
Regulation No. **Synthesis DRAFT 2010_02** **Q-Size**
UNIFORM PROVISIONS CONCERNING THE APPROVAL OF **[ISOFIX Integral/ Enhanced]**
CHILD RESTRAINT SYSTEMS USED ONBOARD OF MOTOR VEHICLES.

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1. SCOPE

This Regulation applies (in Phase 1) to ISOFIX Universal Integral child restraint systems for child occupants of power driven vehicles.

2. DEFINITIONS

Colour code

Blue = CSI
Orange = DFT
Pink = CI
Green = TUB
Grey = CLEPA

For the purposes of this Regulation,

- 2.1. “**Child Restraint System**” means a device offering the child occupant the possibility to sit on, to sit in and/or to lay in. It is so designed as to diminish the risk of injury to the wearer, in the event of a collision or of abrupt deceleration of the vehicle, by limiting the mobility of the child’s body.

Child restraint system means an arrangement of components which may comprise the combination of straps or flexible components with a securing buckle, adjusting devices, attachments and in some cases a supplementary device as a carry-cot, infant carrier, a supplementary chair and/or an impact shield, capable of being anchored to a power-driven vehicle. It is so designed as to diminish the risk of injury to the wearer, in the event of a collision or of abrupt deceleration of the vehicle, by limiting the mobility of the wearer’s body.

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“**Child Restraint System**” means a device so designed as to diminish the risk of injury to the wearer, in the event of a collision or of abrupt deceleration of the vehicle.

- 2.2. “**ISOFIX**” is an indication for the system of connection of a Child Restraint System to vehicles. It is based on two vehicle anchorages and two corresponding attachments on the Child Restraint System.

“**ISOFIX**” is a system for the connection of a Child Restraint System to vehicles. It is based on two vehicle anchorages and two corresponding attachments on the Child Restraint System and a mean to limit the pitch rotation of the child restraint system.

- 2.3. “**ISOFIX Universal**” is an indication for the system of connection of a Child Restraint System to vehicles. It is based on two vehicle anchorages and two corresponding attachments on the Child Restraint System in conjunction with an anti-rotation device meant to limit the pitch rotation of the Child Restraint System, attached to, or supported by, the corresponding vehicle anchorage point. All three vehicle anchorages [and the vehicle floor reception area] are to be approved according Regulation No.14.

“**ISOFIX Universal**” is a system for the connection of a Child Restraint System to vehicles. It is based on two vehicle anchorages and two corresponding attachments on the Child Restraint System in conjunction with an anti-rotation device, comprising a top-tether or support leg, to limit the pitch rotation of the Child Restraint System, attached to, or supported by, the corresponding

Comment [11]: Comment from TUB - I believe that there is something missing. E.g., The anti-rotation device is either a Top Tether or a support leg.

vehicle anchorage point. All three vehicle anchorages [and the vehicle floor contact zone] are to be approved according Regulation No.14.

- 2.4. "ISOFIX specific vehicle" is an indication for the system of connection of a Child Restraint System to specific vehicle types. It is based on two vehicle anchorages and two corresponding attachments on the Child Restraint System in conjunction with an anti rotation device meant to limit the pitch rotation of the Child Restraint System, attached to, or supported by, the corresponding vehicle anchorage point. All three vehicle anchorages [and the vehicle floor reception area] are to be approved according Regulation No.14. It is also an indication for "built in" child restraint
- 2.5. "NON-ISOFIX" is an indication for the system of connection of a child restraint to vehicles meaning that for its fixation no use is made of the ISOFIX anchorage.
- 2.6. "Integral" is a class indication for the retention of the child occupant in the child restraint, meaning that the child is restrained only by means that make part of the child restraint (strap harness, shield, etc.), not by means directly connected to the vehicle.
"Integral" is a class of child restraint system in which the child is restrained by means comprising only of the child restraint system (e.g. strap harness, shield, etc.).
- 2.7. "Non-integral" is a class indication for the retention of the child occupant in the child restraint, meaning that the child has to be restrained not only by means making part of this child restraint but the retention of the child is dependent upon other means directly connected to the vehicle.
"Non-integral" is a class of child restraint system in which the child is restrained by means that do not comprise the child restraint system (e.g. adult safety belt, etc.).
- 2.8. "[IUI]" (Integral Universal Isofix CRS) is a category indication for a child restraint meaning it is for use in all vehicles, not necessarily on all vehicle positions, approved according to Regulation No.16 (to be amended) including its suitability for such a category of child restraint.
"[IUI]" means Integral Universal Isofix [for use in all vehicles, not necessarily on all vehicle positions, IUI compatible according to regulation No.16 (to be amended)].
Ⓢ-Size definition [universal integral isofix CRS meeting the requirements of this regulation will be labeled Ⓢ-Size] in a standardized way in the communication to the public. Cars that are able to accommodate these CRS will be labeled Ⓢ-size ready] in a standardized way to the public.]
- 2.9. "Size" is a stature indication for a child restraint providing information for which range of child occupants it is meant. It is primarily based on stature, in order to facilitate proper use, but also based on maximum mass to provide manufacturers information that is related to expect maximum loads. Child restraint systems may cover any size range provided that all requirements are fulfilled.
"Size" is a means of indicating the range of children for whom a particular child restraint has been approved. It is primarily based on stature, but also [limited by a] maximum mass to ensure that design loads of anchorages are not exceeded. Child restraint systems may cover any size range provided that all requirements of that size range are fulfilled.
- 2.10. "Orientation" is the indication that a child restraint system can be used forward-facing and/or rearward-facing, the following distinction is made:
- forward-facing means facing in the normal direction of travel of the vehicle;

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Comment [I2]: Do we need to define this ???

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- Rearward-facing means facing in the direction opposite to the normal direction of travel of the vehicle.
- Lateral-facing means facing perpendicular to the normal direction of travel of the vehicle

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“Orientation” is a means of indicating the intended direction of travel for the child restraint occupant:

- (a) forward-facing means facing in the normal direction of travel of the vehicle;
- (b) Rearward-facing means facing in the direction opposite to the normal direction of travel of the vehicle.
- (c) Lateral-facing means facing perpendicular to the normal direction of travel of the vehicle.

2.11. "Special Needs Restraint" is a child restraint system designed for children who have special needs as a result of either a physical or mental **disability**; this device may in particular permit additional restraining devices for any part of the child, but it must contain as a minimum a primary means of restraint which complies with the requirements of this Regulation.

2.12. "Restraint anchorages" means these parts of the vehicle structure or seat structure to which the child-restraint attachments are secured;

2.13. "ISOFIX anchorage system" means a system made up of 2 Isofix low/lower anchorages fulfilling the requirements of regulation N°14 which is designed for attaching an Isofix child restraint system in conjunction with an anti-rotation device.

2.13.1. "ISOFIX low anchorage" means one 6 mm diameter rigid round horizontal bar, extending from vehicle or seat structure to accept and restrain an ISOFIX child restraint system with ISOFIX attachments.

2.14. "Anti-rotation device" means a device intended to limit the rotation of the Child Restraint System during an impact consisting of :

- (a) a top-tether strap.
- or
- (b) a support leg.

meeting the requirements of this regulation. and fitted to ISOFIX anchorages system and ISOFIX top tether anchorages [or vehicle floor reception area / or vehicle floor engagement zone] meeting the requirements of Regulation N°14. ...An anti-rotation device for an ISOFIX semi-universal child restraint system consists of either a top tether, the vehicle dashboard or a support leg intended to limit the rotation of the restraint during a frontal impact.

2.15. "ISOFIX top tether strap" means a webbing strap (or equivalent) which extends from the top of an ISOFIX child restraint system to the ISOFIX top tether anchorage, and which is equipped with an adjustment device, a tension-relieving device, and an ISOFIX top tether connector.

2.15.1. "ISOFIX top tether anchorage" means a feature fulfilling the requirements of Regulation No. 14, such as a bar, located in a defined zone, designed to accept an ISOFIX top tether strap connector and transfer its restraint force to the vehicle structure.

2.15.2. "ISOFIX top tether connector" means a device intended to be attached to an ISOFIX top tether anchorage.

2.15.3. "ISOFIX top tether hook" means an ISOFIX top tether connector typically used to attach an ISOFIX top tether strap to an ISOFIX top tether anchorage as defined in Figure 3 of Regulation No. 14.

2.15.4. "ISOFIX top tether attachment" is a device to secure the ISOFIX top tether strap to the ISOFIX child restraint system.

2.15.5. "ISOFIX attachment" means one of the two connections, fulfilling the requirement of paragraph [6.3.2.] of this Regulation, extending from the ISOFIX child restraint system structure, and compatible with an ISOFIX low anchorage

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2.15.6. "Tension relieving device" means a system which allow to release the device which adjust and maintain the tension in the ISOFIX top tether strap

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2.16. "Universal Support leg" means a permanent attachment to a child restraint creating a compressive load path between the child restraint and [a / the] vehicle structure in order to by-pass seat cushion effects during deceleration; a support leg must have a pushing surface with a minimum size and an adjustable length with a minimum and a maximum size.

Comment [13]: Comment from TUB - Better to Universal Support Leg Foot?

"Universal Support leg" means a permanent attachment to a child restraint creating a compressive load path between the child restraint and a vehicle structure in order to by-pass seat cushion effects during deceleration; a Universal support leg shall have a minimum surface area over which to transmit part of the CRS loading during a frontal impact to the car body structure, and shall additionally be adjustable in length with a minimum and a maximum size.

~~2.16.1. "Universal Support Leg Foot" means a pushing surface intended to be applied to the car floor and to transmit a part of the CRS loading during a frontal impact to the car body structure.~~

Comment [14]: To be deleted [proposal from DFT] ???

2.16.2. "Reception area" means a part of the car floor intended to receive/support one or several Universal Support Leg Foot, as defined in Regulation No.14 and 16.

"Engagement Zone" means a part of the car floor intended to receive/support one or several Universal Support Legs, as defined in Regulations No.14 and 16

2.17. "Vehicle seat fixture (VSF)" means a fixture, according to ISOFIX size classes defined in paragraph 2.1.1.7. and whose dimensions are given in Figures 1 to 6 of Annex 17 Appendix 2 of Regulation No. 16, used by a child restraint manufacturer to determine the appropriate dimensions of an ISOFIX child restraint system and the location of its ISOFIX attachments.

Comment [15]: Comment from TUB - not defined in this new regulation

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2.18. "Child-safety chair" means a child restraint incorporating a chair in which the child is held

2.19. "Chair" means a structure which is a constituent part of the child restraint and is intended to accommodate a child in a seated position

2.20. "Chair support" means that part of a child restraint by which the chair can be raised

- 2.21. "**Belt**" means a child restraint comprising a combination of straps with a securing buckle, adjusting devices and attachments;
- 2.22. "**Harness belt**" means a belt assembly comprising a lap belt, shoulder restraints and, **where fitted**, a crotch strap;
- 2.23. "**Y-shaped belt**" means a belt where the combination of straps is formed by a strap to be guided between the child's legs and a strap for each shoulder;
- 2.24. "**Carry cot**" means a restraint system intended to accommodate and restrain the child in a supine or prone position with the child's spine perpendicular to the median longitudinal plane of the vehicle. It is so designed as to distribute the restraining forces over the child's head and body excluding its limbs in the event of a collision;
- 2.25. "**Carry-cot restraint**" means a device used to restrain a carry-cot to the structure of the vehicle
- 2.26. "**Infant carrier**" means a restraint system intended to accommodate the child in a rearward-facing semi-recumbent position. It is so designed as to distribute the restraining forces over the child's head and body excluding its limbs in the event of the frontal collision
- 2.27. "**Child support**" means that part of a child restraint by which the child can be raised within the child restraint.
- 2.28. "**Impact shield**" means a device secured in front of the child and designed to distribute the restraining forces over the greater part of the height of the child's body in the event of a frontal impact
- 2.29. "**Strap**" means a flexible component designed to transmit forces
- 2.30. "**Lap strap**" means a strap which, either in the form of a complete belt or in the form of a component of such a belt, passes across the front of, and restrains, the child's pelvic region
- 2.31. "**Shoulder restraint**" means that part of a belt which restrains the child's upper torso **SHOULDER STRAP?**
- 2.32. "**Crotch strap**" means a strap (or divided straps, where two or more pieces of webbing make it) attached to the child restraint and the lap strap and is so positioned as to pass between the child's thighs; it is designed to prevent the child sliding under the lap belt in normal use and prevent the lap belt moving up off the pelvis in an impact.
- 2.33. "**Child-restraining strap**" means a strap which is a constituent part of the belt (HARNESSES) and restrains only the body of the child.
- 2.34. "**Buckle**" means a quick release device which enables the child to be held by the restraint or the restraint by the structure of the car and can be quickly opened. The buckle may incorporate the adjusting device.

- 2.35. "Enclosed buckle release button", a buckle release button such that it must not be possible to release the buckle using a sphere having a diameter of 40 mm.
- 2.36. "Non-enclosed buckle release button", a buckle release button such that it must be possible to release the buckle using a sphere having a diameter of 40 mm
- 2.37. "Adjusting device" means a device enabling the ~~restraint~~ **BELT** or its attachments to be adjusted to the physique of the wearer, ~~the configuration of the vehicle, or both~~. The adjusting device may either be part of the buckle or be a retractor or any other part of the ~~safety~~ belt.
- 2.38. "Quick adjuster" means an adjusting device which can be operated by one hand in one smooth movement.
- 2.39. "Adjuster mounted directly on child restraint" means an adjuster for the ~~integral~~ harness **BELT** which is directly mounted on the child restraint, as opposed to being directly supported by the ~~webbing~~ **STRAP** that it is designed to adjust
- 2.40. "Energy absorber" means a device which is designed to dissipate energy independently of or jointly with the strap and forms part of a child restraint.
- 2.41. "Retractor" means a device designed to accommodate a part or the whole of the strap of a child restraint. The term covers the following devices
- "Automatically-locking retractor", a retractor which allows extraction of the desired length of a strap and, when the buckle is fastened, automatically adjusts the strap to the wearer's physique, further extraction of the strap without voluntary intervention by the wearer being prevented
- "Emergency-locking retractor", a retractor which does not restrict the belt wearer's freedom of movement in normal driving conditions. Such a device has length-adjusting devices which automatically adjust the strap to the wearer's physique, and a locking mechanism actuated in an emergency by:
- Deceleration of the vehicle, extraction of the strap from the retractor, or any other automatic means (single sensitivity) or a combination of any of these means (multiple sensitivity).
- 2.42. "Inclined position" means a special position of the chair which allows the child to recline.
- 2.43. "Lying down/supine/prone position" means a position where at least the child's head and body excluding its limbs are on a horizontal surface when at rest in the restraint.
- 2.44. "Child-restraint type" means child restraint system which do not differ in such essential respects as:
- the category, ~~and the mass group(s) for which~~ **and the position and orientation** (as defined in paragraphs **2.15**, and **2.16**), in which the restraint is intended to be used
- the geometry of the child restraint system;
- ~~the dimensions, mass, material and colour of the seat, the padding, and the impact shield;~~
- ~~the material, weave, dimensions and colour of the straps;~~
- ~~the rigid components (buckle, attachments, etc.);~~

- 2.45. "Vehicle seat" means a structure, which may or may not be integral with the vehicle structure, complete with trim and intended to seat one adult person. In this respect
"Group of vehicle seats" means either a bench seat or a plurality of seats which are separate but side by side (i.e. so fixed that the front anchorages of one seat are in line with the front or rear anchorages of another seat or on a line passing between those anchorages), each seat accommodating one or more seated adult persons
"Vehicle bench seat" means a structure complete with trim and intended to seat more than one adult person
"Vehicle front seats" means the group of seats situated foremost in the passenger compartment, i.e. having no other seat directly in front of them
"Vehicle rear seats" are fixed, forward-facing seats situated behind another group of vehicle seats
- 2.46. "Seat type" means a category of adult seats which do not differ in such essential respects as the shape, dimensions and materials of the seat structure, the types and dimensions of the seat-lock adjustment and locking systems, and the type and dimensions of the adult safety-belt anchorage on the seat, of the seat anchorage, and of the affected parts of the vehicle structure
- 2.47. "Adjustment system" means the complete device by which the vehicle seat or its parts can be adjusted to suit the physique of the seat's adult occupant; this device may, in particular, permit longitudinal displacement, and/or vertical displacement, and/or angular displacement
- 2.48. "Vehicle seat anchorage" means the system, including the affected parts of the vehicle structure, by which the adult seat as a whole is secured to the vehicle structure
- 2.49. "Displacement system" means a device enabling the adult seat or one of its parts to be displaced angularly or longitudinally, without a fixed intermediate position, to facilitate the entry and exit of passengers and the loading and unloading of objects
- 2.50. "Locking system" means a device ensuring that the adult seat and its parts are maintained in the position of use
- 2.51. "Seat bight" means the area close to the intersection of the surfaces of the vehicle seat cushion and the seat back
- 2.52. "ISOFIX position" means a system which allows to install:
- (a) either an universal ISOFIX ~~forward facing~~ child restraint system as defined in this Regulation
 - ~~(b) or a semi-universal ISOFIX forward facing child restraint system as defined in this Regulation,~~
 - ~~(c) or a semi-universal ISOFIX rearward facing child restraint system as defined in this Regulation~~

~~(d) or a semi-universal ISOFIX lateral facing position child restraint system as defined in this Regulation;~~

(e) or a specific vehicle **OR A "BUILT IN"** ISOFIX child restraint system as defined in this Regulation.

- 2.53. "Type approval test", means a test to determine the extent to which a child restraint system type submitted for approval is capable of satisfying the requirements
- 2.54. "Production qualification test (**QUALIFICATION OF PRODUCTION TEST**)", means a test to determine whether the manufacturer is able to produce a child restraint system in conformity with the child restraint systems submitted for type approval
- 2.55. "Routine testing" (**OR COP TESTING**), means the testing of a number of restraint systems selected from a single batch to verify the extent to which they satisfy the requirements.

3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a type of child restraint system shall be submitted by the holder of the trade mark or by his duly accredited representative, and follow the type approval scheme described in **Annex 14**.
- 3.2. The application for approval, relating to each type of child restraint system, shall be accompanied by:
- 3.2.1. A technical description of the child restraint system, specifying the straps and other materials used, and accompanied by drawings of the parts making up the child restraint system and in the case of retractors, installation instructions for these retractors and their sensing devices, declaration on toxicity (**paragraph 6.1.5.**) and flammability (**paragraph 6.1.6.**), the drawings must show the position intended for the approval number and additional symbol(s) in relation to the circle of the approval mark. ~~The description shall mention the colour of the model submitted for approval;~~
- 3.2.2. ~~four~~ samples of the child restraint system requested by the Technical Service Responsible for conducting the test ;
- 3.2.3. A 10-metre length of each type of strap used in the child restraint system; and
- 3.2.4. ~~additional samples shall be supplied at the request of the Technical Service responsible for conducting the test;~~
- 3.2.5. Instructions and details of packaging in accordance with paragraph 14. below;
- 3.2.6. ~~in case of carry cots, if the carry cot restraint may be used in combination with a number of types of carry cots, the restraint manufacturer shall supply a list of the latter.~~
- 3.3. ~~Where an approved adult safety belt is used to secure the child restraint, the application must stipulate the category of adult safety belt to be used, e.g. static lap belts.~~

- 3.4. The Approval Authority of a Contracting Party must verify, before granting type approval the existence of satisfactory arrangements and procedures for ensuring effective control so that child restraint systems, equipment or parts when in production conform to the approved type.

4. MARKINGS

- 4.1. The samples of child restraint submitted for approval in conformity with the provisions of paragraphs 3.2.2. and 3.2.3. above shall be clearly and indelibly marked with the manufacturer's name, initials or trade mark.

- 4.2. ~~One of the parts made of plastics of~~ The child restraint system (such as shell, impact shield, booster cushion, etc.), except the belt(s) or harness, shall be marked clearly and indelibly with the year of production.

