014;

e) the name and address of the manufacturer of the wheelchair;

f) a description of the sample including the manufacturer's or vendor's trade mark, model or type, unique identification number and any variations or accessories fitted;

g) the manufacturer, type and model of controller and motors and the type and capacity of the batteries fitted to the wheelchair during the tests;

h) the source of the sample;

i) details of the set-up of the wheelchair as specified in ISO 7176-22:2000, including details of how it is equipped and adjustments;

j) the ambient temperature at which each test was carried out;

k) the mass of the dummy or human test occupant and weights used;

l) where the controller is programmable, the settings used while testing;

m) a photograph of the sample equipped as during the test;

n) the results of the tests;

o) if this document does not apply in total to the wheelchair (see Clause 1), a list of the requirements that have been applied and those that have not;

p) a statement as to whether or not the tested sample has met all of the applicable requirements of this European Standard and a list of all the applicable requirements it has not met.

15 Tables

Table 1 — Requirements and tests for driving characteristics of type classes

Driving characteristics	Test	Requirement		
		Class A	**Class B**	**Class C**
Rated slope	8.1.2.2	minimum 3°	minimum 6°	minimum 10°
Dynamic stability	8.1.5.2			
- starting forwards uphill		3° minimum slope	6° minimum slope	10° minimum slope
- stopping forwards uphill		3° minimum slope	6° minimum slope	10° minimum slope
- stopping forwards downhill		3° minimum slope	6° minimum slope	10° minimum slope
- stopping backwards downhill		3° minimum slope	6° minimum slope	10° minimum slope
- turning on a slope		No tipping beyond balance point shall occur	No tipping beyond balance point shall occur	No tipping beyond balance point shall occur
Static stability	8.1.7.2			
- all directions		6° minimum slope **or** the rated slope claimed by the manufacturer if greater	9° minimum slope **or** the rated slope claimed by the manufacturer if greater	15° minimum slope **or** the rated slope claimed by the manufacturer if greater
Maximum operating forces				
Brake levers	10.1.2			
Freewheel lever and controls	11.5.2			
- single finger operation		5 N	5 N	5 N
- more than one finger operation		13,5 N	13,5 N	13,5 N
- whole hand operation		60 N	60 N	60 N
- combined hand and arm operation		60 N	60 N	60 N
- foot operation, pushing operation		100 N	100 N	100 N
- foot operation, pulling operation		60 N	60 N	60 N
Parking brake effectiveness	10.2.2.2	6° **or** the rated slope claimed by the manufacturer if greater	9° **or** the rated slope claimed by the manufacturer if greater	15° **or** the rated slope claimed by the manufacturer if greater
Maximum speed	8.1.8			
- forwards horizontal		15 km/h	15 km/h	15 km/h
- reverse horizontal		70 % of maximum forward speed of the wheelchair **or** 5 km/h whichever is lower	70 % of maximum forward speed of the wheelchair **or** 5 km/h whichever is lower	70 % of maximum forward speed of the wheelchair **or** 5 km/h whichever is lower
Obstacle climbing and descending ability	8.1.6.2			
- minimum obstacle height		15 mm	50 mm	100 mm
Minimum theoretical continuous driving distance range	8.1.9.2	15 km	25 km	35 km
Ground unevenness	8.1.3.3	10 mm	30 mm	50 mm

Table 2 — Requirements and tests for driving characteristics on the horizontal for all type classes

Driving characteristics and requirements		**Test**
Maximum stopping distance		10.2.2.2
Speed (km/h)	Horizontal distance (m)	
4,0	0,6	
5,0	0,8	
6,0	1,0	
7,0	1,2	
8,0	1,5	
9,0	1,8	
10,0	2,1	
11,0	2,5	
12,0	2,9	
13,0	3,4	
14,0	3,9	
15,0	4,5	

Table 3 — Forces for static loading relating to user mass greater than 100 kg

Test	Equation	Maximum force applied
Arm support downward [a]	$F = \frac{m_d \times g \times S}{2 \times \cos 15°}$	950 N
Foot support downward [a]	$F = m_d \times g$	1 230 N
Tipping lever downward [a]	$F = \frac{20}{15}(m_d + m_w)g$	1 000 N
Handgrip pull off [b]	Limited by maximum force that can be applied by one hand	750 N
Arm support upward [a]	$F = \frac{S(m_d + m_w)g}{3 \times \cos 10°}$	1 000 N
Foot support upward: Two single foot supports [a]	$F = \frac{S(m_d + m_w)g}{4}$	500 N
Foot support upward: One-piece foot support [a]	$F = \frac{S(m_d + m_w)g}{2}$	1 000 N
Push handle upward : Two single handles [a]	$F = \frac{S(m_d + m_w)g}{3}$	1 000 N
Push handle upward : One cross bar handle [a]	$F = \frac{2 \times S(m_d + m_w)g}{3}$	2 000 N

Key

m_d dummy mass in kg

m_w wheelchair mass in kg

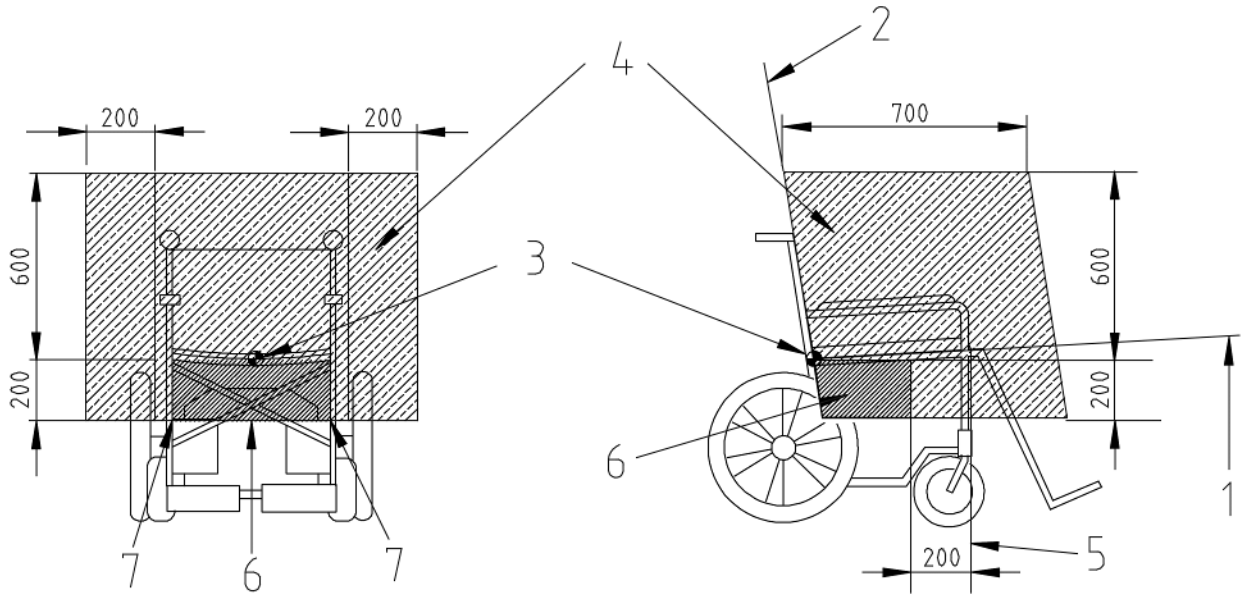
S safety factor equal to 1,5

[a] Result of the calculation or the maximum force, whichever is lower.

