INTERNATIONAL STANDARD

ISO 13215-3

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Road vehicles — Reduction of misuse risk of child restraint systems —

Part 3:
Prediction and assessment of misuse by Misuse Mode and Effect Analysis (MMEA)

Véhicules routiers — Réduction du risque de mauvaise utilisation des systèmes de retenue pour enfants —

Partie 3: Prédiction et évaluation des mauvaises utilisations par MMEA (analyse des modes de mauvaise utilisation et de leurs effets)

Reference numbe
ISO 13215-3:1999(E)

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.

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.

International Standard ISO 13215-3 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Restraint systems*.

ISO 13215 consists of the following parts, under the general title *Road vehicles — Reduction of misuse risk of child restraint systems*:

— *Part 1: Form for field studies*

— *Part 2: Requirements and testing procedures for correct installation (panel method)*

— *Part 3: Prediction and assessment of misuse by Misuse Mode and Effect Analysis (MMEA)*

— *Part 4: Instructions and labels*

Annex A forms an integral part of this part of ISO 13215. Annexes B and C are for information only.

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Road vehicles — Reduction of misuse risk of child restraint systems —

Part 3:
Prediction and assessment of misuse by Misuse Mode and Effect Analysis (MMEA)

1 Scope

This part of ISO 13215 specifies a method to predict and quantify misuse of child restraint systems which is called Misuse Mode and Effect Analysis (MMEA). Such misuse may degrade the performance of child restraint systems.

As a predictive method it should be applied at an early stage, before the child restraint system is put into use by consumers. The MMEA method is recommended to be used by manufacturers of child restraint systems. However, in order to further minimize misuse of child restraint systems, this method may also be used for type approval purposes.

Being predictive implies the possibility of incompleteness and errors. Such errors can be minimized, if the proposed method is supported by the panel method [1] and by field studies. This part of ISO 13215 represents the best present consensus, but should be reviewed more frequently than other International Standards and revised in the light of increasing experience.

2 Definitions

For the purpose of this part of ISO 13215, the following definitions apply.

2.1
child restraint system
any free standing device intended to provide child vehicle occupants with an approved restraint

NOTE Child restraints comprise various categories, such as car beds, infant restraints, toddler seats, booster cushions and booster seats.

2.2
misuse of child restraint systems
any deviation from intended application and use which might reduce the protective performance of the child restraint system

2.3
adult safety belt
approved webbing used to restrain adults

2.4
buckle
quick release device which can be readily operated by an adult to release the child from the attachment to the vehicle

2.5
adjuster
device through which a strap passes and which, by means of moving, enables the effective length of the straps to be controlled to suit the circumstances

2.6
strap
flexible component of webbing designed to transmit forces

3 General

3.1 Compliance with this part of ISO 13215

A child restraint system tested in accordance with the requirements of this part of ISO 13215 is considered to be correctly designed if, when any predicted misuse modes are assessed, it meets the proposed acceptance criteria. Manufacturers of child restraint systems are advised to apply the MMEA method before submitting a child restraint system for type approval.

3.2 Assessment panels

The prediction and assessment of potential misuse modes are carried out by persons experienced in using and testing child restraint systems. Ideally, such persons should also be involved in panel testing and field studies of child restraint systems. In any case, they should be aware of results of these test methods.

4 Assessment

4.1 Assessment form

The assessment shall be performed by using the form given in annex A. Guidance is given in annex B.

4.2 Preliminary steps

Prior to assessment, the examiner shall inspect the child restraint system for completeness and shall carefully read any attached information provided for the consumer such as instructions for installation and use. Particular attention shall be paid to warning instructions.

4.3 Assessment procedure

4.3.1 General

The product name/number and the name of the manufacturer shall be entered into the head of the form (see annex A).

4.3.2 Potential misuse modes

The part and, respectively, the function, subject to potential misuse modes shall be described in the first column. Any misuse mode the examiner anticipates shall be listed in the second column.

In columns 3 and 4 the examiner shall determine the effects of such anticipated misuse and its cause.

4.3.3 Assessment of misuse modes

The assessment is determined by occurrence of a misuse mode and its severity.

Occurrence is the degree of likelihood that a specific misuse will result in the predicted misuse mode. Severity assesses how serious the misuse mode may be with respect to safety of a child within the child restraint system.

4.3.3.1 Rating of occurrence

The occurrence is rated between "0" (no misuse) and "10" (highest degree of misuse) as follows:

no misuse	=	0
misuse rather unlikely	=	1
relatively little misuse	=	2 - 3
occasional misuse	=	4 - 6
repeated misuse	=	7 - 8
misuse almost inevitable	=	9 - 10

4.3.3.2 Rating of severity

The severity of failure as a result of misuse mode is rated as follows:

no effect on safety	=	0
hardly noticeable effects	=	1
insignificant failure	=	2 - 3
moderate failure	=	4 - 6
severe failure	=	7 - 8
very high severity failure	=	9 - 10

4.3.3.3 Risk Priority Number (RPN)

The Risk Priority Number is achieved by multiplying the individual ratings for occurrence and severity.

4.3.4 Corrective actions

If the assessment of an individual misuse mode does not comply with requirements according to 5.2 and 5.3 respectively, the child restraint system shall be rejected unless corrective actions are taken. Such corrective actions are subject to a further assessment which shall be listed within the form under "Actions taken" and "Revised assessment". Thereafter the examiner shall decide whether further actions are required. This shall be listed in the last column.

