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**BS ISO 7176-11:2012**



BSI Standards Publication

# Wheelchairs

Part 11: Test dummies

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This British Standard is the UK implementation of ISO 7176-11:2012.

The UK participation in its preparation was entrusted to Technical Committee CH/173/1, Wheelchairs.

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

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# Wheelchairs —

## Part 11: Test dummies

*Fauteuils roulants —*

*Partie 11: Mannequins d'essai*



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Tel. + 41 22 749 01 11  
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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 7176-11 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 7176-11:1992), which has 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 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*

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- *Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and scooters, and battery chargers*
- *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 25: Batteries and chargers for powered wheelchairs - Requirements and test methods*
- *Part 26: Vocabulary*
- *Part 28: Requirements and test methods for stair-climbing devices*

A technical report (ISO/TR 13570-1) is also available giving a simplified explanation of the parts of ISO 7176.

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## Introduction

When testing wheelchairs it is often necessary to simulate a human occupant. Test dummies designed for motor vehicle crash testing are used where it is appropriate to do so, but they are expensive. A need exists for an affordable alternative. The first edition of ISO 7176-11, published in 1992, specified a set of test dummies that would be suitable for most wheelchair tests. The designs were intended to provide an appropriate total load mass, to approximate the mass distribution of a human occupant, to avoid unrepresentative damage to the wheelchair, to be durable and to be inexpensive to manufacture.

Experience of using the first edition of ISO 7176-11 and related test dummy specifications showed that test dummies did not always provide repeatable results, particularly for static and dynamic stability tests. Several areas for improvement have been identified: to extend the mass range, to enable a test dummy of arbitrary mass to be made, to enable verification of the location of the overall centre of mass and to enable adjustment of the position of the overall centre of mass. This second edition of ISO 7176-11 is intended to provide these improvements.

The ability to measure and adjust the location of the overall centre of mass eliminates the need to specify many aspects of test dummy design. It also allows for the mass of a test dummy to be altered as needed.

The formulae provided in this part of ISO 7176 for the location of the overall centre of mass are based on data and research available to date. It is expected that the range of masses and the mass distribution of wheelchair occupants will change over time. Revisions can be made to this part of ISO 7176 to reflect such changes as and when data becomes available.



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# Wheelchairs —

## Part 11: Test dummies

### 1 Scope

This part of ISO 7176 specifies requirements for test dummies of any mass greater than or equal to 25 kg, to be used in the evaluation of wheelchairs. This part of ISO 7176 provides formulae that specify the location of the overall centre of mass of test dummies, the masses of the segments that comprise the test dummies and the locations of pivots that connect the segments. It also specifies the characteristics of loading pads that support the segments.

The specified location for the centre of mass is approximately the same as that of a human being of the corresponding mass when seated in a wheelchair, and also, for masses up to 100 kg, when in a standing position in a stand-up wheelchair. This part of ISO 7176 does not attempt to represent the mass distribution of a person with limb atrophy or amputation. This part of ISO 7176 is intended to enable the construction of test dummies that will produce comparable results for stability, performance and durability testing of manual wheelchairs and electrically powered wheelchairs, including scooters.

This part of ISO 7176 also includes informative tables of mass and locations of centre of mass, which are derived from the formulae, corresponding to example test dummy masses up to 300 kg in 25 kg increments.

### 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 7176-26, *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

##### **forward location**

distance forward from the back support reference plane, measured perpendicular to it

**NOTE** For the purposes of this document, the back support reference plane is equivalent to the front surface of the test fixture's back support when the test dummy is fitted in the test fixture (see 5.1).

#### 3.2

##### **height**

distance upward from the seat reference plane, measured perpendicular to it

**NOTE** For the purposes of this document, the seat reference plane is equivalent to the upper surface of the test fixture's seat when the test dummy is fitted in the test fixture (see 5.1).