[b] Maximum force to be applied.

16 Figures

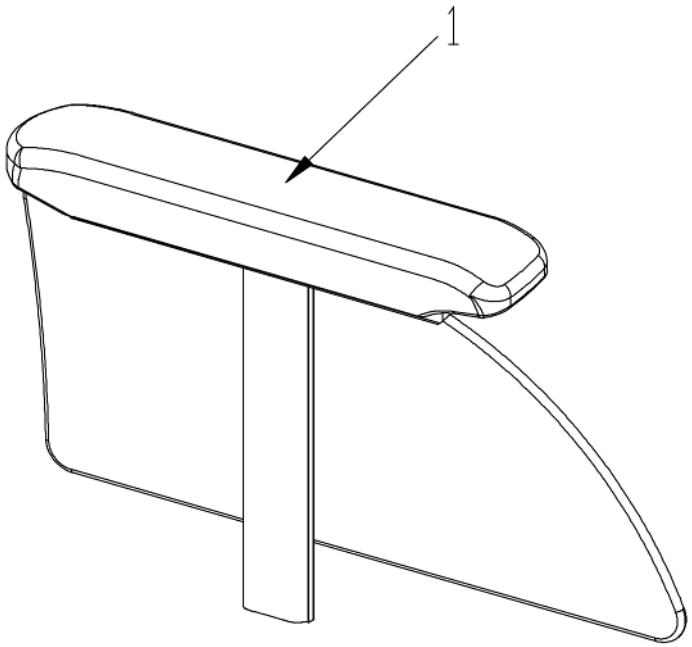
Dimensions in millimetres



Key

1 seat reference plane
2 back support reference plane
3 seat reference point
4 occupant reach space
5 vertical line from the centre of the front edge of the seat
6 region below the rear of the seat that is excluded from the reach space
7 lateral extent of excluded region delimited by vertical lines from the sides of the seat

Figure 1 — Occupant reach space

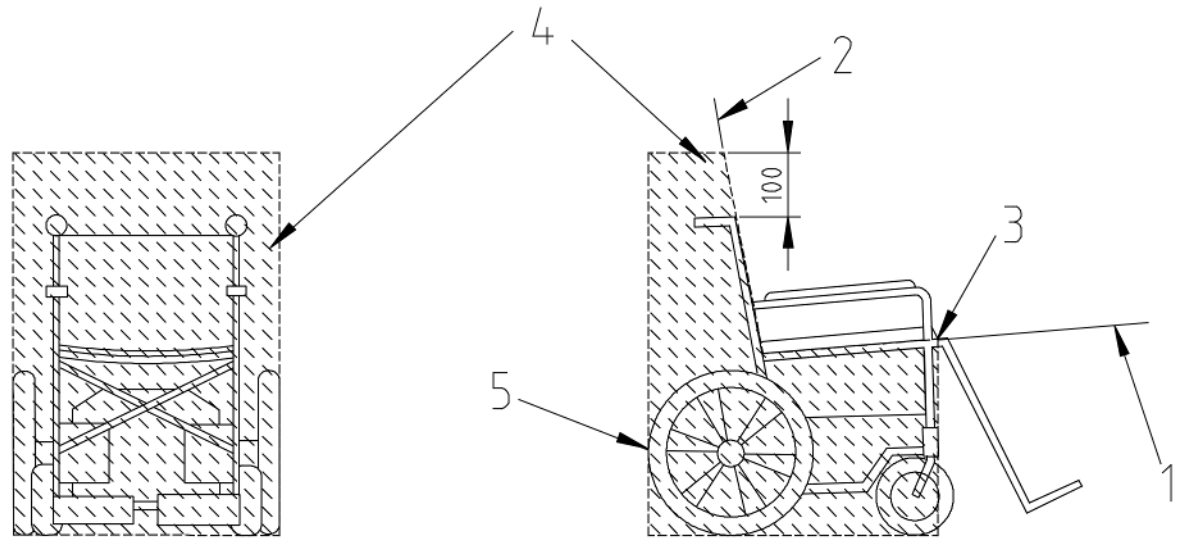


Key

1 application of source to the centre of the surface intended to support the occupant

