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

Part 4:

**Securing of child in child restraint
system and daily handling aspects**

*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 4: Sécuriser l'enfant dans les systèmes de retenue pour enfant,
et aspects de manipulation quotidienne*





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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).

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

Part 4: Securing of child in child restraint system and daily handling aspects

1 Scope

This document provides criteria for judgement of usability of child restraint systems (CRS) with regard to the securing of a child in the child seat and other daily handling aspects.

The document provides criteria for judgement of:

- 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 securing the child or child dummy in a CRS installed in vehicle.

This document can be used in conjunction with either ISO 29061-1 or ISO 29061-3 for making a complete usability evaluation of child restraint systems attached to the vehicle with ISOFIX/LATCH or vehicle seat belts.

NOTE Booster system usability evaluation, including securing of a child in the booster system, is covered by ISO 29061-5.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 29061-1, *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*

ISO 29061-3, *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*

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
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
support leg

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.

3.4
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 vehicle *top tether anchorage* (3.4.1)

3.4.1
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* (3.4) can be attached

3.4.2
top tether strap

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

3.5
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 related to the securing of child in child restraints, and other daily handling aspects. It shall be used in conjunction with ISO 29061-1 or ISO 29061-3 for a complete usability evaluation of child restraint systems attached to the vehicle with ISOFIX/LATCH or vehicle seat belts.

The procedure evaluates 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 securing of child in the CRS and daily handling aspects.

The assessment is done in two steps:

- a separate assessment of the child restraint system; and
- a usability assessment when securing a child or child dummy, with the CRS installed in a vehicle, or in a simulated vehicle setup.

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. The procedure for all aspects of the process takes about 30 min.

The materials necessary include:

- the usability evaluation form (in either paper or electronic format);
- the child restraint manual, including the 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. 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 in the evaluation, but other initial one-time preparations are considered and assessed in the forms.

The mode of use for the child restraint 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 positioning and securing the child or the child dummy in the CRS, in a vehicle environment.

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/-4/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 | | <input type="checkbox"/> Infant only restraint, RF <input type="checkbox"/> Infant only restraint, LF <input type="checkbox"/> RF only toddler CRS <input type="checkbox"/> FF only CRS | | <input type="checkbox"/> Multiple modes CRS (2-in-1) <input type="checkbox"/> Multiple modes CRS (3-in-1) | |
| Manufacturer | | | | | |
| 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) | | | | | |
| CRS has separate base | | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 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 | 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 illustration, and/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"/> | |
| 1.1.2 | Does the CRS indicate the correct harness height position for this mode? | Yes, there is a graphic or contrasting text indicating the correct harness height position to use for this mode but they may be the same colour as the shell. Additional harness adjustment information is included but may be text only. | Yes, there is text indicating the correct harness height position to use for this mode but they may be the same colour as the shell. Additional harness adjustment information is included but may be text only. | There is no indication of a correct height position to use for this mode (for applicable multi-mode CRS) and/or no mention of additional sizing information. | | | |
| | Is there additional information on the CRS about how the shoulder straps should fit for this mode? | | | | | | |
| | Labels on CRS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | A | <input type="checkbox"/> | |
| 1.1.3 | Manual | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | C | <input type="checkbox"/> | |
| | Are the labels durable? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | A | <input type="checkbox"/> | |
| | | Sticky label(s) or other method of technology label is not peeling. | | Sticky label(s) are already peeling when the restraint is removed from the box. | | | |

Form 1.2: CRS hardware: Adapting CRS harnessing and other handling

| | Good | Average | Poor | Importance | N/A | Notes |
|--|---|---|---|------------|--------------------------|-------|
| 1.2.1 Ease of adapting the harness for child's growth. | <input type="checkbox"/> No need to rethread the system. No mandatory pieces exist that may become loose when adjusting the system. | <input type="checkbox"/> No need to rethread the system, but may be otherwise difficult to adapt, or very simple procedure to rethread. | <input type="checkbox"/> Harness must be rethreaded to adapt. Loose mandatory pieces may be present. Could misroute or incorrectly secure harness. | B | <input type="checkbox"/> | |
| 1.2.2 Ease of conversion to the assessed mode from other possible modes of use. | <input type="checkbox"/> Simple operation with only a single or dual action. Illustrations and instructions 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 the manual. | <input type="checkbox"/> Operation is difficult, requiring several complicated steps that must be followed in the manual. | B | <input type="checkbox"/> | |
| 1.2.3 Ease of re-attachment of pad/cover (e.g. if removed for cleaning). | <input type="checkbox"/> Safely remove and reattach the pad/cover, without detaching the harness. | <input type="checkbox"/> Upper part of harness system may need to be detached to remove pad/cover, but no loose parts. | <input type="checkbox"/> Loose parts may exist, including the harness system. The harness system may need to be significantly detached. | B | <input type="checkbox"/> | |

