
**Road vehicles — Anchorages
in vehicles and attachments to
anchorages for child restraint
systems —**

**Part 3:
Classification of child restraint system
and space in vehicle**

*Véhicules routiers — Ancrages dans les véhicules et attaches aux
ancrages pour systèmes de retenue pour enfants —*

*Partie 3: Classification des dimensions des retenues pour enfants et
espace dans le véhicule*



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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.

This second edition cancels and replaces the first edition (ISO 13216-3:2006), which has been technically revised.

The main changes compared to the previous edition are as follows:

- Addition of booster system envelopes ISO/B3, ISO/B2 and ISO/B1;
- Addition of envelope ISO/R2X (modified version of ISO/R2 to provide improved compatibility with the vehicle interior);
- Improved version of the lateral facing envelope (ISO/L1 and ISO/L2);
- Dashed line in seatback area of the ISO/R series of envelopes;
- Corrections in the following envelope drawings: [Figures 3, 5 and 7](#); and
- Addition of recommended CRF masses ([Table 1](#)).

A list of all parts in the ISO 13216 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The basic ISOFIX standard ISO 13216-1 provides requirements needed for positioning of the seat bight anchorages, the geometry around anchorage points and, to some extent, dimensional requirements for forward-facing child restraint systems.

In order to ensure that a child restraint system fits in a vehicle, it is also essential that the vehicle interior and the child restraint system match each other spatially. This document provides requirements for the space needed in vehicles to accommodate child restraints of different types and sizes.

Not all vehicles on the market are capable of accommodating the largest child restraint systems. This document thus provides a classification system to help in judging which types and sizes of child restraint systems will fit in the vehicle. Three size classes of forward-facing systems and three size classes of rearward-facing systems are provided. Two classes of lateral-facing systems are included (dimensionally revised in this second edition). This second edition also incorporates booster system envelopes for size classification of booster systems.

A suggested marking of the space available for the respective child restraint positions in the vehicle, and for the child restraint system dimensions, is included in this document to help consumers choose a child restraint system that is dimensionally suitable for their vehicle. This information is shown in informative [Annex A](#).

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Road vehicles — Anchorages in vehicles and attachments to anchorages for child restraint systems —

Part 3: Classification of child restraint system and space in vehicle

1 Scope

This document classifies the spatial requirements in a vehicle to enable a child restraint system (CRS) to be conveniently mounted. It also specifies the dimensions of child restraint systems, to ensure that they will fit in vehicles.

A classification scheme is provided to determine dimensional compatibility between child restraint systems and the available space at specified seating positions in vehicles. The dimensional requirements refer to forward-facing child restraint systems of three size categories, rearward-facing child restraint systems of three size categories, and lateral-facing child restraint systems of two categories. This edition of the document also incorporates size classification of booster systems.

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 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 terms and definitions given in ISO 13216-1 and the following 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 <https://www.iso.org/obp>

3.1

child restraint envelope

envelope simulating the dimensions of a child restraint system of a specified class, used in this document to evaluate the space available for child restraint systems in a vehicle at a specified seating position

Note 1 to entry: The child restraint envelope is also used to identify the dimensional class for a given child restraint system.

3.2

child restraint fixture

CRF

physical implementation of the envelope dimensions

3.3

booster system envelope

envelope describing a booster seat or a booster cushion

3.4

interference

significant contact with the vehicle interior that impedes the installation of the fixture

4 Vehicle space requirements

4.1 Space required in a vehicle to accommodate specified types and installation modes of child restraint systems

4.1.1 General

Determination of space available in vehicle for child restraint systems is done by use of child restraint envelopes in CAD or physical fixtures (CRF).

It shall be possible to accommodate the child restraint envelopes/fixtures, specified in this document at a specified seating position in a vehicle, without interference with the vehicle interior elements, such as head restraints, dashboard, windshield, or the vehicle seat in front of the seating position.

When checking the child restraint envelope/fixture on a seat, the vehicle seat shall be adjusted longitudinally to its rearmost position and its lowest position.

In addition, when checking the child restraint envelope/fixture in a rear seating position, the related vehicle front seat shall be adjusted as follows:

- longitudinally, to the mid-position between the rearmost position and the foremost position;
- vertically, to the mid position of its height adjustment, if not otherwise recommended by the vehicle manufacturer; and
- the seat backrest may be adjusted, but not to a more upright angle than corresponding to a torso angle of 15°.

NOTE 1 The angle can be measured according to ISO 6549.

The requirements apply for the child restraint envelope/fixture when positioned in the anchorages. It is not required that the child restraint fixture shall move in and out of the seat under these conditions.

Adjustable attachments (adjustable longitudinally between -10 mm and +70 mm) may be used to facilitate the interference checking. Envelope illustrations are showing the most extended position.

When installed on a vehicle seat, the child restraint envelopes in [4.2](#) to [4.9](#) should have a pitch angle of $15^\circ \pm 10^\circ$, which corresponds to a clockwise rotation of the side view (upper-right drawing) in [Figures 1](#) to [11](#).

NOTE 2 The ISO/F, ISO/R and ISO/B envelope series are fully modular in size, except for the "X" versions. This means that a vehicle compatible with the larger envelope is also compatible with the smaller one(s) of the same category. For example, a vehicle seating position accommodating ISO/R3 also accommodates ISO/R2 and ISO/R1.

4.1.2 Mass of CRF

Child restraint fixtures for practical testing should have a mass according to [Table 1](#) to obtain a realistic compression of the vehicle seat.

Table 1 — CRF masses

Envelope / CRF	Mass (kg)	Tolerance (kg)
R1 ^a	10	±1,0
R2 / R2X ^a	10	±1,0
R3	13	±1,0
L1 / L2	13	±1,0
F2 / F2X ^a	13	±1,0
F3	13	±1,0
B1	3	±1,0
B2	7	±1,0
B3	7	±1,0
^a ISOFIX base mass taken into account.		

4.1.3 Installation and assessment using virtual tools and procedures

When using virtual tools for the assessment of the envelopes in a vehicle interior, the assessments shall be representative of installing a physical fixture in a vehicle seating position, e.g. with regard to CRF mass, centre of gravity, vehicle seat compression and extent of interference.