Figure 2 — Application of ignition source to a postural support

Dimensions in millimetres

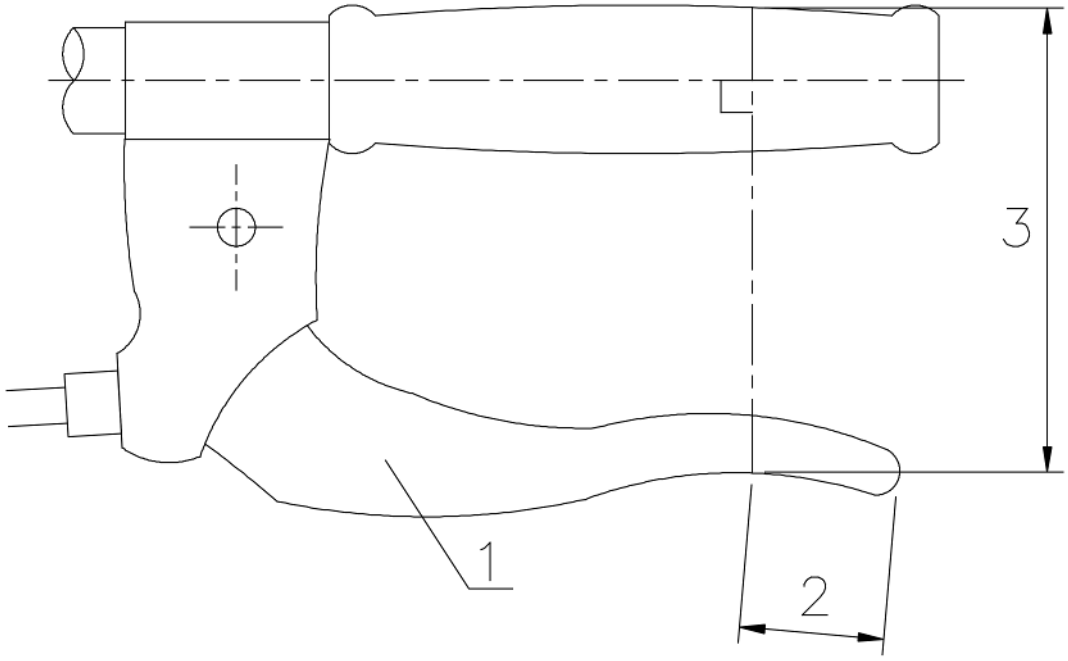


Key

1 seat reference plane
2 back support reference plane
3 front edge of seat
4 assistant reach space for controls
5 most rearward point on wheelchair

Figure 3 — Assistant reach space for controls

Dimensions in millimetres

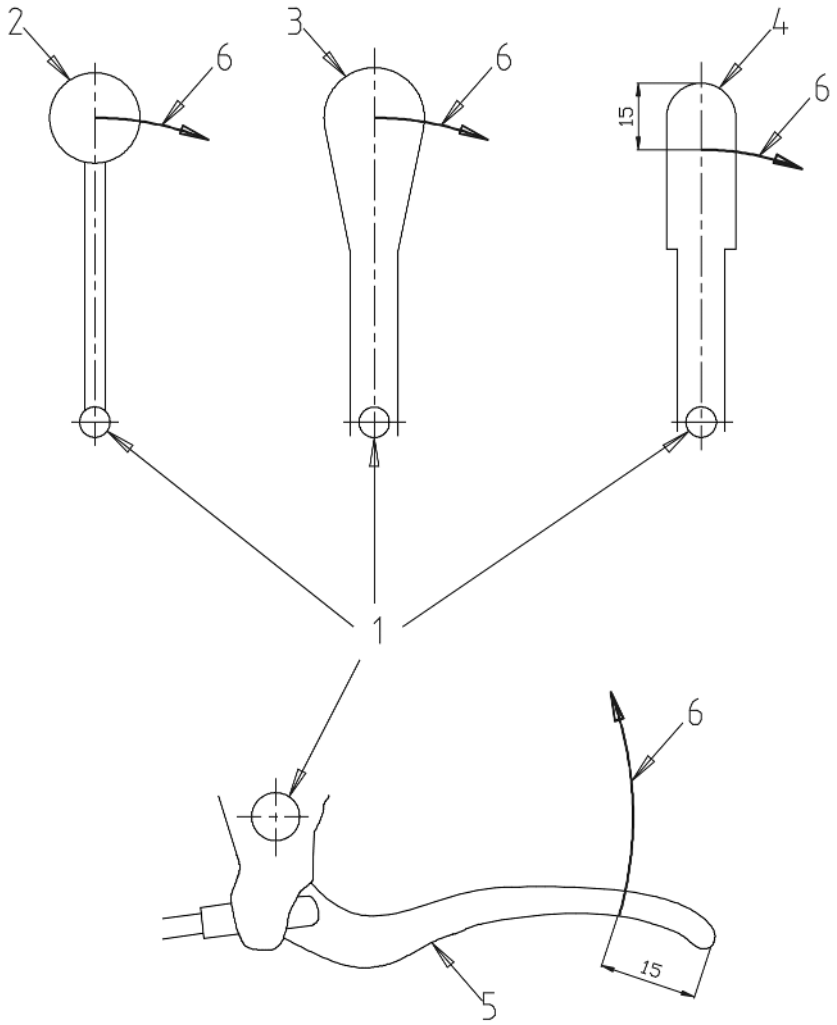


Key

1 lever gripped by the fingers of one hand
2 15 mm
3 handgrip width

Figure 4 — Handgrip width

Dimensions in millimetres



Key

1 fulcrum
2 generally spherical knob
3 tapered lever
4 parallel lever
5 bicycle-style lever
6 path of the point of application of the operating force

Figure 5 — Application of forces to levers

Dimensions in millimetres

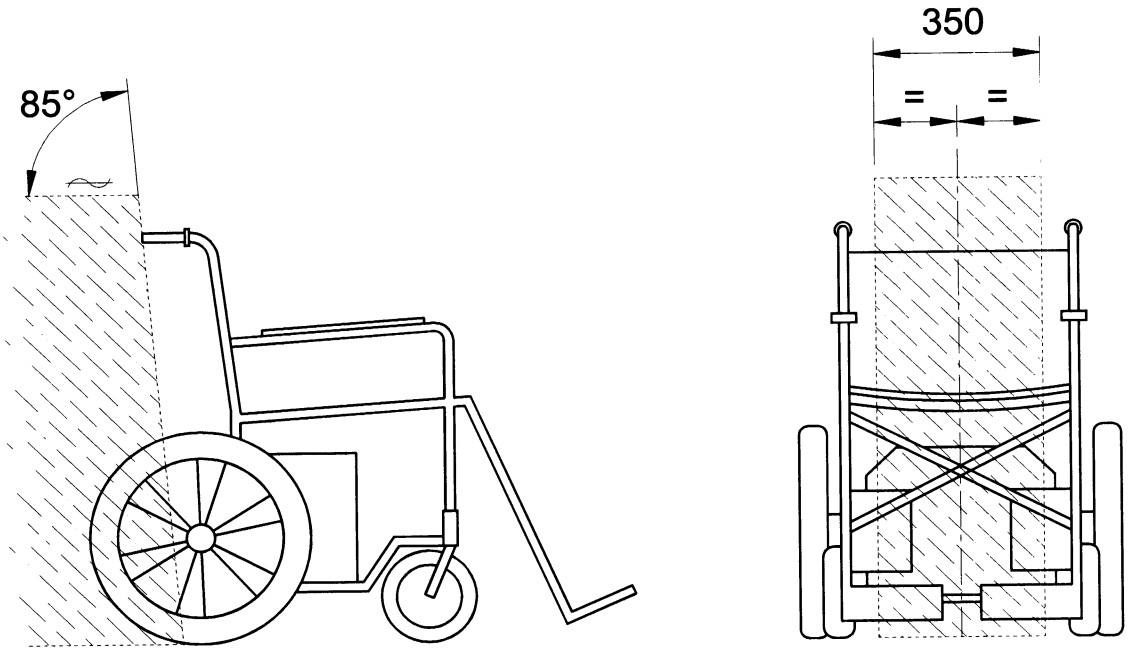


Figure 6 — Space for assistant movement

Figure 7 — Symbol for wheelchair not intended to be used as a seat in a motor vehicle

Annex A
(informative)

Recommendations for dimensions and manoeuvring space of electrically powered wheelchairs

A.1 Specific dimensions

A.1.1 Dimensions when ready for use

The overall width and full overall length, when measured in accordance with ISO 7176-5:2008, should not be greater than the applicable values specified in Table A.1 for the type class of the wheelchair.

