INTERNATIONAL STANDARD

ISO 7176-21

First edition
2003-04-15

Wheelchairs —

Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and motorized scooters

Fauteuils roulants —

Partie 21: Exigences et méthodes d'essai pour la compatibilité des fauteuils roulants électriques et scooters motorisés

Reference number
ISO 7176-21:2003(E)

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Published in Switzerland

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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 7176-21 was prepared by Technical Committee ISO/TC 173, *Technical systems and aids for disabled or handicapped persons*, Subcommittee SC 1, *Wheelchairs*.

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

— *Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered*

— *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 overall dimensions, mass and turning 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 electric wheelchairs — 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*

The following parts are also on the programme of work

— *Part 20: Determination of the performance of stand-up type wheelchairs*

— *Part 24: User-operated stair-climbing devices — Requirements and test methods*

Introduction

Electrically powered wheelchairs should operate without introducing significant electromagnetic disturbances to the environment and without significant degradation of operational performance in the presence of electromagnetic disturbances that can be expected in normal use. Wheelchairs can be expected to operate in traffic areas and therefore should be immune to radio frequency fields from fixed and mobile communications equipment, as well as from other sources of electromagnetic disturbance. Injury could occur in the event of unintentional movement or change in direction of a wheelchair.

This part of ISO 7176 specifies requirements and test methods for wheelchairs to minimize the risks connected with reasonably foreseeable electromagnetic interference and electrostatic discharge and to minimize the risk of producing electromagnetic fields which could impair the operation of other devices or equipment in the wheelchair's usual environment.

Wheelchairs —

Part 21:
Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and motorized scooters

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 the manufacturer or test house from legal obligations relating to health and safety at any stage.

1 Scope

This part of ISO 7176 specifies requirements and test methods for electromagnetic emissions and for electromagnetic immunity of electrically powered wheelchairs and motorized scooters with a maximum speed of not more than 15 km/h for indoor and outdoor use by people with disabilities. It is also applicable to manual wheelchairs with an add-on power kit. It is not applicable to vehicles designed to carry more than one person.

This part of ISO 7176 also specifies additional requirements for electromagnetic emissions and for electromagnetic immunity of electrically powered wheelchairs and motorized scooters with a built-in battery charger. It is not applicable to battery chargers that are not built into a wheelchair.

A reference configuration is specified for adjustable wheelchairs and scooters to enable test results to be used for comparison of performance.

NOTE The term “wheelchair” is used in this part of ISO 7176 to cover electrically powered wheelchairs, motorized scooters and manual wheelchairs with an add-on power kit.

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 7176-5, *Wheelchairs — Part 5: Determination of overall dimensions, mass and turning space*

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

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

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

IEC 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient / burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 6: Immunity to conducted disturbances, induced by radio frequency fields*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 11: Voltage dips, short interruptions and voltage variations immunity tests*

CISPR 11, *Industrial, scientific and medical (ISM) radio frequency equipment — Electromagnetic disturbance characteristics — Limits and methods of measurement*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
front vertical plane
vertical plane which is normal to the forward direction of travel and tangential to the front edge of the furthest forward wheel

