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

**Part 3:
Installation of child restraint systems
using vehicle seat belts**

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

*Partie 3: Installation des systèmes de retenue pour enfant utilisant les
ceintures de sécurité*



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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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 36, *Safety and impact testing*.

A list of all parts in the ISO 29061 series can be found on the ISO website.

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 (e.g. securing, harnessing, adaption for a growing child, etc.)

is of utmost importance to ensure that a child restraint system 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 document is to develop and validate a usability evaluation system for installation of child restraint systems with vehicle seat belts to promote improved design for an easy and correct use.

It provides child restraint and vehicle manufacturers with a tool for the assessment of the usability of new and current systems. At the same time, it provides consumers (parents and caregivers) with usability information on the key features related to the proper use of the attachment system, and assist them in selecting child restraints and vehicles that are easy to use properly.

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

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

Part 3: Installation of child restraint systems using vehicle seat belts

1 Scope

This document specifies the criteria for judgement of usability of child restraint systems (CRS) when installing them with the vehicle seat belts.

This document provides criteria for judgement of:

- ease of availability of instructions;
- clarity of instruction manual and labelling; and
- ease of use of design related features of the CRS related to the installation in a vehicle.

NOTE Booster system usability evaluation is covered by ISO 29061-5.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

audible

capability of being heard in normal environmental conditions

3.2

child restraint system

CRS

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

Note 1 to entry: 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.

3.2.1

multiple modes CRS

type of *CRS* (3.2) that can be used in several modes, for example converting from integral to non-integral or for use in different orientations

3.3

misuse

any deviation from the intended application and use of a *CRS* (3.2) that might reduce its protective performance

3.4

pictogram

illustration or photo used to represent a concept or an operation which can be supplemented by text

3.5

rebound bar

type of anti-rotational device intended to restrict the rearward rotation of a rearward-facing *CRS* (3.2)

Note 1 to entry: It usually comprises a rigid device that, when in its operational position, rests against the car seatback.

3.6

rebound tether

lower tether

type of anti-rotational device intended to restrict the rearward rotation of a rearward-facing *CRS* (3.2)

Note 1 to entry: 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.

3.7

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* (3.6) (lower tether) can be attached

3.8

single action

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

EXAMPLE This includes 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.

3.9

slack

unintended looseness of a strap that is likely to affect adversely the performance of the *CRS* (3.2)

3.10

support leg

type of anti-rotational device comprising a permanent attachment to a *child restraint system* (3.2), 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 1 to entry: A support leg may be adjustable.

3.11

top tether

tether strap attached at or near the top of a *CRS* (3.2), incorporating a device to enable it to be connected to a *top tether anchorage* (3.11.1)

3.11.1**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* (3.11) can be attached

3.11.2**top tether strap**

webbing strap which extends from the top of a *CRS* (3.2) to the *top tether anchorage* (3.11.1) and which is equipped with an adjustment device, a tension-relieving device and a *top tether* (3.11) connector

3.12**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 to entry: Interpretation of the generic definition for the purpose of this document: the extent to which a *CRS* (3.2) is capable of being used and is convenient and practical in use (separately or in combination with a vehicle).

[SOURCE: ISO 9241-11:1998, 3.1, modified — a new Note 1 to entry has been added.]

4 Usability evaluation procedure and scoring principles**4.1 Evaluation procedure**

This document provides a procedure to evaluate the usability of child restraint systems, equipped with integral harness or shield, intended to be installed in the vehicle using the vehicle seat belts. The procedure evaluates ease of availability of instructions, clarity of instruction manual and labelling, and the ease of use of design-related features of the CRS related to the installation in a vehicle.

The assessment is done in two steps:

- a separate assessment of the child restraint system; and
- a usability assessment when installing the child restraint system in specified vehicle seating positions.

The evaluation takes into consideration the various modes of installation and conversions between installation modes. The usability protocol is intended to be objective and repeatable.

The evaluation is most easily accomplished using a team of two people having basic knowledge of child restraints and being familiar with the technical terms used. However, they should preferably be unfamiliar with the CRS model to be evaluated.