A.1.2 Push handle height

The height of push handles, if fitted, should be between 900 mm and 1 200 mm when the wheelchair is set up as specified in ISO 7176-22:2000.

A.1.3 Ground clearance

The ground clearance, when measured in accordance with the method specified in ISO 7176-5:2008, should not be less than the value specified in Table A.1. This recommendation does not apply to wheelchairs designed for special purposes that are incompatible with the recommendation, e.g. stand-up wheelchairs and wheelchairs with a seat that lowers to ground level.

A.2 Manoeuvring space

A.2.1 Turning diameter

The turning diameter, as measured by the test specified in ISO 7176-5:2008, should not be greater than the value specified in Table A.1 for the type class of the wheelchair.

A.2.2 Pivot width or reversing width

For wheelchairs with full differential steering, the pivot width, when measured in accordance with ISO 7176-5:2008, should not be greater than the value specified in Table A.1 for the type class of the wheelchair.

For wheelchairs with limited differential steering or direct steering, the reversing width, when measured in accordance with ISO 7176-5:2008, should not be greater than the value specified in Table A.1 for the type class of the wheelchair.

A.3 Speed settings

The pre-set value of the maximum speed should be limited to a maximum of 15 km/h.

If a maximum speed regulator is present, the highest values capable of being set by the operator should not exceed 15 km/h.

It should not be possible to change other settings of the wheelchair without the aid of a tool, key entry combination or similar means of restricting access. If the means of restricting access is other than a tool, it should not consist of operations that are performed in normal use of the wheelchair.

Table A.1 — Dimensions and manoeuvring space of electrically powered wheelchairs

Dimensions	Class A mm	Class B mm	Class C mm
Full overall length - maximum	1 200	1 400	no recommendation
Overall width - maximum	700	700	800
Turning diameter - maximum	2 000	2 800	no recommendation
Pivot width - maximum	1 300	1 800	no recommendation
Reversing width - maximum	1 300	1 800	no recommendation
Ground clearance - minimum	30	60	80

Annex B
(informative)

Recommended design features

B.1 Introduction

Since wheelchairs serve many different users who have many different requirements and demands, it is not possible to make the recommendations contained in this annex mandatory for every wheelchair. Manufacturers should follow the recommendations as far as possible and applicable, depending on the intended use of the wheelchair.

B.2 General recommendations

B.2.1 Anti-tip devices

If the wheelchair is fitted with anti-tip devices, they should not move from their pre-set positions or lose their function when preventing a loaded wheelchair from tipping.

Anti-tip devices should be positioned so they will not cause the wheelchair to exceed the applicable full overall length limit specified in Table A.1, and they should not interfere with mounting or dismounting kerbs when in a non-working position.

Anti-tip devices should be labelled with a warning that the occupant should be informed when an anti-tip device is fitted or removed.

B.2.2 Component mass

If any parts can be removed from the wheelchair, or if the wheelchair can be dismantled, the maximum mass of any component should not exceed 10 kg.

B.2.3 Fittings and tools

All screws, fasteners and similar fittings should be of metric size as specified in ISO 68-1:1998. The number of tools should be required for their operation should be a minimum.

B.2.4 Tyres

The wheelchair should be fitted with tyres that do not mark indoor floors.

B.2.5 Means to inflate tyres

An appropriate means to inflate the tyres should be supplied with the wheelchair if it is fitted with pneumatic tyres.

B.2.6 Surface temperature

The thermal properties of materials that come into direct contact with the occupant, e.g. control units or upholstered parts, should be considered when selecting these materials to avoid excessive surface temperatures when they are exposed to external sources of heat (e.g. sunlight).

B.2.7 Occupant transfer into or out of the wheelchair

When the manufacturer specifies that a sideways transfer can be made:

— arm supports should be movable or removable;

— lower leg support assemblies should be removable, and when they are removed, swung to the side or retracted, their mountings should not protrude more than 50 mm in front of the occupied seat nor protrude more than 20 mm above it, and no sharp edges or protrusions should be present.

When the manufacturer specifies that the occupant can make a sideways step to a standing position in front of the wheelchair, lower leg support assemblies should be removable.

When lower leg support assemblies are not removable, foot supports should be movable or removable so that the occupant has room to rise from a seated position in the wheelchair to a standing position. The underside of a movable foot support should not present any sharp edges or protrusions that can contact the occupant's lower legs or feet when the foot supports are raised.

B.2.8 Resistance to contamination from urine incontinence

Contamination resistance and methods for cleaning and decontamination should be considered when selecting materials that can come in contact with urine (e.g. upholstered parts) in order to avoid the occurrence of unhygienic conditions, odours and degradation of materials.

B.2.9 Indication for rated slope

The wheelchair should have the provision for including a device which indicates or provides an alarm to the operator when 80 % of the rated slope is reached.

This indicator should operate when facing up a slope, down a slope and also across a slope.

B.2.10 Mirrors

The wheelchair should have the capability of mounting a rear view mirror or mirrors when required by the occupant.

NOTE This is essential where the occupant cannot rotate their upper body or neck to see behind them when seated in the wheelchair.

B.2.11 Head support

If the use of the wheelchair allows the seat or the back support to be reclined to an angle of more than 25° to the vertical, the wheelchair should have a head support or provision to attach a head support.

The manufacturer of a wheelchair that has such provision should have a head support available as an option.

The “head support height above seat” dimension (see ISO 7176-7:1998, dimension 10) of the wheelchair should cover the range 680 mm to 844 mm in order to be appropriate for the body size of various occupants.

If a wheelchair is available with a head support, and the seat or the back support can be reclined to an angle of more than 25° to the vertical, the operator’s manual should contain an instruction to use the head support when the seat or the back support is reclined.

B.2.12 Continuous operating forces

Appropriate measures should be adopted wherever practicable to minimise the forces applied for extended periods of time by operators in normal use of the wheelchair.