4.2 Space required for full-height forward-facing toddler child restraint systems

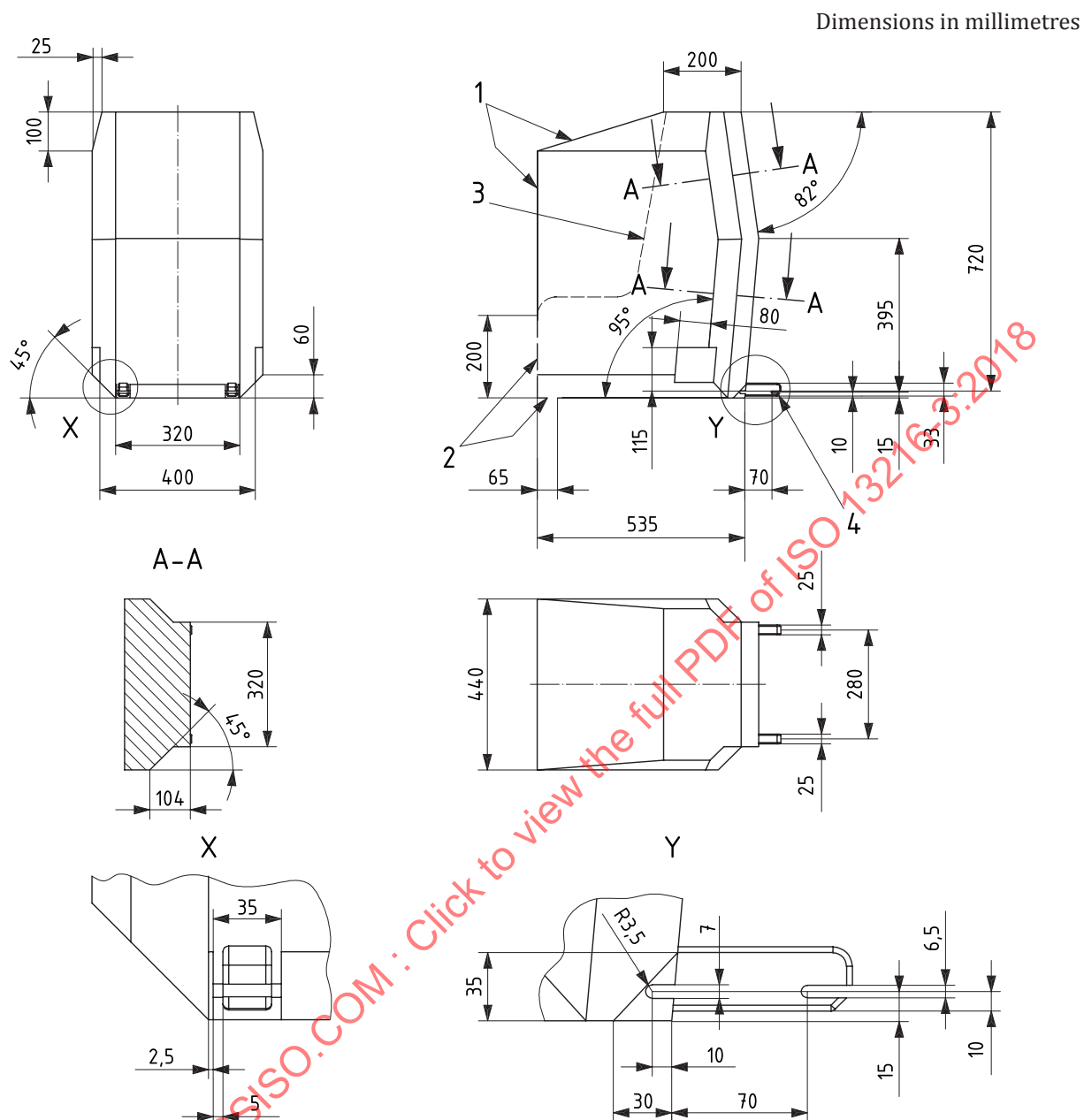
The vehicle seating position accommodates a full-height forward-facing toddler CRS. The child restraint envelope according to [Figure 1](#) can be positioned without interference with the vehicle interior when installed as in [4.1](#).

4.3 Space required for reduced-height forward-facing toddler child restraint systems

The vehicle seating position accommodates a reduced-height forward-facing toddler CRS. The child restraint envelope according to [Figure 2](#) can be positioned without interference with the vehicle interior when installed as in [4.1](#).

4.4 Space required for reduced-height forward-facing toddler child restraint systems having a reduced contour in the upper part, and an extended seatback upper part

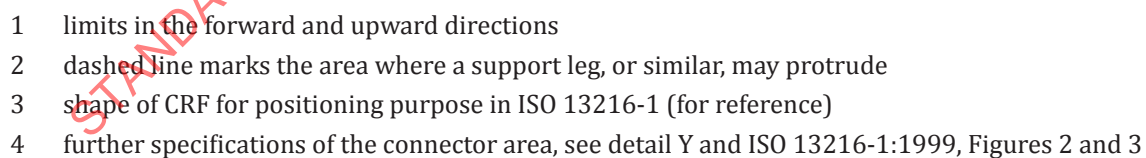
The vehicle seating position accommodates a reduced-height forward-facing toddler CRS having a reduced contour in the upper part (to allow fitting in low-roof cars), and an extended upper part of the seatback. The child restraint envelope according to [Figure 3](#) can be positioned without interference with the vehicle interior when installed as in [4.1](#).



Key

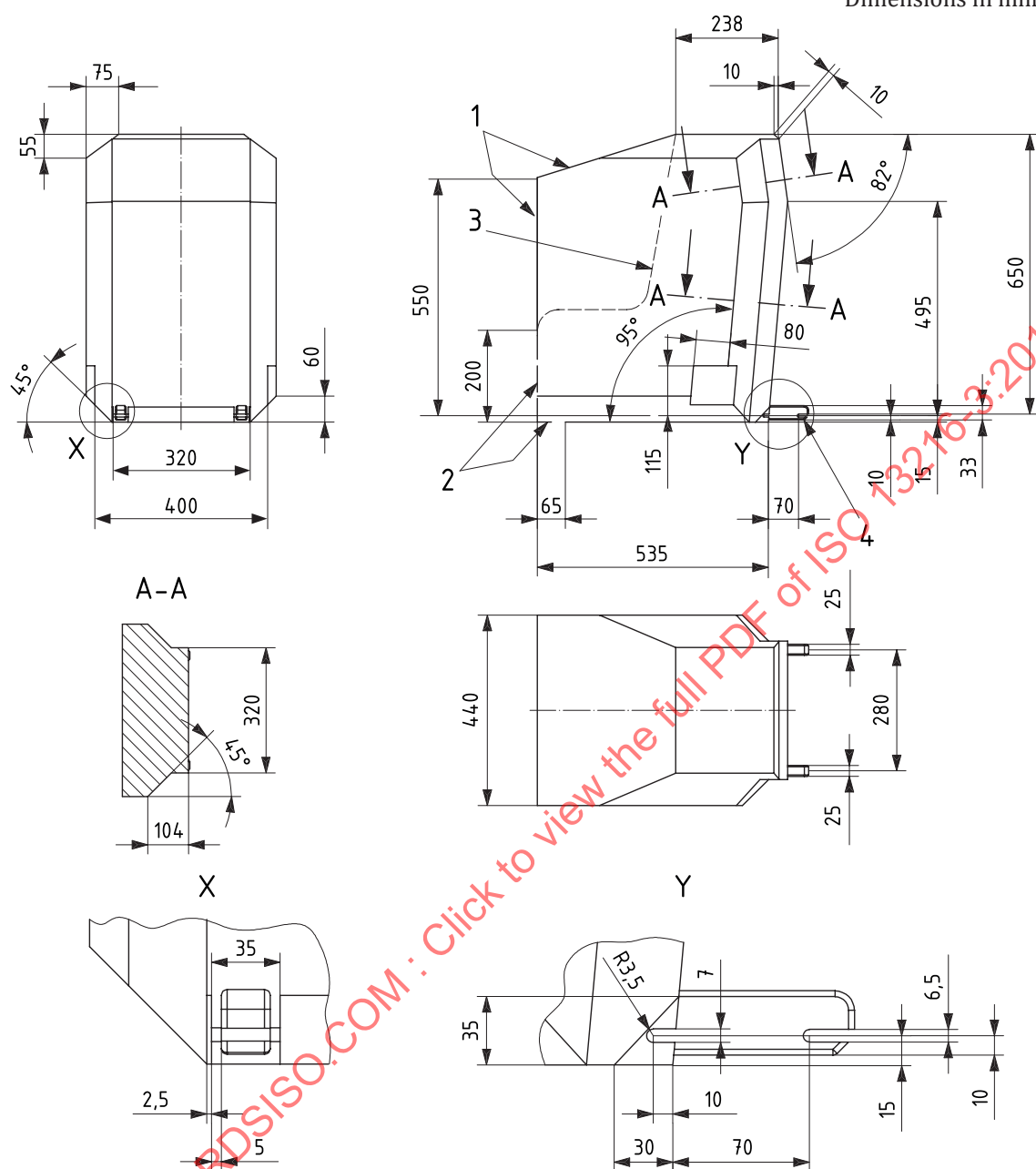
- 1 limits in the forward and upward directions
- 2 dashed line marks the area where a support leg, or similar, may protrude
- 3 shape of CRF for positioning purpose in ISO 13216-1 (for reference)
- 4 further specifications of the connector area, see detail Y and ISO 13216-1:1999, Figures 2 and 3

