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Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems —

Part 1: Vehicles and child restraint systems equipped with ISOFIX anchorages and attachments

Véhicules routiers — Méthodes et critères pour l'évaluation de la facilité d'utilisation des systèmes de retenue pour enfants, et leurs interfaces avec les systèmes d'ancrage dans le véhicule —

Partie 1: Véhicules et systèmes de retenue pour enfants équipés d'ancrages et d'attaches ISOFIX

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

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 29061-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*.

ISO 29061 consists of the following parts, under the general title *Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems*:

— *Part 1: Vehicles and child restraint systems equipped with ISOFIX anchorages and attachments*

— *Part 2: Manual to assist the usability assessments of ISO 29061-1* (Technical Report)

Introduction

The usability of a child restraint system (CRS) in terms of ease of

— installation of child restraint systems in various vehicles, and

— day-to-day use with a child (securing, harnessing, adaption for a growing child, etc.),

is of utmost importance to ensure that a CRS is used properly in accordance with the manufacturer's intentions, and to ensure that it will provide maximum protection in a crash situation. An international agreement on usability criteria and measurements is beneficial for both consumers and manufacturers.

The aim of this part of ISO 29061 is to develop and validate a usability rating system for ISOFIX systems to promote improved ISOFIX design for easy and correct use. It provides child restraint and vehicle manufacturers with a tool for the assessment of the usability of new and current ISOFIX systems. At the same time, it provides consumers (parents and caregivers) with information on the key features related to the proper use of the ISOFIX system, and assists them in selecting CRS and vehicles with ISOFIX systems that are easy to use properly.

The rating system consists of an assessment form and a manual (see ISO/TR 29061-2). In the manual, the content of the assessment form is clarified and guidelines and interpretations are provided. The rating form is also available in Excel (xls) format for download from the ISO standards maintenance site.

The usability of ISOFIX is addressed both in terms of the CRS (attachment system) and in terms of the vehicle (anchorage system) as well as the interaction of the two, emerging when child restraint systems are mounted in cars.

The usability evaluation system in ISO 29061 has been developed with participation from, and based on the experiences from, usability rating systems from Canada (Transport Canada and ICBC), the USA (NHTSA), and the EU (NPACS and consumer rating programmes, such as ICRT, ADAC).

It is envisaged that this methodology could be useful for current vehicle rating systems such as US NCAP and Euro NCAP.

Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems —

Part 1: Vehicles and child restraint systems equipped with ISOFIX anchorages and attachments

1 Scope

This part of ISO 29061 provides criteria for the judgement of usability of child restraint systems (CRS) with ISOFIX attachments and their corresponding anchorages in the vehicle.

This part of ISO 29061 provides criteria for a separate evaluation of the child restraint ISOFIX attachments, of the ISOFIX anchorage installation in the vehicle, and an evaluation of the interface issues when installing a child restraint system in a certain vehicle.

This part of ISO 29061 covers both rigid and flexible attachment systems of the CRS.

NOTE Although ISOFIX is defined in the original “ISOFIX” standard (ISO 13216-1) to be a rigid system, the term “ISOFIX” in this part of ISO 29061 is extended to include flexible CRS attachments (LATCH, UAS).

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 13216-1:1999, *Road vehicles — Anchorages in vehicles and attachments to anchorages for child restraint systems — Part 1: Seat bight anchorages and attachments*

3 Terms and definitions

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

3.1
anchorage
part of the universal interface provided in a vehicle

NOTE See also ISOFIX anchorages and top tether anchorage.

3.2
anti-rotational device
device intended to restrict forward or rearward rotation of a child restraint system (3.6)

3.2.1
primary anti-rotational device
device intended to restrict forward rotation of a child restraint system

EXAMPLE Top tether or support leg.

3.2.2
secondary anti-rotational device
device intended to restrict rearward rotation of a rearward-facing child restraint system

EXAMPLE Rebound bar or rebound tether.

3.3
attachment
part of the universal interface provided with the child restraint system

NOTE See also ISOFIX attachments (3.9.3) and non-rigid (flexible) attachment (3.11).