B.3 Recommendations for performance characteristics

B.3.1 Indication of electrical faults

The wheelchair should be equipped with a means for indicating fault(s) in its electrical system.

B.3.2 Batteries and their containers

Batteries and battery containers should be resistant to mechanical damage (e.g. cracking).

Batteries should be removable from wheelchairs with powered seat lifts, with the seat at any position of its travel, if there is no manual operation of the seat lift when the power is off.

Batteries used for driving the wheelchair should be of the traction or semi-traction type.

Batteries for wheelchairs which might be used indoors (Class A and Class B) should be non-spillable.

NOTE Non-spillable batteries might be more acceptable in aircrafts and road vehicles than batteries containing free liquid electrolytes.

B.3.3 Control mechanism feedback

The operator should receive feedback from a function's control mechanisms (e.g. light or sound, etc.) to verify that the function is actually operating.

B.3.4 Freewheel alarm

When the freewheel device is operated, an auditory warning and/or a visual warning should be made until the freewheel device is deactivated and the drive and braking system is fully operational.

B.3.5 Maximum speed

Operation of functions which can adversely affect the stability and safety of a wheelchair (e.g. elevating seats, elevating lower leg support assemblies and reclining back supports) should automatically reduce the maximum speed of the wheelchair.

Annex C
(informative)

Recommendations for lighting and reflectors

C.1 General

Lighting equipment and light sources (e.g. exchangeable light bulbs) should be type-approved vehicle parts.

Only legally prescribed and authorised lighting equipment should be used.

Where lighting equipment is used without type approval, an independent evaluation report should be available.

A light is considered not to be present if it cannot be put into operation by simple installation of a light source (ECE 48 [6], subclause 5.22).

Lights and reflectors should be mounted securely on non-moveable parts of the wheelchair.

C.2 Headlights

Headlights should be adjustable.

The lowest point of a headlight reflector should not be less than 500 mm above the ground.

For wheelchairs with a maximum speed not exceeding 8 km/h, at least one white light should be provided.

For wheelchairs with a maximum speed exceeding 8 km/h, at least one white light with headlight effect should be provided, and each headlight should meet or exceed applicable requirements for bicycle front lights.

No more than two headlights should be used.

C.3 Lateral reflectors

Two yellow reflectors should be provided, one on each side of the wheelchair.

The highest point of a lateral reflector should be not be more than 600 mm above the ground.

Each lateral reflector may form a horizontal or vertical band.

C.4 Rear lights

Two red rear lights should be provided.

The lowest point of a rear light should not be less than 350 mm above the ground.

The rear lights should be as far as possible from each other.

Separate fuses should be provided for each rear light.

Two additional red tail lights may be used.

C.5 Rear reflectors

Two red rear reflectors should be provided.

Rear reflectors should not be triangular.

The highest point of a rear reflector should not be more than 900 mm above the ground.

The rear reflectors should be as far as possible from each other.

Annex D
(informative)

EN 12184 and rail interoperability

D.1 Background

Directive 2008/57/EC concerns the interoperability of the European rail network. It provides for mandatory Technical Specifications for Interoperability (TSIs) to cover particular subsystems of the rail network. One such TSI deals with rail infrastructure and passenger rolling stock subsystems in relation to 'persons with reduced mobility' (PRM). This document, usually referred to as the PRM-TSI, was adopted by the European Commission on 21 December 2007 (2008/164/EC).

The PRM-TSI defines 'persons with reduced mobility' as including wheelchair users. It goes on to specify several aspects of rail infrastructure and rolling stock in relation to a notional wheelchair that meets limits for characteristics, including dimensions and mass, specified in Annex M of that document. These limits appear to be based on the results of the European COST 335 study, with some modifications. The COST 335 study in turn made use of ISO 7193:1985, *Wheelchairs — Maximum overall dimensions*, which only specifies maximum overall dimensions for wheelchairs primarily intended for indoor use, i.e. Class A wheelchairs.

The PRM-TSI specifies the following aspects in relation to the limits in Annex M:

— boarding aids at stations;

— level track crossings;

— universal toilet compartments;

— dimensions of clearways;

— wheelchair-accessible sleeping accommodation.

The PRM-TSI specifies other aspects in relation to wheelchairs, but without reference to the limits in Annex M.

The PRM-TSI does not make any statement concerning access to rail travel for passengers whose wheelchairs have characteristics exceeding the limits specified in Annex M. In addition, it does not define the term 'wheelchair' and so does not indicate whether scooters used for powered mobility are included within its scope.

D.2 Related provisions in this document

Wheelchairs are used in many situations, only some of which will involve travel by rail. Their characteristics are usually determined by the clinical needs and preferences of the occupant. Some wheelchairs will, of necessity, exceed the limits specified in the PRM-TSI. On the other hand, many wheelchair users will want to travel by rail at some point. It would be useful for them to know whether their wheelchair could present difficulties when they are travelling. Therefore, to assist prescribers, purchasers and users of wheelchairs, this document specifies a requirement for disclosure if the wheelchair characteristics exceed the engineering limits specified in the PRM-TSI.

Annex E
(informative)

Recommendations for safety in freewheel mode

E.1 General

Unintentional movement of a wheelchair may occur when it is in freewheel mode on a slope, for example when:

a) the wheelchair is being pushed down a slope with all driven/braked wheels manually set to freewheel mode and the wheelchair gathers greater speed than intended;

b) the wheelchair is being driven down a slope and the occupant or assistant manually sets one of the driven/braked wheels to freewheel mode, resulting in the wheelchair deviating from its intended path.

Both situations can be dealt with by manually reengaging the drive and/or brakes to exit freewheel mode. However, this reengagement may be dangerous for the occupant or impossible to manage for an elderly assistant, especially if the wheelchair is already moving quickly. Therefore means should be provided to limit the speed and to allow safe reengagement.

These means may be provided mechanically or electromechanically. For example, if the controller is operational, the wheelchair is switched on, the motor drive is still engaged and there is sufficient energy in the battery, the control system may actively slow or stop the wheelchair through its normal control function.

If there is no battery power available, the controller is not operational or the wheelchair is switched off, some other means could be implemented to limit the speed to a crawl, such as short-circuiting the drive motors. In this case the speed that results would depend on the combined mass of wheelchair and occupant and on the angle of the slope.

To allow for small manoeuvring forces at low speeds (see ISO 7176-14:2008, 8.11, non-powered mobility) the means for limiting speed should only operate once the wheelchair has moved too quickly.

E.2 Recommendation

When in freewheel mode, the wheelchair should be prevented from travelling faster than 1,0 m/s on the rated slope.