Figure 1 — Envelope dimensions for a full-height forward-facing CRS — ISO/F3



5

Dimensions in millimetres



Key

- 1 limits in the forward and upward directions
2 dashed line marks the area where a support leg, or similar, may protrude
3 shape of CRF for positioning purpose in ISO 13216-1 (for reference)
4 further specifications of the connector area, see detail Y and ISO 13216-1:1999, Figures 2 and 3

Figure 3 — Envelope dimensions for a reduced-height forward-facing CRS having a reduced contour in the upper part, and an extended seatback upper part — ISO/F2X

4.5 Space required for full-size rearward-facing toddler child restraint systems

The vehicle seating position accommodates a full-size rearward-facing toddler CRS. The child restraint envelope according to [Figure 4](#) can be positioned without interference with the vehicle interior when installed as in [4.1](#).

4.6 Space required for reduced-size rearward-facing toddler child restraint systems

The vehicle seating position accommodates a reduced-size rearward-facing toddler CRS. The child restraint envelope according to [Figure 5](#) or [Figure 6](#)¹⁾ can be positioned without interference with the vehicle interior when installed as in [4.1](#).

4.7 Space required for rearward-facing infant child restraint systems

The vehicle seating position accommodates a rearward-facing infant CRS. The child restraint envelope according to [Figure 7](#) can be positioned without interference with the vehicle interior when installed as in [4.1](#).

4.8 Space required for lateral-facing infant child restraint system (carry-cot)

The vehicle seating position accommodates a lateral-facing (left or right) infant CRS. The child restraint envelope according to [Figure 8](#) can be positioned without interference with the vehicle interior when installed as in [4.1](#).

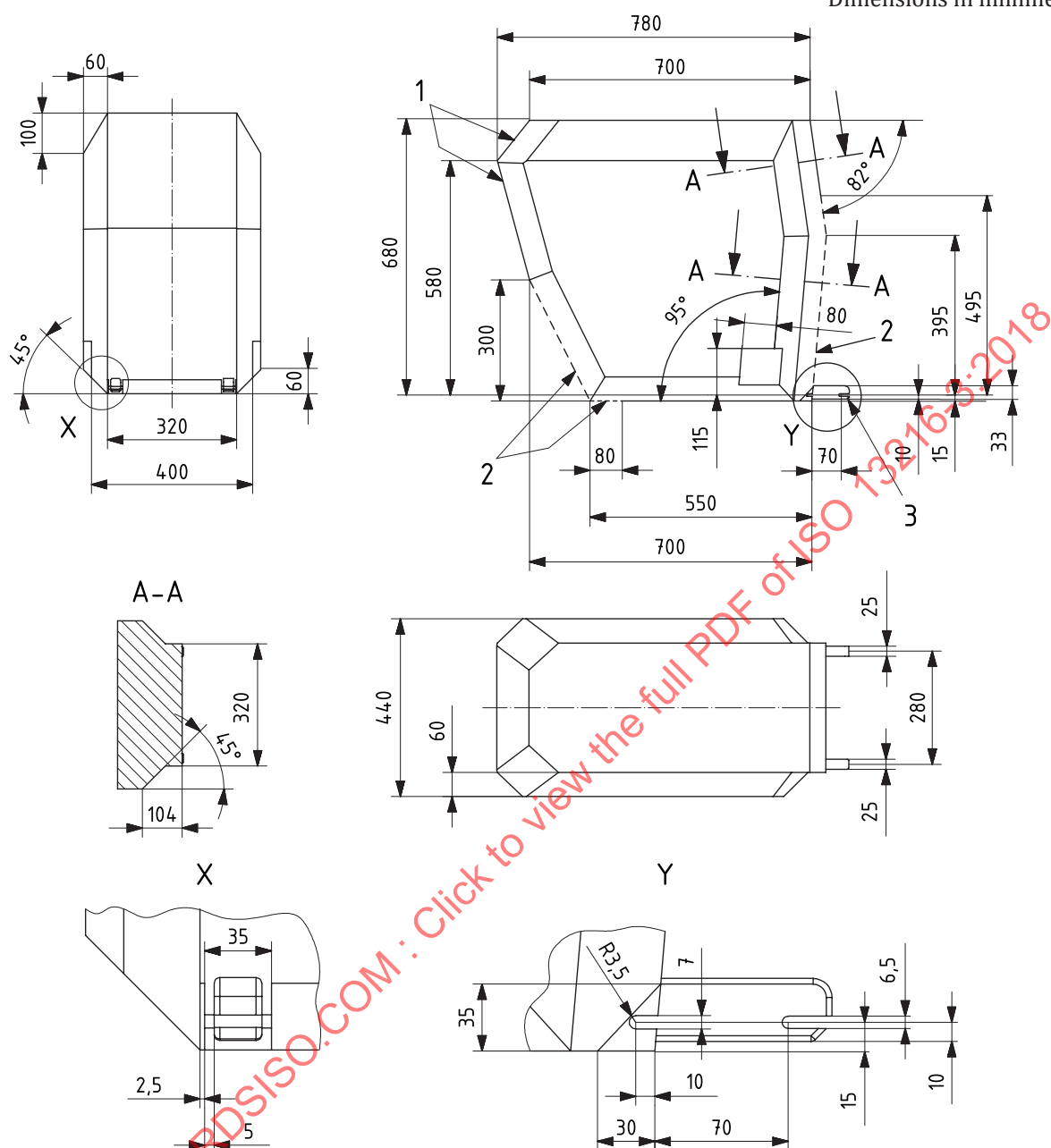
NOTE 1 ISO/L1 is intended for the left vehicle seating position. ISO/L2 is intended for the right vehicle seating position.

NOTE 2 The envelope for a left lateral-facing infant CRS (ISO/L1) has dimensions symmetric to ISO/L2 ([Figure 8](#)), with regard to its intermediate longitudinal plan.

