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**Wheelchairs —**

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

*Fauteuils roulants —*

*Partie 14: Systèmes d'alimentation et de commande des fauteuils  
roulants et des scooters électriques — Exigences et méthodes d'essai*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 7176-14 was prepared by Technical Committee ISO/TC 173, *Assistive products for persons with disability*, Subcommittee SC 1, *Wheelchairs*.

This second edition cancels and replaces the first edition (ISO 7176-14:1997), all clauses of which have been technically revised.

ISO 7176 consists of the following parts, under the general title *Wheelchairs*:

- *Part 1: Determination of static stability*
- *Part 2: Determination of dynamic stability of electric wheelchairs*
- *Part 3: Determination of effectiveness of brakes*
- *Part 4: Energy consumption of electric wheelchairs and scooters for determination of theoretical distance range*
- *Part 5: Determination of dimensions, mass and manoeuvring space*
- *Part 6: Determination of maximum speed, acceleration and deceleration of electric wheelchairs*
- *Part 7: Measurement of seating and wheel dimensions*
- *Part 8: Requirements and test methods for static, impact and fatigue strengths*
- *Part 9: Climatic tests for electric wheelchairs*
- *Part 10: Determination of obstacle-climbing ability of electric wheelchairs*
- *Part 11: Test dummies*
- *Part 13: Determination of coefficient of friction of test surfaces*
- *Part 14: Power and control systems for electrically powered wheelchairs and scooters — Requirements and test methods*
- *Part 15: Requirements for information disclosure, documentation and labelling*
- *Part 16: Resistance to ignition of upholstered parts — Requirements and test methods*

- *Part 19: Wheeled mobility devices for use in motor vehicles*
- *Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and motorized scooters*
- *Part 22: Set-up procedures*
- *Part 23: Requirements and test methods for attendant-operated stair-climbing devices*
- *Part 24: Requirements and test methods for user-operated stair-climbing devices*
- *Part 26: Vocabulary*

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## Introduction

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

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

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## Wheelchairs —

Part 14:

# Power and control systems for electrically powered wheelchairs and scooters — Requirements and test methods

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

## 1 Scope

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

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

## 2 Normative references

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

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

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

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

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

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

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

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

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

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

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

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

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

IEC 60601-1-2, *Medical electrical equipment — Part 1-2: General requirements for basic safety and essential performance — Collateral standard: Electromagnetic compatibility — Requirements and tests*

IEC 61032, *Protection of persons and equipment by enclosures — Probes for verification*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

EN 563, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

EN 12182, *Technical aids for disabled persons — General requirements and test methods*

EN 30993-1, *Biological evaluation of medical devices — Part 1: Guidance on selection of tests*

UL 94, *Tests for flammability of plastic materials for parts in devices and appliances*

### 3 Terms and definitions

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

#### 3.1

##### **nominal voltage**

suitable approximate value of the voltage used to designate or identify a battery

[Adapted from IEC 482-03-31]

#### 3.2

##### **command signal**

electrical signal from the control device

#### 3.3

##### **control device**

device with which the operator indicates the desired speed and/or direction of movement of the wheelchair

NOTE A control device can be an integral part of a controller.

#### 3.4

##### **controller**

electrical devices, circuits, and the case(s) in which they are housed that are used to convert the operator's indication of desired speed and/or direction of movement into the appropriate power to be supplied to the motor(s)

#### 3.5

##### **pinch point**

location at which a moving part comes into contact with or close proximity to another part such that another object at that location would be cut or crushed