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

**Part 5:
Installation and securing of child in a
booster system**

*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 5: Installation et fixation d'un enfant dans un système de
réhausseur*





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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 (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 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).

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

Part 5: Installation and securing of child in a booster system

1 Scope

This document provides criteria for judgement of usability of booster seat child restraint systems (CRS) when installing them and securing a child.

The 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.

The procedure can also be used for evaluation of vehicle integrated booster systems.

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

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

capable of being heard in normal environmental conditions

3.2

booster system

any kind of belt-positioning *child restraint system* (3.3) where the adult seat belt is the primary restraint for the child

3.3
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.

3.3.1
multiple modes CRS

type of *CRS* (3.3) that can be used in several modes, for example converting from integral to non-integral, or for use in different orientations

3.4
misuse

any deviation from the intended application and use of a *CRS* (3.3) that might reduce its protective performance

3.5
pictogram

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

3.6
single action

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

EXAMPLE A single action 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.

3.7
slack

unintended looseness of a strap that is likely to affect the performance of the *CRS* (3.3) adversely

3.8
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* (3.3) 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 booster systems, i.e. booster seats with or without seatbacks, including booster seats integrated in the vehicle seat, and the securing of a child in the seat. The procedure evaluates the ease of availability of instruction, 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 three steps:

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

- securing a child or child dummy in the booster system.

The evaluation takes into consideration the various modes of installation and conversions between installation modes. The usability protocol, consisting of two forms, 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 takes about 30 min.

The necessary materials include:

- the usability evaluation form (in either paper or electronic format);
- the vehicle owner's manual;
- the CRS manual, including instruction video if applicable; and
- a force gauge for measuring belt tension.

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

Initially, the booster system 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 booster system 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, then the ease of positioning the booster seat followed by securing the child or child dummy, and finally the removal of the child restraint system. Installation and removal does not apply to integrated systems.

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 of the booster system. 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/-5/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: Booster system, separate evaluation					
Child restraint system evaluated		<input type="checkbox"/> Backless booster cushion		<input type="checkbox"/> Integrated booster system	
Manufacturer		<input type="checkbox"/> Booster seat with seatback		<input type="checkbox"/> Other (convertible/combination, etc.) Describe:	
Child seat make and model		Booster system features:			
Country/Region of use		<input type="checkbox"/> Multiple modes CRS (2-in-1)			
Approval no. (where applicable)		<input type="checkbox"/> Booster seat using ISOFIX anchorages			
Production no.		<input type="checkbox"/> Booster seat with removable seatback:			
Date of manufacturing, yyyy-mm-dd		<input type="checkbox"/> Multiple modes CRS (3-in-1) evaluated <input type="checkbox"/> with / <input type="checkbox"/> without ISOFIX <input type="checkbox"/> Seatback <u>on</u> <input type="checkbox"/> Seatback <u>off</u>			
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 instructions clearly show how to prepare and/or install the CRS in the vehicle (in this mode)?	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 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A	<input type="checkbox"/>	
	Manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	C	<input type="checkbox"/>	
1.1.2	Do CRS instructions clearly show how to route the vehicle belt and how to adjust it properly?	Illustrated clearly with no need to read the text in order to route seatbelts. Label is directly next to the corresponding belt path or positioning device on both sides of CRS. Positioning devices (if applicable) are clearly explained. Illustrative video provided (included or through web link).	Between good and poor.	Belt routing label not next to corresponding path. Belt routing path or device is only labelled on one side. Routing requires reading text or is otherwise not obvious from the illustration. May also be obscured by seat pad. Or nothing shown.			
	Labels on CRS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A	<input type="checkbox"/>	
	Manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	C	<input type="checkbox"/>	

		Good	Average	Poor	Importance	N/A	Notes
1.1.3	Is there a clear indication of a child's size range for this mode?	Separate, clear, complete height/weight/age information directly next to the illustration. Additional size information included as a picture.	Separate, clear, complete height/weight/age information. Additional size information included as short, simple text.	Incomplete text as indicated, text independent of illustration, or no mention of additional sizing information.			
	Labels on CRS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A	<input type="checkbox"/>	
	Manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	C	<input type="checkbox"/>	
1.1.4	Are the labels durable?	Sticky label(s) or other method of technology label not peeling.	<input type="checkbox"/>	Sticky label(s) are already peeling when restraint is removed from box. <input type="checkbox"/> No	A	<input type="checkbox"/>	
1.1.5	Do the instructions on labels on the CRS or base and in manual convey the same meaning?	<input type="checkbox"/> Yes		<input type="checkbox"/> No	B	<input type="checkbox"/>	