Score (points)

Score (% of achievable)

| | |
|--|---|
| Form 2: Evaluation in a vehicle environment | Evaluation includes assessment of the following interfaces and modes: |
| Vehicle – Make, model and model year | <input type="checkbox"/> Rearward facing mode <input type="checkbox"/> CRS upright/normal <input type="checkbox"/> CRS reclined |
| Child seat – Make and model | <input type="checkbox"/> Lateral facing mode |
| Seating position(s) evaluated (see Figure 1) | <input type="checkbox"/> Forward facing (integral) mode |
| Vehicle seat position (fore/mid/aft) | |
| Additional information | |
| | |

Form 2.1: Securing the child or child dummy in harness or shield (with CRS installed in vehicle or simulated vehicle setup)

| | Good | Average | Poor | Importance | N/A | Notes |
|--|---|--------------------------|--|------------|--------------------------|-------|
| 2.1.1 Are all functional parts (i.e. required for correct use as per instructions), including seat pad or cover, attached and ready to use? | <input type="checkbox"/> Yes, all parts are assembled when unpacking the CRS. System is ready for use with the smallest child size. | <input type="checkbox"/> | <input type="checkbox"/> No, not ready to use regardless of how difficult the assembly may be. May direct user to manual or is otherwise difficult. Tools may be required. Please describe under notes. | B | <input type="checkbox"/> | |
| 2.1.2 Is it easy to install a child in the CRS? | <input type="checkbox"/> Yes, means are provided to assist the placement of a child in the CRS, and/or sufficient space available in combination with the car model. | <input type="checkbox"/> | <input type="checkbox"/> No, placement of the child requires a complex manoeuvring before the child is in place or insufficient space for the child access to the CRS. | B | <input type="checkbox"/> | |
| 2.1.3 Is it easy to access the harness system with the child (or child dummy) placed in the seat? | <input type="checkbox"/> Harness is easily kept away when placing the child in the CRS. Means are provided to avoid twisting the belts of the harness. Harness does not get stuck behind the body. | <input type="checkbox"/> | <input type="checkbox"/> Belts easily get stuck under the body, and/or get easily twisted or otherwise difficult to access | B | | |
| 2.1.4 Is it easy to insert the harness buckle tongues into the buckle? Is there clear feedback of latching? | <input type="checkbox"/> Easy to insert the tongues and clear feedback of latching. E.g. separate harness portion insertion, or puzzle buckle with simple means of holding the different portions together. | <input type="checkbox"/> | <input type="checkbox"/> Puzzle buckle with no intermediate method of holding the different portions together. No clear feedback of latching. | B | <input type="checkbox"/> | |

| | Good | Average | Poor | Importance | N/A | Notes |
|--------|---|--|---|------------|--------------------------|---|
| 2.1.5 | <input type="checkbox"/> Requires less than 100 N for tightening or is achieved automatically. | <input type="checkbox"/> | <input type="checkbox"/> Slack is not removed with a force less than 100 N. | A | <input type="checkbox"/> | |
| 2.1.6 | <input type="checkbox"/> Visual plus tactile and/or audible indication that the harness is correctly tensioned. | <input type="checkbox"/> Tactile and/or audible indication that the harness is correctly tensioned. | <input type="checkbox"/> No indication | B | <input type="checkbox"/> | NOTE Not applicable if there is an automatic retractor. |
| 2.1.7 | <input type="checkbox"/> Yes | | <input type="checkbox"/> No | A | <input type="checkbox"/> | |
| 2.1.8 | <input type="checkbox"/> Yes, and the harness clip is labelled. | <input type="checkbox"/> Yes, but the harness clip is not labelled, alternatively requires simple threading and is labelled | <input type="checkbox"/> No, the harness clip requires threading in a more or less difficult way | C | <input type="checkbox"/> | NOTE Not applicable to UN-ECE R44 systems, where harness clips are not allowed. |
| 2.1.9 | <input type="checkbox"/> One hand/action to unbuckle the harness, and easy to remove the child out from the CRS. | <input type="checkbox"/> Two hands action to unbuckle the harness, some problems to release the child. | <input type="checkbox"/> Considerable efforts needed, problems to release the child. | B | <input type="checkbox"/> | |
| 2.1.10 | <input type="checkbox"/> Easy to achieve a good restraint of the upper and lower body. | <input type="checkbox"/> | <input type="checkbox"/> Properly tight fit cannot be achieved. | B | <input type="checkbox"/> | |