NOTE 3 The lateral-facing envelopes have been modified in this edition to improve vehicle compatibility and to reflect current CRS designs.

1) R2X (shown in [Figure 6](#)) is a modified version of R2 for improved compatibility with the vehicle interior.

Dimensions in millimetres



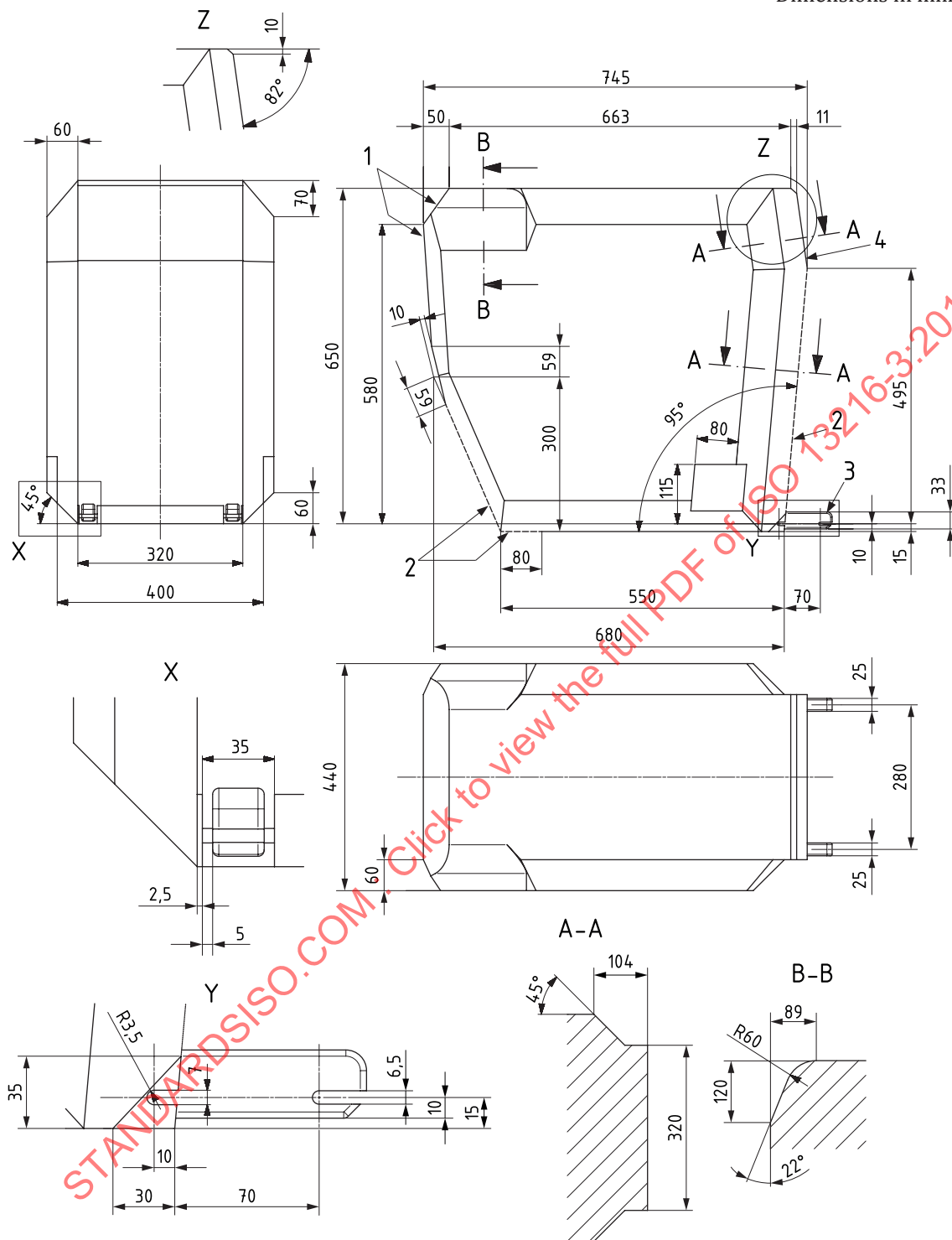
Key

- 1 limits in the rearward and upward directions
- 2 dashed line marks the area where a support leg, or similar, may protrude (for seatback area up to 495 mm)
- 3 further specifications of the connector area, see detail Y and ISO 13216-1:1999, Figures 2 and 3

Figure 4 — Envelope dimensions for a full-size rearward-facing CRS — ISO/R3



Dimensions in millimetres



Key

- 1 limits in the rearward and upward directions
- 2 dashed line marks the area where a support leg, or similar, may protrude
- 3 further specifications of the connector area, see detail Y and ISO 13216-1:1999, Figures 2 and 3
- 4 the backward limitation (to the right in the figure) is identical to the forward-facing envelope in [Figure 3](#) (ISO/F2X)

Figure 6 — Envelope dimensions for a reduced-size rearward-facing CRS, modified for improved compatibility with the vehicle interior — ISO/R2X