E.3 Recommended test methods

E.3.1 Caution

CAUTION — This testing is potentially hazardous to a human test occupant and test personnel. Appropriate safety precautions should be taken to avoid injury.

E.3.2 Wheelchair switched on

a) Place the loaded wheelchair on a test plane inclined at the rated slope.

b) Switch on the wheelchair.

c) Operate the freewheel device(s) in accordance with the manufacturer's instructions to enable freewheel mode.

d) Measure the maximum speed of the wheelchair travelling down the slope.

e) If the speed travelling down the slope exceeds 0,5m/s the wheelchair fails the test.

E.3.3 Wheelchair switched off

Repeat E.3.1 with the wheelchair switched off.

E.3.4 Attempted switch-on

a) Place the loaded wheelchair on a test plane inclined at the rated slope.

b) Switch off the wheelchair.

c) Operate the freewheel device(s) in accordance with the manufacturer's instructions to enable freewheel mode.

d) After the wheelchair has begun to move, attempt to switch it on.

e) Measure the maximum speed of the wheelchair travelling down the slope.

f) If the speed travelling down the slope exceeds 0,5m/s the wheelchair fails the test.

E.3.5 Battery set disconnected

a) Place the loaded wheelchair on a test plane inclined at the rated slope.

b) Disconnect the battery set.

c) Operate the freewheel device(s) in accordance with the manufacturer's instructions to enable freewheel mode.

d) Measure the maximum speed of the wheelchair travelling down the slope.

e) If the speed travelling down the slope exceeds 0,5m/s the wheelchair fails the test.

Annex F
(informative)

Wheelchairs with nominal speed of not less than 10 km/h — Dynamic stability for slopes of 10° or steeper

F.1 General

Most of the adjustable test slopes in use today are approximately 10 m long and can be set to an angle of 10°. If a wheelchair has a nominal speed greater than 10 km/h, it is unlikely to be able to accelerate to its maximum speed and stop on the test slope.

A wheelchair with a nominal speed of 15 km/h will commonly reach a speed of about 19 km/h on a 10° slope. In order to test such a wheelchair the test slope would have to be at least 15 m in length. A slope of this size is not feasible for most test houses.

Testing a wheelchair's dynamic stability on a slope that does not have the specified coefficient of friction, or which is not subject to the specified environmental conditions, is preferable to not doing the test at all.

The modifications to the dynamic stability test environment specified in F.2 are suitable for testing wheelchairs which cannot be accommodated on an adjustable test plane meeting the requirements of ISO 7176-2:2001 and 4.1 in this document.

F.2 Modifications to dynamic stability test environment

Conduct the test on an inclined test plane, which may be indoors or outdoors. The test plane shall have a region, inclined to the horizontal at the required angle, of sufficient length and breadth that the wheelchair can complete the manoeuvres specified in 8.1.5. The term "test area" is used to refer to this region. The parts of the test plane close to the test area should have a gradient sufficiently similar to the required gradient, so that the speed of the wheelchair, when it enters the test area, will be approximately equal to the speed it would achieve if the entire plane had the required angle. The coefficient of friction of the test plane need not conform to ISO 7176-13, but the wheelchair should have sufficient grip to drive normally on the surface. The test plane should also be dry, free from ice, free from loose material (such as gravel), and sufficiently flat.

EXAMPLE An inclined asphalt track.

Annex G
(informative)

Technical changes from previous editions of EN 12184

G.1 Technical changes between the first (1999) and second (2006) editions

In preparing the second edition, the content of the first edition was revised to incorporate numerous technical and editorial changes. All potential changes suggested by member bodies and working group members were considered by the working group. Where consensus could be achieved the changes were incorporated into the second edition. Where consensus could not be achieved, or the technical changes suggested were not of sufficient maturity to include in the second edition, the subject area was recommended to be put forward for a future revision. Some of these points were included in informative Annexes A, B, C and D (which correspond to Annexes B, C, D and E respectively in the third edition).

One major change from the first edition was the separation of design and performance requirements into two clauses. In some areas changes to the technical requirements of the previous edition were not incorporated, however others did incorporate updated technical content either in the design or the performance requirements or in both. This led to considerable changes in the format from the previous edition.

The list below includes the significant technical changes between the first and second editions, but it does not include all changes. Clause number references apply to the second edition.

— The scope of the second edition did not limit the applicability of the standard to wheelchairs with a maximum occupant mass of 100 kg, and the second edition specified a method of augmenting the 100 kg ISO test dummy to test wheelchairs with larger maximum occupant mass.

— The scope of the second edition included electrically powered scooters with three or more wheels. Those scooters were also included within the type classes specified in Clause 5 and throughout the content of the second edition.

— The normative references included appropriate new or revised standards that had been issued by CEN, ISO and IEC since the first edition was published. The normative references were dated to ensure that any subsequent revisions of the normative reference standards could be considered for their potential effect on the content of this European Standard. Future issues of revised normative references might not apply in total without further revision being made to this European Standard.

— The test apparatus was revised and updated to incorporate brake lever test equipment.

— Design requirements in the second edition were extracted from the performance requirements clause in the first edition. Design and performance requirements were clearly separated between Clauses 7 and 8 in the second edition.

— Design requirements in the second edition incorporated new or updated specific requirements for wheelchairs for use in motor vehicles (7.4), braking systems (7.5), freewheel device (7.6), component mass (7.7), battery enclosure (7.8), operations intended to be carried out by the occupant and/or assistant (7.10), control operation when seated (7.11), assistant control (7.12) and charging connector (7.13).

— Performance requirements in the second edition incorporated new or updated specific requirements for foot, leg, and arm supports (8.2), static, impact and fatigue strength (8.3), braking systems (8.4), operating force (8.7), assistant control (8.8), charging connector (8.9), joystick and control device (8.10), driving characteristics (8.11), surface temperature (8.12), noise (8.13) and resistance to ignition (8.14).

— Electrical requirements in the second edition incorporated new or updated specific requirements for electromagnetic compatibility (9.1), controller on/off switch (9.2) and on-board chargers (9.6).

— The requirement for information to be supplied by the manufacturer (Clause 10) was considerably updated in the second edition following input from users, member countries and working group members.

— A new requirement for a test report was added in Clause 11 of the second edition.

— Revised and updated tables were placed into Clause 12 of the second edition.

— Revised and new figures referenced within the second edition were placed into Clause 13.

— The content of Annex ZA of the second edition was compiled taking into account the new and updated content.