- 4.3. ~~If the restraint is to be used in combination with an adult safety belt the correct routing of the webbing shall be clearly indicated by means of a drawing permanently attached to the restraint. If the restraint is held in place by the adult safety belt, the routes of the webbing shall be clearly marked on the product by colour coding. The colours for the safety belt route to be used when the device is installed forward facing shall be red and when installed rear facing shall be blue. The same colours shall also be used on the labels on the device that illustrate the methods of use. There must be a clear differentiation between the intended routes for the lap section and the diagonal section of the safety belt. Indication such as colour coding, words, shapes etc. shall distinguish each section of the safety belt.~~

~~In any illustration of the belt route on the product~~ The orientation of the child restraint relative to the vehicle must be clearly indicated on the product. ~~Belt route diagrams that do not show the vehicle seat are not acceptable.~~

The marking defined in this paragraph shall be visible with the child restraint system in the vehicle ~~For group 0 restraints, this marking shall also be visible with the child in the child restraint system.~~

- 4.4. On the visible inner surface (including the side wing beside the child's head) in the approximate area where the child's head rests within the child restraint, rearward facing restraints shall have the following label permanently attached (the text information shown is a minimum).

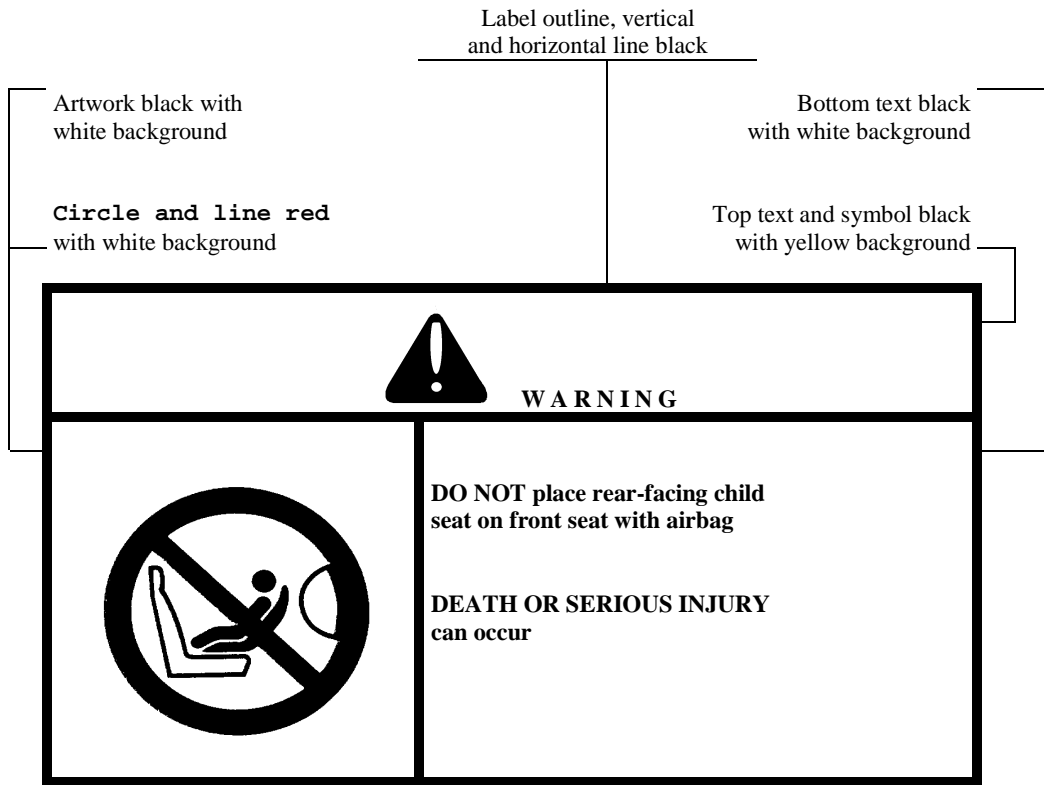
This label shall be provided in the language(s) of the country where the device is sold.

Label minimum size: 60 x 120 mm

The label shall be stitched to the cover around its entire perimeter and/or permanently bonded to the cover over its entire back surface. Any other form of attachment that is permanent and not liable to removal from the product or to becoming obscured is acceptable. Flag type labels are specifically prohibited.

Comment [16]: Chairman comment - to be harmonized with amendment of regulation No.94

If sections of the restraint or any accessories supplied by the child restraint manufacturer are able to obscure the label an additional label is required. One warning label shall be permanently visible in all situations when the restraint is prepared for use in any configuration.



4.5. In the case of child restraints that can be used forward and rear-facing, include the words:

"IMPORTANT - DO NOT USE FORWARD FACING BEFORE THE CHILD'S AGE EXCEEDS [15 or 18] (Refer to instructions)"

4.6. ~~In the case of child restraints system with alternative belt routes, the alternative load bearing contact points between the child restraint and the adult safety belt must be permanently marked. This marking shall indicate that it is the alternative belt route, and shall conform with the above coding requirements for forward and rearward facing seats.~~

4.7. ~~If the child restraint offers alternative load bearing contact points, the marking required in paragraph 4.3. shall include an indication that the alternative belt route is described in the instructions.~~"

4.8. **i**-Size Marking

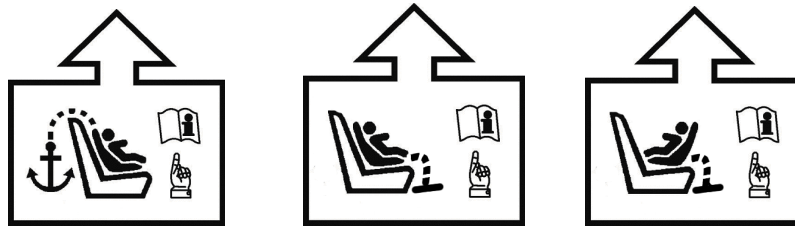
~~If the product includes ISOFIX attachments,~~The following information must be permanently visible to someone installing the child restraint system in a vehicle:

The **i**-Size logo. As a minimum, a symbol consisting of a circle with a diameter of minimum 13 mm and containing a pictogram, the pictogram shall contrast with the background of the circle. The pictogram shall be clearly visible either by means of contrast colors or by adequate relief if it is molded or embossed.



THE FOLLOWING INFORMATION MAY BE CONVEYED BY PICTOGRAMS AND/OR TEXT. THE MARKING MUST INDICATE:

- a) The essential relevant steps needed for making the seat ready for installation. For example, the method of extending the ISOFIX latch system must be explained.
- b) The position, function, and interpretation of any indicator must be explained
- c) The position and if necessary the routing of top tethers, or other means of limiting seat rotation requiring action by the user, must be indicated using one of the following symbols as appropriate.



- d) The adjustment of ISOFIX latches and the top tether, or other means of limiting seat rotation, requiring action of the user must be indicated.
- e) The marking must be permanently attached and be visible to a user installing the seat.
- f) Where necessary reference should be made to the child restraint user

instructions and to the location of that document using the symbol below.



5. APPROVAL

- 5.1. Each sample submitted in conformity with paragraphs 3.2.2. and 3.2.3. above shall meet the specifications set forth in paragraphs 6. to 8. of this Regulation in every respect before approval can be granted.
- 5.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 corresponding to the 00 series of amendments which entered into force on XXX) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another type of child restraint system covered by this Regulation.
- 5.3. Notice of approval or of extension or refusal of approval of a child restraint system pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in Annex 1 to this Regulation.
- 5.4. In addition to the marks prescribed in paragraph 4. above, the following particulars shall be affixed in a suitable space to every child restraint system conforming to a type approved under this Regulation:
 - 5.4.1. an international approval mark consisting of:

- 5.4.1.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval;^{1/}
- 5.4.1.2. an approval number;
- 5.4.2. The following additional symbols:
- 5.4.2.1. the word(s) **E-Size** or "vehicle specific" depending on the category of child restraint system.
- 5.4.2.2. the size range for which the child restraint has been designed, ~~namely, 0-10 kg; 0-13 kg; 9-18 kg; 15-25 kg; 22-36 kg; 0-18 kg; 9-25 kg; 15-36 kg; 0-25 kg; 9-36 kg; 0-36 kg.~~
- 5.4.2.3. the symbol "Y", in the case of a device containing a crotch strap, in conformity with the requirements of supplement 3 to the 02 series of amendments to the Regulation;**
- 5.4.2.4. the symbol "S" in the case of a "Special Needs Restraint".
- 5.5. **Annex 2** to this Regulation gives an example of the arrangement of the approval mark.
- 5.6. The particulars referred to in paragraph 5.4. above shall be clearly legible and be indelible, and may be affixed either by means of a label or by direct marking. The label or marking shall be resistant to wear.

^{1/} ¹ for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Serbia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32 for Latvia, 33 (vacant), 34 for Bulgaria, 35 (vacant), 36 for Lithuania, 37 for Turkey, 38 (vacant), 39 for Azerbaijan, 40 for The former Yugoslav Republic of Macedonia, 41 (vacant), 42 for the European Community (Approvals are granted by its Member States using their respective ECE symbol), 43 for Japan, 44 (vacant), 45 for Australia, 46 for Ukraine, 47 for South Africa, 48 for New Zealand, 49 for Cyprus, 50 for Malta, 51 for the Republic of Korea, 52 for Malaysia, 53 for Thailand, 54 and 55 (vacant) and 56 for Montenegro. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

5.7. The labels referred to in paragraph 5.6. above may be issued either by the authority which has granted the approval or, subject to that authority's authorization, by the manufacturer.

6. GENERAL SPECIFICATIONS

6.1. Positioning and securing on the vehicle

6.1.1. The use of child restraints in the ["TUI" / **Ⓢ-Size**] category is permitted in **Ⓢ-Size** ready vehicles, for any seat positions if the child restraints are fitted in conformity with the vehicle manufacturer's instructions.

The use of child restraints in the "specific vehicle" category is permitted only for ISOFIX Integral CRS in all seat positions and also in the luggage area if the restraints are fitted in conformity with the vehicle manufacturer's instructions.

6.1.2. According to the category which it belongs to, the child restraint shall be secured to the vehicle structure or to the vehicle seat structure :

POSSIBLE CONFIGURATIONS FOR APPROVAL TYPE / CATEGORIES TABLE

| TYPE / CATEGORY | Universal ISOFIX CRS ⁽⁴⁾ | Specific Vehicle ISOFIX CRS |
|----------------------------|-------------------------------------|-----------------------------|
| Lateral facing (Carry-cot) | A | A |
| Rearward facing | A | A |
| Forward facing (integral) | A | A |

With:
CRS: Child restraint system
A: Applicable
NA: Not Applicable

⁽⁴⁾ TUI CRS means forward, rearward or lateral facing restraints for use in vehicles with positions equipped with ISOFIX anchorages system and an anti-rotation device.

6.1.2.1. For ISOFIX universal integral child restraint systems ["TUI" / **Ⓢ-Size**] by means of two ISOFIX attachments, and the addition for forward and rearward facing child restraint system of an anti-rotation device.

Comment [17]: Comment from DFT - to be deleted, definition in 2.8

6.1.2.2. For the ISOFIX "specific vehicle" category: by means of the ISOFIX anchorages designed by the manufacturer of the vehicle or the manufacturer of the child restraint.

Comment [18]: Following comment from TUB regarding redondance between §6.1.2.1 and 6.2.1.5

6.1.3. The child restraint manufacturer has to declare in written form that the toxicity of materials used in the manufacture of restraint systems and accessible to the restrained child is in

conformity with the relevant parts of CEN Safety of Toys, part 3 (June 1982). ^{2/} Tests confirming the validity of the declaration may be carried out at the discretion of the test authority.

6.1.4. The child restraint manufacturer has to declare in written form that the flammability of materials used to manufacture the restraint system is in conformity with the relevant paragraphs of the ECE Consolidated Resolution on the Construction of Vehicles (R.E.3) (document TRANS/WP.29/78/Rev.1, paragraph 1.20.). Tests confirming the validity of the declaration may be carried out at the discretion of the test authority.

The child restraint manufacturer has to declare in written form that the flammability of materials used to manufacture the restraint system is in conformity with the relevant paragraphs of EN 71 Part 2. Tests confirming the validity of the declaration may be carried out at the discretion of the test authority.

6.1.5. For children under the age of [15 or 18] months only carry-cot or rearward facing CRS must be used. The use of rearward facing CRS is authorised for any age.

6.1.6. All child restraint systems defined for sizes smaller than [105 cm] shall belong to the integral class.

Comment [19]: We need to be discussed this value of 105 cm - comment from TUB

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6.2 Configuration of the Child Restraint

6.2.1. The configuration of the child restraint shall be such that

6.2.1.1. The restraint of the child shall give the required protection in any intended position of the child restraint system; for "Special Needs Restraints" the primary means of restraint shall give the required protection in any intended position of the child restraint system without the use of the additional restraining devices which may be present.

6.2.1.2. The child is easily and quickly restrained and removed; in the case of a child restraint system in which the child is restrained by means of a harness belt or a Y-shaped belt without a retractor each shoulder restraint and lap strap shall be capable of movement relative to each other during the procedure prescribed in paragraph 7.2.1.4. - (to be defined in a next step)

In these cases the belt assembly of the child restraint may be designed with two or more connecting parts. For "Special Needs Restraints" it is recognized that the additional restraining devices will restrict the speed by which a child can be restrained and removed. However, the additional devices shall be designed to release quickly so far as possible.

Comment [110]: Comment from TUB - need some explanations

6.2.1.3. If it is possible to change the inclination of the child restraint system, this change in inclination shall not require manual readjustment of any other part of the child restraint system. A deliberate hand-action is required in order to change the inclination of the child restraint system.

^{2/} The address to obtain the relevant CEN standards is: CEN, 2 rue Bréderode, B.P. 5, B 1000 Bruxelles, Belgium.

6.2.1.4. To prevent submarining, either by impact or through restlessness, a crotch strap shall be required on all forward-facing restraints incorporating an integral harness belt system. With the crotch strap attached and in its longest position if adjustable, it shall not be possible to adjust the lap strap to lie above the pelvis of the dummy.

~~6.2.1.5. To prevent excessive rotation, an anti rotation device shall be required on all forward and rearward facing child restraint systems.~~

Comment [I11]: Following comment from TUB regarding redondance between §6.1.2.1 and 6.2.1.5

6.2.1.6. The assembly shall not subject weak parts of the child's body (abdomen, crotch, etc.) to excessive stresses. The design shall be such that compression loads shall not be imposed on the crown of the child's head in the event of a collision.

6.2.2. The child restraint system shall be so designed and installed as:

6.2.2.1. not to exhibit sharp edges or protrusions liable to cause damage to vehicle-seat covers or to occupant's clothing;

6.2.2.2. To ensure that its rigid parts do not, at points where they are in contact with straps, exhibit sharp edges capable of abrading the straps.

6.2.3. *[Any components shall be so designed as to avoid any risk of incorrect assembly and use. Any separable part shall need special tools to be detached or fixed.]*

6.2.4. "Special Needs Restraints" may have additional restraining devices; these shall be designed to avoid any risk of incorrect assembly and that their means of release and mode of operation is immediately obvious to a rescuer in an emergency.

6.2.5. A child restraint system may be designed for use in any range of size specified by the manufacturer, provided that it is able to satisfy the requirements laid down in this regulation.

Comment [I12]: Comment from CI : " Need to emphasise that CRS manufacturer is free to define the size range"

6.3. ISOFIX restraint specifications

6.3.1. General characteristics

6.3.1.1. Dimensions

The maximum lateral, downward, and rearward dimensions for the ISOFIX child restraint system and the locations of the ISOFIX anchorages system with which its attachments must engage are defined for the ISOFIX child restraint system manufacturer by the Vehicle Seat Fixture (VSF) as defined in [paragraph 2.17](#) of this Regulation.

6.3.1.2. Mass

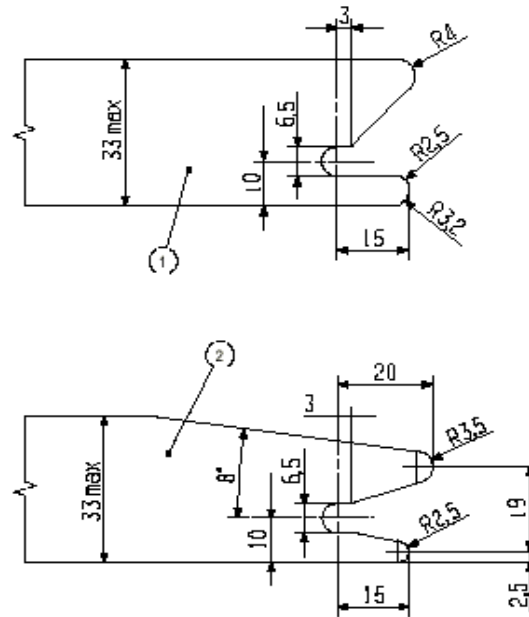
The mass of an ["IUI" / Ⓢ-Size] child restraint system associated to the mass of the biggest child intended to use the child restraint system shall not exceed [32 / 37] kg.

Comment [I13]: Take into account remark from CI in § 6.8.7

6.3.2. ISOFIX Attachments

6.3.2.1. Type

ISOFIX Attachments may be according to examples shown in Figure 0 (a), or other appropriate designs that are part of a rigid mechanism having provision for adjustment, the nature of which is determined by the ISOFIX child restraint system manufacturer.



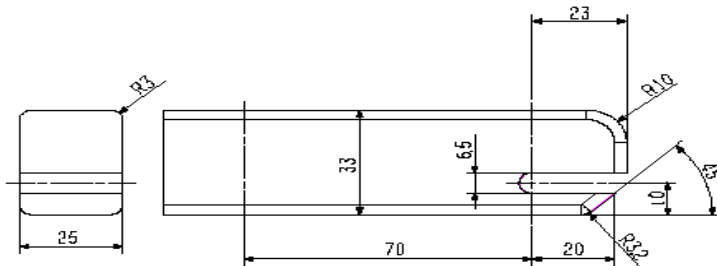
Dimensions in mm
 Figure 0 (a)

Key

- 1 ISOFIX child restraint system attachment - example 1
- 2 ISOFIX child restraint system attachment - example 2

6.3.2.2. Dimensions

Dimensions for the portion of the ISOFIX child restraint system attachment that engages the ISOFIX anchorage system must not exceed the maximum dimensions given by the envelope in figure 0 (b)



Dimensions in mm

Figure 0 (b)

6.3.2.3. Partial latching indication

The ISOFIX child restraint system shall incorporate means by which there is a clear indication that both of the ISOFIX attachments are completely latched with the corresponding ISOFIX lower anchorages. The indication means may be audible, tactile or visual or a combination of two or more. In case of visual indication it must be detectable under all normal lighting conditions.

6.3.3. ISOFIX child restraint top tether strap specifications

6.3.3.1. Top tether connector

The top tether connector should be ISOFIX top tether hook as shown in figure 0 (c), or similar devices that fit within the envelope given by figure 0 (c).

6.3.3.2. ISOFIX Top tether strap features

The ISOFIX top tether strap shall be supported by webbing (or its equivalent), having a provision for adjustment and release of tension.

6.3.3.2.1. ISOFIX Top tether strap length

ISOFIX Child restraint top tether strap length shall be at least 2,000 mm.

6.3.3.2.2. No-slack indicator

The ISOFIX top tether strap or the ISOFIX child seat shall be equipped with a device that will indicate that all slack has been removed from the strap. The device may be part of adjustment and tension relieving device.

6.3.3.2.3. Dimensions

Engagement dimensions for ISOFIX top tether hooks are shown in figure 0 (c).

b) Mechanical requirement: a maximum load to the vehicle floor reception area

Note: Geometrical and mechanical requirements need to be defined (Reception area, Maximum Load acceptable, adjustment limits).

6.3.4.2. Universal Support Leg Adjustment

The Support Leg adjustment, measured at the level of the Support Leg Foot shall be:

- In longitudinal [535 mm] < L < XXX mm from the ISOFIX low anchorages as defined in § 2.11.1
- In transversal +/- YYY mm from the medium axis of ISOFIX low anchorages as defined in §2.11.1.

Pictures to be added

The support leg may have more than only one pushing surfaces. Each pushing surfaces must fulfill the above requirements.

Nota:

- In particular, the position adjustment requirements are needed to define a reception area on the vehicle floor.
- The values 535 mm and 550 mm are the size in X-direction of the gabarits defined in ECE16 for rearward and forward CRS.
- The maximum values in X and Y Directions are under discussion with CRS manufacturers.

6.3.4.3. Universal Support Leg Inclination

The support leg shall have an angle of [90° +/- 5°], measured relatively to the plane defined by the bottom surface of the CRS.

