INTERNATIONAL STANDARD

ISO 7176-2

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Wheelchairs —

Part 2:
Determination of dynamic stability of electric wheelchairs

Fauteuils roulants —

Partie 2: Détermination de la stabilité dynamique des fauteuils roulants électriques

Reference number
ISO 7176-2:1990(E)

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.

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.

International Standard ISO 7176-2 was prepared by Technical Committee ISO/TC 173, *Technical systems and aids for disabled or handicapped persons*.

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 efficiency of brakes*

— *Part 4: Determination of energy consumption of electric wheelchairs*

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

— *Part 6: Determination of maximum speed, acceleration and retardation of electric wheelchairs*

— *Part 7: Determination of seating dimensions*

— *Part 8: Static, impact and fatigue strength tests for wheelchairs*

— *Part 9: Climatic tests for electric wheelchairs*

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— *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 controls*

— *Part 15: Requirements for information disclosure, documentation and labelling*

— *Part 16: Flammability*

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Wheelchairs —

Part 2:
Determination of dynamic stability of electric wheelchairs

1 Scope

This part of ISO 7176 specifies methods for determining the dynamic stability of electric wheelchairs.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7176. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7176 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6440:1985, *Wheelchairs — Nomenclature, terms and definitions.*

ISO 7176-11:—[1], *Wheelchairs — Part 11: Test dummies.*

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

ISO 7930:1986, *Wheelchairs — Type classification based on appearance characteristics.*

3 Definitions

For the purposes of this part of ISO 7176, the definitions given in ISO 6440 apply.

1) To be published.

4 Principle

Performance of a number of stability tests designed to determine the dynamic stability of electric wheelchairs. The tests are designed to simulate situations occurring in normal use.

Use of criteria for instability:

— lifting of one or more wheels from the underlay;

— tipping over of the wheelchair.

Both criteria are used in each test.

5 Test plane

The tests shall be carried out on an even, hard and smooth plane, the slope of which shall be adjustable or predetermined. The surface of the plane shall have a coefficient of friction as defined in ISO 7176-13.

6 Test wheelchair

Unless otherwise specified and wherever appropriate, the following conditions shall be fulfilled during testing.

6.1 The wheelchair shall be fully equipped for normal use as supplied by the manufacturer, including armrests and leg supports with footrests, elevated leg rests, and seat cushions.

6.2 On some wheelchairs the wheels can be attached in more than one way. In this case, both the least and most critical ways shall be tested.

6.3 If the wheelchair has pneumatic tyres, the air pressure in them shall be adjusted in accordance with the manufacturer's instructions. If a pressure range is specified, the highest recommended pressure shall be selected.

6.4 During the tests, the wheelchair shall be loaded with a test dummy of appropriate size, constructed and positioned in accordance with ISO 7176-11 or with a person of the same mass. The dummy shall be secured to prevent movement from its position during the tests. If a human equivalent is used, motion of the body from the stated dummy position shall be minimized.

6.5 The body support system, if adjustable, shall be set to correspond to natural sitting posture, with the lowest part of the leg support/footrest 50 mm above the test plane and the seat corresponding to the mid-point sitting height. The slope of the seat relative to the horizontal shall be as close as possible to 4°. The slope of the backrest relative to the vertical shall be as close as possible to 10° of recline. The angle between the seat and the leg support shall be as close as possible to 90°. All other parts of the body support system shall be set at their middle position.

6.6 The batteries (accumulators) shall, when each test starts, have at least 75 % of their rated nominal capacity.

6.7 The force that is required to operate the hand- or foot-operated controls shall be measured and recorded in the test report. If the force is adjustable, record the minimum and maximum force required to operate the controls. Note any equipment on the wheelchair which is designed to prevent the wheelchair from tipping.

7 Test procedures

7.1 Stability when starting forward on uphill slope

Position the wheelchair on a tilt platform. From a stationary start, operate the controls to give maximum acceleration in the forward (uphill) direction.

Record the minimum slope at which any of the following occurs:

a) one or more wheels lift from the test plane;

b) the wheelchair tips beyond the balance point.

7.2 Braking stability when travelling forward down slope

Run the wheelchair at maximum speed down a slope of 5°. Operate the controls to produce maximum retardation.

Record the following:

a) if one or more wheels lift from the test plane;

b) if the wheelchair tips beyond the balance point;

c) if the wheelchair slides.

7.3 Stability when turned

Run the wheelchair at maximum speed in both the forward and reverse directions on a flat, horizontal surface. Operate the steering control to produce a turn with minimum turning radius, in one direction. If possible, carry out this manoeuvre without braking. Repeat the whole procedure, turning in the opposite direction.

Record the following:

a) if one or more wheels lift from the test plane;

b) if the wheelchair tips beyond the balance point.

8 Test report

The test report shall contain the following information:

a) a reference to this part of ISO 7176;

b) the product type and type designation, in accordance with ISO 7930;

c) the name and address of the manufacturer;

d) a photograph of the wheelchair equipped as during the test;

e) the name and address of the test institution;

f) the test results as specified in 7.1, 7.2 and 7.3;

g) details of the test load used during the test;

h) the forces required to operate controls as specified in 6.7.

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Descriptors: wheel chairs, electric vehicles, tests, determination, dynamic properties, stability.

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