G.2 Technical changes between the second (2006) and third (2009) editions

Following publication of the second edition, errors were discovered in the equations for augmenting the 100 kg ISO test dummy. These errors could have affected the evaluation of the stability of wheelchairs intended for users of mass greater than 100 kg, and hence have been potentially hazardous. This matter was raised officially, and in early 2007 CEN/BT circulated a resolution for the withdrawal of the second edition, together with EN 12183:2006, the related standard for manual wheelchairs, that contained the same errors.

After considering alternatives, the committee has decided that the most suitable corrective action was to limit the scope of the standard to a maximum occupant mass of 100 kg, and to provide information on the construction of 125 kg and 150 kg test dummies to assist those wishing to evaluate the performance of wheelchairs with a larger user mass.

Revised editions of several normative reference documents had been published since the second edition was prepared. These were included in an appropriate manner, which led to the removal or modification of some requirements and test methods where they were duplicated in the referenced documents. Generally these did not result in any technical changes unless noted below.

In the same intervening period, Council Directive 93/42/EEC was amended by Directive 2007/47/EC. Changes to the Essential Requirements were addressed, as were the implications of the link to Directive 2006/42/EC on machinery.

The list below includes the significant technical changes between the second and third editions, but it does not include all changes.

— The scope was limited to a maximum occupant mass of 100 kg. References to maximum occupant mass that exceeded that limit were removed from the normative content throughout the document.

— All normative references were dated and referred to the latest editions at the time of publication, apart from the reference to EN 12182, which was undated, and a reference to ISO 7176-19:2001.

— The reference to ISO 7176-14:2008 implied a number of technical changes.

— The reference to ISO 7176-14:1997 was retained for requirements and test methods related to battery chargers, since they were not included in ISO 7176-14:2008.

— Some additional references were made to provisions in EN 12182 as required by the amendments to the Directive concerning medical devices.

— The maximum stopping distances for use on slopes was specified, and the test method clarified.

— The requirement for dynamic stability was clarified.

— Ambiguous requirements for uncontrolled movement of seating were removed, since that topic was already covered by requirements in EN 12182 relating to adjustable parts.

— The reference to ISO 7176-8 was corrected.

— Annex ZA was updated to reflect the revised content and changes to the Essential Requirements.

In addition, many minor editorial changes were made. In particular, definitions which appeared in ISO 7176-26:2007 were removed, and the third edition used its applicable terms.

G.3 Technical changes from the third (2009) edition

The list below includes the significant technical changes between the third and fourth editions, but it does not include all changes. Clause number references apply to the fourth edition.

— The upper limit for maximum occupant mass covered by the scope has been extended to 300 kg.

— The standard deals more clearly with wheelchairs which come partially into its scope.

— The list of normative references has been brought up to date, most notably including the latest editions of ISO 7176-11, ISO 7176-19 and ISO 7176-21.

— Wheelchairs are tested at the specified maximum user mass, except for distance range (see 8.1.9).

— The document has been extensively restructured to group related requirements and test methods together.

— Human test occupants may not be used for dynamic stability testing.

— The lateral dynamic stability test is not conducted for wheelchairs with manual steering.

— Some sections of text in ISO 7176-19:2008 have been replaced, and the reference to ISO 10542-5 has been removed.

— The requirement for handgrip width has been relaxed.

— Static loading force limits for occupant mass above 100 kg have been provided in Table 2.

— The term ‘maximum safe slope’ is no longer used, replaced with ‘rated slope’.

— The criteria for footrest gaps has been improved.

— Either ISO 8191-2 or EN 1021-2 may be used for assessment of ignitability. ISO 8191-1 and EN 1021-1 are no longer used.

— Power and control systems may optionally meet the requirements for resistance to ignition in this document or those in ISO 7176-14.

— Stopping distance limits for slopes have been removed.

— A separate test rig can be used for the parking brake fatigue test.

— The occupant reach space is extended beneath the front part of the seat.

— Requirements for brakes and freewheel devices have been clarified.

— Recommendations for protection of parking brakes and freewheel devices against accidental release have been made into requirements.

— Requirements which duplicate those in ISO 7176-14 have been removed.

— Requirements for charging connector location have been modified.

— Requirements for emergency stop devices and lighting have been added.

— Requirements for electronic programmable systems have been added.

— Recommended dummy designs have been removed.

— Guidance has been added concerning the PRM-TSI (see Annex C).

— Annexes concerning recommended seating design and manoeuvring forces have been removed.

— Annex E concerning recommendations for safety in freewheel mode has been added.

— Annex F has been added to support dynamic stability testing of fast wheelchairs on steep slopes.

— Annex ZA has been updated.

CEN/TC 293 agreed a three-year transition period between the third and fourth editions.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of Council Directive 93/42/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 93/42/EEC concerning medical devices.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 93/42/EEC

Clause(s)/ subclause(s) of this European Standard	Essential Requirements (ERs) of Directive 93/42/EEC	Qualifying remarks/Notes
Clause 6, 9.5, 12.1	7.1, first and second indents	Toxicity and biocompatibility are covered by reference to EN 12182. Flammability of upholstered parts, foam materials which support the occupant, sling seats, sling backs, belts, restraint harnesses and clothing guards are covered by 9.5. Flammability of polymeric components close to battery terminals, electrical enclosures, lamp housings and exposed housings for electrical connectors carrying battery charging current, motor current or lamp current are covered by reference to ISO 7176-14. Flammability of other parts is not covered.
Clause 6	7.2	Contaminants and residues are covered by reference to EN 12182. Packaging is not covered.
Clause 6, 12.1	7.5, first paragraph	Leakage of substances is covered by reference to EN 12182 and by reference to ISO 7176-14.
Clause 6, 8.4, 12.1, 12.5	7.6	Ingress of liquids is covered by reference to EN 12182, by 8.4 and by reference to ISO 7176-14. Ingress of other substances is not covered.
Clause 6, 9.2, 10.1, 10.3, 11.4, 11.5, 12.1	9.2, first indent	Risks regarding the following physical features are covered by reference to EN 12182: • traps for parts of the human body; • surfaces, corners and edges. Risks regarding the following ergonomic features are covered: • means for handling heavy components, by 9.2; • forces applied to means for operating brakes, by 10.1; • forces applied to means for operating freewheel devices, by 10.3; • handgrip dimensions, by 11.4; • operating forces for controls, by 11.5; • pushing force when power is lost, by reference to ISO 7176-14.