Nota: the value of 90° for the inclination is proposed because the majority of the support legs on the market have a support leg inclination around 90° (except one!). Today all the work done is based on a horizontal reception area.

The tolerance on the value is under discussion with CRS manufacturers.

6.3.4.4. Universal Support Leg Surface Area and Positioning

The pushing surface must have a minimum size of [100 mm²] and a shape as defined in the following picture (to be defined).

Picture of the pushing surface to be added

In some cases, the support leg may have more than only one pushing surface. Each pushing surface must fulfill with the above requirements of size and shape.

The pushing surface measurement is presented in annex.

The Universal Support leg shall have a minimum surface area over which to transmit the support leg loading to the vehicle structure of [100 mm²]. It shall be further possible to position all of this surface area(s) within the vehicle engagement zone.

Picture of the pushing surface to be added

Comment [I14]: Comment from Sweden - This section is very design-restricting because of its detailed description of angle, surface size etc. The focus should instead be load limits no matter how the support leg is constructed. A better solution would be a third lower ISOFIX point. In this section it's stated several times that the support leg should be **transversally** adjustable and be tested accordingly (6.3.4a and 6.3.4.2). We don't think this is a good idea. In what position is it going to be tested? If the support leg must be transversally adjustable this will lead to a very uneven/obliquely load situation in the outer position

Comment [I15]: This DFT formulation is taking into account comment from TUB

6.3.4.5. Universal Support Leg length

The Universal Support Leg Length shall be between [MIN and MAX] (*values and tolerances have to be defined*).

Picture to explain how to measure the length to be included.

6.3.4.6. Universal Support Leg Loading

The maximum load apply by a Universal Support Leg on a vehicle floor must be less than [X kN] (*value between 2 kN and 4 kN to be defined*).

6.3.4.7. Adjustment provisions

The ISOFIX attachments, or the ISOFIX child restraint system itself, shall be adjustable to accommodate the range of ISOFIX anchorage locations and/or vehicle floor described in Regulation No. 14 (following ISO recommendations).

6.4. Control of Markings

6.4.1. The Technical Service conducting the approval tests shall verify that the markings conform to the requirements of [paragraph 4](#).

6.5. Control of Instructions on Installation and the Instructions for Use

6.5.1. The Technical Service conducting the approval tests shall verify that the instructions on installation and the instructions for use conform to [paragraph 14](#).

6.6. Provisions applicable to the assembled child restraint system

6.6.1. Resistance to corrosion

6.6.1.1. A complete child restraint system, or the parts thereof that are liable to corrosion, shall be subject to the corrosion test specified in [paragraph 7.1.1](#), below.

6.6.1.2. After the corrosion test as prescribed in [paragraphs 7.1.1.1](#) and [7.1.1.2](#), no signs of deterioration likely to impair the proper functioning of the child restraint system, and no significant corrosion, shall be visible to the unaided eye of a qualified observer.

6.6.2. Energy absorption

6.6.2.1. For all devices with backrests there shall be internal surfaces, defined in [Annex 18](#) to this Regulation, comprising material with a peak acceleration of less than 60g when measured in accordance with [Annex 17](#) to this Regulation. This requirement applies also to areas of impact shields which are in the head strike area.

6.6.2.2. In the case of child restraint systems with permanent mechanically attached adjustable head support devices, in which the height of the child harness is directly controlled by the adjustable head support, it is not necessary to demand energy absorbing material in areas as defined in [Annex 18](#), which are not contactable by the manikin's head, i.e. behind the head support.

6.6.3. Overturing

6.6.3.1. The child restraint shall be tested as prescribed in paragraph 7.1.2.; the manikin shall not fall out of the device and, when the test seat is in the upside down position the manikin's head shall not move more than 300 mm from its original position in a vertical direction relative to the test seat.

6.6.4. Geometrical tests

~~“ Geometrical validation of available space offer by the child restraint systems to install “Geometrical reference dummies”~~

~~Tests with reference child dummies “~~

6.6.5. Dynamic test

6.6.5.1. General. The child restraint system shall be subjected to dynamic tests in conformity with paragraph 7.1.4. below.

6.6.5.1.1. Child restraint systems of the "universal" category shall be tested on the test trolley by means of the test seat prescribed in [Annex 6](#), and in conformity with paragraph 7.1.4.1.

6.6.5.1.2. Child restraint systems of the "specific vehicle" category shall be tested with each vehicle model for which the child restraint system is intended. The Technical Service responsible for conducting the test may reduce the number of vehicle models tested if they do not differ greatly in the aspects listed in paragraph 6.6.4.1.2.3. The child restraint system may be tested in one of the following ways:

6.6.5.1.2.1. On a complete vehicle, as prescribed in paragraph 7.1.4.3

6.6.5.1.2.2. In a vehicle body shell on the test trolley, as prescribed in paragraph 7.1.4.2.; or,

6.6.5.1.2.3. In sufficient parts of the vehicle body shell to be representative of the vehicle structure and impact surfaces. If the child restraint system is intended for use in the rear seat, these shall include the back of the front seat, the rear seat, the floor pan, the B and C pillars and the roof. If the child restraint system is intended for use in the front seat, the parts shall include the dashboard, the A pillars, the windscreen, any levers or knobs installed in the floor or on a console, the front seat, the floor pan and the roof. ~~Furthermore, if the child restraint system is intended for use in combination with the adult safety belt, the parts shall include the appropriate adult belt(s).~~ The Technical Service responsible for conducting the test may permit items to be excluded if they are found to be superfluous. Testing shall be as prescribed in paragraph 7.1.4.2.

Comment [I16]: Comment from Sweden - New paragraph to describe that the stature mentioned by the manufacturer should be tested with the VTI-device for the largest stated stature. This is referred to as a "measurement device" in paragraph 3 in the status report of the WP29-149-.

Deleted: paragraph

Deleted: 6

Comment [I17]: Comment from CI - To be deleted for Phase 1

6.6.5.1.3. The dynamic test shall be performed on child restraint systems which have not previously been under load.

6.6.5.1.4. If a "specific vehicle" child restraint system is installed in the area behind the rearmost forward facing adult seat positions (for example, the luggage area), one test with the largest dummy/dummies on a complete vehicle as prescribed in paragraph 7.1.4.3.3. shall be performed. The other tests, including the conformity of production, may be done as prescribed in paragraph 7.1.4.3.2., if the manufacturer so wishes.

6.6.5.1.5. In the case of a "Special Needs Restraint" every dynamic test specified by this Regulation for the range of size specified by the manufacturer shall be performed twice: first, using the primary means of restraint and second, with all restraining devices in use. In these tests, special attention shall be given to the requirements in paragraphs 6.2.1.6. and 6.2.4.

6.6.5.1.6. In the case of an ["IUI" / $\text{\textcircled{C}}$ -size] child restraint system with a support leg as an anti rotation device the hereafter mentioned dynamic tests shall be carried out as follows:

a) The tests for frontal impact shall be conducted with the support leg adjusted to its maximum adjustment compatible with the positioning of the trolley floor pan. The tests for rear impact shall be conducted with the worst case position selected by the Technical Service. During the tests the support leg shall be supported by the trolley floor pan as described in Annex 6, Appendix 3, Figure 2.

b) In the case of support legs out of the plane of symmetry, the worst case shall be selected by the Technical Service for the test.

c) In the case of specific vehicle category, the support leg shall be adjusted as specified by the child restraint system manufacturer.

d) The leg length of a support leg must be adjustable in such a way that it is able to cover the complete span of floor pan levels that are allowed for in Regulation No.16, Annex 17 for car seats to be approved for the installation of ISOFIX Universal Integral ["IUI" / $\text{\textcircled{C}}$ -size] Child Restraints Systems.

Comment [118]: § modified and moved to § 7.1.4.6.10

6.6.5.1.7. In the case of an ["IUI" / $\text{\textcircled{C}}$ -Size] Child Restraint System making use of a top-tether strap as an anti-rotation device, the dynamic test shall be carried out as follows:

6.6.5.1.7.1. With the anti-rotation device in use, and

6.6.5.1.7.2. Without the anti-rotation device in use, unless special device is provided to prevent non-use of the anti-rotation device.

6.6.5.2. During the dynamic tests, no part of the child restraint system actually helping to keep the child in position shall break, and no buckles or locking system or displacement system shall release. It is permissible for parts of the seat to deform provided in doing so it does not directly affect the integrity of the seat to protect the occupant.

Comment [119]: Comment from DFT regarding misuses - When ISOFIX was being implemented into Reg 44 during 2001, the informal group recommended that, due to the potential for misuse, a misuse test should be adopted. Such a misuse test should not be withdrawn unless there is robust evidence to suggest that this risk can be managed effectively through some other means e.g. robust engineering solutions.

6.6.5.3. Dummy criteria for frontal and rear impact

6.6.5.3.1. Abdominal penetration: During the frontal impact the “Resultant of Fx and Fz registered in the lower lumbar spine shall not exceed [xx] percent of the lap belt force; this ratio shall be measured instantaneous with respect to time.

6.6.5.3.2. Injury assessment criteria for frontal and rear impact

| Criterion | Abbreviation | Q0 | Q1 | Q1.5 | Q3 | Q6 |
|--|--------------|-----------|-----------|-----------|------------|-------------|
| Head Impact Criterion (only in case of hard contact during in-vehicle testing) | HIC | 523 - 671 | 491 - 629 | 578 - 741 | 780 - 1000 | 1083 - 1389 |
| Head Acceleration 3ms | A head 3ms | 85 | 72 | 76 | 81 | 89 |
| [Upper Neck Tension Force | Fz | 546 | 1201 | 1364 | 1705 | 2304] |
| [Upper Neck Flexion Moment | My | 17 | 53 | 61 | 79 | 118] |
| Thorax Chest Deflection | D chest | NA | 40 | 38 | 36 | 33 |
| Chest Acceleration 3 ms | A chest 3ms | 55 | 55 | 55 | 55 | 55 |

Comment [120]: Criteria and limits must be confirmed during validation program

Comment from Sweden :
Criterion HIC: A definition of what “hard contact” means must be included
Sweden wants the Neck tension force criterion to be included

6.6.5.4. Manikin’s head displacement for frontal and rear impact

6.6.5.4.1. Child restraint systems of the "universal" category:

6.6.5.4.1.1. Forward facing child restraint systems:
Head excursion: no part of the head of the manikin shall pass beyond the planes BA, ~~and~~ DA and DE as defined in Figure 1 below. This shall be judged up to 300 ms or the moment that the manikin has come to a definitive standstill whatever occurs first.

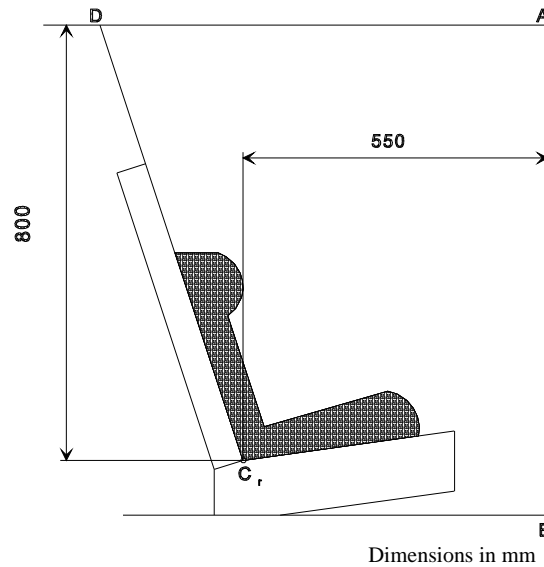


Figure 1
Arrangement for testing a forward-facing device

6.6.5.4.1.2. Rearward-facing child restraint systems and carrycots:

6.6.5.4.1.2.1. **Head exposure:** during the dynamic tests the head must remain fully contained within the child restraint [shell / system] (i.e. the top of the head must not be exposed to the possibility of direct contact with surfaces of the vehicle).

6.6.5.4.1.2.2. **Head excursion:** no part of the head of the manikin shall pass beyond the planes FD, FG and DE, as shown in Figure 2 below. This shall be judged up to 300 ms or the moment that the manikin has come to a definitive standstill whatever occurs first.

In the case there is a contact of such a child restraint system with the 100 mm diameter bar and all injury assessment and manikin's head displacement criteria are met, there shall be one further dynamic test (front impact) with the heaviest dummy intended for the given range of size indication and without the 100 mm diameter bar; the requirements for this test are that the criteria of paragraph 7.1.4.2. (child restraint system integrity) and paragraph 7.1.4.4.1.2.1. (head exposure) are met.

Comment [I21]: Sweden request:
We want to exclude this paragraph because there is no need for such a requirement. All traffic safety experts in Sweden have always recommended that children should use the rear-facing child restraints until the top of the child's ears reach the top of the restraint, which means that lots of children travel with the top of their head above the top of the restraint and we have never seen any serious injuries due to this. (Of course in roll over collisions with massive roof intrusion, even children have been seriously injured)

Comment [I22]: Comment from TUB - "Has the bar been removed?". Answer is "NO" due to the fact that it is not used as an anti-rotational device but as a possible contact during dynamic test.

Comment [I23]: Numbering update

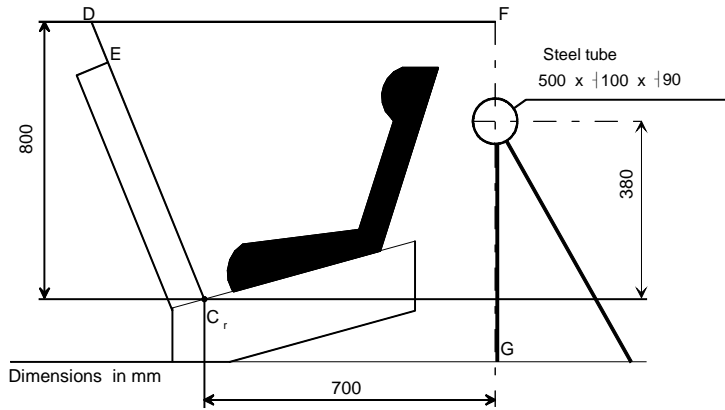


Figure 2
Arrangement for testing a rearward-facing device,
not supported by the dashboard

6.6.5.4.2. Child restraint systems of the "specific vehicle" category: when tested in a complete vehicle or a vehicle body shell, the head shall not come into contact with any part of the vehicle. However, if there is contact, the head impact criterion HIC and the Head Acceleration 3ms shall be used as assessment criteria. In tests with complete vehicles it shall be possible to remove the manikins from the child restraint system without the use of tools after the test.

6.6.5.5. Dummy criteria for lateral impact

6.6.5.5.1. Main injury assessment criterion - Head containment

During the loading phase of lateral impact testing, up to [80] ms, side protection shall always be positioned at the level at the dummy's head centre of gravity perpendicular to the direction of the door intrusion. This containment will be assessed by a video analysis. Front-on and overhead camera views are assessed.

6.6.5.5.2. During the dynamic tests, no part of the child restraint system actually helping to keep the child in position shall break, and no buckles or locking system or displacement system shall release.

It is permissible for parts of the seat to deform provided in doing so it does not directly affect the integrity of the seat to protect the occupant.

6.6.5.5.3. Additional Injury assessment criteria

Knowing that the Q Dummy family was not designed for side impact assessment adding other parameters might be useless. However in order to comply with the Informal group goal to ensure energy absorption within the CRS, head acceleration resultant acceleration could be considered.

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6.6.6. Resistance to temperature

6.6.6.1. Buckle assemblies, retractors, adjusters and lock-off devices that are liable to be affected by temperature, shall be subject to the temperature test specified in paragraph 7.2.x. below.

6.6.6.2. After the temperature test as prescribed in paragraph 7.2.x.x., no signs of deterioration likely to impair the proper functioning of the restraint of the child, shall be visible to the unaided eye of a qualified observer. **The dynamic tests should then be performed.**

Comment [124]: Sentence added by Sweden

6.7. Provisions applicable to individual components of the restraint

6.7.1. Buckle

6.7.1.1. The buckle shall be so designed as to preclude any possibility of incorrect manipulation. This means, inter/alia, that it must not be possible for the buckle to be left in a partially closed position; it must not be possible to exchange the buckle parts inadvertently when the buckle is being locked; the buckle must only lock when all parts are engaged. Wherever the buckle is in contact with the child, it shall not be narrower than the minimum width of strap as specified in paragraph 6.7.4.1.1 below. This paragraph is not applicable to belt assemblies already approved according to ECE Regulation No. 16 or any equivalent standard in force. In the case of a "Special Needs Restraint" only the buckle on the primary means of restraint need comply with the requirements of paragraphs 6.7.1.2. to 6.7.1.8. inclusive.

6.7.1.2. The buckle, even when not under tension, shall remain closed whatever its position. It shall be easy to operate and to grasp. It shall be possible to open it by pressure on a button or on a similar device.

The surface to which this pressure must be applied must have, in the position of actual unlocking and when projected into a plane perpendicular to the button's initial direction of motion:

- a) for enclosed devices, an area of not less than 4.5 cm² with a width of not less than 15 mm;
- b) for non-enclosed devices, an area of 2.5 cm² and a width of not less than 10 mm. The width shall be the smaller of the two dimensions forming the prescribed area and shall be measured rectangular to the direction of movement of the release button.

Comment [125]: Comment from TUB - reviewed presentation for better understanding

6.7.1.3. The buckle release area shall be coloured red. No other part of the buckle shall be of this colour.

6.7.1.4. It shall be possible to release the child from the restraint by a single operation on a single buckle. It is allowed to remove the child together with devices such as infant carrier/carry-cot/carry-cot restraints if the child restraint system can be released by operation of a maximum of two **buckles/release buttons**.

Comment [126]: Comment from CI - "Is this the correct wording? Or should we use 'release buttons' for isofix systems"

6.7.1.4.1. **A clip connection between the shoulder straps of a harness belt is deemed not to comply with the single operation requirement given in paragraph 6.7.1.4. above.**

Comment [127]: Comment from TUB - "I would be happy to discuss this point as there is a trade-off between releasing and reduction of risk resulting from common misuse"

6.7.1.5. Opening of the buckle shall enable the child to be removed independently of the "chair", "chair support" or "impact shield", if fitted, and if the device includes a crotch strap the crotch strap shall be released by operation of the same buckle.

6.7.1.6. The buckle shall be capable of withstanding the temperature test operation requirements given in paragraph 7.2 (to be defined – tests of individual components / paragraph for temperature

test) and repeated operation, and shall, before the dynamic test prescribed in paragraph 7.1.4. undergo a test comprising $5,000 \pm 5$ opening and closing cycles under normal conditions for use.

6.7.1.7. The buckle shall be subjected to the following tests of opening:

6.7.1.7.1. Test under load

6.7.1.7.1.1. A child restraint having already undergone the dynamic test prescribed in paragraph 7.1.4. below shall be used for this test.

6.7.1.7.1.2. The force required to open the buckle in the test prescribed in paragraph 7.2 (to be defined – **tests of individual components**) shall not exceed 80 N.

6.7.1.7.2. No-load test

6.7.1.7.2.1. A buckle which has not previously been subjected to a load shall be used for this test. The force needed to open the buckle when it is not under load shall be in the range of 40-80 N in the tests prescribed in 7.2 (to be defined – **tests of individual components**)

6.7.1.8. Strength.

6.7.1.8.1. During the test in accordance with paragraph 7.2 (to be defined – **tests of individual components**). No part of the buckle or the adjacent straps or adjusters shall break or be detached.

6.7.1.8.2. Depending of the mass limit declared by the manufacturer, a harness buckle shall withstand:

6.7.1.8.2.1. 4 kN, if the mass limit is less or equal to 13 kg

6.7.1.8.2.2. 10 kN, if the mass limit is greater than 13 kg

6.7.1.8.3. The competent authority may dispense with the buckle strength test if information already available renders the test superfluous.

6.7.2. Adjusting device

6.7.2.1. The range of adjustment shall be sufficient to permit correct adjustment of the child restraint with all size for which the device is intended and to permit satisfactory installation in all ["IUI" / **Ⓢ**-Size] compatible vehicles.

6.7.2.2. All adjusting devices shall be of the "quick adjuster" type. ~~except that adjusting devices used only for the initial installation of the restraint in the vehicle may be of other than the "quick adjuster" type.~~

6.7.2.3. Devices of the "quick adjuster" type shall be easy to reach when the child restraint is correctly installed and the child or manikin is in position.

