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Wheelchairs —

Part 19:

Wheelchairs for use as seats in motor vehicles

Fauteuils roulants —

Partie 19: Fauteuils roulants destinés à être utilisés comme sièges dans des véhicules à moteur



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Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Design requirements and recommendations	9
4.1 General	9
4.2 Wheelchair securement	9
4.3 Occupant restraints	9
4.3.1 Accommodation of vehicle-mounted three-point belt restraints	9
4.3.2 Wheelchair-mounted occupant restraints	9
4.4 Wheelchair head and back supports for small children	10
4.5 Risk management in modifying wheelchairs that conform to this document	10
5 Performance requirements and recommendations	10
5.1 General	10
5.2 Frontal impact	10
5.3 Accessibility of securement points intended for use with strap-type tiedowns	12
5.4 Clear paths for strap-type tiedowns	12
5.5 Accommodation of vehicle-mounted belt restraints	12
5.6 Wheelchair-mounted belt restraints	13
6 Identification, labelling, user instructions, warning, and disclosure requirements and recommendations	13
6.1 General	13
6.2 Identification and labelling	13
6.3 Presale literature	14
6.4 User and maintenance instructions	15
7 Documentation of conformance	18
7.1 General	18
7.2 Frontal impact test	18
7.3 Design, labelling, and literature requirements	19
Annex A (normative) Method for frontal impact test	20
Annex B (normative) Specifications for securement points on wheelchairs intended for attachment of four-point strap-type tiedowns	29
Annex C (normative) Method for testing accessibility and tiedown clear paths of wheelchair securement points intended for attachment of four-point strap-type tiedowns	33
Annex D (normative) Methods for rating wheelchair accommodation of vehicle-mounted occupant belt restraints	42
Annex E (normative) Specifications for Surrogate Wheelchair Tiedown and Occupant Restraint System (SWTORS) with four-point strap-type tiedown and three-point belt restraint	48
Annex F (informative) Specifications for wheelchair Universal Docking Interface Geometry (UDIG)	61
Annex G (informative) Wheelchair design, performance, and labelling recommendations for improved protection of occupants seated facing forward in wheelchairs during rear impacts	66
Annex H (normative) Design and performance requirements for five-point harness restraints for children less than 23 kg	75

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Annex I (informative) Performance considerations for five-point harness restraints for children less than 23 kg	77
Annex J (informative) Design and performance requirements for wheelchair-mounted occupant restraints for use by people with body mass equal to or greater than 23 kg	78
Annex K (normative) Requirements and recommendations when providing more than four securement points	84
Annex L (informative) Checklist of requirements	87
Annex M (informative) Indication of main values in imperial units	89
Bibliography	90

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 173, *Assistive products*, Subcommittee SC 1, *Wheelchairs*.

This third edition cancels and replaces the second edition (ISO 7176-19:2008), which has been technically revised. It also incorporates the Amendment ISO 7176-19:2008/Amd.1:2015.

The main changes are as follows:

- scope has been expanded to include wheelchairs for occupants with a mass less than 22 kg;
- clause has been added to address risk management in modification of wheelchairs;
- the conformance label has been revised;
- design and performance requirements have been expanded, for example related to wheelchair tiedown clear-paths, wheelchair-mounted occupant restraints, and wheelchair securement with strap-type tiedowns;
- specifications for the surrogate WTORS have been enhanced;
- a checklist of the requirements has been added in [Annex L](#).

A list of all parts in the ISO 7176 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Transportation safety research has shown that the vehicle seat is an important part of the occupant restraint system and therefore plays a key role in reducing the risk of serious injuries to vehicle occupants in many types of vehicle crashes. In particular, the seat needs to allow and facilitate the proper positioning of belt restraints on the skeletal regions of the occupant, not add to forces on the occupant during impact loading, and provide effective support for the occupant so that the belt restraint will remain in place over skeletal regions throughout a crash. People with physical disabilities often remain in their wheelchairs whilst travelling in motor vehicles as drivers or passengers. Since many wheelchairs were not designed for this purpose, wheelchair-seated occupants are often at higher risk of injury in crashes than are people seated in seats provided by the vehicle manufacturer.

ISO 10542-1 provides design, performance, labelling and manufacturer literature requirements, and specifies associated test methods, for Wheelchair Tiedown and Occupant Restraint Systems (WTORS). This document addresses the seating part of wheelchair-user occupant-protection systems by establishing design, performance, labelling and manufacturer literature requirements, as well as associated test methods, for wheelchairs that can be used as seats in motor vehicles.