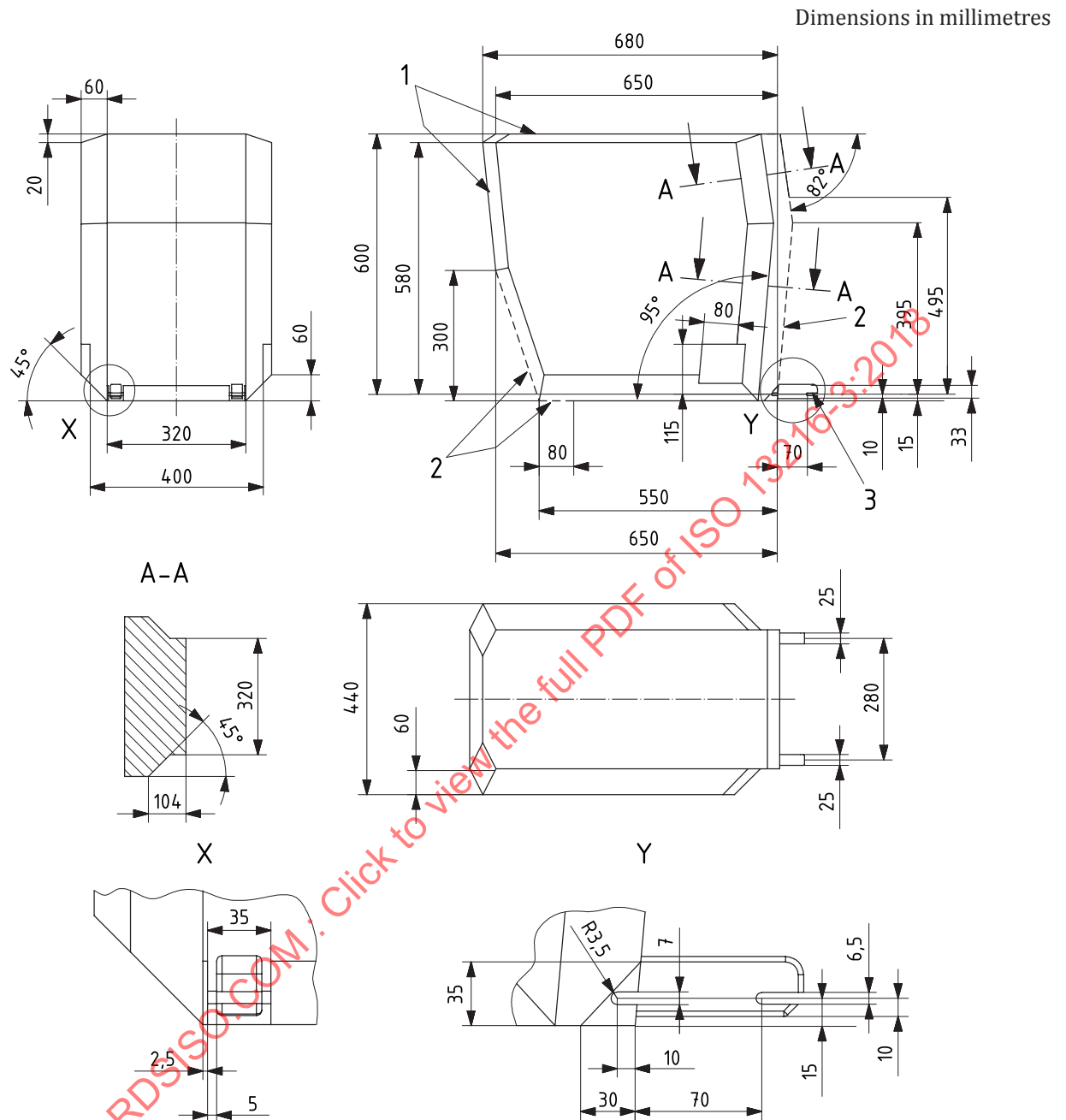
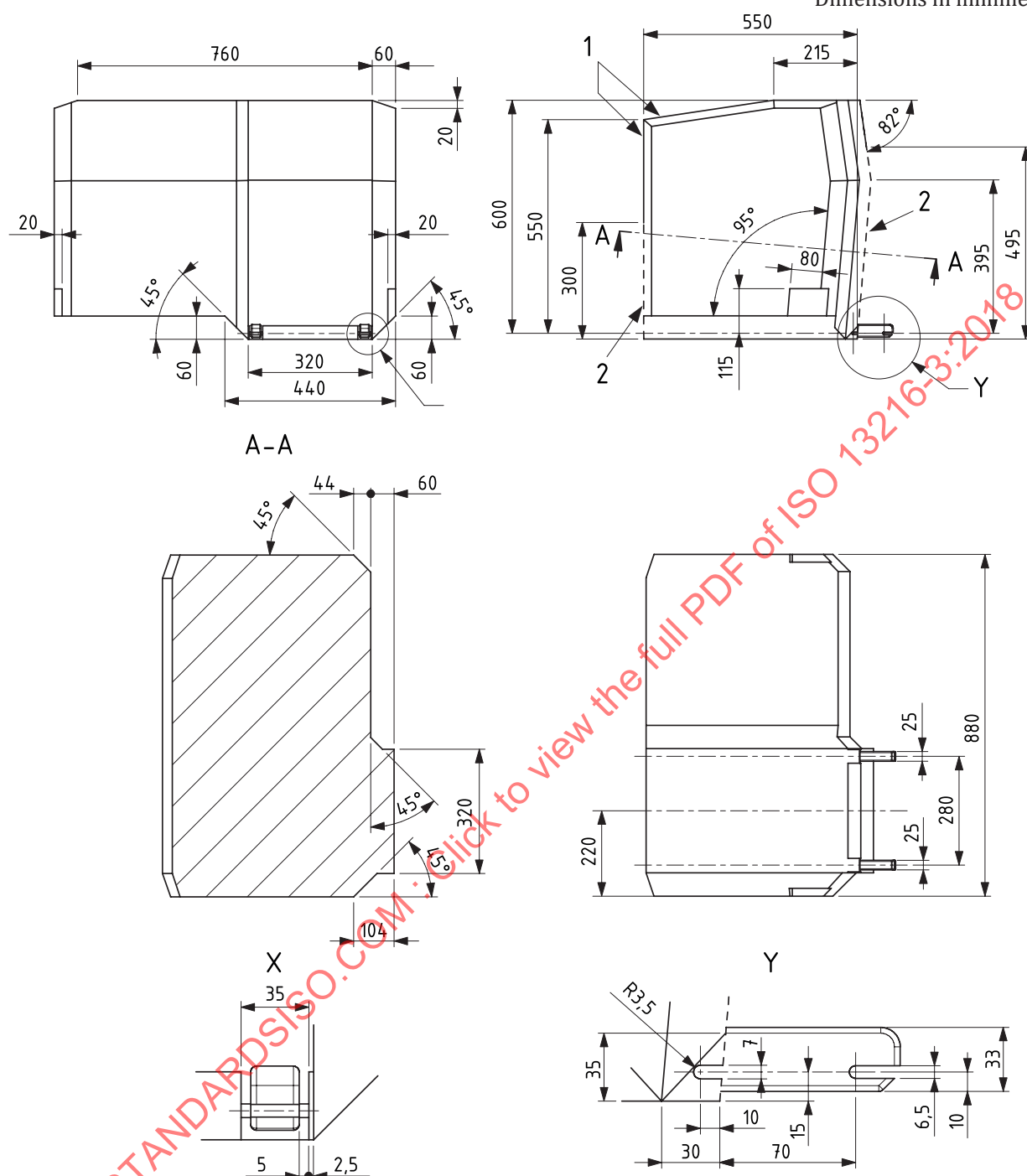


Figure 7 — Envelope dimensions for a rearward-facing infant CRS — ISO/R1

Dimensions in millimetres



Key

- 1 limits in the rearward and upward directions
2 dashed line marks the area where a support leg, or similar, may protrude (for seatback area up to 495 mm)

NOTE The envelope for a left lateral-facing infant CRS (ISO/L1) has dimensions symmetric to ISO/L2 with regard to its intermediate longitudinal plan.

Figure 8 — Envelope dimensions for a right lateral-facing infant CRS — ISO/L2

4.9 Space required for booster seat and booster cushion

4.9.1 Purpose of the booster system envelopes for determination of space and seat belt alignment in vehicles

The booster system envelopes have been developed to become tools for improving the compatibility between vehicle seats and booster systems. These envelopes provide reference measurements and can be used for identification of possible conflicts with vehicle interiors. They are also useful for checking the alignment between ISOFIX and vehicle seat belt anchorage positions.

Two booster seat envelopes are specified:

- ISO/B3: Full width 520 mm. See [Figure 9](#).
- ISO/B2: Reduced width 440 mm. See [Figure 10](#).

In addition, a booster cushion is specified, ISO/B1. See [Figure 11](#).

The booster seat envelope B3 is designed to accommodate a child of 135 cm 95 percentile seated height and width.

The booster seat envelope B2 has a reduced width aligned with the other ISOFIX forward-facing and rear-facing envelopes.

4.9.2 Installation requirements

The vehicle seating position accommodates a booster seat envelope according to [Figure 9](#) or [Figure 10](#) if it can be positioned without interference with the vehicle interior when installed as in [4.9.4](#) or [4.9.5](#) respectively.

The installation check could be evaluated in two installation configurations, with or without the use of ISOFIX anchorages, in ISOFIX equipped vehicle seating positions.