5 Requirements

5.1 General safety requirements

A child restraint system in addition to satisfying the requirements specified in 5.2 and 5.3 shall meet the general requirements for approval, as specified in various applicable national and international standards.

5.2 Acceptance criteria of a single misuse mode

The result of the assessment is a failure if the Risk Priority Number of the initial assessment, or, after corrective action(s), of the revised assessment is 25 or more.

5.3 Acceptance criteria of more than one misuse mode

If three or more misuse modes have a Risk Priority Number of 20 or more, the child restraint system is deemed to have failed.

6 Final steps

If deemed to be necessary, the examiner shall provide additional explanations or details. Finally, the examiner shall sign and date the MMEA form.

Annex A
(normative)

Misuse Mode and Effect Analysis (MMEA) — Assessment sheet

Product name/number: No.:

Supplier(s) name(s): Sheet:

Part/function	Potential misuse mode	Effects of misuse	Cause(s) of misuse	Initial assessment			Action(s) taken	Revised assessment			Further actions required
				Occur-rence	Severity	RPN		Occur-rence	Severity	RPN	

Likelihood of occurrence:

no misuse	=	0
misuse rather unlikely	=	1
relatively little misuse	=	2 - 3
occasional misuse	=	4 - 6
repeated misuse	=	7 - 8
misuse almost inevitable	=	9 -10

Severity (effect on safety):

no effect on safety	=	0
hardly noticeable effects	=	1
insignificant failure	=	2 - 3
moderate failure	=	4 - 6
severe failure	=	7 - 8
very high severity failure	=	9 -10

Date:

Signature

Annex B
(informative)

Guidelines for examiners using the MMEA method

B.1 Cases of potential misuse

Two hypothetical cases of major misuse on a child restraint system are predicted and assessed (the effects of the predicted misuse modes were simulated by means of dynamic tests and found to be correct).

B.1.1 Case 1

a) Design feature

The handle of a locking mechanism for a reclinable child seat is not springloaded and requires additional manual engagement to secure a given recline position.

If not properly engaged, the seat shell will be forced into its maximum recline position upon frontal impact.

b) Assessment

— Occurrence:

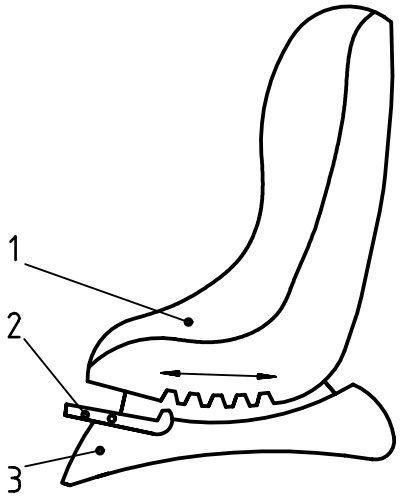
It was assumed that in 65 % of all cases with bigger children suited for this child restraint system an upright position is chosen and that 40% of the seats are not engaged properly. This would lead to repeated misuse.

— Severity:

Due to excessive head excursion the head of a bigger child would inevitably hit the dashboard or the seat back (when positioned in the rear seat) in a frontal impact.

c) Action taken

A spring-loaded mechanism will prevent this misuse mode and helps to keep the head excursion within the desirable limits.



Key
1 Shell
2 Handle
3 Base

Figure B.1 — Reclinable child seat

B.1.2 Case 2

a) Design feature

The frame of a child restraint system gets close to the intersection between car seat back and bottom. Therefore on a large number of cars the seat belt buckle may rest on the frame.

b) Assessment

— Occurrence:

Upon checking a number of cars it was established that this condition is inevitable in about 50 % of the car fleet and that most of the plastic buckle housings will break upon crash loads leading to repeated cases of failure.

— Severity:

A broken buckle housing may lead to the most severe failure.

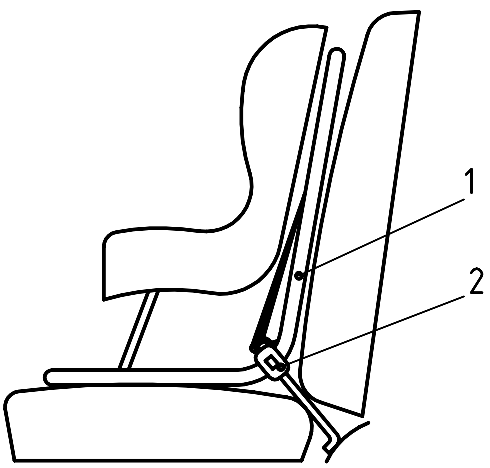
c) Action taken

The most effective remedy of this failure mode would be re-design of the frame with sufficient distance between the belt guide across the frame and the intersection between the seat back and seat bottom.

With its present design the child restraint system should be rejected.

B.2 Compliance

The findings and assessment of the two hypothetical cases are entered into the MMEA form (see example given in clause B.3). According to the acceptance criteria of 5.2 and 5.3 respectively, each of the two cases would deem a child restraint system as a failure.



Key
1 Metal frame
2 Buckle

Figure B.2 — Child seat with metal frame