The 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 form (in either paper or electronic format);
- the vehicle owner's manual;
- the child restraint manual, including instruction video if applicable; and
- a screwdriver, or a simple prying/turning tool.

A copy of the terms and definitions from this document may also be helpful.

Initially, the child restraint should be in the condition as supplied to the consumer. The evaluation process includes all the steps, including assembly, to complete the installation.

Unpacking the CRS, removing the box and plastic protections, detaching the handbook, etc., should be disregarded in the evaluation, 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 evaluation form.

The evaluation process first addresses the labels and instructions, followed by 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 scoring of the above are multiplied. A maximum score for a "Good" solution on an item with "A" importance is 9 points.

In this document, "average" means "mid-level" and should not be perceived as a statistical average between good and poor.

The maximum possible score will depend on the features and usage of the restraint and vehicle. Different products may have different maximum possible scores, and therefore, comparisons of the raw number of total points would not be meaningful. 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](#).

5 Usability evaluation forms

See the following pages.

To enhance the value and applicability of this document, the forms are also provided in a revisable [MS Excel¹⁾] format. These forms are provided at the following URL: <http://standards.iso.org/iso/29061/-3/ed-1/en>.

1) MS Excel is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Date of evaluation		Evaluated by		Test no.	
Form 1: Separate evaluation of CRS: Rearward facing (RF), forward facing (FF) or lateral facing (LF) with internal harness or shield					
Child restraint system evaluated		☐ Infant only CRS, RF ☐ Infant only CRS, LF ☐ RF only toddler CRS		☐ FF only CRS	
Manufacturer		☐ Multiple modes CRS (2-in-1)		☐ Multiple modes CRS (3-in-1)	
Child seat make and model		Base make and model (if applicable)			
Country/Region of use		Country/Region of use			
Approval no. (where applicable)		Approval no. (where applicable)			
Production no.		Production no.			
Date of manufacturing, yyyy-mm-dd		Date of manufacturing, yyyy-mm-dd			
Type (E.g. UN-ECE Group 0+/I/II)		Primary anti-rotational device			
CRS has separate base		☐ Yes ☐ No		☐ Top tether ☐ Support leg ☐ N/A ☐ Rebound tether ☐ Rebound bar ☐ N/A	
Appropriate child size range for this mode according to manual		Mass range (kg):		Height range (cm):	
		Age range (months or years):			

Form 1.1: CRS instructions and labels

		Good	Average	Poor	Importance	N/A	Notes
1.1.1	Do CRS or base instructions clearly show how to prepare and install the CRS in the vehicle (in this mode)?	Illustrated clearly with the CRS in the vehicle seat. Visually obvious, able to use with pictures only. Labels on CRS self-explanatory, or not necessary to prepare. Illustrative video provided (included or through web link).	Pictures plus written instructions are provided. Labels on CRS are non-self-explanatory, or viewable from one direction only.	Method missing, partially illustrated, or no illustrations. CRS shown without a vehicle seat. Only written instructions provided (may also be non-self-explanatory pictures) or nothing shown.			
	Labels on CRS Manual	☐ ☐	☐ ☐	☐ ☐	A C	☐ ☐	
1.1.2	Do CRS or base instructions clearly show how to prepare and use/attach the anti-rotational devices?	Illustrated clearly with CRS in vehicle seat. Visually obvious, able to use with pictures only. Labels on CRS self-explanatory, or not necessary to prepare. Illustrative video provided (included or through web link).	Pictures plus written instructions provided. Labels on CRS not self-explanatory or viewable from one direction only.	Installation method missing, partially illustrated, or no illustrations. CRS shown without a vehicle seat. Written instructions only provided (may also be non-self-explanatory pictures) or nothing shown.			
	Labels on CRS Manual	☐ ☐	☐ ☐	☐ ☐	A C	☐ ☐	
1.1.3	Are the labels durable?	☐ Sticky label(s) or other method of technology label not peeling.	☐	☐ Sticky label(s) are already peeling when restraint is removed from the box.	A	☐	
1.1.4	Do the instructions on labels on CRS or base and in the manual convey the same meaning?	☐ Yes		☐ No	B	☐	