6.7.2.4. A device of the "quick adjuster" type shall be easily adjustable to the child's physique. In particular, in a test performed in accordance with paragraph 7.2 (to be defined – **tests of**

- individual components**, the force required to operate a manual adjusting device shall not exceed 50 N.
- 6.7.2.5. Two samples of the child-restraint adjusting devices shall be tested as prescribed by the temperature test operation requirements given in paragraph **7.2 (to be defined - tests of individual components)**
- 6.7.2.5.1. The amount of strap slip shall not exceed 25 mm for one adjusting device or 40 mm for all adjusting devices.
- 6.7.2.6. The device must not break or become detached when tested as prescribed in paragraph **7.2 (to be defined - tests of individual components)**.
- 6.7.2.7. An adjuster mounted directly on the child restraint shall be capable of withstanding repeated operation and shall, before the dynamic test prescribed in paragraph **7.1.4**, undergo a test comprising $5,000 \pm 5$ cycles as specified in paragraph **7.2 (to be defined - tests of individual components)**.
- 6.7.3. Retractors
- 6.7.3.1. Automatically-locking retractors
- 6.7.3.1.1. The strap of a safety belt equipped with an automatically-locking retractor shall not unwind by more than 30 mm between locking positions of the retractor. After a rearward movement of the wearer the **belt strap** must either remain in its initial position or return to that position automatically on subsequent forward movement of the wearer.
- 6.7.3.1.2. If the retractor is part of a lap belt, the retracting force of the strap shall be not less than 7 N as measured in the free length between the manikin and the retractor as prescribed in paragraph **7.2 (to be defined - tests of individual components)** below. If the retractor is part of a chest restraint, the retracting force of the strap shall be not less than 2 N or more than 7 N as similarly measured. If the strap passes through a guide or pulley, the retracting force shall be measured in the free length between the manikin and the guide or pulley. If the assembly incorporates a device, manually or automatically operated, that prevents the strap from being completely retracted, that device shall not be in operation when these measurements are effected.
- 6.7.3.1.3. The strap shall be repeatedly withdrawn from the retractor and allowed to retract, in the conditions prescribed in paragraph **7.2 (to be defined - tests of individual components)** below, until 5,000 cycles have been completed. The retractor shall then be subjected to the temperature test operation requirements given in paragraph **7.2 (to be defined - tests of individual components)**, and corrosion test described in paragraph **7.1.1** and the dust-resistance test described in paragraph **7.2 (to be defined - tests of individual components)**. It shall then satisfactorily complete a further 5,000 cycles of withdrawal and retraction. After the above tests the retractor shall continue to operate correctly and to meet the requirements of paragraphs **6.7.3.2.1.1.** and **6.7.3.2.1.2.** above.
- 6.7.3.2. Emergency-locking retractors

- 6.7.3.2.1. An emergency-locking retractor shall when tested as prescribed in paragraph 7.2 (to be defined – tests of individual components), satisfy the conditions below:
- 6.7.3.2.1.1. It shall be locked when the deceleration of the vehicle reaches 0.45 g.
 - 6.7.3.2.1.2. It shall not lock for strap accelerations of less than 0.8 g as measured in the axis of strap extraction.
 - 6.7.3.2.1.3. It shall not lock when its sensing device is tilted by not more than 12° in any direction from the installation position specified by its manufacturer.
 - 6.7.3.2.1.4. It shall lock when its sensing device is tilted by more than 27° in any direction from the installation position specified by its manufacturer.
 - 6.7.3.2.2. Where the operation of a retractor depends on an external signal or power source, the design shall ensure that the retractor locks automatically upon failure or interruption of that signal or power source.
 - 6.7.3.2.3. A multiple-sensitivity emergency-locking retractor shall meet the requirements set out above. In addition, if one of the sensitivity factors relates to strap extraction, locking must have occurred at a strap acceleration of 1.5 g as measured in the axis of strap extraction.
 - 6.7.3.2.4. In the tests referred to in paragraphs 6.7.3.2.1.1. and 6.7.3.2.1.3. above, the amount of strap extraction occurring before the retractor locks shall not exceed 50 mm, starting at the length of unwinding specified in paragraph 7.2 (to be defined – tests of individual components). In the test referred to in paragraph 7.2 (to be defined – tests of individual components) above, locking shall not occur during the 50 mm of strap extraction starting at the length of unwinding specified in paragraph 7.2 (to be defined – tests of individual components) below.
 - 6.7.3.2.5. If the retractor is part of a lap belt, the retracting force of the strap shall be not less than 7 N as measured in the free length between the manikin and the retractor as prescribed in paragraph 7.2 (to be defined – tests of individual components). If the retractor is part of a chest restraint, the retracting force of the strap shall be not less than 2 N or more than 7 N as similarly measured. If the strap passes through a guide or pulley, the retracting force shall be measured in the free length between the manikin and the guide or pulley. If the assembly incorporates a device, manually or automatically operated, that prevents the strap from being completely retracted, that device shall not be in operation when these measurements are effected.
 - 6.7.3.2.6. The strap shall be repeatedly withdrawn from the retractor and allowed to retract, in the conditions prescribed in paragraph 7.2 (to be defined – tests of individual components), until 40,000 cycles have been completed. The retractor shall then be subjected to the temperature test operation requirements given in paragraph 7.2 (to be defined – tests of individual components), and corrosion test described in paragraph 8.1.1 and to the dust-resistance test described in paragraph 7.2 (to be defined – tests of individual components). It shall then satisfactorily complete a further 5,000 cycles of withdrawal and retraction (making 45,000 in all). After the above tests the retractor shall continue to operate correctly and to meet the requirements of paragraphs 6.7.3.2.1. to 6.7.3.2.5. above.

6.7.4. Straps

6.7.4.1. Width

6.7.4.1.1. The minimum width at the child-restraint straps which contact the dummy shall be **25 mm**. These dimensions shall be measured during the strap strength test prescribed in paragraph **7.2 (to be defined – tests of individual components)**, without stopping the machine and under a load equal to 75 percent of the breaking load of the strap.

6.7.4.2. Strength after room conditioning

6.7.4.2.1. On two sample straps conditioned as prescribed in paragraph **7.2 (to be defined – tests of individual components)**, the breaking load of the strap shall be determined as prescribed in paragraph **7.2 (to be defined – tests of individual components)**. below.

6.7.4.2.2. The difference between the breaking loads of the two samples shall not exceed 10 percent of the greater of the two breaking loads measured.

6.7.4.3. Strength after special conditioning

6.7.4.3.1. On two straps conditioned as prescribed in one of the provisions of paragraph **7.2.X.x** (except paragraph **7.2.X.x**), the breaking load of the strap shall be not less than 75 percent of the average of the loads determined in the test referred to in paragraph **7.2.X.x**. below.

6.7.4.3.2. In addition, the breaking load shall be not less than 3.6 kN for the restraints of [**"IUI" / @-Size**] child restraint systems.

6.7.4.3.3. The competent authority may dispense with one or more of these tests if the composition of the material used, or information already available, renders the test or tests superfluous.

6.7.4.3.4. The abrasion conditioning procedure of type 1 defined in paragraph **7.2.X.x** shall only be performed when the microslip test defined in paragraph **7.2.X**. below gives a result above 50 percent of the limit prescribed in paragraph **6.7.2.5.1**. above.

6.7.4.4. It shall not be possible to pull the complete strap through any adjusters, buckles or anchoring points.

6.7.5. Lock-off device

6.7.5.1. The lock-off device must be permanently attached to the child restraint.

6.7.5.2. The lock-off device must not impair the durability of the adult belt and undergo temperature test operation requirements given in paragraph **7.2.X.x**.

6.7.5.3. The lock-off device must not prevent the rapid release of the child.

6.7.5.4. Class A devices.

The amount of slip of the webbing shall not exceed 25 mm after the test prescribed in paragraph **7.2.X.x**.

6.7.5.5. Class B devices.

The amount of slip of the webbing shall not exceed 25 mm after the test prescribed in paragraph **7.2.X.x**.

6.7.6. ISOFIX attachment specifications

"ISOFIX attachments" and latching indicators shall be capable of withstanding repeated operations and shall, before the dynamic test prescribed in paragraph **7.1.4.**, undergo a test comprising 2000 ± 5 opening and closing cycles under normal conditions of use.

6.8. Classification

6.8.1. Child restraint systems may cover any size range between **[40cm]** en **[105cm]** provided that the requirements of each size are fulfilled. Moreover the size range has to be indicated on the child restraint and at least the shoulder heights belonging to this size range must be clearly visible for the user.

~~6.8.2. Forward facing is not permitted under age of [15 / 18] months.~~

Comment [I28]: Also specified in § 6.1.5

~~6.8.3. There are no restrictions with regard to forward facing for sizes above size 50-80, however for size 74-98 the orientation rearward facing is strongly recommended.~~

Comment [I29]: Also specified in § 6.1.5

~~6.8.4. The class integral is required for size 50-74, size 50-80 and size 74-98.~~

~~6.8.5. The class integral for an ISOFIX child restraint is restricted to size 50-74, size 50-80 and size 74-98.~~

Comment [I30]: Also specified in § 6.1.6

~~6.8.6. ISOFIX child restraints of sizes above size 74-98 shall be of the class non-integral.~~

Comment [I31]: To be deleted in phase 1

~~6.8.7. The mass of an ISOFIX child restraint shall not exceed 15 kg.~~

Comment [I32]: Also specified in § 6.3.1.2

7. TESTS

7.1. Tests of the assembled child restraint system

7.1.1. Corrosion

7.1.1.1. The metal items of the child restraint system shall be positioned in a test chamber as prescribed in **Annex 4**. In the case of a child restraint system incorporating a retractor, the strap shall be unwound to full length less 100 ± 3 mm. Except for short interruptions that may be necessary, for example, to check and replenish the salt solution, the exposure test shall proceed continuously for a period of 50 ± 0.5 hours.

7.1.1.2. On completion of the exposure test the metal items of the child restraint system shall be gently washed, or dipped, in clean running water with a temperature not higher than 38°C to remove

any salt deposit that may have formed and then allowed to dry at room temperature of 18 to 25 °C for 24 ± 1 hours before inspection in accordance with paragraph 6.6.1.2. above.

7.1.2. Overtuning

7.1.2.1. The manikin shall be placed in the restraints installed in accordance with this Regulation and taking into account the manufacturer's instructions and with the standard slack as specified in paragraph 7.1.3.5.

7.1.2.2. The restraint shall be fastened to the test seat or vehicle seat. The whole seat shall be rotated around a horizontal axis contained in the median longitudinal plane of the seat through an angle of 360° at a speed of 2-5 degrees/second. For the purposes of this test, devices intended for use in specific cars may be attached to the test seat described in [Annex 6](#).

7.1.2.3. This test shall be carried out again rotating in the reverse direction after having [\[replaced/repositioned\]](#), if necessary, the manikin in its initial position. With the rotational axis in the horizontal plane and at 90° to that of the two earlier tests, the procedure shall be repeated in the two directions of rotation.

7.1.2.4. These tests shall be carried out using both the smallest and the largest appropriate manikin of the size range for which the restraining device is intended.

7.1.3. Dynamic tests for frontal, rear and side impact

7.1.3.1. Tests on the trolley and test seat

7.1.3.1.1. Frontal impact

7.1.3.1.1.1. The trolley and test seat used in the dynamic test shall meet the requirements of [Annex 6](#) to this Regulation, and the dynamic crash test installation procedure is to be in accordance with [Annex 21](#).

7.1.3.1.1.2. The trolley shall remain horizontal throughout deceleration or acceleration.

7.1.3.1.1.3. Deceleration or acceleration devices

The applicant shall choose to use one of the two following devices:

7.1.3.1.1.3.1. Deceleration test device:

The deceleration of the trolley shall be achieved by using the apparatus prescribed in [Annex 6](#) to this Regulation or any other device giving equivalent results. This apparatus shall be capable of the performance specified in paragraph 7.1.4.4. and hereafter specified:

Calibration procedure:

[\[The deceleration curve of the trolley, in the case of child restraint tests performed in accordance with paragraph 7.1.4.1., ballasted with inert masses up to 55 kg in order to reproduce one occupied child restraint, and in the case of child restraint tests in a vehicle body](#)

shell performed in accordance with paragraph 7.1.4.2., where the trolley is ballasted with the vehicle structure and inert masses up to x times 55 kg reproducing the number of x occupied child restraint systems, must remain, in the case of frontal impact, within the hatched area of the graph in [Annex 7, Appendix 1](#) of this Regulation, and, in the case of rear impact, within the hatched area of the graph in [Annex 7, Appendix 2](#) of this Regulation.

During calibration of the stopping device, the stopping distance shall be 650 ± 30 mm for frontal impact, and 275 ± 20 mm for rear impact.

Dynamic testing conditions during testing:

For frontal and rear impact the deceleration shall be achieved with the apparatus calibrated as stated above, however:

- a) The deceleration curve shall not have a more than 3 ms time duration exceedance of the lower borders of the performance requirements;
- b) If the tests above were performed at a higher speed and/or the deceleration curve has exceeded the upper level of the hatched area and the child restraint meets the requirements, the test shall be considered satisfactory.

7.1.3.1.1.3.2. Acceleration test device

Dynamic testing conditions:

For frontal impact, the trolley shall be so propelled that, during the test, its total velocity change ΔV is $52 + 0 - 2$ km/h and its acceleration curve is within the hatched area of the graph in Annex 7, Appendix 1 and stay above the segment defined by the coordinates (5g, 10ms) and (9g, 20ms). The start of the impact (T0) is defined, according to ISO 17 373 for a level of acceleration of 0.5g.

For rear impact, the trolley shall be so propelled that, during the test, its total velocity change ΔV is $32 + 2 - 0$ km/h and its acceleration curve is within the hatched area of the graph in Annex 7, Appendix 2 and stay above the segment defined by the coordinates (5g, 5ms) and (10g, 10ms). The start of the impact (T0) is defined, according to ISO 17 373 for a level of acceleration of 0.5g.

Despite the fulfilment of the above requirements, the Technical Service shall use a mass of trolley (equipped with its seat), as specified in paragraph 1. of [Annex 6](#), superior to 380 kg.

However, if the tests above were performed at a higher speed and/or the acceleration curve has exceeded the upper level of the hatched area and the child restraint meets the requirements, the test shall be considered satisfactory.

7.1.3.1.1.4. The following measurements shall be made:

- 7.1.3.1.1.4.1. The trolley speed immediately before impact (only for deceleration sleds, needed for stopping distance calculation),

Comment [I33]: Sweden's proposal - to be deleted ? - As the dynamic test both is defined as a acceleration or deceleration curve with low and high corridors and with a certain deltaV, a definition of the stopping distance is not necessary to define

Comment [I34]: TUB Comment - " I understood that we will control the trolley performance for each test but I could be wrong"

7.1.3.1.1.4.2. The stopping distance (only for deceleration sleds), which may be calculated by double integration of the recorded sled deceleration,

7.1.3.1.1.4.3. The displacement of the manikin's head in the vertical and horizontal direction of the tests with all Q-dummies necessary for the given **Q-Size** indication for at least the first 300 ms,

7.1.3.1.1.4.4. The lower lumbar spine loads F_x and F_z [and M_y], the lap belt force at both sides [and the pelvis angular velocities ω_y and ω_z] for at least the first 300 ms,

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Comment [135]: TUB proposes to delete this §

7.1.3.1.1.4.5. The parameters required to perform the injury assessment against the criteria as mentioned in paragraph 7.1.4.3.2. for at least the first 300 ms,

7.1.3.1.1.4.6. The trolley acceleration or deceleration for at least the first 300 ms.

7.1.3.1.1.5. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure or breakage.

7.1.3.1.2. Rear impact

7.1.3.1.2.1. The test seat shall be rotated 180° when testing in compliance with the requirements of the rear impact test.

7.1.3.1.2.2. When testing a rearward-facing child restraint intended for use in the front seating position, the vehicle facia shall be represented by a rigid bar attached to the trolley in such a way that all the energy absorption takes place in the child restraint.

7.1.3.1.2.3. The deceleration conditions shall satisfy the requirements of paragraph 7.1.4.1.1.3.1.

The acceleration conditions shall satisfy the requirements of paragraph 7.1.4.1.1.3.2.

7.1.3.1.2.4. The measurements to be made shall be similar to those listed in paragraphs 7.1.4.1.1.4. to 7.1.4.1.1.4.6. above.

7.1.3.1.2.5. The deceleration conditions shall satisfy the requirements of paragraph 7.1.4.1.1.3.1.

The acceleration conditions shall satisfy the requirements of paragraph 7.1.4.1.1.3.2.

7.1.3.1.3. Lateral impact

7.1.3.1.3.1. The test seat shall be rotated 90° when testing in compliance with the requirements of the lateral impact test.

7.1.3.1.3.2. The lower ISOFIX anchorages should be movable in the Y direction to avoid damage of the attachments and to the test equipment. The ISOFIX anchorages are individually fixed to a sliding system allowing a movement up to [X] mm.

7.1.3.1.3.3. The lateral impact loading to the CRS is generated by a door panel as defined in Annex 6 4. The stiffness and strength of the door panel shall be sufficient to avoid excessive oscillation or significant deformation during lateral dynamic test. The surface of the panel is covered with padding as specified in Annex X

7.1.3.1.3.4. The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with Annex 7 Appendix 3. The initial relative velocity between the door panel and the bench is 7 m/s +/- 0.2 m/s. The maximum intrusion depth of the door panel is defined in Annex 7 Appendix 3. The relative velocity between the door panel and the test bench shall not be affected by contact with the CRS and shall remain within the corridor defined in Annex 7 appendix 3.

7.1.3.1.3.5. The CRS is tested in its most upright position.

7.1.3.1.3.6. At time t0 defined Annex 7 Appendix 3, the dummy must be in its initial position as defined in Annex 21.

Comment [I36]: § added by CLEPA

7.1.3.2. Test on trolley and vehicle body shell

7.1.3.2.1. Lateral impact (for ISOFIX only)

Comment [I37]: DFT's comment - "During this phase of development, the regulation only covers ISOFIX systems".

7.1.3.2.1.1. The test seat shall be rotated 90° when testing in compliance with the requirements of the lateral impact test.

7.1.3.2.1.2. The lower ISOFIX anchorages should be movable in the Y direction to avoid damage of the attachments and to the test equipment. The ISOFIX anchorages are individually fixed to a sliding system allowing a movement up to [X] mm.

7.1.3.2.1.3. The lateral impact loading to the CRS is generated by a door panel as defined in Annex X. [The stiffness and strength of the door panel shall be sufficient to avoid excessive oscillation or significant deformation during lateral dynamic test]. The surface of the panel is covered with padding as specified in Annex X

7.1.3.2.1.4. The test rig shall reproduce a relative velocity between the door panel and the test bench in compliance with Annex 7 Appendix 3. The initial relative velocity between the door panel and the bench is [7.3] m/s +/- 0.2 m/s. The maximum intrusion depth of the door panel is defined in Annex 7 Appendix 3. The relative velocity between the door panel and the test bench shall not be affected by contact with the CRS and shall remain within the corridor defined in Annex 7 appendix 3.

Comment [I38]: TUB's comment - Value from Task group

The corresponding velocity – time corridor remains to be established.