3.4
audible
capable of being heard in normal environmental conditions

3.5
base
part of the CRS (3.6) equipped with ISOFIX attachments (3.9.3) which can be attached to the ISOFIX anchorages (3.9.2) separately from the CRS shell

NOTE The CRS shell is attached on the CRS base in the normal use.

3.6
child restraint system
CRS
free-standing device intended to provide child vehicle occupants with an approved restraint

NOTE CRSs comprise various categories such as car beds, infant restraints, toddler seats (forward and rearward-facing), booster cushions, and booster seats. Combination products may cover two or more of these product categories.

[ISO 13216-1:1999, definition 3.3]

3.7
connector
connecting and locking device to the universal interface, provided with the child restraint system, and part of the attachment

3.8
hidden slack
unintended looseness of a strap that is likely to adversely affect the performance of the CRS, and that cannot be easily detected or can only be detected by handling the CRS attachments in a non-standard way

3.9
ISOFIX
system for the connection of CRS to vehicles, which has two rigid anchorages in a vehicle seating position located near the seat bight, corresponding rigid attachments on the CRS, and a means to limit the pitch rotation of the CRS

NOTE 1 In this part of ISO 29061, the term ISOFIX is extended to include flexible CRS attachments (LATCH, UAS).

NOTE 2 Adapted from ISO 13216-1:1999.

3.9.1
ISOFIX accessibility tester
device used to check the accessibility of an ISOFIX anchorage

NOTE The dimensions are defined in Figure 3, ISO 13216-1:1999.

3.9.2
ISOFIX anchorages
two horizontal rigid bars, 6 mm in diameter and at least 25 mm long, as specified in ISO 13216-1, installed in vehicles in or near the seat bight, and to which two ISOFIX attachments are connected to secure the lower part of the CRS

NOTE Anchorages may be rigid or semi-rigid according to Annex A of ISO 13216-1:1999.

3.9.3
ISOFIX attachments
two hardware assemblies, built into the CRS base at 280 mm apart, that meet the requirements of ISO 13216-1 and are used to connect a CRS to ISOFIX anchorages

NOTE Attachments may be rigid or non-rigid according to Annex B of ISO 13216-1:1999.

3.10
misuse
any deviation from the intended application and use of a CRS that might reduce its protective performance

3.11
non-rigid attachment
flexible attachment
one of two (2) prescribed connections, in accordance with ISO 13216-1:1999, Annex B, flexibly supported from the child restraint system structure, between a CRS and an anchorage

NOTE 1 A non-rigid (flexible) attachment may consist of a CRS connector or hook supported by webbing or the equivalent. A CRS connector is an attachment with certain specified dimensions designed to be rigidly supported, described in ISO 13216-1:1999, Figure 8. When designed according to ISO 13216-1:1999, Annex B, a CRS connector may be flexibly supported.

NOTE 2 Adapted from ISO 13216-1:1999.

3.12
pictogram
illustration or photo used to represent a concept or an operation

NOTE It may be supplemented by text.

3.13
rebound bar
type of anti-rotational device intended to restrict the rearward rotation of a rearward-facing CRS

NOTE It usually comprises a rigid device that, when in its operational position, rests against the car seatback.

3.14
rebound tether
lower tether
type of anti-rotational device intended to restrict the rearward rotation of a rearward-facing CRS

NOTE It usually comprises a tether strap or other hardware attached near the back or base of the CRS that connects to a rebound tether (lower tether) anchorage. It incorporates a device to enable it to be connected to such an anchorage.

3.15
rebound tether anchorage
lower tether anchorage
anchorage on the vehicle seat track or on or close to the vehicle floor to which a rebound tether (lower tether) can be attached

3.16
seat bight
area close to the intersection of the surfaces of the vehicle seat cushion and the seatback or squab

3.17
single action
operation that can be completed without the need to undertake a secondary action

NOTE Examples include tightening a strap by pulling it without the need to release a locking system, or attaching to an anchorage without the need to depress the seat cushion.

3.18
support leg
type of anti-rotational device comprising a permanent attachment to a child restraint system, or a base of a child restraint system, creating a compressive load path between the child restraint and a vehicle structure (for example, the vehicle floor) to prevent or reduce forward rotation of the child restraint

NOTE A support leg may be adjustable.