Form 1.2: CRS hardware evaluation

	Good	Average	Poor	Importance	N/A	Notes
1.2.1	☐ All parts are assembled when unpacking the CRS.	☐ Some parts are necessary to assemble, but in a self-explanatory way and without the need of tools.	☐ CRS delivered as a kit. Parts are necessary to assemble with the use of tools.	B	☐	
	Yes, or if stored clear single action with pictures or markings on CRS.	Steps are necessary and described with pictures, or a single action without pictures or markings.	No, or if stored steps are not defined with pictures or markings on CRS.		☐	
1.2.2	☐	☐	☐	B	☐	
	☐	☐	☐	B	☐	
	☐	☐	☐	B	☐	
	☐	☐	☐	B	☐	
1.2.3	☐ All elements that guide the belt are colour-coded.	☐ Some elements that guide the belt are colour-coded.	☐ Colour coding is limited or not durable.	B	☐	
	Yes		No			
1.2.4	☐		☐	B	☐	
	☐		☐	B	☐	
	☐		☐	B	☐	

Score (points)

Score (% of achievable)

Form 2: Interface – Installing the CRS, or base with seat, in the vehicle	Evaluation includes assessment of the following interfaces and modes:
Vehicle – Make, model and model year	☐ Rearward facing mode ☐ Top tether anchorages/attachments
Child seat – Make and model	☐ Lateral facing mode ☐ Support leg
Seating position(s) evaluated (see Figure 1)	☐ Forward facing (integral) mode ☐ Secondary anti-rotational device
Vehicle seat position (fore/mid/aft)	☐ CRS upright/normal ☐ CRS reclined
Additional information	☐ Separate base interface

Form 2.1: CRS installation features

	Good	Average	Poor	Importance	N/A	Notes
2.1.1 Is the vehicle seat belt routing path through/around the CRS easy to understand?	☐ Visually obvious and intuitive; routing follows the seat belt geometry; the risk of misrouting through alternative paths is minimal. Labels on CRS describing the belt routing are self-explanatory.	☐ Not fully obvious or intuitive, but understandable when looking at labels on CRS or some risks of routing belt through alternative paths	☐ Complex and non-intuitive, and difficult to understand even with the help of labels and/or poorly described with labels	A	☐	
2.1.2 Is the vehicle seat belt routing through/around the CRS easy to perform?	☐ Seatbelt routing can be performed without problems with large hand(s). No need to move the padding, textile, or other devices in order to route the belt.	☐ Some difficulties to perform the routing, e.g. due to friction between the lap and diagonal portions of the belt, or minor catches in the belt route.	☐ The belt path does not accommodate large hand(s), or the belt needs complex handling, such as multiple belts, routing under padding, textile or other devices. Belt length is insufficient for easy installation.	A	☐	NOTE 1 A poor rating due to insufficient belt length will result in an overall poor rating result for this CRS-vehicle combination. NOTE 2 A large hand is considered to have a minimum of 280 mm circumference measured around the widest part of the hand, excluding the thumb.
2.1.3 Can the vehicle seat belt be tightened without unreasonable force and without resulting in slack?	☐ The force needed to tighten the belt can easily be applied (using a force of up to approximately 100 N). No slack is introduced when tightening the belt, or minor slack can easily be removed with a smooth action.	☐ Tightening requires an iterative process for reducing slack or untwisting belts but leads to an acceptable result. A force of 100 N to 150 N is required to tighten the belt.	☐ The belt cannot be sufficiently tightened using the force of 150 N. Slack easily occurs in the tightening process, e.g. by friction between the lap and diagonal portions of the belt, or catches in the belt route.	A	☐	NOTE The force is to be applied in the diagonal part of the belt.