7.1.3.2.1.5. The CRS is tested in its most upright position.

- 7.1.3.2.1.6. At time t_0 defined [Annex 7 Appendix 3](#), the dummy must be in its initial position as defined in Annex 21.
- 7.1.3.2.1.7. Test set-up
- CRS Simulation
 - Dummy installation
- 7.1.3.2.2. Frontal impact
- 7.1.3.2.2.1. The method used to secure the vehicle during the test shall not be such as to strengthen the anchorages of the vehicle seats, adult safety belts and any additional anchorages required to secure the child restraint or to lessen the normal deformation of the structure. No part of the vehicle shall be present which, by limiting the movement of the manikin, would reduce the load imposed on the child restraint during the test. The parts of the structure eliminated may be replaced by parts of equivalent strength, provided they do not hinder the movement of the manikin.
- 7.1.3.2.2.2. A securing device shall be regarded as satisfactory if it produces no effect on an area extending over the whole width of the structure and if the vehicle or structure is blocked or fixed in front at a distance of not less than 500 mm from the anchorage of the restraint system. At the rear the structure shall be secured at a sufficient distance behind the anchorages to ensure that all requirements of [paragraph 8.1.3.2.1.1](#) above are fulfilled.
- 7.1.3.2.2.3. The vehicle seat and child restraint shall be fitted and shall be placed in a position chosen by the Technical Service conducting approval tests to give the most adverse conditions in respect of strength, compatible with installing the manikin in the vehicle. The position of the vehicle seat-back and child restraint shall be stated in the report. The vehicle seat-back, if adjustable for inclination, shall be locked as specified by the manufacturer or, in the absence of any specification, at an actual seat-back angle as near as possible to 25°.
- 7.1.3.2.2.4. Unless the instructions for fitting and use require otherwise, the front seat shall be placed in the most forward normally used position for child restraints intended for use in the front seating position, and in the rearmost normally used position for child restraints intended for use in the rear seating position.
- 7.1.3.2.2.5. The deceleration conditions shall satisfy the requirements of [paragraph 7.1.4.4](#) below. The test seat will be the seat of the actual vehicle.
- 7.1.3.2.2.6. The following measurements shall be made:
- 7.1.3.2.2.6.1. The trolley speed immediately before impact (only for deceleration sleds, needed for stopping distance calculation),
- 7.1.3.2.2.6.2. The stopping distance (only for deceleration sleds), which may be calculated by double integration of the recorded sled deceleration,
- 7.1.3.2.2.6.3. Any contact of the manikin's head with the interior of the vehicle body shell;

~~7.1.3.2.2.6.4. The lower lumbar spine loads F_x and F_z [and M_y], the lap belt force at both sides [and the pelvis angular velocities ω_y and ω_z] for at least the first 300 ms lower lumbar spine loads,~~

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Comment [139]: TUB proposes to delete this §

7.1.3.2.2.6.5. The parameters required to perform the injury assessment against the criteria as mentioned in paragraph 7.1.4.3.2. for at least the first 300 ms,

7.1.3.2.2.6.6. The trolley and vehicle body shell acceleration or deceleration for at least the first 300 ms.

7.1.3.2.2.7. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure.

7.1.3.2.3. Rear impact -

7.1.3.2.3.1. For rear impact tests the vehicle body shell shall be rotated 180° on the test trolley.

7.1.3.2.3.2. Same requirements as for frontal impact.

7.1.3.3. Test with complete vehicle

7.1.3.3.1. The deceleration conditions shall satisfy the requirements of paragraph 7.1.4.4. below.

7.1.3.3.2. For frontal impact tests the procedure shall be that set out in [Annex 9](#) to this Regulation.

7.1.3.3.3. For rear impact tests the procedure shall be that set out in [Annex 10](#) to this Regulation.

7.1.3.3.4. The following measurements shall be made:

7.1.3.3.4.1. The speed of the vehicle/impactor immediately before impact; **only for deceleration sleds, needed for stopping distance calculation);**

7.1.3.3.4.2. Any contact of the manikin's head with the interior of the vehicle;

~~7.1.3.3.4.3. The lower lumbar spine loads F_x and F_z [and M_y], the lap belt force at both sides [and the pelvis angular velocities ω_y and ω_z] for at least the first 300 ms lower lumbar spine loads,~~

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Comment [140]: TUB proposes to delete this §

7.1.3.3.4.4. The parameters required to perform the injury assessment against the criteria as mentioned in paragraph 7.1.4.3.2. for at least the first 300 ms.

7.1.3.3.5. The front seats, if adjustable for inclination, shall be locked as specified by the manufacturer or, in the absence of any specification, at an actual seat-back angle as near as possible to 25°.

7.1.3.3.6. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure or breakage.

7.1.3.4. The conditions for dynamic test are summarized in the table below:

| Test | Restraint | FRONTAL IMPACT | | | REAR IMPACT | | | LATERAL IMPACT | | |
|------------------------|-----------------|----------------|------------|------------------------------------|-------------|------------|------------------------------------|----------------|------------|--|
| | | Speed km/h | Test pulse | Stopping distance during test (mm) | Speed km/h | Test pulse | Stopping distance during test (mm) | Speed km/h | Test pulse | Stopping distance during test (mm) [Maximum intrusion] |
| Trolley with test seat | forward facing | 50+0 -2 | 1 | 650±50 | 30+2 -0 | 2 | 275±25 | 25 +/- 1 | 5 | [300] |
| | rearward facing | 50+0 -2 | 1 | 650±50 | 30+2 -0 | 2 | 275±25 | 25 +/- 1 | 5 | [300] |

LEGEND:

Test Pulse No. 1 - As prescribed in Annex 7 - frontal impact.

Test Pulse No. 2 - As prescribed in Annex 7 - rear impact.

~~Test Pulse No. 3 - Deceleration pulse of vehicle subjected to frontal impact.~~

~~Test Pulse No. 4 - Deceleration pulse of vehicle subjected to rear impact.~~

Test Pulse No. 5 Deceleration pulse of vehicle subjected to side impact to be defined.

7.1.3.5. **Dynamic test manikins**

7.1.3.5.1. The child restraint system shall be tested using the manikins prescribed in [Annex 8](#) to this Regulation.

7.1.3.5.2. Installation of the manikin **for frontal and rear impacts**

7.1.3.5.2.1. **The manikin shall be placed so that the gap is between the rear of the manikin and the restraint. In the case of carry-cots the manikin is placed in a straight horizontal position as close as possible to the centre line of the carry-cot.**

7.1.3.5.2.2. Place the child restraint system on the test seat.
Place the manikin in the child restraint system, such that:
~~-the dummy head is horizontal following the ...~~
~~-the arms of the dummy are placed following the~~

Place a hinged board or a similar flexible device 2.5 cm thick and 6 cm wide and of length equal to the shoulder height (sitting, Annex 8) less the hip centre height (sitting, in Annex 8 popliteus height plus half of thigh height, sitting) relevant to the manikin size being tested between the manikin and the seat back of the chair. The board should follow as closely as possible the curvature of the chair and its lower end should be at the height of the manikin's hip joint.

Adjust the belt in accordance with the manufacturer's instructions, but to a tension of 250 ± 25 N above the adjuster force, with a deflection angle of the strap at the adjuster of $45 \pm 5^\circ$, or alternatively, the angle prescribed by the manufacturer.

Comment [I41]: To avoid confusion between geometrical and dynamical test dummies

Comment [I42]: Added by CLEPA

Comment [I43]: TUB's comment - problem of understanding

Comment [I44]: TUB's comment - problem of understanding

Comment [I45]: TUB's comment - "I believe that this information is sufficient and the length description above can be deleted"

Complete the installation of the child restraint system to the test seat in accordance with Annex 21 to this Regulation.

Remove the flexible device.

This only applies to harness restraints and to restraints where the child is restrained by the adult three-point belt and where a lock-off device is used and does not apply to child restraining straps connected directly to a retractor.

7.1.3.5.2.3. The longitudinal plane passing through the centre line of the dummy shall be set midway between the two lower belt anchorages, however note shall also be taken of paragraph 8.1.3.2.1.3. In case of booster cushions to be tested with the manikin representing a 10-year-old child, the longitudinal plane passing through the centre line of the manikin shall be positioned 75 ± 5 mm to the left or right with regard to the point midway between the two lower belt anchorages.

Comment [I46]: TUB's comment - "I hope that we do not need anymore this exception with Q10 and new test bench"

7.1.3.5.2.4. In the case of devices requiring the use of a standard belt, the shoulder strap may be positioned on the manikin prior to the dynamic test by the use of a light-weight masking tape of sufficient length and width. In the case of rear-facing restraints, it is permitted to use a light-weight masking tape to connect the dummy's head to the 100 mm bar or the back of the restraint during the sled acceleration.

Comment [I47]: TUB's comment - still relevant ?

7.1.3.5.3. Installation of the manikin for side impact

7.1.3.5.3.1. Key parameters to be controlled:

-Exact alignment of dummy centre line with CRS centre line and CRS centre line with the centreline of the bench.

-Pre impact stability of the dummy

-Arm position in relation to the torso

7.1.3.5.3.2.

Installation is in general similar to that for frontal impact e.g. harness tension 250 N with spacer and dummy shall be pushed toward the seat back after removing the spacer.

CRS and dummy centrelines aligned with bench centre line

Arms shall be positioned symmetrical. Elbows to be positioned in such a way that the upper arms are aligned with the sternum

Hands shall be position on the thighs

Legs shall be positioned parallel or at least symmetrical

CRS and dummy shall be kept stable until t_0 to be checked by markers at dummy, CRS and sled. Any mean used to stabilise the dummy before t_0 shall not influence the dummy kinematics after t_0

[In case of deceleration sleds the impact speed shall be stabilised and be kept constant at least 5 m before t_0 position] (to be compared with other regulations)

A Figure is to be added here to illustrate dummy installation for side impact

Comment [I48]: § added by CLEPA

7.1.3.6.

Q-Size indication

The manikin(s) that are used in testing will be the nominator for the **Q-Size** indication that the child restraint may carry, in the following way /

The dynamic tests shall be conducted with the largest dummy and the smallest dummy defined in the following tables for according to the size indication of the test CRS.
Selection criteria for the smallest dummy according to the minimum size indication

| Minimum size indication | below 70 cm | between 70 and 75 cm | between 75 and 90 cm | between 90 and 110 cm | between 110 and 125 cm |
|-------------------------|-------------|----------------------|----------------------|-----------------------|------------------------|
| Dummy | Q0 | Q1 | Q1.5 | Q3 | Q6 |

Selection criteria for the largest dummy according to the maximum size indication

| Maximum size indication | below 75 cm | between 75 and 85 cm | between 85 and 100 cm | between 100 and 120 cm | above 120 cm |
|-------------------------|-------------|----------------------|-----------------------|------------------------|--------------|
| Dummy | Q1 | Q1.5 | Q3 | Q6 | Q10 |

In case of substantial modification of the CRS installation between different sizes (e.g., convertible CRS) the relevant intermediate dummy according to the manufacturers advice shall be tested in addition to the two dummies defined above.

Comment [I49]: Following TUB proposal

*Remark: so the classification of groups will be left and an **Q-Size** indication will be introduced. The table below is inspired by the segmentation presented in the German document CRS-07-04, that is to say that a test with a certain Q-dummy will provide the indication and that tests with more Q-dummy will simply extend the indication.
A certain restriction with respect to mass is not (yet?) taken on board!*

7.1.3.6.1. **Q0, Q-Size 40-60,** / If the child restraint system is designed for two or more children, one test shall be carried out with the heaviest manikins occupying all seat positions. A second test with the lightest and the heaviest manikins specified above shall be carried out. The tests shall be conducted using the test seat as shown in Annex 6, Appendix 3, Figure 3. The laboratory conducting the tests may, if it deems it advisable, add a third test with any combination of manikins or empty seat positions.

Comment [I50]: Following TUB proposal

7.1.3.6.2. **Q1, Q-Size 60-80,** / If the ISOFIX child restraint system must use a top tether, one test shall be carried out with the smallest dummy with the shorter distance of the top tether (anchorage point G1). A second test shall be carried out with the heavier dummy with the longer distance of the top tether (anchorage point G2). Adjust the top tether to achieve a tension load of 50 ± 5 N.

Comment [I51]: Following TUB Proposal

7.1.3.6.3. **Q1.5, Q-Size 70-90,** / [The test specified in paragraph 6.6.4.1.7.2. need only be carried out with the largest manikin for which the child restraint is designed.]

Comment [I52]: Following TUB Proposal

7.1.3.6.4. **Q3, Q-Size 85-105,**

7.1.3.6.5. **Q6, Q-Size 105-130,**

7.1.3.6.6. **Q10, Q-Size 130-[150]**

- 7.1.3.6.7. If the child restraint system is suitable for wider **①-Size** indications than stated above for one dummy, the tests shall be carried out using all manikins specified above to create a complete cover of this larger indication.
- 7.1.3.6.8. If the child restraint system is designed for two or more children, one test shall be carried out with the heaviest manikins occupying all seat positions. A second test with the lightest and the heaviest manikins specified above shall be carried out. The tests shall be conducted using the test seat as shown in [Annex 6, Appendix 3, Figure 3](#). The laboratory conducting the tests may, if it deems it advisable, add a third test with any combination of manikins or empty seat positions.
- 7.1.3.6.9. If the **["IUI" / ①-Size]** child restraint system uses a top tether, one test shall be carried out with the smallest dummy with the shorter distance of the top tether (anchorage point G1). A second test shall be carried out with the heavier dummy with the longer distance of the top tether (anchorage point G2). Adjust the top tether to achieve a tension load of 50 ± 5 N. ~~For side impact the ISOFIX child restraint must be tested with the shorter distance of the top tether.~~
- 7.1.3.6.10. If the **["IUI" / ①-Size]** child restraint system uses a support leg, as an anti-rotation device the hereafter mentioned dynamic tests shall be carried out as follows:
- The tests for frontal impact shall be conducted with the support leg adjusted to its maximum adjustment compatible with the positioning of the trolley floor pan. The tests for rear impact shall be conducted with the worst case position selected by the Technical Service. During the tests the support leg shall be supported by the trolley floor pan as described in [Annex 6, Appendix 3, Figure 2](#).
 - In the case of support legs out of the plane of symmetry, the worst case shall be selected by the Technical Service for the test.
 - In the case of specific vehicle category, the support leg shall be adjusted as specified by the child restraint system manufacturer.
 - The leg length of a support leg must be adjustable in such a way that it is able to cover the complete span of floor pan levels that are allowed for in Regulation No.16, Annex 17 for car seats to be approved for the installation of ~~ISOFIX~~ **Universal Integral ["IUI" / ①-Size]** Child Restraints Systems.
- 7.1.3.6.11. The test specified in paragraph **7.1.4.1.10.1.2 (doesn't exist)** need only be carried out with the largest manikin for which the child restraint is designed.

Comment [I53]: § added by CLEPA

7.1.4. Restraint of booster cushions

~~Place a cotton cloth on the seating surface of the test bench. Position the booster cushion on the test bench, position the lower torso body block as described in Annex 22, Figure 1, on the seating surface, fit and apply the 3-point adult safety belt and tension as prescribed in Annex 21. With a piece of 25 mm width webbing or similar tied round the booster, apply a~~

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load of 250 ± 5 N in the direction of arrow A, see Annex 22, Figure 2, in line with the seating surface of the test bench.

7.2. Tests of individual components

Remark: the contents of paragraph 7.2. concern all kinds of tests for several components and is not taken on board in this piece of work.

Comment [I54]: DFT's comment - Light conditioning - Need to check reference to ISO/105-B02(1978) contained in Reg 44. This document was replaced by ISO /105-B02 (2002) as reflected in Reg 16.

7.3. Certification of Test Bench Cushion

Remark: the contents of 7.3. will be replaced by the certification derived from the work done by NPACS.

7.4. Registration of dynamic behaviour

7.4.1. In order to determine the behaviour of the manikin and its displacements, all dynamic tests shall be registered according to the following conditions:

7.4.1.1. Filming and recording conditions:

- (a) The frequency shall be at least 1000 frames per second;
- (b) The test shall be recorded on video or digital data carrier over at least the first 300 ms;

7.4.1.2. Estimation of uncertainty:

Testing laboratories shall have and shall apply procedures for estimating uncertainty of measurement of the displacement of the manikin's head. The uncertainty shall be within ± 25 mm.

Examples of international standards of such procedure are EA-4/02 of the European Accreditation Organization or ISO 5725:1994 or the General Uncertainty Measurement (GUM) method.

Comment [I55]: TUB's comment - put as foot note ?

7.5. The measuring procedures shall correspond to those defined in ISO 6487: 2002. The channel frequency class shall be:

| <u>Type of measurement</u> | <u>CFC(F_H)</u> | <u>Cut-off frequency (F_N)</u> |
|----------------------------|------------------------------|---|
| Trolley acceleration | 60 | see ISO 6487:2002 Annex A |
| Belt loads | 600 | see ISO 6487:2002 Annex A |
| Chest acceleration | 600 | see ISO 6487:2002 Annex A |
| Head acceleration | 1000 | [1650] |
| Upper neck force | 600 | |
| Upper neck moment | 600 | |
| Chest deflection | 600 | |

The sampling rate should be a minimum of 10 times the channel frequency class (i.e. in installations with channel frequency class of 1000, this corresponds to a minimum sampling rate of 10000 samples per second per channel).]

8. TEST REPORTS OF TYPE APPROVAL AND OF PRODUCTION QUALIFICATION

- 8.1. The test report shall record the results of all tests and measurements including the following test data:
- (a) the type of device used for the test (acceleration or deceleration device),
 - (b) the total velocity change,
 - (c) the trolley speed immediately before impact only for deceleration sleds,
 - (d) the acceleration or deceleration curve during all the velocity change of the trolley and at least 300 ms,
 - (e) the time (in ms) when the head of the manikin reaches its maximum displacement during the performance of the dynamic test,
 - (f) the place occupied by the buckle during the tests, if it can be varied,
 - (g) any failure or breakage,
 - (h) the following dummy criteria: HIC, Head Acceleration 3ms, Upper Neck Tension Force, Upper Neck Moment, Thorax Chest Deflection and Lower Lumbar Load Cel Force, and
 - (i) the lap belt force

Remark: the list of data above could be replaced by the requirement that the test report must be formulated according a harmonized test report given in Annex so and so!

- 8.2. If provisions relating to anchorages contained in Annex 6, Appendix 3, to this Regulation have not been respected, the test report shall describe how the child restraint is installed and shall specify important angles and dimensions.
- 8.3. When the child restraint is tested in a vehicle or vehicle structure, the test report shall specify the manner of attaching the vehicle structure to the trolley, the position of the child restraint and vehicle seat and the inclination of the vehicle seat-back.

- 8.4. The test reports of type approval and of production qualification shall record the verification of markings and of instructions on installation and use.

9. PRODUCTION QUALIFICATION

10.CONFORMITY OF PRODUCTION AND ROUTINE TESTS

11.MODIFICATION AND EXTENSION OF APPROVAL OF A CHILD RESTRAINT SYSTEM

12.PENALTIES FOR NON-CONFORMITY OF PRODUCTION

13.PRODUCTION DEFINITELY DISCONTINUED

14.INFORMATION FOR USERS

15.TRANSITIONAL PROVISIONS

16.NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

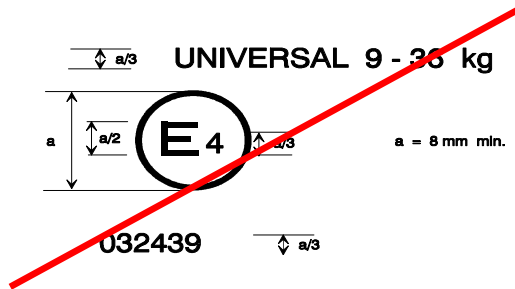
The Parties to the 1958 Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, or production definitely discontinued, issued in other countries, are to be sent.

Annex 1 A

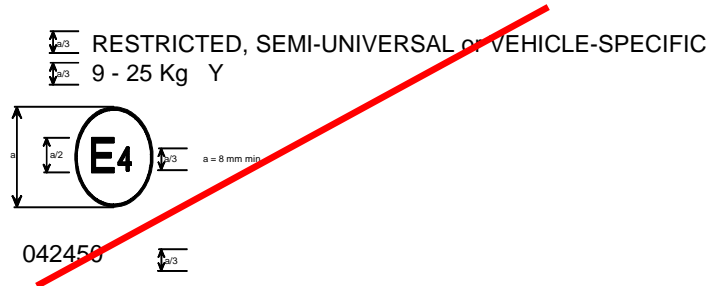
Annex 1 B

Annex 2

ARRANGEMENTS OF THE APPROVAL MARK



THE CHILD RESTRAINT SYSTEM BEARING THE ABOVE APPROVAL MARK IS A DEVICE CAPABLE OF BEING FITTED IN ANY **①-SIZE** COMPATIBLE VEHICLE AND OF BEING USED FOR THE [40CM-70CM] SIZE RANGE AND MASS LIMIT OF [24KG]; IT IS APPROVED IN FRANCE (E2) UNDER THE NUMBER 00XXXX. THE APPROVAL NUMBER INDICATES THAT THE APPROVAL WAS GRANTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE REGULATION CONCERNING THE APPROVAL OF [ISOFIX INTEGRAL/ ENHANCED] CHILD RESTRAINT SYSTEMS USED ONBOARD OF MOTOR VEHICLES AS AMENDED BY THE 00 SERIES OF AMENDMENTS.



