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Rullstolar –
Del 3: Bestämning av bromsars effektivitet
(ISO 7176-3:2012, IDT)

Wheelchairs –
Part 3: Determination of effectiveness of brakes
(ISO 7176-3:2012, IDT)

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Den internationella standarden ISO 7176-3:2012 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 7176-3:2012.

The International Standard ISO 7176-3:2012 has the status of a Swedish Standard. This document contains the official version of ISO 7176-3:2012.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Rullstolar, SIS/TK 344/AG 6.

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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 7176-3 was prepared by Technical Committee ISO/TC 173, *Assistive products for persons with disability*, Subcommittee SC 1, *Wheelchairs*.

This third edition cancels and replaces the second edition (ISO 7176-3:2003), all clauses of which have been technically revised.

Significant technical changes from the second edition are under consideration.

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 electrically powered 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 postural support devices*

— *Part 19: Wheeled mobility devices for use as seats in motor vehicles*

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

— *Part 22: Set-up procedures*

— *Part 25: Batteries and chargers for powered wheelchairs - Requirements and test methods*

— *Part 26: Vocabulary*

— *Part 28: Requirements and test methods for stair-climbing devices*

Introduction

The performance of a wheelchair's brakes can be critical for safety. The tests specified in this part of ISO 7176 determine the ability of a wheelchair to stop in a safe manner on level ground and on a slope, and determine the ability of a wheelchair to remain stationary when parked on a slope.

Wheelchairs —

Part 3:
Determination of effectiveness of brakes

1 Scope

This part of ISO 7176 specifies test methods for the measurement of the effectiveness of brakes of manual wheelchairs and electrically powered wheelchairs, including scooters, intended to carry one person, with a maximum speed not exceeding 15 km/h. It also specifies disclosure requirements for the manufacturer.

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 7176-6, *Wheelchairs — Part 6: Determination of maximum speed, acceleration and deceleration of 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 7176-22, *Wheelchairs — Part 22: Set-up procedures*

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

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
tipping
rotational movement of the wheelchair that occurs when the vertical projection of the centre of mass of the occupied wheelchair moves outside of a polygon connecting the ground contact points of all the running wheels

Note 1 to entry: The instant at which the wheelchair starts to tip is reached when the forces become zero under all uphill running wheels (i.e. there is only force through one side of the polygon). See ISO 7176-1 for more details.

3.2
sliding
movement of the wheelchair across the test surface where there is a difference in velocity between the test surface and the braked wheel rolling surface

4 Principle

A number of wheelchair braking operations are carried out and the resulting responses of the wheelchair are measured and observed.

5 Apparatus

5.1 Rigid, flat test planes and ramp

5.1.1 All test planes specified under this clause shall be rigid with a surface coefficient of friction as specified in ISO 7176-13 and of sufficient size to conduct the tests. The surface shall be flat such that any two points 1m apart on the plane shall be contained between two imaginary horizontal planes 5 mm apart, as an indication of flatness. Conformity with this requirement may be evaluated using a 1 m straight edge.

NOTE The imaginary planes are intended to provide a measure of control on the flatness of the test plane.

The planes and ramps in 5.1.2 to 5.1.4 may be combined into one or two units providing the plane/ramp requirements for each applicable type of plane/ramp are satisfied.

5.1.2 Rigid, flat, horizontal test plane, which shall meet the requirements of 5.1.1 and have no more than 0,5 degrees of variation in slope or cross slope from the horizontal throughout the test.

5.1.3 Rigid, flat, adjustable test plane, which shall meet the requirements of 5.1.1 and be of sufficient size to accommodate the wheelchair during parking brake testing, having a slope which can be adjusted from the horizontal about a single axis.

If the slope of the test plane is increased in a continuous fashion, the rate of increase should not exceed 1°/s as the angle of wheelchair instability is approached.

If the slope of the test plane is increased in a stepwise fashion, the size of the steps shall not exceed 0,5° and the movement between steps should be sufficiently smooth that it does not affect the test results.

NOTE A range of inclinations from horizontal to 25° is usually sufficient for most wheelchairs.

5.1.4 Rigid, flat, inclined test ramp, which shall meet the requirements of 5.1.1 and be of sufficient size to accommodate the wheelchair during running brake testing, having a slope which is adjustable to a specific inclination ($^{0}_{+0,5}$)° or which is fixed at that inclination. Conformity with the inclination requirement may be evaluated using the inclinometer specified in 5.5.

NOTE 1 If the angle is fixed, several different test ramps will have to be used.

NOTE 2 The recommended minimum size is 5 m × 1,5 m, but a size of 10 m × 1,5 m will often be necessary.

5.2 Test dummy, as specified in ISO 7176-11, with appropriate restraints, or a human test occupant.

NOTE 1 If a dummy is used, remote control devices may be used to operate the wheelchair controls.

NOTE 2 A human test occupant should take care to minimize any movement during testing as it can affect the results.

5.3 Supplementary weights, with appropriate restraints, to add to the human test driver to give the mass and mass distribution equivalent to the applicable dummy.

5.4 Braking distance measurement equipment to measure the braking distance of a wheelchair with an accuracy of ± 50 mm.

5.5 Inclinometer to measure the angle of the slope of a test plane with respect to the horizontal to an accuracy of ± 0,2°.

5.6 Force measurement equipment to measure force with an accuracy of 5 % over a range of 10 N to 250 N.

6 Preparation of test wheelchair

Prepare the test wheelchair as follows before commencing the sequence of tests.

a) Set up the wheelchair as specified in ISO 7176-22. If a test dummy is used, select and fit the dummy as specified in ISO 7176-22 and add restraints to minimize movement of the dummy. If a human test occupant is used, position and secure the supplementary weights (see 5.3) to give substantially the same mass distribution as the test dummy when the human test occupant is seated in the wheelchair.

b) Adjust the brakes so that:

— where the manufacturer's instructions for use specify the method for adjustment of the brakes, the brakes are adjusted in accordance with those instructions;

— if there are no specifications, the brakes are adjusted so that the operating forces lie within the ranges specified in Table 1;

— where brakes cannot be adjusted to give operating forces as specified in Table 1, the brakes are adjusted so that the operating forces are as close as possible to those in Table 1.

Table 1 — Operating forces

Means of operation	Operating force
	N
hand/arm operation[a]	60 ± 5
foot, push	100 ± 10
foot, pull	60 ± 5
finger	5 ± 1
hand[b]	13,5 ± 2

[a] An operation where the strength of the combined hand and arm can be used.

[b] An operation where only the strength of a single hand can be used; this may include two or more fingers.

The operating forces are derived from ISO 9355-3 where maximum recommended force for a normal adult is given, considering the direction of force applied.

If an operating force exceeds the value specified in Table 1, the operating force shall be disclosed as specified in Clause 9.

c) Immediately before testing, condition the wheelchair by maintaining it at an ambient temperature of 20 °C ± 10 °C for at least 3 h.

d) If a human test occupant is used, seat the occupant in the wheelchair.

7 Brake performance

WARNING — These tests are potentially hazardous to test personnel. Take appropriate precautions.

7.1 General

Perform the tests specified in 7.2 to 7.5 in any order.