3.19
top tether
tether strap attached at or near the top of a CRS, incorporating a device to enable it to be connected to a top tether anchorage

3.19.1
top tether anchorage
device, such as a ring, bar, bracket, or webbing loop, and its underlying structure, either user-ready or aftermarket-installed, to which a top tether can be attached

3.19.2
top tether strap
webbing strap which extends from the top of a CRS to the top tether anchorage and which is equipped with an adjustment device, a tension-relieving device and a top tether connector

3.20
usability
extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

NOTE 1 This is a generic definition taken from ISO 9241-11.

NOTE 2 Interpretation of the generic definition for the purpose of this part of ISO 29061: the extent to which an ISOFIX-equipped vehicle or CRS is capable of being used and is convenient and practical in use (separately or combined).

3.21
visible
capable of being seen without tools (other than spectacles) in normal environmental conditions

4 ISOFIX usability evaluation procedure and scoring principles

4.1 Evaluation procedure

This part of ISO 29061 provides a procedure to evaluate the usability of ISOFIX attachments on child restraints, ISOFIX hardware in vehicle seating positions, and the interface between ISOFIX systems for specific combinations of child restraints and vehicle seating positions. The rating system takes into consideration child restraint systems that are equipped with either flexible or rigid ISOFIX attachments including those that include a top tether or other anti-rotation device(s). The usability rating protocol, aided by the manual in ISO/TR 29061-2, is intended to be objective and repeatable.

The rating is most easily accomplished using a team of two people having basic knowledge of child restraints and being familiar with the technical terms used. The rating procedure for all three aspects of the process — the child restraint, the vehicle seating position, and the resulting interface — takes about 45 min.

The materials necessary include

— the usability evaluation rating form (in either paper or electronic format),

— the usability rating manual (see ISO/TR 29061-2),

— the vehicle owner's manual,

— the child restraint manual, and

— a screwdriver, or a simple prying/turning tool.

A copy of the terms and definitions from this part of ISO 29061 may also be helpful.

For the independent assessment of CRS ISOFIX connector function, the use of an ISOFIX bar dummy is recommended. In its simplest form, this can be a straight 6 mm wide bar of at least 280 mm length. It could consist of two aligned ISOFIX anchorages connected to a rigid supporting material, or a demo seat equipped with ISOFIX anchorages.

For the independent assessment of vehicle ISOFIX anchorages and the available space around them, the use of an ISOFIX accessibility tester or a standard ISOFIX connector is recommended, in accordance with the requirements of ISO 13216-1:1999, Figure 3.

Initially, the child restraint should be as delivered new and separate from the vehicle. The rating process includes all of the steps necessary, including assembly, to complete the installation. The process should preferably be carried out by a person unfamiliar with the CRS and vehicle.

Unpacking the CRS, removing the box and plastic protections, detaching the handbook, etc., should be disregarded for rating purposes, but other initial one-time preparations are considered and assessed in the forms.

The mode of use for the child restraint (i.e. forward-facing/rearward-facing, upright/reclined, with base/without base) and the seating position in the vehicle should be determined in advance and documented in the rating form.

The rating process first addresses the labels and instructions, and finally the ease of installation and removal of the child restraint system.

4.2 Scoring system

The scoring system consists of a Good/Average/Poor rating (scored with 3/1/0 points) of each item assessed, and an importance rating A/B/C (scored with 3/2/1 points) for each item. For each assessment, the scores of the above are multiplied. A maximum score for a “Good” solution on an item with “A” importance is 9 points.

The maximum possible score will depend on the features and usage of the restraint and vehicle. Different products may have different possible maximum scores and therefore comparisons of the raw number of total points would not be appropriate. The final rating consists of a total number of points that should be expressed as a percentage of the maximum possible score for the particular conditions. See also further recommendations given in Annex A.

In addition, the rating will result in a total poor rating (or fail) if the product evaluated does not meet the most crucial questions of this rating. These are questions 2.2.2 and 2.2.3 for the vehicle (poor rating meaning that it is not possible to use the ISOFIX anchorages), and questions 3.1.1, 3.1.3 and 3.4.3 for the assessed combination of a CRS and a vehicle (poor rating meaning that it is not possible to attach the CRS to the ISOFIX anchorages, or that the CRS/base interface fails).