The child restraint system bearing the above approval mark is a device not capable of being fitted in every vehicle and of being used for the [40cm to 70cm] size range and mass limit of [24kg]; it is approved in France (E2) under the number 002450. The approval number indicates that the approval was granted in accordance with the requirements of the Regulation concerning the approval of [ISOFIX Integral/ Enhanced] child restraint systems used onboard of motor vehicles as amended by the 00 series of amendments. The symbol "Y" indicates that the system contains a crotch strap.

Note: The approval number and additional symbol(s) must be placed close to the circle and either above or below the "E" or to left or right of it. The digits of the approval number must be on the same side of the "E" and oriented in the same direction. The additional symbol(s) must be diametrically opposite the approval number. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

Annex 3

Annex 4

CORROSION TEST

1. Test apparatus
 - 1.1. The apparatus shall consist of a mist chamber, a salt solution reservoir, a supply of suitably conditioned compressed air, one or more atomizing nozzles, sample supports, provision for heating the chamber, and necessary means of control. The size and detailed construction of the apparatus shall be optional, provided that the test conditions are met.
 - 1.2. It is important to ensure that drops of solution accumulated on the ceiling or cover of the chamber do not fall on test samples.
 - 1.3. Drops of solution which fall from test samples shall not be returned to the reservoir for respraying.
 - 1.4. The apparatus shall not be constructed of materials that will affect the corrosiveness of the mist.
2. Location of test samples in the mist cabinet
 - 2.1. Samples, except retractors, shall be supported or suspended between 15° and 30° from the vertical and preferably parallel to the principal direction of horizontal flow of mist through the chamber, based upon the dominant surface being tested.
 - 2.2. Retractors shall be supported or suspended so that the axes of the reel for storing the strap shall be perpendicular to the principal direction of horizontal flow of mist through the chamber. The strap opening in the retractor shall also be facing in this principal direction.
 - 2.3. Each sample shall be so placed as to permit free settling of mist on all samples.
 - 2.4. Each sample shall be so placed as to prevent salt solution from one sample dripping on to any other sample.
3. Salt solution
 - 3.1. The salt solution shall be prepared by dissolving 5 ± 1 parts by mass of sodium chloride in 95 parts of distilled water. The salt shall be sodium chloride substantially free of nickel and copper and containing not more than 0.1 percent of sodium iodide and not more than 0.3 percent of total impurities in the dry state.
 - 3.2. The solution shall be such that, when atomized at 35°C, the collected solution is in the pH range of 6.5 to 7.2.

4. Compressed air

- 4.1. The compressed air supply to the nozzle or nozzles for atomizing the salt solution shall be free of oil and dirt, and maintained at a pressure between 70 kN/m^2 and 170 kN/m^2 .

5. Conditions in the mist chamber

- 5.1. The exposure zone of the mist chamber shall be maintained at $35 \pm 5^\circ\text{C}$. At least two clean mist collectors shall be placed within the exposure zone, so that no drops of solution from the test samples or any other sources are collected. The collectors shall be placed near the test samples, one as near as possible to any nozzle and one as far as possible from all nozzles. The mist shall be such that, for each 80 cm^2 of horizontal collecting area, from 1.0 to 2.0 ml of solution per hour, when measured over an average of at least 16 hours, is collected in each collector.
- 5.2. The nozzle or nozzles shall be directed or baffled, so that the spray does not impinge directly on the test samples.

Annex 5

Annex 6 (to be revised)

DESCRIPTION OF TROLLEY

1. Trolley
 - 1.1. For tests on child restraints, the trolley, carrying the seat only, shall have a mass greater than 380 kg. For tests on child restraint systems in the vehicle specific category, the trolley with the attached vehicle structure shall have a mass greater than 800 kg.
2. Calibration screen
 - 2.1. A calibration screen shall be attached firmly to the trolley with a movement limit line plainly marked on it to enable compliance with forward movement criteria to be determined from photographic records.
3. Seat
 - 3.1. The seat shall be constructed as follows:
 - 3.1.1. A rigid back, fixed, dimensions of which are given in Appendix 1 to this annex. The lower part and the upper part is made of a 20 mm diameter tube;
 - 3.1.2. Rigid seating, dimensions of which are given in Appendix 1 to this annex. The rear part of the seating is made from a rigid sheet metal, the upper edge of which is a 20 mm diameter tube. The front part of the seating is also made of a 20 mm diameter tube;
 - 3.1.3. For access to the anchor brackets, openings shall be made at the rear of the cushion of the seat, as prescribed in Appendix 1 to this annex;
 - 3.1.4. The width of the seat shall be 800 mm;
 - 3.1.5. The back and the seating shall be covered with polyurethane foam, the characteristics of which are given in Table 1. The dimensions of the cushion are given in Appendix 1 to this annex;

Table 1:

| | |
|---|-----|
| Density according to ISO 485 (kg/m ³) | 43 |
| Bearing strength according to ISO 2439B (N) | |
| p - 25 percent | 125 |
| p - 40 percent | 155 |
| Bearing strength factor according to ISO 3386 (kPa) | 4 |
| Elongation at rupture according to ISO 1798 (percent) | 180 |
| Breaking strength according to ISO 1798 (kPa) | 100 |
| Compression set according to ISO 1856 (percent) | 3 |

- 3.1.6. The polyurethane foam shall be covered with a sun shade cloth, made of poly-acrylate fibre, the characteristics of which are given in Table 2.

Table 2:

| | |
|---|-----|
| Specific mass (g/m ²) | 290 |
| Breaking strength according to DIN 53587 on test specimen 50 mm wide: | |
| lengthwise (kg): | 120 |
| breadth wise (kg): | 80 |

- 3.1.7. Covering the seat and the seat back^{3/}

- 3.1.7.1. The seat foam cushion is produced out of a square foam block (800 x 575 x 135 mm) in such a way (see Figure 1 of Appendix 1 to this annex) that its shape resembles the shape of the aluminium bottom-plate specified in Figure 2 of Appendix 1 to this annex.
- 3.1.7.2. Six holes are drilled in the bottom-plate in order to fasten it to the trolley with bolts. The holes are drilled alongside the longest side of the plate, three on each side, their position being dependent on the construction of the trolley. Six bolts are put through the holes. It is recommended to glue the bolts on the plate with an appropriate adhesive. Afterwards, the bolts are fastened with nuts.
- 3.1.7.3. The cover material (1250 x 1200 mm, see Figure 3 of Appendix 1 to this annex) is cut across the width in such a way that it is not possible for the material to overlap after covering. There should be a gap of about 100 mm between the edges of the cover material. Therefore the material has to be cut at about 1200 mm.
- 3.1.7.4. The cover material is marked with two lines which run across the width. They are drawn 375 mm from the centreline of the cover material. (See Figure 3 of Appendix 1 to this annex)

^{3/} Details of materials used in this process can be obtained from TNO (Research Institute for Road Vehicles), Schoemakerstraat 97, 2628 VK Delft, The Netherlands.

- 3.1.7.5. The seat foam cushion is placed upside down on the cover material with the aluminium bottom-plate on top.
- 3.1.7.6. On both sides the cover material is stretched until the lines drawn on it match the edges of the aluminium bottom-plate. At each bolt position, small incisions are made and the cover material is pulled over the bolts.
- 3.1.7.7. At the position of the grooves in the bottom-plate and in the foam, the cover material should be incised.
- 3.1.7.8. The cover is glued to the aluminium plate with a flexible glue. The nuts have to be removed before gluing.
- 3.1.7.9. The flaps on the side are folded onto the plate and are glued as well.
- 3.1.7.10. The flaps in the grooves are folded inside and taped with a strong tape.
- 3.1.7.11. The flexible glue has to dry for at least 12 hours.
- 3.1.7.12. The seat back cushion is covered in exactly the same way as the seat, only the lines on the cover material (1250 x 850 mm) are drawn 320 mm apart from the centreline of the material.
- 3.1.8. Line Cr is coincident with the intersection line between the top plane of the seat and the front lane of the seat back.
- 3.2. Test of rearward-facing devices
 - 3.2.1. A special frame shall be fitted on the trolley in order to support the child restraint as shown in Figure 1.
 - 3.2.2. A steel tube shall be attached firmly to the trolley in such a way that a load of $5,000 \pm 50$ N applied horizontally to the centre of the tube does not cause a movement greater than 2 mm.
 - 3.2.3. The dimensions of the tube shall be: 500 x 100 x 90 mm.

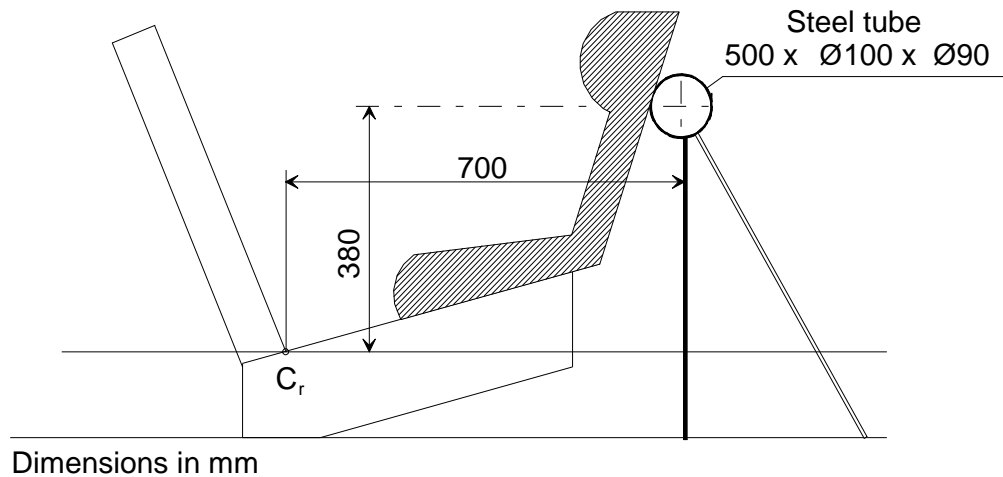


Figure 1

Arrangement for testing a rearward-facing device

- 3.3. Trolley floor pan
- 3.3.1. The floor pan of the trolley shall be constructed of a flat sheet of metal of uniform thickness and material, see Figure 2 of Appendix 3 to this annex.
- 3.3.1.1. The floor pan shall be rigidly mounted on the trolley. The height of the floor pan relative to the C_r axis projection point, dimension X ^{4/} in Figure 2, shall be adjusted to meet the requirements of paragraph 7.1.4.1.9.
- 3.3.1.2. The floor pan shall be designed so that the surface hardness should not be below 120 HB, according to EN ISO 6506-1:1999.
- 3.3.1.3. The floor pan shall withstand an applied vertical concentrated load of 5 kN without causing a vertical movement greater than 2 mm referring to C_r axis and without any permanent deformation occurring.
- 3.3.1.4. The floor pan shall have a surface roughness not exceeding Ra 6,3 according to ISO 4287:1997.

^{4/} The dimension X shall be of 210 mm with an adjustment range of ± 70 mm.

3.3.1.5. The floor pan shall be designed so that no permanent deformation is occurring after a dynamic test of a child restraint system, according to this Regulation.

4. Stopping device

4.1. The device consists of two identical absorbers mounted in parallel.

4.2. If necessary, an additional absorber shall be used for each 200 kg increase in nominal mass. Each absorber shall comprise:

4.2.1. an outer casing formed from a steel tube;

4.2.2. a polyurethane energy-absorber tube;

4.2.3. a polished-steel olive-shaped knob penetrating into the absorber; and

4.2.4. a shaft and an impact plate.

4.3. The dimensions of the various parts of this absorber are shown in the diagram reproduced in Appendix 2 to this annex.

4.4. The characteristics of the absorbing material are given in table 3 and table 4 of this annex.

4.5. The stopping device assembly shall be maintained for at least 12 hours at a temperature between 15 ° and 25 °C before being used for the calibration tests described in Annex 7 to this Regulation. The stopping device shall, for each type of test, meet the performance requirements laid down in Annex 7, Appendices 1 and 2. For dynamic tests of a child restraint, the stopping device assembly shall be maintained for at least 12 hours at the same temperature, to within ± 2 °C, as that of the calibration test. Any other device giving equivalent results can be accepted.

Table 3

CHARACTERISTICS OF THE ABSORBING MATERIAL "A" ^{5/}

(ASTM Method D 735 unless otherwise stated)

Shore hardness A: 95 ± 2 at 20 ± 5 °C temperature

| | |
|-----------------------------------|--------------------------------|
| Breaking strength: | $R_o \geq 350 \text{ kg/cm}^2$ |
| Minimum elongation: | $A_o \geq 400 \text{ percent}$ |
| Module at 100 percent elongation: | $\geq 110 \text{ kg/cm}^2$ |
| at 300 percent elongation: | $\geq 240 \text{ kg/cm}^2$ |

Low temperature brittleness (ASTM Method D 736): 5 hours at - 55 °C

Compression set (Method B): 22 hours at 70 °C ≤ 45 percent

Density at 25 °C: 1.05 to 1.10

Ageing in air (ASTM Method D 573):

70 hours at 100 °C: Shore hardness: max. variation ± 3
breaking strength: decrease < 10 percent of R_o
elongation: decrease < 10 percent of A_o
weight: decrease < 1 percent

Immersion in oil (ASTM Method No. 1 Oil):

70 hours at 100 °C: Shore hardness: max. variation ± 4
breaking strength: decrease < 15 percent of R_o
elongation: decrease < 10 percent of A_o
volume: swelling < 5 percent

Immersion in oil (ASTM Method No. 3 Oil):

70 hours at 100 °C: breaking strength: decrease < 15 percent of R_o
elongation: decrease < 15 percent of A_o
volume: swelling < 20 percent

^{5/} The address to obtain the relevant ASTM standards is: ASTM, 1916 Race Street, Philadelphia, USA PA 19 103.

Immersion in distilled water:

1 week at 70 °C:

breaking strength: decrease < 35 percent of R_0

elongation: increase < 20 percent of A_0

Table 4

CHARACTERISTICS OF THE ABSORBING MATERIAL "B"

(ASTM Method 2000 (1980) unless otherwise stated)

| | |
|-----------------------------------|---|
| Shore hardness A: | 88 ± 2 at 20 ± 5 °C temperature |
| Breaking strength: | $R_o \geq 300$ kg/cm ² |
| Minimum elongation: | $A_o \geq 400$ percent |
| Module at 100 percent elongation: | ≥ 70 kg/cm ² |
| at 300 percent elongation: | ≥ 130 kg/cm ² |

Low temperature brittleness (ASTM Method D 736): 5 hours at - 55 °C

Compression set (Method B): 22 hours at 70 °C \leq 45 percent

Density at 25 °C: 1.08 to 1.12

Ageing in air (ASTM Method D 573 (1981)):

| | |
|---------------------|---|
| 70 hours at 100 °C: | Shore hardness: max. variation ± 3 breaking strength: decrease < 10 percent of R_o elongation: decrease < 10 percent of A_o weight: decrease < 1 percent |
|---------------------|---|

Immersion in oil (ASTM Method D 471 (1979) Oil No. 1):

| | |
|---------------------|---|
| 70 hours at 100 °C: | Shore hardness: max. variation ± 4 breaking strength: decrease < 15 percent of R_o elongation: decrease < 10 percent of A_o volume: swelling < 5 percent |
|---------------------|---|

Immersion in oil (ASTM Method D 471 (1979) Oil No. 3):

| | |
|---------------------|--|
| 70 hours at 100 °C: | breaking strength: decrease < 15 percent of R_o elongation: decrease < 15 percent of A_o volume: swelling < 20 percent |
|---------------------|--|

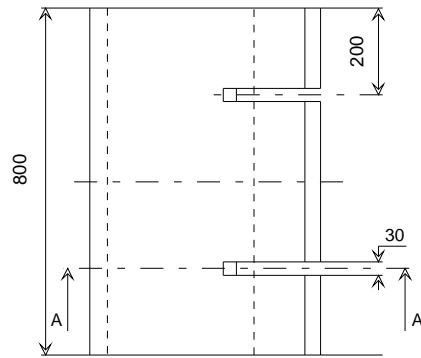
Immersion in distilled water:

1 week at 70°C:

breaking strength: decrease < 35 percent of R_0

elongation: increase < 20 percent of A_0

Annex 6 - Appendix 1 **to be reviewed**



Square foam block, section A-A
Dimensions: 800 x 575 x 135

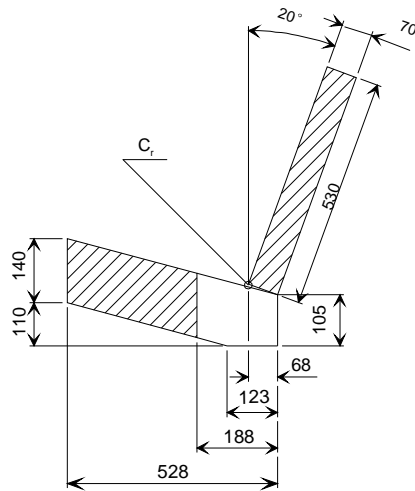
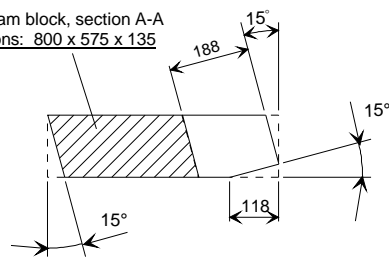