Form 1.2: CRS hardware evaluation

	Good	Average	Poor	Importance	N/A	Notes
1.2.1 All functional parts (i.e. required for correct use as per instructions) are ready to use.	<input type="checkbox"/> No need to assemble parts after unpacking the CRS.	<input type="checkbox"/> Some parts are necessary to assemble, but in a self-explanatory way and without the need for tools.	<input type="checkbox"/> Not ready to use. May direct user to manual or is otherwise difficult. Tools may be required. Please describe under notes.	B	<input type="checkbox"/>	
1.2.2 Ease of conversion from any other mode of use to a booster seat. NOTE: Attachment/detachment of seatback is covered in 1.2.4.	<input type="checkbox"/> Simple operation with only a single or dual action. Illustrations on seat showing mode change.	<input type="checkbox"/> Simple operation but multiple actions are required. Illustrations may be missing from the label, requiring the user to read text which must be present on the CRS.	<input type="checkbox"/> Operation is difficult, requiring many complicated steps. The instructions may be confusing, or missing altogether.	B	<input type="checkbox"/>	
1.2.3 Ease of adjusting height and width of booster seat.	<input type="checkbox"/> Simple action. Clear illustration provided on the seat.	<input type="checkbox"/> Simple action but no specific illustration is provided on the seat. Text may be present.	<input type="checkbox"/> Action difficult or need additional instructions not found on the CRS labels. Tools may be required.	A	<input type="checkbox"/>	
1.2.4 Ease of attaching/detaching seatback.	<input type="checkbox"/> Simple action. Clear illustration provided on seat.	<input type="checkbox"/> Simple action but no specific illustration is provided on seat. Text may be present.	<input type="checkbox"/> Action difficult or need additional instructions not found on the CRS labels. Tools may be required.	A	<input type="checkbox"/>	NOTE Some markets/ regulations do not allow the detachment of the seatback.

	Good	Average	Poor	Importance	N/A	Notes
1.2.5	Booster system using ISOFIX anchorages: Are CRS attachments ready to use?	Steps necessary, described with pictures, or a single action without pictures or markings.	No, or if stored steps not defined with pictures or markings on CRS.			
	Rigid attachments	<input type="checkbox"/>	<input type="checkbox"/>	B	<input type="checkbox"/>	
	Flexible attachments	<input type="checkbox"/>	<input type="checkbox"/>	B	<input type="checkbox"/>	

Score (points)

Score (% of achievable)

Form 2: Interface – Installing the booster system and securing the child	Evaluation includes assessment of the following interfaces and modes <input type="checkbox"/> Booster mode of convertible CRS <input type="checkbox"/> Head restraint in normal use position <input type="checkbox"/> Using ISOFIX anchorage support <input type="checkbox"/> Head restraint adjusted in highest position <input type="checkbox"/> Integrated booster in vehicle seat <input type="checkbox"/> Head restraint removed/modified
Vehicle – Make, model and model year	
Child seat – Make and model	
Seating position(s) evaluated (see Figure 1)	
Vehicle seat position (fore/mid/aft)	
Additional information	

Form 2.1: Installing the booster system in vehicle

	Good	Average	Poor	Importance	N/A	Notes
Booster system using ISOFIX anchorages: 2.1.1 Do the CRS ISOFIX attachments remain accessible during the process of connecting until they are secured to the vehicle anchorages?	<input type="checkbox"/> Yes	<input type="checkbox"/>	<input type="checkbox"/> No	B	<input type="checkbox"/>	
Booster system using ISOFIX anchorages: 2.1.2 Is there clear feedback that the booster system is correctly attached to the ISOFIX anchorages?	<input type="checkbox"/> Visual plus tactile and/or audible indication that both CRS ISOFIX attachments are correctly attached.	<input type="checkbox"/> Tactile and/or audible indication that both CRS ISOFIX attachments are correctly attached.	<input type="checkbox"/> None, or false False means indicating correct attachment without actually being attached to anchorage.	A	<input type="checkbox"/>	
Integrated booster system: 2.1.3 How easy is it to prepare the integrated booster system for use?	<input type="checkbox"/> Easy to prepare the booster system for use from stored position according to labelling assessed in 1.1.1. Able to confirm that booster system is ready for use.	<input type="checkbox"/>	<input type="checkbox"/> Difficult to understand and prepare the system for use. No ability to confirm that booster system is ready for use.	A	<input type="checkbox"/>	
2.1.4 Is the vehicle seating position compatible with the booster system from a usability point of view?	<input type="checkbox"/> No interference with vehicle seat/structure/interior or belt system observed.	<input type="checkbox"/> Minor interference observed but easily corrected.	<input type="checkbox"/> Vehicle seat/structure/interior causes severe interference that cannot be corrected.	A	<input type="checkbox"/>	NOTE A poor rating of this question will result in an overall poor rating result.