| | Good | Average | Poor | Importance | N/A | Notes |
|---|--|--------------------------|---|------------|--------------------------|-------|
| 2.1.11 Impact shield system: Is it easy to close (buckle, lock) the impact shield with the child or dummy in place? | <input type="checkbox"/> Can close (buckle) the shield with a one-hand operation. | <input type="checkbox"/> | <input type="checkbox"/> Two hands or considerable efforts needed. | B | <input type="checkbox"/> | |
| 2.1.12 Impact shield system: Is it easy to open/remove the impact shield with the child or dummy in place? | <input type="checkbox"/> Can open/remove the shield with a one-hand operation. | <input type="checkbox"/> | <input type="checkbox"/> Two hands or considerable efforts needed. | B | <input type="checkbox"/> | |

Score (points)

Score (% of achievable)

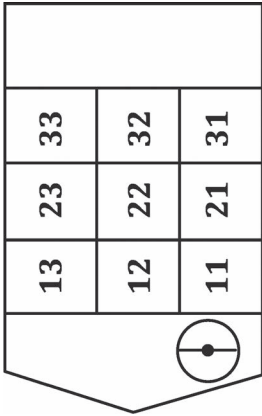


Figure 1 — Seating position codes
If right-hand drive - mirror image

| | | | |
|--|--------------|--|--|
| 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 (Forward/Rearward Facing) | | | |

| | | | |
|----------------------------|-------|--------|---|
| Scoring results | Score | out of | % |
| CRS, separate evaluation | | | |
| CRS in vehicle environment | | | |

| |
|-----------------------|
| 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 |

Bibliography

- [1] ISO 2575, *Road vehicles — Symbols for controls, indicators and tell-tales (including amendments)*
- [2] ISO 9241-11:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 11: Guidance on usability*
- [3] ISO 13215-2, *Road vehicles — Reduction of misuse risk of child restraint systems — Part 2: Requirements and test procedures for correct installation (panel method)*
- [4] ISO 13215-3, *Road vehicles — Reduction of misuse risk of child restraint systems — Part 3: Prediction and assessment of misuse by Misuse Mode and Effect Analysis (MMEA)*
- [5] ISO 13216-2, *Road vehicles — Anchorages in vehicles and attachments to anchorages for child restraint systems — Part 2: Top tether anchorages and attachments*
- [6] ISO 13216-3, *Road vehicles — Anchorages in vehicles and attachments to anchorages for child restraint systems — Classification of child restraint dimensions and space in vehicle*
- [7] ISO/TS 20282-2, *Ease of operation of everyday products — Part 2: Test method*
- [8] ISO 29061-5, *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 a child in a booster seat*
- [9] UN-ECE R.14-06, *Uniform provisions concerning the approval of vehicles with regard to safety-belt anchorages, ISOFIX anchorages systems and ISOFIX top tether anchorages*
- [10] UN-ECE R.44-04, *Uniform provisions concerning the approval of restraining devices for child occupants of power-driven vehicles ("Child Restraint System")*
- [11] UN-ECE R.129, *Uniform provisions concerning the approval of enhanced Child Restraint Systems used on board of motor vehicles (ECRS)*
- [12] NHTSA ease of use evaluation, <http://www.safercar.gov/parents/CarSeats/Car-Seat-Ratings-Ease-Of-Use.htm>
- [13] Transport Canada usability evaluation, <http://www.tc.gc.ca/eng/roadsafety/safedrivers-childsafety-programs-labelling-890.htm>
- [14] NPACS usability evaluation, <https://trl.co.uk/reports/PR/VE/031/06>
- [15] Australian Child Restraint Evaluation Programme (CREP), <https://www.childcarseats.com.au/>