Figure 1

Dimensions of the seat and the seat cushions

Aluminium plate before bending

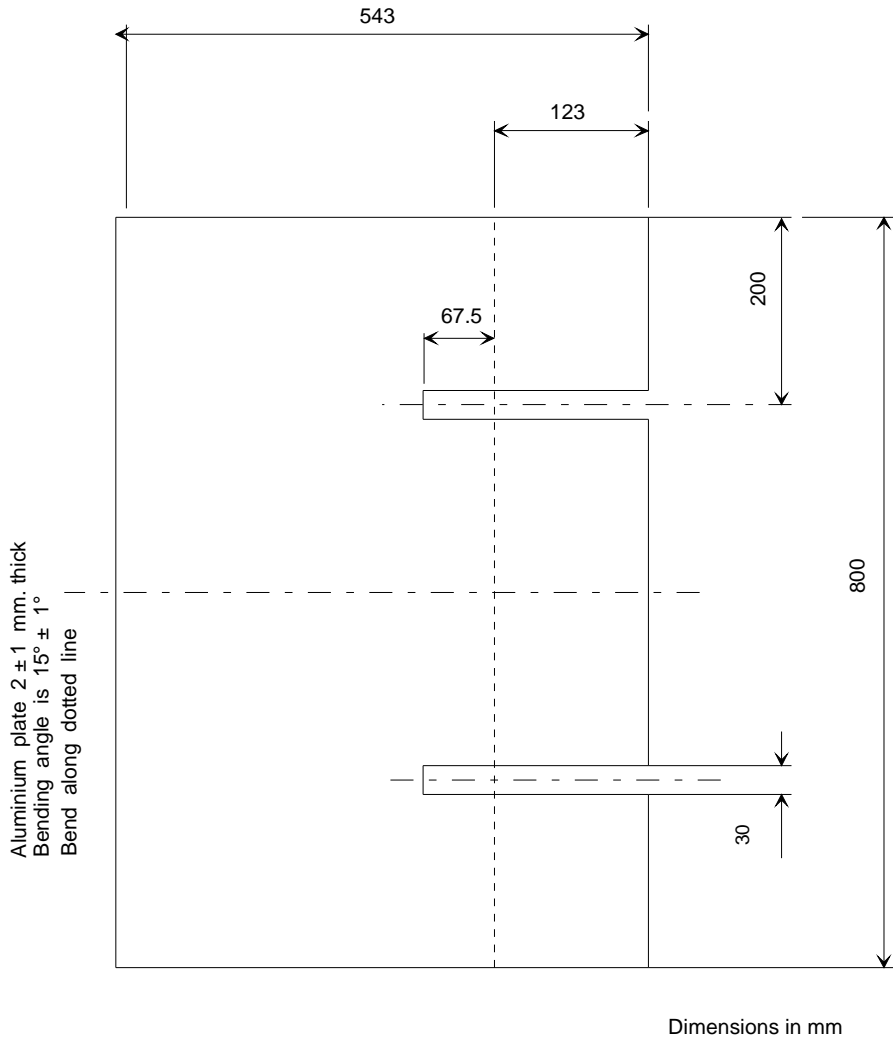


Figure 2: Dimensions of the aluminium bottom-plate

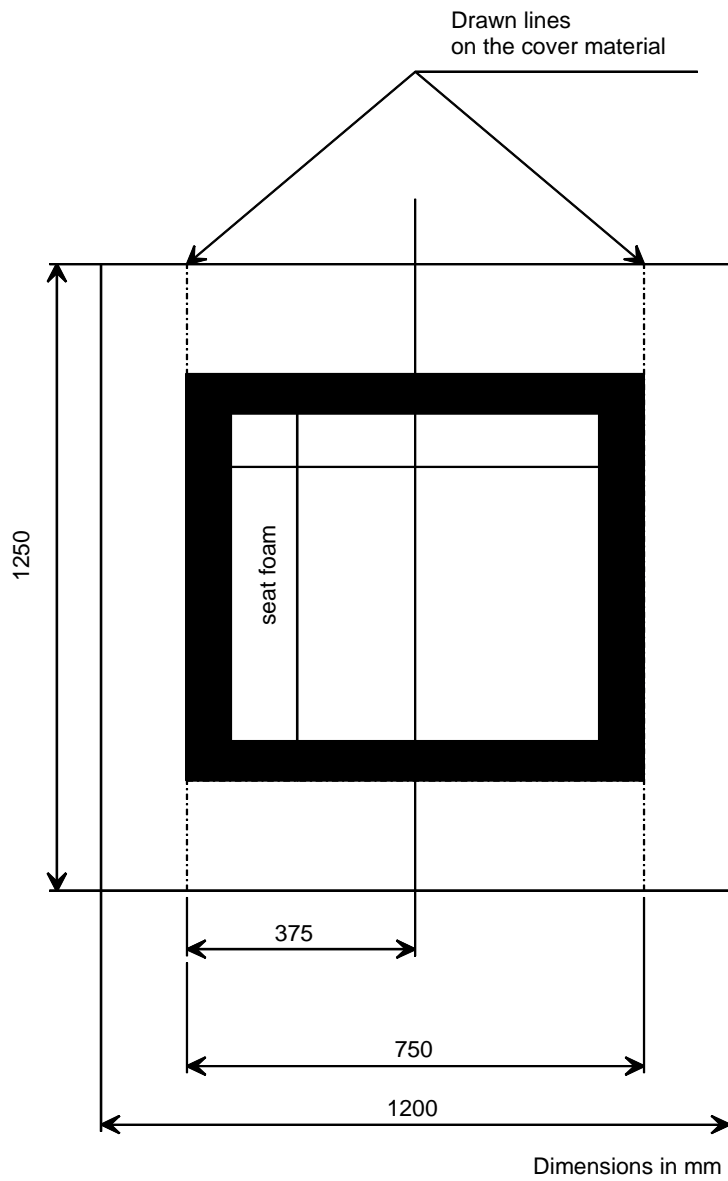


Figure 3: Dimensions of the cover material

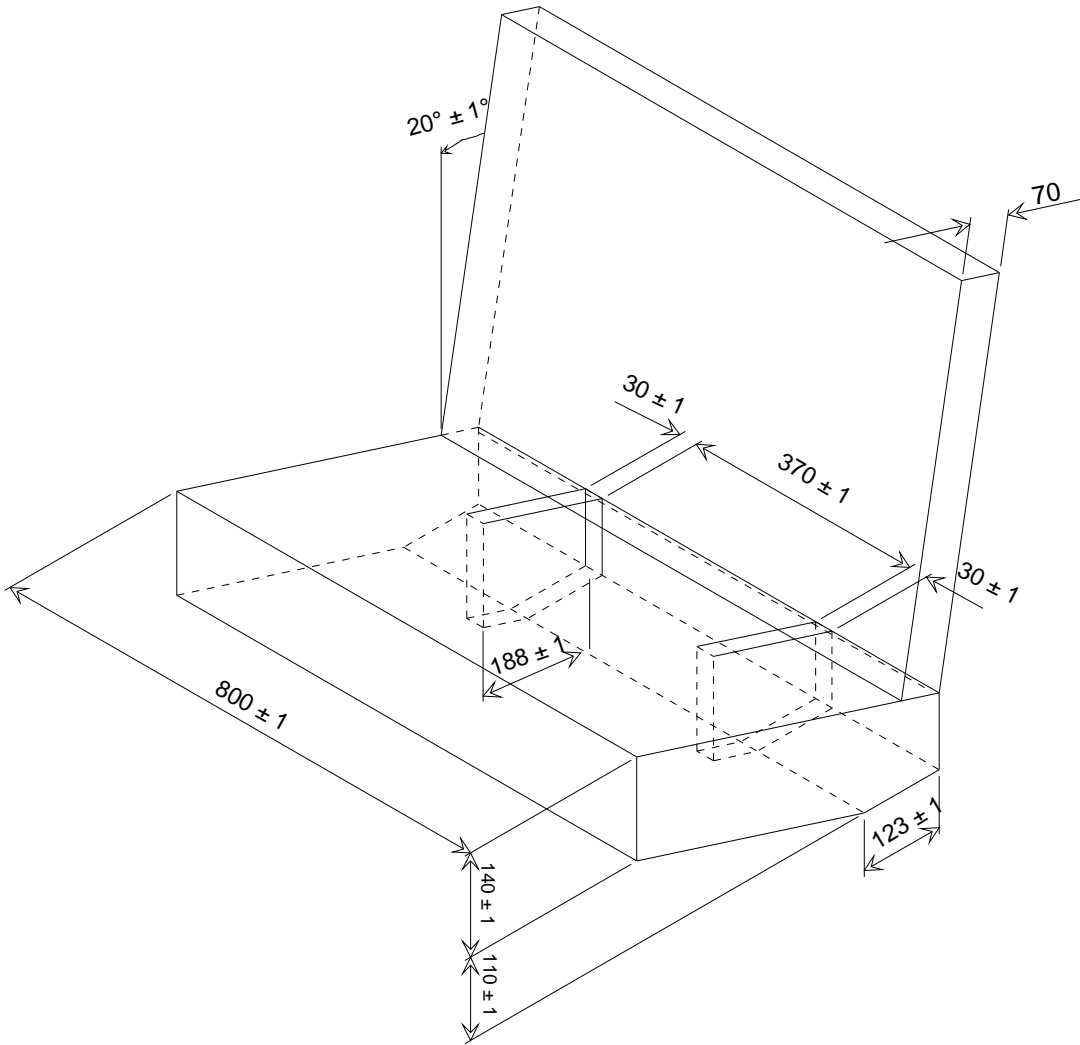


Figure 4:
3- Dimensional view of seat

Annex 6 - Appendix 3 to be reviewed

ARRANGEMENT AND USE OF ANCHORAGES ON THE TEST TROLLEY

1. The anchorages shall be positioned as shown in the figure below.
When attaching the standard anchorage plate to the anchorage points A and B or B0 the plates shall be mounted with the bolt in the transverse horizontal direction with the angled surface facing inboard and shall be free to rotate about the axis
2. Child restraints in the "universal" and "restricted" categories shall use the following anchorage points:
 - 2.1. For child restraint using lap belts, points A and B;
 - 2.2. For child restraint using lap and diagonal belts, points A, B0 and C.
 - 2.3. For child restraints using ISOFIX attachment, rearmost point H1 and H2.
3. Anchorages A, B and/or (rearmost) H₁ H₂ and D shall be used for child restraints in the "semi-universal" category having only one additional upper anchorage.
4. Anchorages A, B and/or (rearmost) H₁ H₂, E and F shall be used for child restraints in the "semi-universal" category having only one additional upper anchorages.
5. Anchorage points R₁, R₂, R₃, R₄ and R₅ are the additional anchorage points for rearward-facing child restraint systems in the "semi-universal" category having one or more additional anchorages (see paragraph 8.1.3.5.3.).
6. Except in the case of point C, (which represents the pillar loop position) the points, which correspond to the arrangement of the anchorages show where the ends of the belt are to be connected to the trolley or to the load transducer, as the case may be. The structure carrying the anchorages shall be rigid. The upper anchorages must not be displaced by more than 0.2 mm in the longitudinal direction when a load of 980 N is applied to them in that direction. The trolley shall be so constructed that no permanent deformation shall occur in the parts bearing the anchorages during the test.
7. For carry-cots, the points A₁ and/or B₁ can be used alternatively, as specified by the manufacturer of the restraint systems. A₁ and B₁ are located on a transverse line through R₁ at a distance of 350 mm from R₁.
8. For testing of child restraints in the "universal" and "restricted" categories, a standard retractor belt, as specified in Annex 13, shall be fitted to the test seat. The webbing used between the retractor and the anchorage plate A₁ of the standard safety belt shall be renewed for each dynamic test.
9. For testing of child restraints with top tether, the anchorage G₁ or G₂ shall be used.

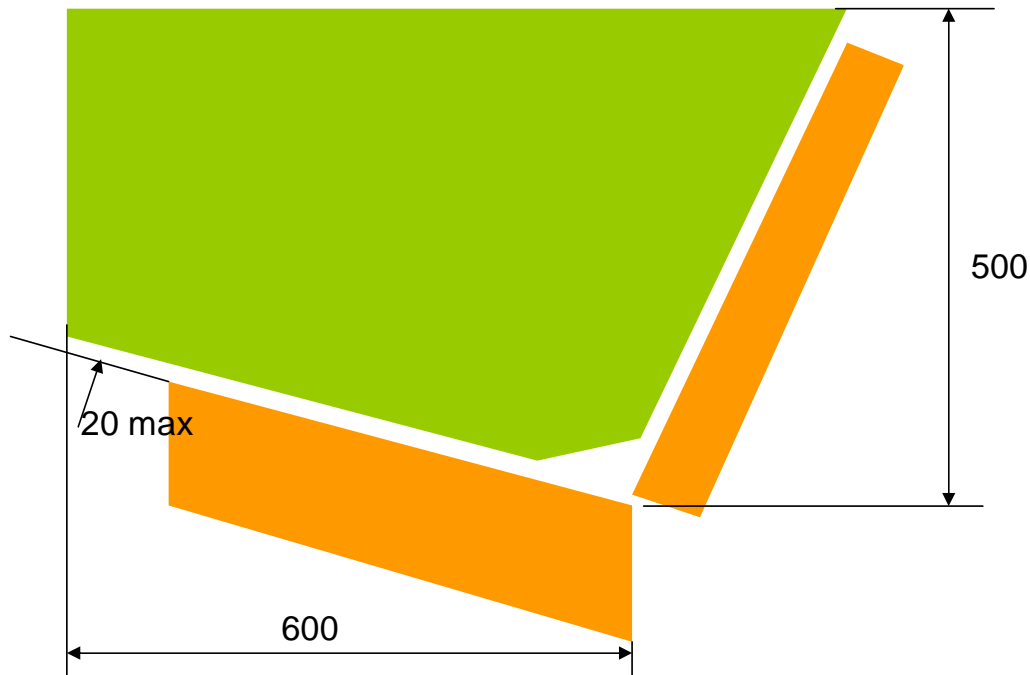
10. In the case of child restraints utilising a support leg, the Technical Service shall select the anchorages to be used according to paragraphs 2., 3., 4. or 5. above and with the support leg adjusted as specified in paragraph 7.1.4.1.9.

Annex 6 - Appendix 4

Side Impact - Door Panel Description

1. Door panel Definition

*The door panel geometry must be in line with the bench definition
Drawing to describe the door will be proposed in line with the NPACS Bench*



2. Panel padding specification

2.1 General

The door panel is padded with 55 mm padding material, which has to comply with the performance criteria as described in Annex X 2.3 realised in a test set up as described in Annex X 2.2. Finally an example for material meeting the requirements is described in Annex X 2.4.

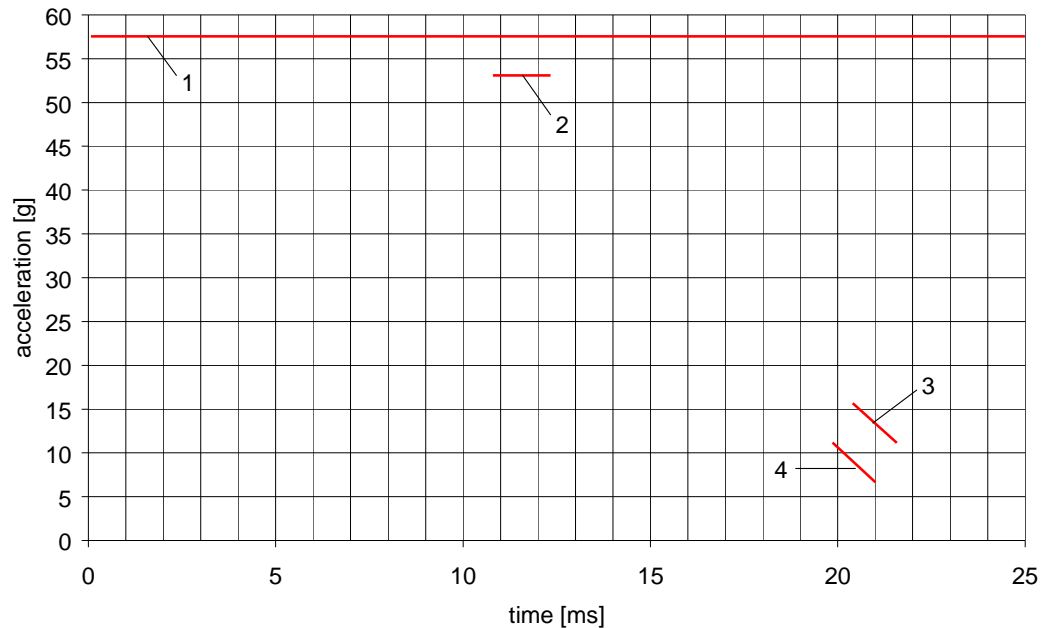
2.2 Test procedure for the assessment of panel padding material

The test set up consists of a simple drop test using a spherical head form. The spherical head form has a diameter of 150 mm and a mass of 6 kg ($\pm 0,1$ kg). The impact speed is 4 m/s ($\pm 0,1$ m/s). The instrumentation should allow the assessment of the time of first contact between the impactor and the sample as well as the head form acceleration at least in direction of impact (Z-direction). The material sample should have the dimensions of 400 X 400 mm. The sample should be impacted in its centre.

2.3 Performance criteria for the padding material

The time of first contact between sample material and head form (t_0) is 0 ms.

The impactor acceleration shall not exceed 58 g.



Key

1 Upper limit of 58 g

2 Lower limit for the maximum peak at 53 g (11 to 12 ms)

3 Upper limit for the decline of acceleration (15 g at 20,5 ms to 10 g at 21,5 ms)

4 Lower limit for the decline of acceleration (10 g at 20 ms to 7 g at 21 ms)

Figure B.1 — Corridor for the padding material

2.4 Example of material meeting the test requirements.

Using 35 mm rubber cell foam Polychloropren CR4271 at the side of the panel structure and 20 mm Styrodur C2500 on top guarantees to meet the requirements. The Styrodur needs to be replaced after each test.

Remark: [Styrodur C2000 is not available, but 2500 could be an acceptable alternative as is available and used for current testing.]

Annex 7

CURVE OF TROLLEY'S DECELERATION OR ACCELERATION, AS FUNCTION OF TIME

In all cases the calibration and measuring procedures shall correspond to those defined in the International Standard ISO 6487:2002; the measuring equipment shall correspond to the specification of a data channel with a channel frequency class (CFC) 60.

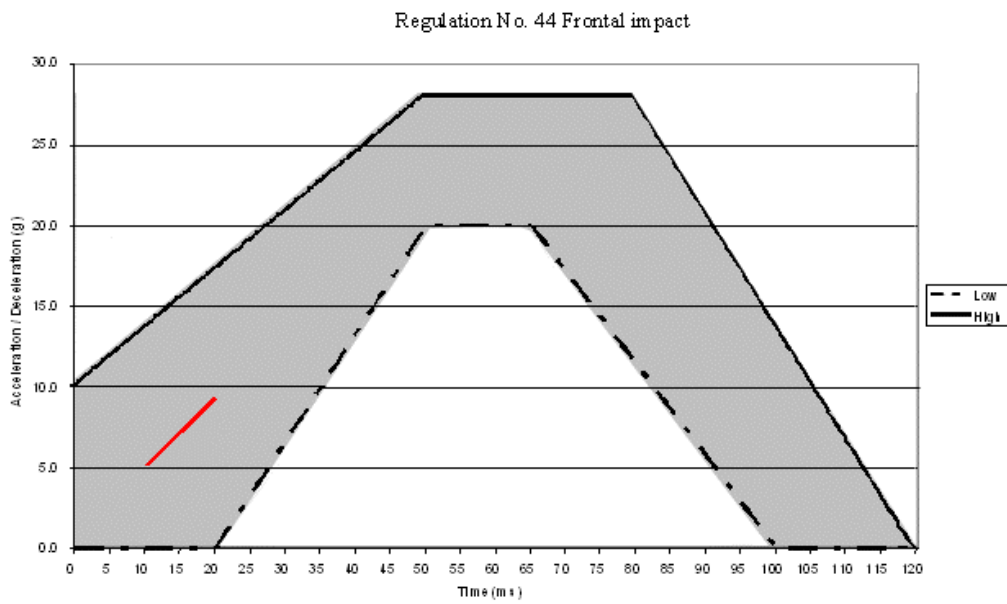
Annex 7 - Appendix 1

CURVE OF TROLLEY'S DECELERATION OR ACCELERATION,
AS FUNCTION OF TIME

FRONTAL IMPACT

Definition of the different curves

| Time (ms) | Acceleration (g) Low corridor | Acceleration (g) High corridor |
|-----------|----------------------------------|-----------------------------------|
| 0 | - | 10 |
| 20 | 0 | - |
| 50 | 20 | 28 |
| 65 | 20 | - |
| 80 | - | 28 |
| 100 | 0 | - |
| 120 | - | 0 |



The additional segment (see paragraph 7.1.4.1.1.3.2.) applies only for the acceleration sled

Annex 7 - Appendix 2

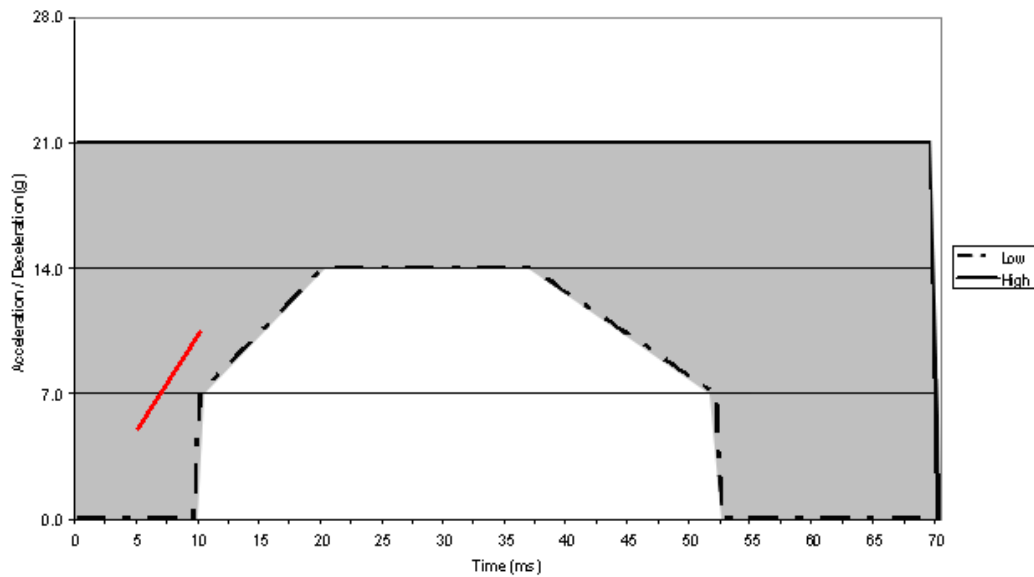
CURVES OF TROLLEY'S DECELERATION OR ACCELERATION,
 AS FUNCTION OF TIME

REAR IMPACT

Definition of the different curves

| Time (ms) | Acceleration (g) | |
|-----------|------------------|---------------|
| | Low corridor | High corridor |
| 0 | - | 21 |
| 10 | 0 | |
| 10 | 7 | - |
| 20 | 14 | - |
| 37 | 14 | - |
| 52 | 7 | - |
| 52 | 0 | |
| 70 | - | 21 |
| 70 | - | 0 |