When the evaluation is performed using the support of ISOFIX anchorages, adjustable attachments according to detail A may be used to facilitate the interference checking.

The booster seat envelope is equipped with an adjustable backrest. Compatibility with the vehicle seating position shall be achieved in at least one position of the backrest range shown in [Figure 9](#) and [Figure 10](#).

4.9.3 Belt routing requirements

It shall be possible to route the lap portion of the vehicle seat belt through the belt guides defined in the envelope (see [Figure 12](#)) and to buckle up the vehicle seat belt of the respective seating position. The lap portion of the belt shall touch the envelope on both sides at the rear of the lap belt path without interference with the belt buckle.

NOTE The diagonal part of the belt can be routed around the upper part of the backrest portion. Diagonal belt geometry is not part of the evaluation with this envelope.

4.9.4 Installation with ISOFIX support

- 1) Place a cotton cloth on the vehicle seatback and cushion.
- 2) Place the CRF on the vehicle seat.
- 3) Arrange the seat belt through the CRF in approximately the correct position, and then fasten the buckle.
- 4) Attach the ISOFIX connectors and adjust as necessary.

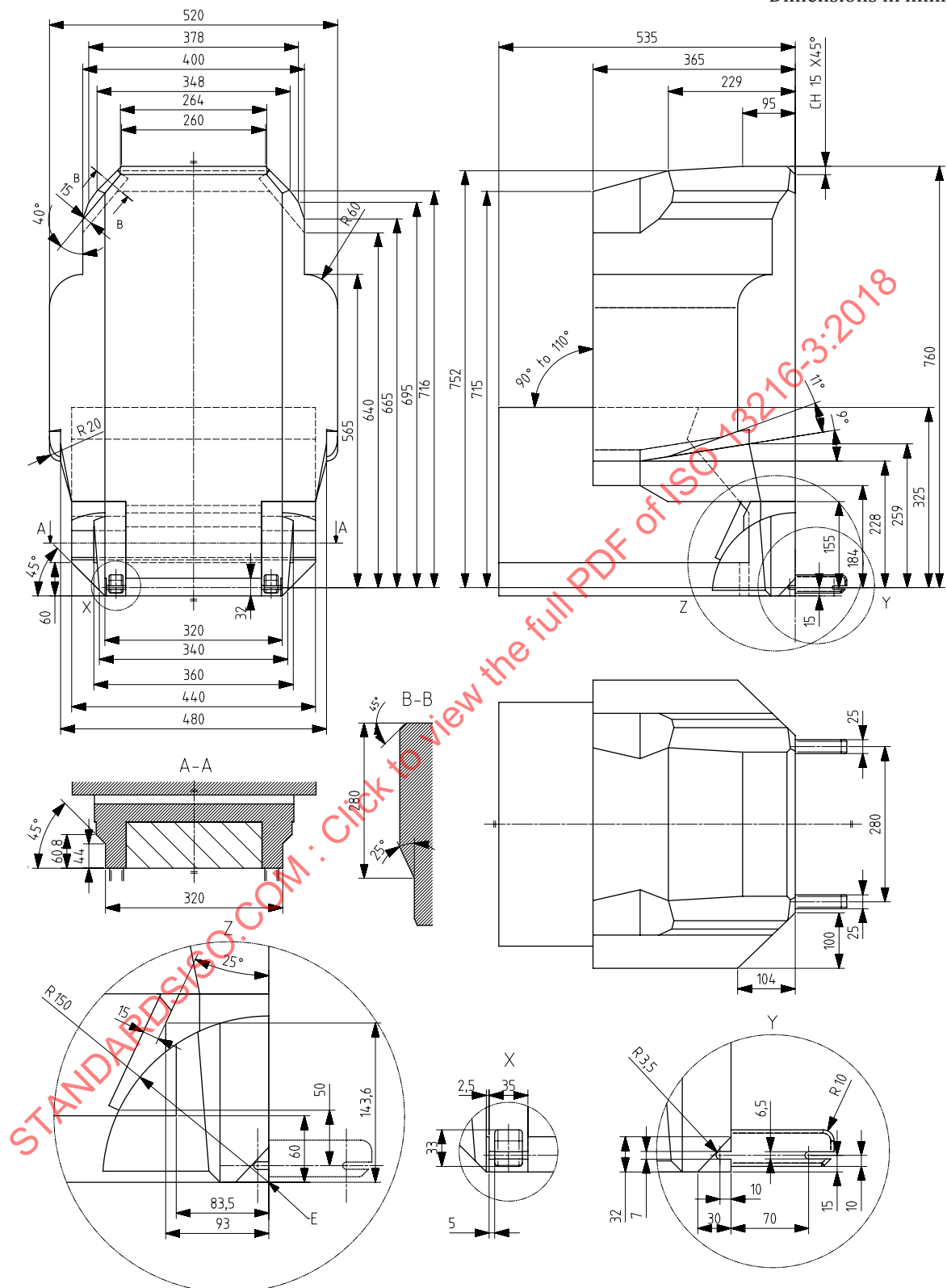
- 5) Push, towards ISOFIX anchorages system, on the centre between the ISOFIX anchorages with a force of $100\text{ N} \pm 10\text{ N}$ applied parallel to the lower surface and remove the force.
- 6) Push vertically downwards on the centre of the upper surface of the CRF with a force of $100\text{ N} \pm 10\text{ N}$, and remove the force.
- 7) Ensure that all webbing slack is removed.

4.9.5 Installation without ISOFIX support

- 1) Place a cotton cloth on the vehicle seatback and cushion.
- 2) Remove the ISOFIX attachments from the CRF, or retract them to a position fully inside the backseat line (reference line E).
- 3) Place the CRF on the vehicle seat.
- 4) Arrange the seat belt through the CRF in approximately the correct position, and then fasten the buckle.
- 5) Ensure that the CRF is located with its centreline on the apparent centreline of the seating position, $\pm 25\text{ mm}$, with its centreline parallel with the centreline of the vehicle. The roll angle shall be within $0^\circ \pm 5^\circ$, in accordance with ISO 13216-1.
- 6) Push rearwards on the centre of the front of the CRF with a force of $100\text{ N} \pm 10\text{ N}$, applied parallel to the lower surface, and remove the force.
- 7) Push vertically downwards on the centre of the upper surface of the CRF with a force of $100\text{ N} \pm 10\text{ N}$, and remove the force.
- 8) Ensure that all webbing slack is removed.

NOTE The above installation procedures are in line with the UN R.16 and Euro NCAP procedures.