	Good	Average	Poor	Importance	N/A	Notes
2.1.4	☐ Easy to understand and perform the locking of seatbelt. Locking device(s) are logically positioned in the belt path.	☐ Some difficulties to perform the locking, e.g. the device may close itself inadvertently or hide under the belt.	☐ Difficult to understand and/or perform the locking. Necessary to force the belt into position for locking. Difficult to judge the status of locking. Possible to place locking device in a poor belt path position.	A	☐	
2.1.5	☐ The ALR function assists in securing the CRS.	☐ The ALR function does not affect the seat belt locking on the CRS in a negative way.	☐ The ALR function interferes with the CRS installation.	A	☐	NOTE If ALR mode is not required, this question is not applicable.
2.1.6	☐ Contact or interference is not possible.	☐ Interference is possible but unlikely and easily discovered and corrected.	☐ Vehicle seat belt interferes with harness or other CRS components.	A	☐	

Form 2.2: Attaching a top tether (if applicable)

	Good	Average	Poor	Importance	N/A	Notes
2.2.1 Actions required to attach the top tether to the tether anchorage?	☐ One hand to attach from position of installing.	☐ One hand to attach and must be routed from other position.	☐ Other actions not foreseen in the vehicle manual, e.g. must move something out of the way.	B	☐	
2.2.2 Can the top tether be tightened properly?	☐ Single action and one hand to tighten the tether.	☐ With two hands and/or multiple steps.	☐ No, e.g. catches on seat or slips off fixed head restraint or too short distance between CRS and top tether hook.	A	☐	
2.2.3 Is there a clear feedback that the child restraint system is correctly attached to the top tether anchorage?	☐ Visual plus tactile and/or audible indication that top tether attachment is correctly attached.	☐ Tactile and/or audible indication that top tether attachment is correctly attached.	☐ None or false. False means indicating correct attachment without actually being attached to anchorage.	A	☐	

Form 2.3: Using anti-rotational device(s) other than top tether (if applicable)

	Good	Average	Poor	Importance	N/A	Notes
2.3.1	☐ One hand operation from position of installing or no operation at all.	☐ One hand operation from other position or two hands.	☐ Other, more complicated adjustment procedures.	B	☐	
2.3.2	☐ One hand operation from position of installing or no operation at all.	☐ One hand operation from other position or two hands single operation from position of installing.	☐ Other, more complicated adjustment procedures.	B	☐	

Form 2.4: CRS/base interface evaluation

	Good	Average	Poor	Importance	N/A	Notes
2.4.1	CRS and base preparation: CRS base and CRS shell ready for installation? ☐ Yes, no further action is necessary.	☐ No, single action is need- ed.	☐ No, multiple actions is needed, or additional or specific parts or actions are required.	B	☐	
2.4.2	Actions required to attach the CRS shell to base? ☐ Single operation from posi- tion of installing.	☐	☐ Multiple operations are required.	B	☐	
2.4.3	Is there a clear feedback of correct locking of the CRS to the base? ☐ Tactile plus visual and/or audible indication that the CRS is correctly locked to base.	☐ Tactile and/or audible indication that the CRS is correctly locked to base.	☐ None or false. False means indicating correct locking without ac- tually being locked to base.	A	☐	
2.4.4	Actions required to detach CRS from base? ☐ Dual action (e.g. lifting and releasing button).	☐ Triple actions, or more.	☐ Not possible or requires considerable effort.	C	☐	

Form 2.5: Detachment and removal of CRS

		Good	Average	Poor	Importance	N/A	Notes
2.5.1	Ease of releasing tension of top tether?	☐ One hand/action to release tension of top tether, or not necessary.	☐ Two hands, e.g. one hand to loosen strap, one hand to push button.	☐ Not possible or requiring considerable effort.	C	☐	
2.5.2	Actions required to detach and store the top tether strap after tension has been released?	☐ One hand/action to undo top tether from anchorage. Simple storage.	☐ Two hands action or multiple steps. Actions needed for storage.	☐ Not possible or requiring considerable effort. No storage facilities.	C	☐	
2.5.3	Actions required to remove and store the primary anti-rotational device, if other than the top tether?	☐ Single quick release action. Simple storage or auto storage.	☐ Two hands action or multiple steps. Actions needed for storage.	☐ Not possible or requiring considerable effort. No storage facilities.	C	☐	