Clause(s)/ subclause(s) of this European Standard	Essential Requirements (ERs) of Directive 93/42/EEC	Qualifying remarks/Notes
8.4, 12.1	9.2, second indent	Risks regarding the following foreseeable environmental conditions are covered: • operating temperature range, storage temperature range and exposure to moisture, by reference to ISO 7176-9; • power frequency magnetic fields, external electrical influences and electrostatic discharge, by reference to ISO 7176-21.
9.5, 12.1	9.3	Risk of fire due to the power and control system is covered in 9.5 and by reference to ISO 7176-14. The risk of explosion in single fault condition is not covered.
12.1	12.1	Risks due to single fault conditions in the control system are covered by reference to ISO 7176-14. Other aspects of this essential requirement are not covered.
12.9	12.1a	Embedded or integral software introduced after the date of withdrawal of EN 12184:2009 is covered by 12.9.
12.1	12.5	Covered by reference to ISO 7176-21.
12.1, 12.3	12.6	Electrical risks from carry-on battery chargers are covered by reference to EN 60335-1. Electrical risks from on-board battery chargers are covered by references to EN 60335-1 and EN 60601-1. Isolation of the frame of the wheelchair from the wheelchair battery in normal use is covered by reference to ISO 7176-14. Other electrical risks are not covered.
Clause 6, 8.1.5, 8.1.7, 12.1	12.7.1	Risks due to moving parts, traps and adjusting mechanisms are covered by reference to EN 12182 and by reference to ISO 7176-14. Static stability and dynamic stability are covered by 8.1.5 and 8.1.7.
12.1	12.7.3	Noise is covered by reference to ISO 7176-14.
12.1	12.7.4	The output connectors of battery chargers are covered by reference to ISO 7176-14. Gas, hydraulic and pneumatic connectors and terminals are not covered. Electrical connectors to supply mains for built-in battery chargers are covered by reference to EN 60601-1. Other electrical connections to supply mains are not covered.
12.1	12.7.5	Surface temperatures of parts within the occupant reach space shown in Figure 1 are covered by reference to ISO 7176-14. Surface temperatures of other accessible parts are not covered.
12.1	12.9	Markings, visual indicators and displays are covered by reference to ISO 7176-14.
Clause 13	13.1	
13.1, 13.3	13.3 a)	Labelling bearing the manufacturer's name and address are covered by reference to ISO 7176-15. Information concerning the authorised representative is covered by 13.3.
13.1	13.3 b)	Covered by reference to ISO 7176-15.
13.1	13.3 d)	Covered by reference to ISO 7176-15.
Clause 13	13.4	Requirements for the label are not covered.
Clause 13	13.6 a)	Details in 13.3 a), b), i), j) and k) are covered.

Clause(s)/ subclause(s) of this European Standard	Essential Requirements (ERs) of Directive 93/42/EEC	Qualifying remarks/Notes
		Other details are not covered.
Clause 13	13.6 c)	Covered by reference to EN 12182.
Clause 13	13.6 d)	Covered by reference to EN 12182 and ISO 7176-15.
Clause 13	13.6 h), first paragraph	Covered by reference to EN 12182 and ISO 7176-15.
Clause 13	13.6, i)	Covered by reference to EN 12182 and ISO 7176-15.

For devices which are also machinery within the meaning of Article 2(a) of Directive 2006/42/EC on Machinery, in accordance with Article 3 of Directive 93/42/EEC the following Table ZA.2 details the relevant essential health and safety requirements (EHSRs) of Directive 2006/42/EC on Machinery to the extent to which they are more specific than those of Directive 93/42/EEC along with the corresponding clauses of this European Standard. Table ZA.2, however, does not imply any citation in the OJEU under the machinery directive and thus do not provide presumption of conformity for the machinery directive.

Determination of whether a certain EHSR is “relevant” and thus applies to a particular device, pertains to the responsible parties (e.g. manufacturer, notified bodies, competent authorities) in accordance with the applicable procedures.

Table ZA.2 — Relevant Essential Health and Safety Requirements from Directive 2006/42/EC on machinery that are addressed by this European Standard
(according to Article 3 of amended Directive 93/42/EEC)

Clause(s)/ subclause(s) of this European Standard	Essential Health and Safety Requirements (EHSRs) of Directive 2006/42/EC	Qualifying remarks/Notes
12.7	1.1.4	
8.2	1.1.8	Resistance to operating stresses of seat mountings is covered by reference to ISO 7176-8.
	1.2.2	This relevant EHSR is not covered by this standard.
	1.2.3	This relevant EHSR is not covered by this standard.
10.2, 11.2, 11.3, 12.1	1.2.4.1	Priority of stop control and cut-off of energy supply are not covered.
12.6	1.2.4.3	
12.1	1.5.4	Risk of erroneous electrical connections are covered by reference to ISO 7176-14.
	1.6.1	This relevant EHSR is not covered by this standard.
11.1, 12.1	1.6.2	Access for operation and adjustment is covered by 11.1. Access to batteries for maintenance is covered by reference to ISO 7176-14. Safety of access is not covered.
12.1	1.6.3	Isolation of the battery set is covered by reference to ISO 7176-14.
	3.6.2	This relevant EHSR is not covered by this standard.

WARNING — Other requirements and other EU Directives might be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN 12183, *Manual wheelchairs — Requirements and test methods*

[2] ISO 68-1:1998, *ISO general purpose screw threads — Basic profile — Part 1: Metric screw threads*

[3] ISO 7176-5:2008, *Wheelchairs — Part 5: Determination of dimensions, mass and manoeuvring space*

[4] ISO 7176-7:1998, *Wheelchairs — Part 7: Measurement of seating and wheel dimensions*

[5] ISO 7193:1985, *Wheelchairs — Maximum overall dimensions*

[6] ECE Regulation 48, *Uniform provisions concerning the approval of vehicles with regard to the installation of lighting and light-signalling devices*

[7] COST 335, *Passengers' Accessibility of Heavy Rail Systems, Final Report of the Action*

[8] FMVSS 302, *Federal Motor Vehicle Safety Standard No. 302 — Flammability of Interior Materials*

[9] Official Journal of the European Union, Council Directive 93/42/EEC of 14 June 1993 concerning medical devices

[10] Official Journal of the European Union, Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC

[11] Official Journal of the European Union, 2008/164/EC, Commission Decision of 21 December 2007 concerning the technical specification of interoperability relating to ‘persons with reduced mobility’ in the trans-European conventional and high-speed rail system

[12] Council Directive 76/756/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to the installation of lighting and light-signalling devices on motor vehicles and their trailers

[13] Commission Directive 97/28/EC of 11 June 1997 adapting to technical progress Council Directive 76/756/EEC relating to the installation of lighting and light-signalling devices on motor vehicles and their trailers

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