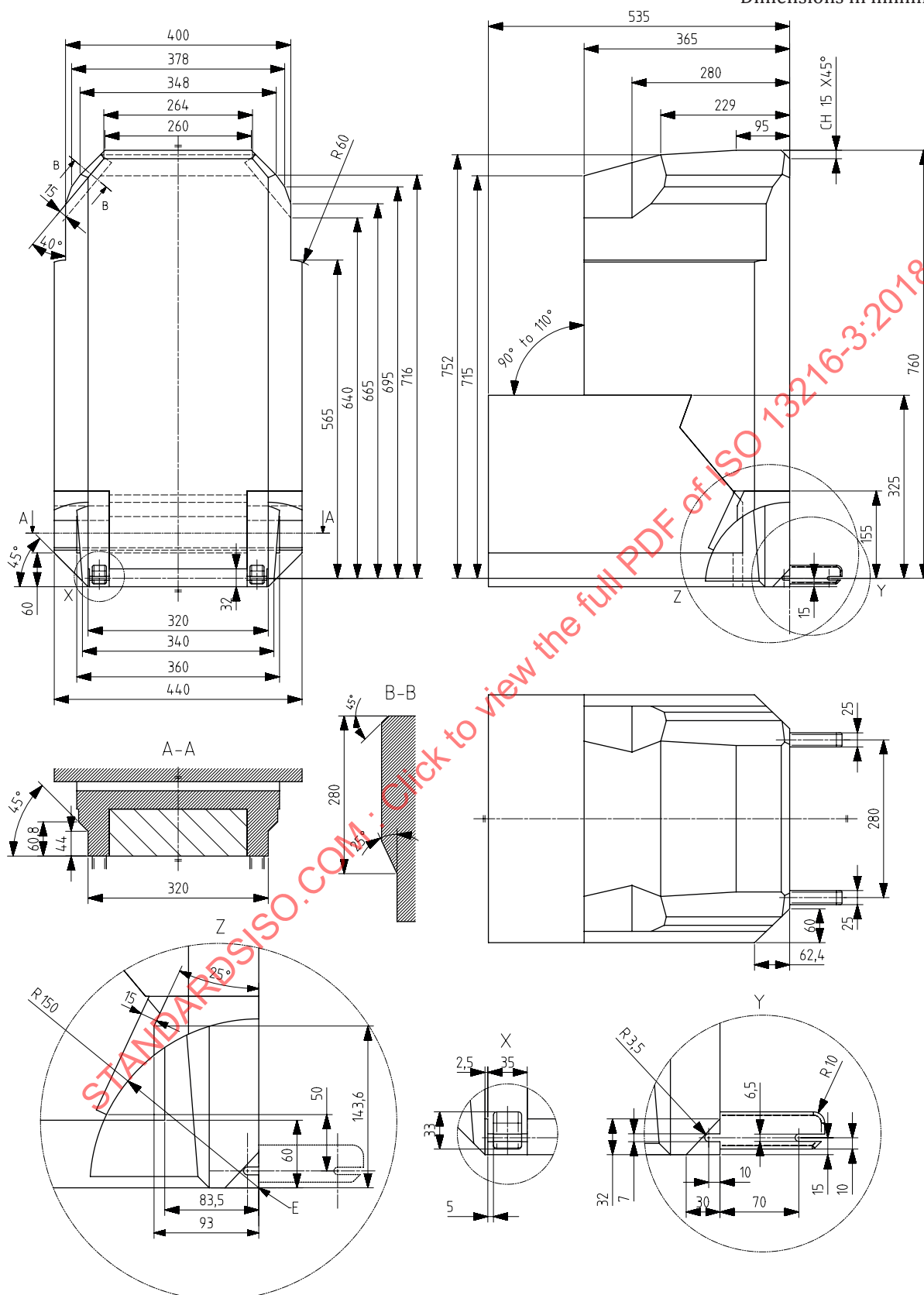
Dimensions in millimetres

**Key**

- E reference axle of rotation of the backrest (90° to 110°) and reference line for retraction/stowing of ISOFIX attachment

Figure 9 — Envelope dimensions for booster seat, full width 520 mm — ISO/B3

Dimensions in millimetres



Key

E reference axle of rotation of the backrest (90° to 110°) and reference line for retraction/stowing of ISOFIX