Whilst wheelchairs can be secured by various types of tiedown and securement systems that were available throughout the world at the time this document was developed, effective wheelchair securement in the real world cannot be achieved without compatibility of the wheelchair tiedown system available in the vehicle and the method of securement provided on the wheelchair. At the time that this document was developed, the four-point strap-type tiedown was considered to be the most effective, common, and universally adaptable system for securing a wide range of wheelchair types and sizes. Therefore the provisions and test methods of this document are based on the use of four-point strap-type tiedowns to secure the wheelchair in the vehicle. However, wheelchairs can also be designed for securement in motor vehicles by other methods, such as docking-type devices, which are commonly used by wheelchair-seated drivers. Manufacturers who wish to evaluate wheelchairs with other methods of securement can make use of provisions and test methods of this document.

To evaluate the crashworthiness performance of wheelchairs, [Annex A](#) specifies procedures for dynamically testing a wheelchair loaded with an appropriate-size crash-test dummy using a 48 km/h crash pulse with the wheelchair secured facing forward on the impact sled. This test is based on well-documented motor vehicle crash and injury statistics, which show that more than 50 % of all serious injuries to occupants of motor vehicles occur in frontal crashes, and that more than 95 % of frontal crashes result in a longitudinal change in vehicle speed of less than 48 km/h. Dynamic performance for forward-facing wheelchairs in rear impacts is addressed in [Annex G](#). Recent research has shown that some commercial wheelchairs offer significantly less protection in rear-impact than conventional motor vehicle seats. Manufacturers who wish to test wheelchairs to determine their performance in rear-impact conditions can use the test methods and performance measures in [Annex G](#).

This document has also been developed with the recognition that the use of a pelvic-belt restraint alone does not provide the wheelchair occupant with the same level of crash protection in a frontal impact as does the use of both pelvic-belt and shoulder-belt restraints for adults or five-point harness restraints for children. Therefore, the provisions and test methods of this document are based on the use of both pelvic- and shoulder-belt-type restraints or five-point harness restraints.

The first edition of this document only addressed wheelchairs designed for use by people who weigh 22 kg or more because it is best practice to have those under 22 kg transfer to a child safety seat that meets applicable standards (e.g. FMVSS 213, UN Regulation No. 44). Whilst transfer to a child safety seat should continue to be the first choice, there is a portion of people who use wheelchairs and weigh less than 22 kg that cannot safely or practically transfer and these individuals would be safer in a crashworthy wheelchair. To fill this need, the scope of this document has been expanded (see scope) to include products designed for people who weigh between 12 kg and 22 kg and includes additional design features and performance criteria (including buckle release characteristics, restraint belt width, back-support height, restraint fit and adjustment) for these products that have been shown to provide a higher level of protection for smaller occupants.

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The four-point strap-type tiedown system relies on the involvement of a second person and cannot be implemented by the wheelchair occupant. Accordingly, it is desirable to progress toward a securement method that can be implemented independently by the wheelchair-seated passenger who might travel in different public transportation and private vehicles. As a step toward this goal, [Annex F](#) establishes universal docking interface geometry (UDIG) for securement points on wheelchairs when it is intended for the wheelchair to be secured by docking-type securement devices in public transportation and/or multiple private vehicles.

It is recognized that single sample testing does not mean that every variation of a given wheelchair model will exhibit exactly the same performance behaviour. However, it is also recognized that it is not feasible for manufacturers to independently test every variation of a given wheelchair model. As such, the expectation is that wheelchair manufacturers will test a suitably representative sample (or samples) that adequately represents the range of model variation for which conformance is claimed, based on an engineering assessment. In addition, where requested, manufacturers should make details of the wheelchair configuration used for testing available to suppliers and/or purchasers, and specify which options are available on the wheelchair when used as a seat in a motor vehicle.

Finally, this document should be viewed in the totality of daily wheelchair use and the range of standards to which all wheelchairs are expected to conform. Wheelchairs primarily serve as mobility devices. Transportation is only one of many daily activities that introduce unique circumstances and requirements that wheelchairs and people who use wheelchairs can experience. Wheelchair products that conform with this document will have additional features that provide increased levels of occupant security and safety whilst their occupants are riding in motor vehicles. However, a wheelchair's failure to conform with this document cannot be used to limit access to, and availability of, motor vehicle transportation for people who use wheelchairs.