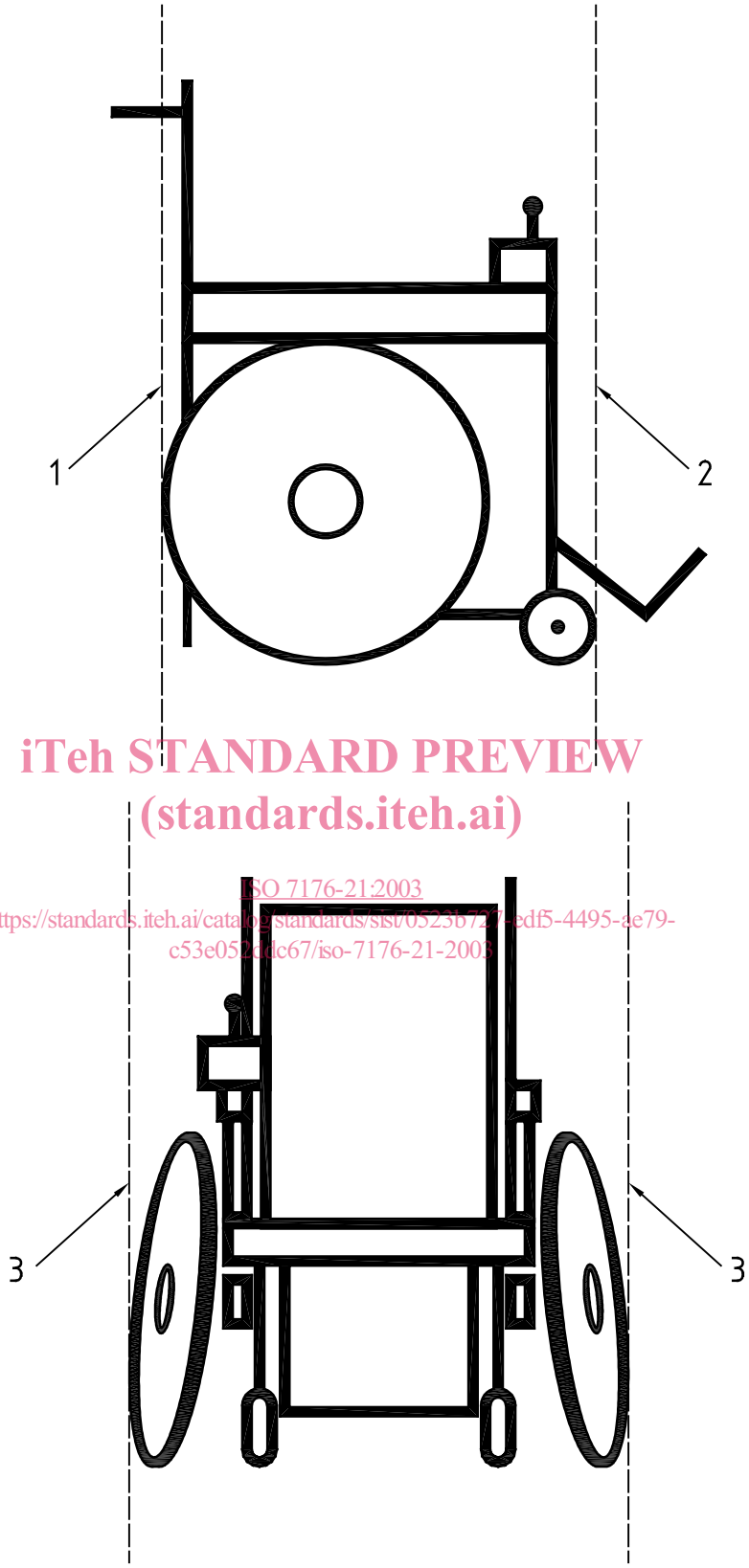
See Figure 1.

3.2
rear vertical plane
vertical plane which is normal to the forward direction of travel and tangential to the back edge of the rearmost wheel

See Figure 1.

3.3
side vertical plane
vertical plane which is parallel to the forward direction of travel and tangential to the outer edge of the outermost wheel on the side of the wheelchair

See Figure 1.



Key

1 rear vertical
2 front vertical
3 side vertical

Figure 1 — Reference planes

4 Classification of electrically powered wheelchairs

Electrically powered wheelchairs are classified as follows:

— category A: wheelchairs with electronic differential steering and electronic brake control;

— category B: wheelchairs with electronic speed control, electronic servo steering and electronic brake control;

— category C: wheelchairs with electronic speed control, manual steering and electronic brake control;

— category D: wheelchairs with electronic differential steering and manual brake control;

— category E: wheelchairs with electronic speed control, electronic servo steering and manual brake control;

— category F: wheelchairs with electronic speed control, manual steering and manual brake control;

— category G: wheelchairs with a simple on-off motor, manual steering and manual brake control.