Form 2.2: Securing child (or child dummy) in the booster system

	Good	Average	Poor	Importance	N/A	Notes
2.2.1 How easy is it to achieve a lap belt routing according to the CRS instructions?	<input type="checkbox"/> A proper lap belt routing can be easily achieved. Routing through guides is obvious and intuitive. Booster routes the lap belt to be (at least partially) in contact with the child's/dummy's legs.	<input type="checkbox"/> Difficult to achieve a correct lap belt routing. Routing through guides is not obvious and intuitive. Lap belt is routed slightly above the child's/dummy's legs.	<input type="checkbox"/> Impossible to achieve a proper lap belt routing. Lap belt is routed over the child's/dummy's abdomen.	A	<input type="checkbox"/>	
2.2.2 How easy is it to achieve a shoulder belt routing, including routing through guide(s) according to the CRS instructions?	<input type="checkbox"/> A proper shoulder belt routing can be easily achieved (midway along the shoulder). Routing through guides is obvious and intuitive. Easy to understand the function of the belt guide and to perform the correct operation.	<input type="checkbox"/> Difficult to achieve a proper shoulder belt routing. Routing through guides is not obvious and intuitive.	<input type="checkbox"/> Impossible to achieve a proper shoulder belt routing. Difficult to understand the function of the belt guide and to perform the correct operation.	A	<input type="checkbox"/>	
2.2.3 How easy is it to access the vehicle buckles to secure the child and booster seat?	<input type="checkbox"/> Easy to access the buckles and to perform the buckle operation. The buckles do not interfere with the booster seat in a negative way.	<input type="checkbox"/> It is possible to access the buckles and to perform the buckle operation, but some interference with booster seat does occur, which requires additional action.	<input type="checkbox"/> Buckles get stuck under or behind the booster seat, or otherwise difficult to access the buckles and to perform the buckle operation.	A	<input type="checkbox"/>	

		Good	Average	Poor	Importance	N/A	Notes
2.2.4	Can the vehicle seatbelt slack be removed without unreasonable force?	<input type="checkbox"/> The system is designed to prevent the occurrence of slack, or slack can be removed easily. The force needed to tighten the belt can be easily applied using a force of up to approximately 100 N.	<input type="checkbox"/> The slack can be removed with some difficulty. Tightening requires a repetitive 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.	<input type="checkbox"/> It is difficult to remove the slack that occurs. The belt cannot be sufficiently tightened using a force of 150 N. The slack reoccurs easily in the tightening process, e.g. by friction between the lap and diagonal portions of the belt, or catches in the belt route.	A	<input type="checkbox"/>	
2.2.5	How easy is the slack removed after the child has been leaning forward (approximately 45°) and then returned back?	<input type="checkbox"/> Seatbelt returns to original position, or a mechanism prevents the child from moving forward.	<input type="checkbox"/>	<input type="checkbox"/> The slack is not removed if it occurs.	A	<input type="checkbox"/>	NOTE Some markets/regulations do not allow fixed positioning of the child in a booster system.

Form 2.3: Detachment and removal of CRS

	Good	Average	Poor	Importance	N/A	Notes
2.3.1	<div>Actions required to detach the vehicle seat belt from CRS and remove the CRS?</div> <div><input type="checkbox"/> Easy to detach (single action once tension is released if applicable). Means to avoid unintentional release are considered in design.</div>	<div><input type="checkbox"/> Detachment requires multiple steps or actions.</div>	<div><input type="checkbox"/> Not possible or requiring considerable effort or risk of unintentional release.</div>	C	<input type="checkbox"/>	

Score (points)

Score (% of achievable)

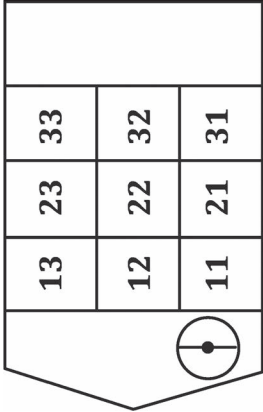


Figure 1 — Seating position codes
If right-hand drive - mirror image

Summary

Date of Evaluation	Evaluated by
Vehicle — Make, model and model year	Test no.
Seating position(s) evaluated (see Figure 1)	
Child seat — Make and Model	
Type (E.g. UN-ECE Group 0+/I/II)	
Mode tested	

Scoring results	Score	out of	%
CRS			
Interface			

Comments/Observations

Annex A **(informative)**

Recommendations regarding scoring and assessment

Various uses and purposes of the usability assessment according to this document can be assumed. The purpose can, for example, be:

- to assess the strength and weaknesses of a certain child restraint system in different car models;
- to assess a vehicle interface in combination with different child restraint systems; and
- to assess the usability of a number of child restraint systems for consumer information purposes.

Depending on the purpose, one form or several forms in combination may be used.

It should be observed that the number of questions related to certain features of the CRS or the vehicle may affect the scoring results.

The balance of the scoring is affected by the number of questions applicable to a certain solution. This means that the usability scoring cannot give a completely "fair" comparison between different CRS types and designs.

Annex B

(informative)

Example usability rating classes

Based on the percentage outcome of the assessment procedure of this document, usability rating classes according to the following example can be considered:

From 89 % to 100 %	Excellent
From 76 % to 88 %	Good
From 63 % to 75 %	Average
From 50 % to 62 %	Marginal
Less than 50 %	Poor

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