Figure 10 — Envelope dimensions for booster seat, reduced width 440 mm — ISO/B2

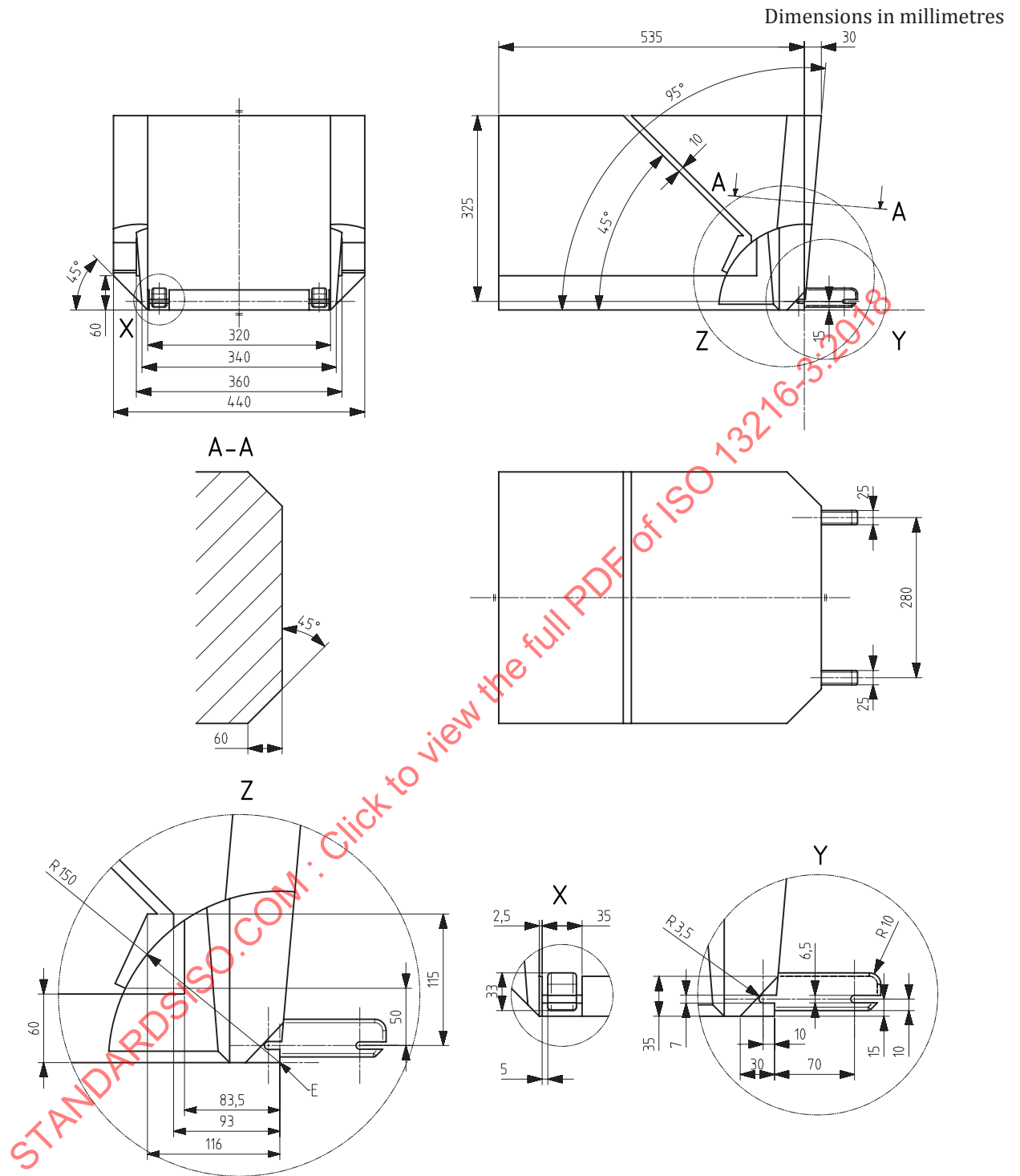


Figure 11 — Envelope dimensions for a booster cushion — ISO/B1

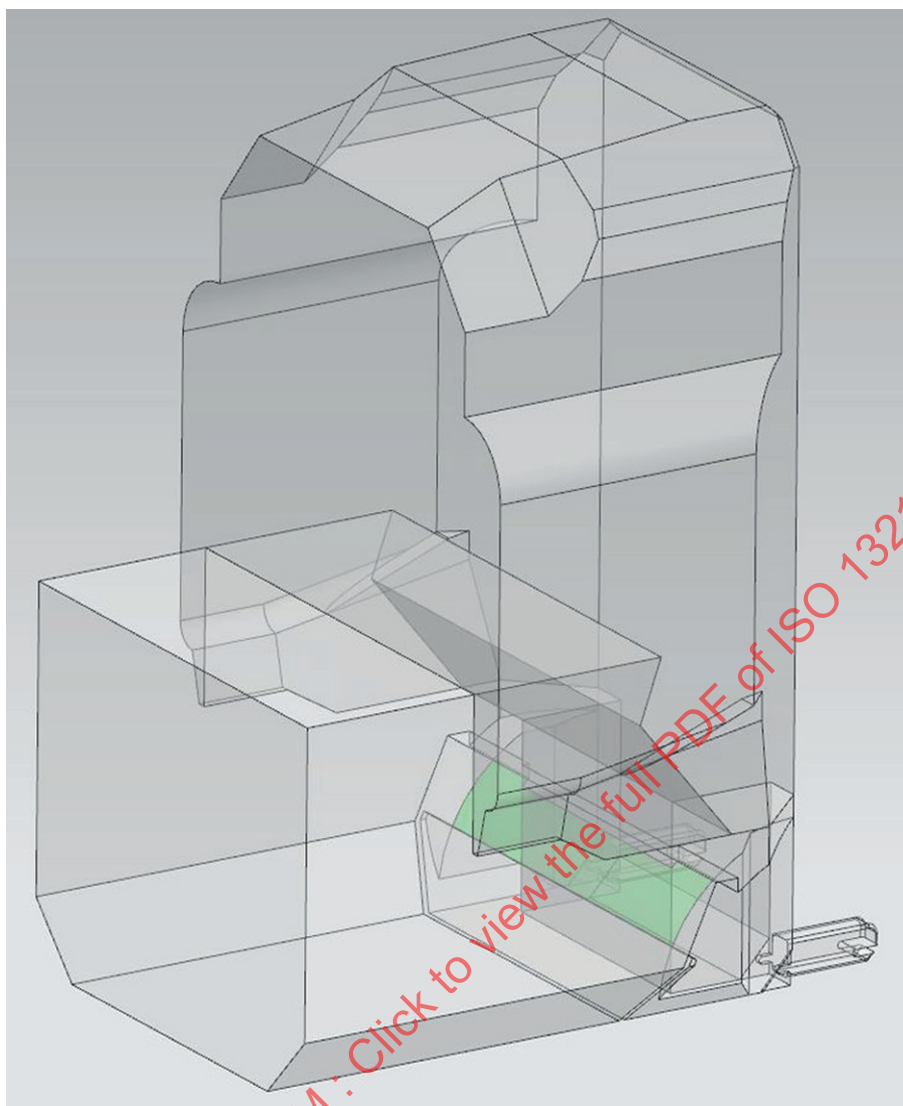


Figure 12 — Illustration of the booster seat envelope showing the lap belt path

5 Dimensions of child restraint system

5.1 Maximum dimensions of child restraint systems

The child restraint system shall not exceed the dimensions given by the respective child restraint envelopes specified in [5.2](#) to [5.9](#).

5.2 Full-height forward-facing toddler child restraint system

Forward-facing CRS with a height range of 650 mm to 720 mm. The CRS fits within the full-height envelope shown in [Figure 1](#), but does not fit within the reduced-height envelope shown in [Figure 2](#). A support leg, or similar, is allowed to protrude the area marked with a dashed line.

5.3 Reduced-height forward-facing toddler child restraint system

Forward-facing CRS with a maximum height of 650 mm. The CRS fits within the reduced-height envelope shown in [Figure 2](#). A support leg, or similar, is allowed to protrude the area marked with a dashed line.

5.4 Reduced-height forward-facing toddler child restraint systems with a reduced contour in the upper part, and an extended seatback upper part

Forward-facing CRS with a maximum height of 650 mm, having a reduced contour in the upper part (to allow fitting in low-roof cars), and an extended upper part of the seatback. The CRS fits within the reduced-height envelope shown in [Figure 3](#). A support leg, or similar, is allowed to protrude the area marked with a dashed line.

5.5 Full-size rearward-facing toddler child restraint system

The CRS fits within the full-size rearward-facing toddler envelope shown in [Figure 4](#), but does not fit within the reduced-size rearward-facing toddler envelope shown in [Figure 5](#) and [Figure 6](#). Anti-rotation devices are allowed to protrude the area marked with a dashed line. A rebound anti-rotation device acting on the vehicle seatback shall stay inside the dashed line in at least one position, but may protrude the dashed line in its adjusted position.

5.6 Reduced-size rearward-facing toddler child restraint system

The CRS fits within the reduced-size rearward-facing toddler envelope shown in [Figure 5](#) and [Figure 6](#), but does not fit within the rearward-facing infant CRS envelope shown in [Figure 7](#). Anti-rotation devices are allowed to protrude the area marked with a dashed line. A rebound anti-rotation device acting on the vehicle seatback shall stay inside the dashed line in at least one position, but may protrude the dashed line in its adjusted position.

5.7 Rearward-facing infant child restraint systems

The CRS fits within the rearward-facing infant CRS envelope shown in [Figure 7](#). Anti-rotation devices are allowed to protrude the area marked with a dashed line. A rebound anti-rotation device acting on the vehicle seatback shall stay inside the dashed line in at least one position, but may protrude the dashed line in its adjusted position.

5.8 Lateral-facing infant child restraint systems

The carry-cot (car-bed) fits within the lateral-facing infant CRS envelope shown in [Figure 8](#). Anti-rotation devices are allowed to protrude the area marked with a dashed line. A rebound anti-rotation device acting on the vehicle seatback shall stay inside the dashed line in at least one position, but may protrude the dashed line in its adjusted position.

5.9 Booster seat and booster cushion restraint systems

5.9.1 Purpose of the booster system envelopes with regard to child restraint systems

The purpose of the booster seat and booster cushion envelopes for CRS manufacturers is to ensure that these booster systems fit in the space provided by a vehicle. The evaluation can be performed with or without the use of ISOFIX supports.

5.9.2 Maximum dimensional requirements

For compatibility, the CRS should fit within the envelope.

The booster seat envelope has an adjustable backrest. To ensure complete compatibility with vehicles, the CRS fitment evaluation in the envelope should be performed in the two extreme positions of the backrest (90° and 110°).