A wheelchair can fall into more than one category.

5 Requirements

5.1 General

All wheelchairs shall meet the requirements of 5.2.

Wheelchairs with a built-in battery charger shall also meet the requirements of 5.3.

5.2 Driving

NOTE An observation period of 2 s is specified in many of the requirements of 5.2 and 5.3. This is not intended to imply that it is acceptable for the wheelchair to fail after the observation period has elapsed. An indefinite observation period is impractical and it is assumed that, if the wheelchair does fail during a test, it will fail within 2 s of a test event.

5.2.1 Radiated emissions

When tested in accordance with 9.1, the wheelchair shall meet the requirements of the group 1, class B radiated emissions limits specified in CISPR 11.

5.2.2 Electrostatic discharge (ESD) immunity (driving)

Prior to and at the conclusion of testing in accordance with 10.1 and 10.2, the wheelchair shall meet the functional requirement specified in ISO 7176-9 (see also clause 8 in this part of ISO 7176).

When the wheelchair is tested in accordance with 10.1, using test levels of ± 2 kV, ± 4 kV and ± 6 kV for contact discharges and test levels of ± 2 kV, ± 4 kV and ± 8 kV for air discharges, and when the wheelchair is tested in accordance with 10.2 using a test level of ± 8 kV:

a) the drive system of the wheelchair shall meet the requirements of 5.2.4 during each discharge and for 2 s following each discharge or set of discharges if a programmable ESD generator is used;

b) electrically powered devices which are not used for driving (such as servo-assisted leg supports and seating systems with stand-up functions) shall not move during each discharge and for 2 s following each discharge or set of discharges, if a programmable ESD generator is used.

5.2.3 Radiated immunity

Prior to and at the conclusion of testing in accordance with 10.3, the wheelchair shall meet the functional requirement specified in ISO 7176-9 (see also clause 8 in this part of ISO 7176).

When the wheelchair is tested in accordance with 10.3, using a test level of 12 V/m, from 26 MHz to 1 GHz:

a) the drive system of the wheelchair shall meet the requirements of 5.2.4 in the presence of the applied radio frequency (RF) field;

b) electrically powered devices which are not used for driving (such as servo-assisted leg supports and seating systems with stand-up functions) shall not move in the presence of the applied RF field.

5.2.4 Stability of speed and direction

5.2.4.1 Speed

For category A, B, C, D, E and F wheelchairs, the average wheel speed change, ΔS_{avg}, calculated as specified in clause 11, shall not exceed ± 20 %.

NOTE A positive number indicates a speed increase, while a negative number indicates a speed decrease.

For category G wheelchairs, the speed requirement does not apply.

5.2.4.2 Steering

For category A and D wheelchairs (wheelchairs with electronic differential steering), the differential wheel speed change, ΔS_{diff}, calculated as specified in clause 11, shall not exceed ± 25 %.

NOTE A positive number corresponds to a right turn, while a negative number corresponds to a left turn.

For category B and E wheelchairs (wheelchairs with electronic servo steering), the maximum permissible change in steering servo position or steered wheel angle is that corresponding to a turning radius of 4 m, as specified in ISO 7176-5.

For category C, F and G wheelchairs (wheelchairs with manual steering), the steering requirement does not apply.

5.3 Charging

5.3.1 Conducted emissions

When tested in accordance with 9.2, the wheelchair shall meet the requirements of the group 1, class B conducted emissions limits of CISPR 11.

5.3.2 Radiated emissions

When tested in accordance with 9.1, the wheelchair shall meet the requirements of the group 1, class B radiated emissions limits of CISPR 11.

5.3.3 Electrostatic discharge (ESD) immunity (charging)

Prior to and at the conclusion of testing in accordance with 10.1, the wheelchair shall meet the functional requirement specified in ISO 7176-9 (see also clause 8 in this part of ISO 7176).