Regulation No. 44 Rear impact

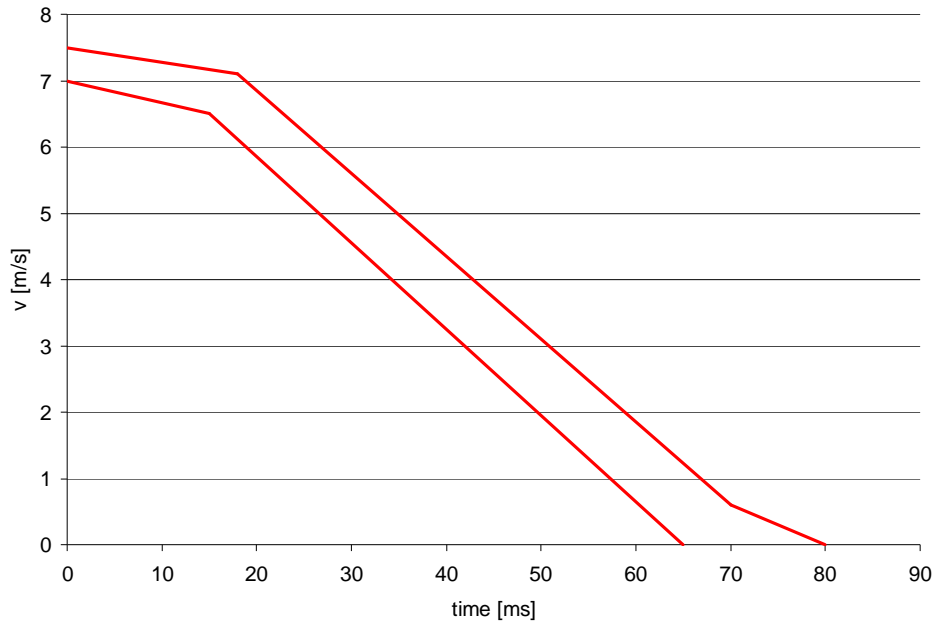


The additional segment (see paragraph 7.1.4.1.1.3.2.) applies only for the acceleration sled

Annex 7 - Appendix 3

SIDE IMPACT

CURVE OF RELATIVE VELOCITY BETWEEN TROLLEY AND DOOR PANEL AS
FUNCTION OF TIME

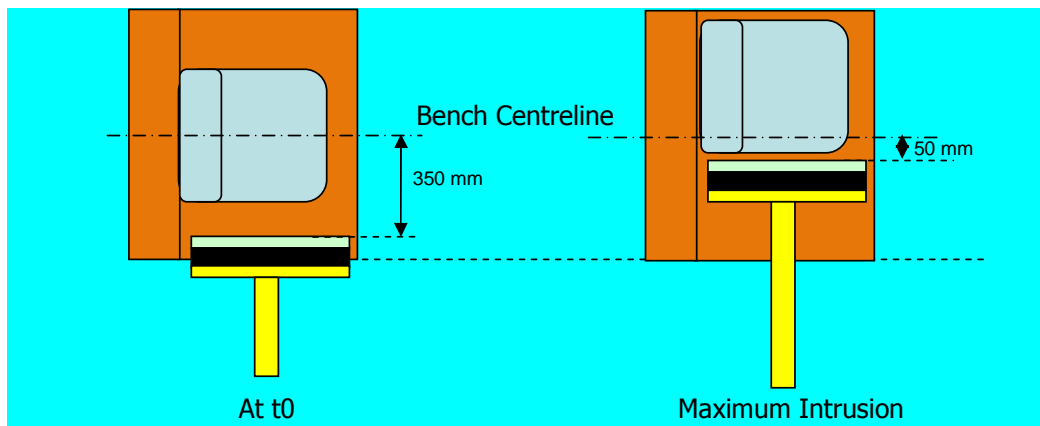


Definition of the different curves

| Time (ms) | Door Bench Relative Velocity (m/s) | Door Bench Relative Velocity (m/s) |
|-----------|--|--|
| | Low corridor | High corridor |
| 0 | 7 | 7.5 |
| 15 | 6.5 | - |
| 18 | - | 7.1 |
| 18 | - | - |
| 65 | 0 | - |
| 70 | - | 0.6 |
| 80 | - | 0 |

Remark: The corridor must be defined on experiences of respective test labs.

Definition of Door maximum intrusion



3. Door panel Definition

← | --- **Formatted:** Bullets and Numbering

*The door panel geometry must be in line with the bench definition
Drawing to describe the door will be proposed in line with the NPACS Bench*

4. Panel padding specification

← | --- **Formatted:** Bullets and Numbering

2.1 General

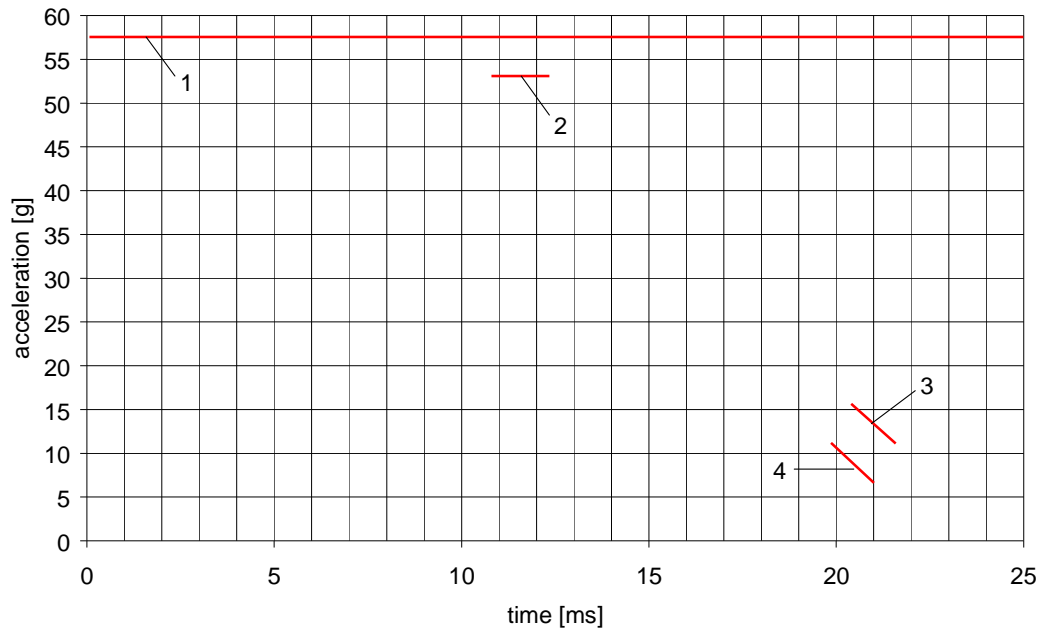
The door panel is padded with 55 mm padding material, which has to comply with the performance criteria as described in Annex X 2.3 realised in a test set up as described in Annex X 2.2. Finally an example for material meeting the requirements is described in Annex X 2.4.

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The test set up consists of a simple drop test using a spherical head form. The spherical head form has a diameter of 150 mm and a mass of 6 kg ($\pm 0,1$ kg). The impact speed is 4 m/s ($\pm 0,1$ m/s). The instrumentation should allow the assessment of the time of first contact between the impactor and the sample as well as the head form acceleration at least in direction of impact (Z-direction). The material sample should have the dimensions of 400 X 400 mm. The sample should be impacted in its centre.

2.3 Performance criteria for the padding material

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4 Lower limit for the decline of acceleration (10 g at 20 ms to 7 g at 21 ms)

Figure B.1 — Corridor for the padding material

2.4 Example of material meeting the test requirements.

Using 35 mm rubber cell foam Polychloropren CR4271 at the side of the panel structure and 20 mm Styrodur C2500 on top guarantees to meet the requirements. The Styrodur needs to be replaced after each test.

Remark: [Styrodur C2000 is not available, but 2500 could be an acceptable alternative as is available and used for current testing.]

Overall Test Rig Lay Out

Annex 8

DESCRIPTION OF MANIKINS

1. General

- 1.1. The manikins prescribed in this Regulation are described in this annex, in technical drawing held by First Technology Safety Systems and in the user manuals delivered with the dummies.
- 1.2. Alternative manikins may be used provided that:
 - 1.2.1. Their equivalence can be demonstrated to the satisfaction of the competent authority, and
 - 1.2.2. Their use is recorded in the test report, and in the communication form described in Annex 1 to this Regulation.

2. Description of the Manikins

- 2.1. The dimensions and masses of the manikins called Q0, Q1, Q1.5, Q3 and Q6 [and Q10] described below are based on the anthropometry of 50th percentile children aged 0, 1, 1.5, 3 and 6 [and 10.5] years respectively.
- 2.2. The manikins consist of a metal and plastic skeleton covered with plastic skinned foam parts to complete body components.
- 2.3. For overview of the manikins, see below.



Q-dummy family from left to right: Q1.5, Q3, Q0, Q6 and Q1
[Q10 dummy, being under development, not yet shown]

3. Construction

3.1. Head

The head is largely made from synthetics. The head cavity is large enough to allow use of several instruments, including linear accelerometers and angular velocity sensors.

3.2. Neck

The neck is flexible and allows shear and bending in all directions. The segmented design allows a realistic rotational behaviour. The neck is equipped with low stretch neck-cord in order to prevent excessive elongation. The neck-cord is also designed to act as a safety cord in case of rubber failure. A six channel load cell can be mounted at the neck-head and neck-torso interface. The Q0, Q1 and Q1.5 cannot accommodate the load cell between neck and torso

3.3. Thorax

The thorax of the child is represented by a single rib-cage. The deformation can be measured with a string potentiometer in Q1 and Q1.5 and an IR-TRACC sensors in Q3 and Q6 [and Q10]. The shoulders are connected with a flexible joint to the thorax, allowing deformation forwards.

3.4. Accelerometers can be mounted on the spine to measure linear accelerations. The Q0 thorax has a simplified layout with an integral foam part for the complete torso.

3.5. Abdomen

The abdomen is foam covered with skin. Biomechanical data from children has been used to determine the required stiffness. The Q0 abdomen has a simplified layout with an integral foam part for the complete torso.

3.6. Lumbar

The lumbar spine is a flexible rubber column, which allows shear and bending in all directions. A six channel load cell can be mounted between the lumbar spine and the pelvis, except for the Q0.

3.7. Pelvis

The pelvis is constructed from a iliac-sacrum bone part covered with a plastic flesh outer contour simulation. In the bone part removable hip joints are inserted. An accelerometer array can be mounted in the pelvis. Special hip joints are available that allow to position the dummy in a standing position. The Q0 pelvis has a simplified layout with an integral foam part for the complete torso.

3.8. Legs

The legs are constructed with metal reinforced plastic bones cover with PVC skinned foam parts that represent the upper and lower flesh. The knee joints can be locked in any position. This feature can be used to facilitate positioning the dummy in a standing position. (Note that the dummy does not have the ability to stand without external support.) The Q0 legs have a simplified layout with one integral part per leg with a fixed angle at the knee.

3.9. Arms

The arms are constructed with plastic bones cover with PVC skinned foam parts that represent the upper and lower flesh. The elbow joints can be locked in any position. The Q0 arms have a simplified layout with one integral part per leg with a fixed angle at the knee.

4. Main characteristics

4.1. Mass

Table 1:Q-dummy manikin mass distributions

| | Q0 | Q1 | Q1.5 | Q3 | Q6 | [Q10] (design targets) |
|---|------------------|-----------------|-------------------|-------------------|-------------------|-----------------------------------|
| | Mass in [kg] | | | | | |
| Head + Neck (incl. acc. mount) | 1.10±0.10 | 2.41±0.10 | 2.80±0.10 | 3.17±0.10 | 3.94±0.10 | [4.19] |
| Torso (incl. acc. mount and chest deflection sensor) | 1.50±0.15 | 4.21±0.25 | 4.74±0.25 | 6.00±0.30 | 9.07±0.40 | [14.85] (incl. suit) |
| Legs (together) | 0.58±0.06 | 1.82±0.10 | 3.06±0.10 | 3.54±0.10 | 6.90±0.10 | [12.50] |
| Arms (together) | 0.28±0.03 | 0.89±0.10 | 1.20±0.10 | 1.48±0.10 | 2.49±0.10 | [4.00] |
| Suit | 0.27±0.05 | 0.27±0.05 | 0.30±0.05 | 0.40±0.10 | 0.55±0.10 | (see torso) |
| Total | 3.46±0.34 | 9.6±0.30 | 11.10±0.40 | 14.60±0.40 | 22.90±0.40 | [35.50] |

4.2. Principal dimensions

Table 2:Q-dummy manikin dimensions

| | Q0 | Q1 | Q1.5 | Q3 | Q6 | [Q10] (design targets) |
|---|--------------------|-----------|-------------|-----------|-----------|-----------------------------------|
| | Dimensions in [mm] | | | | | |
| Seating height (head tilted forward) | 355 | 479 | 499 | 544 | 601 | < 748 |
| Shoulder height (sitting) | 225 | 298 | 309 | 329 | 362 | 473 |
| Stature (head tilted forward) | - | 740 | 800 | 985 | 1143 | < 1443 |
| Chest depth | - | 114 | 113 | 146 | 141 | 171 |
| Shoulder width | 230 | 227 | 227 | 259 | 305 | 338 |
| Hip width | - | 191 | 194 | 200 | 223 | 270 |
| Back of buttocks to front of knees | 130 | 211 | 235 | 305 | 366 | 488 |
| Back of buttocks to popliteus | - | 161 | 185 | 253 | 299 | 418 |

OLD TEXT (based on Annex 8 Appendix 1)
TO BE RECONSIDERED

4. Adjustment of joints

4.1. General

4.1.1. In order to achieve reproducible results using the manikins, it is essential to specify and adjust the friction in the various joints, the tension in the neck and lumbar cables, and the stiffness of the abdominal insert.

4.2. Adjustment of the neck cable

4.2.1. Place the torso on its back in a horizontal plane.

4.2.2. Mount the complete neck assembly without the head.

4.2.3. Tighten the tensioner nut on the Atlas-Axis block.

4.2.4. Place a suitable bar or bolt through the Atlas-Axis block.

4.2.5. Loosen the tensioner nut until the Atlas-Axis block is lowered by 10 ± 1 mm when a load of 50 N directed downwards is applied to the bar or bolt through the Atlas-Axis block (see Figure 2).

4.3. Atlas-Axis joint

4.3.1. Place the torso on its back in a horizontal plane.

4.3.2. Mount the complete neck and head assembly.

4.3.3. Tighten the bolt and adjustment nut through the head and the Atlas-Axis block with the head in a horizontal position.

50 N

Figure 2

4.3.4. Loosen the adjustment nut until the head starts moving (see Figure 3).

4.4. Hip joint

4.4.1. Place the pelvis on its front in a horizontal plane.

4.4.2. Mount the upper leg without the lower leg.

4.4.3. Tighten the adjustment nut with the upper leg in a horizontal position.

4.4.4. Loosen the adjustment nut until the upper leg starts moving.

4.4.5. The hip joint should be checked frequently in the initial stages because of "running-in" problems (see Figure 4).

Figure 3

Figure 4

4.5. Knee joint

4.5.1. Place the upper leg in a horizontal position.

4.5.2. Mount the lower leg.

4.5.3. Tighten the adjustment nut of the knee joint with the lower leg in a horizontal position.

4.5.4. Loosen the adjustment nut until the lower leg starts moving (see Figure 5).

4.6. Shoulder joint

4.6.1. Place the torso upright.

4.6.2. Mount the upper arm without the lower arm.

4.6.3. Tighten the adjustment nuts of the shoulder with the upper arm in a horizontal position.

Figure 5

4.6.4. Loosen the adjustment nuts until the upper arm starts moving (see Figure 6).

- 4.6.5. The shoulder joints should be checked frequently in the initial stages because of "running-in" problems.
- 4.7. Elbow joint
 - 4.7.1. Place the upper arm in a vertical position.
 - 4.7.2. Mount the lower arm.
 - 4.7.3. Tighten the adjustment nut of the elbow with the lower arm in a horizontal position.
Figure 6
 - 4.7.4. Loosen the adjustment nut until the lower arm starts moving (see Figure 7).
- 4.8. Lumbar cable
 - 4.8.1. Assemble the upper torso, lumbar vertebrae, lower torso, abdominal insert, cable and spring.
 - 4.8.2. Tighten the cable adjustment nut in the lower torso until the spring is compressed to 2/3 of its unloaded length (see Figure 8).
- 4.9. Calibration of the abdominal insert
 - 4.9.1. General
 - 4.9.1.1. The test shall be carried out by means of a suitable tension-producing machine.
Figure 7
Figure 8
 - 4.9.2. Place the abdominal insert on a rigid block with the same length and width as the lumbar spinal column. The thickness of this block shall be at least twice the thickness of the lumbar spinal column (see Figure 9).
 - 4.9.3. An initial load of 20 N shall be applied.
 - 4.9.4. A constant load of 50 N shall be applied.
 - 4.9.5. The deflection of the abdominal insert after 2 minutes shall be:
for the 9 months dummy : 11.5 ± 2.0 mm
3 years dummy: 11.5 ± 2.0 mm
6 years dummy: 13.0 ± 2.0 mm
10 years dummy: 13.0 ± 2.0 mm
- 5. Instrumentation
 - 5.1. General
 - 5.1.1. The calibration and measuring procedures shall be based upon the international standards ISO 6487 (1980).
 - 5.2. Installation of the accelerometer in the chest
 - The accelerometer shall be mounted in the protected cavity in the chest.
Figure 9
 - 5.3. Indication of abdominal penetration
 - 5.3.1. A sample of modelling clay shall be vertically connected to the front of the lumbar vertebrae by means of thin adhesive tape.
 - 5.3.2. A deflection of the modelling clay does not necessarily mean that penetration has taken place.
 - 5.3.3. The modelling clay samples shall be of the same length and width as the lumbar spinal column; the thickness of the samples shall be 25 ± 2 mm.
 - 5.3.4. Only the modelling clay supplied with the manikins shall be used.
 - 5.3.5. The temperature of the modelling clay during the test shall be $30 \pm 5^\circ\text{C}$.

Annex 9

FRONTAL IMPACT TEST AGAINST A BARRIER

1. Installations, procedure and measuring instruments

1.1. Testing ground

The test area shall be large enough to accommodate the run-up track, barrier and technical installations necessary for the test. The last part of the track, for at least 5 m before the barrier, must be horizontal, flat and smooth.

1.2. Barrier

The barrier consists of a block of reinforced concrete not less than 3 m wide at the front and not less than 1.5 m high. The barrier must be of such thickness that it weighs at least 70 tonnes. The front face must be vertical, perpendicular to the axis of the run-up track, and covered with plywood boards 20 ± 1 mm thick in good condition. The barrier shall be either anchored in the ground or placed on the ground with, if necessary, additional arresting devices to limit its displacement. A barrier with different characteristics, but giving results at least equally conclusive, may likewise be used.

1.3. Propulsion of the vehicle

At the moment of impact, the vehicle must no longer be subjected to the action of any additional steering or propelling device or devices. It must reach the obstacle on a course perpendicular to the collision wall; the maximum lateral disalignment permitted between the vertical median line of the front of the vehicle and the vertical median line of the collision wall is ± 30 cm.

1.4. State of the vehicle

1.4.1. The vehicle under test must either be fitted with all the normal components and equipment included in its unladen service weight or be in such a condition as to fulfil this requirement in so far as the components and equipment of concern to the passenger compartment and the distribution of the service weight of the vehicle as a whole are concerned.

1.4.2. If the vehicle is driven by external means, the fuel installation must be filled to at least 90 percent of its capacity, either with fuel or with a non-inflammable liquid, having a density and a viscosity close to those of the fuel normally used. All other systems (brake-fluid containers, radiator, etc.) must be empty.

1.4.3. If the vehicle is driven by its own engine, the fuel tank must be at least 90 percent full. All other liquid-holding tanks must be filled to capacity.

1.4.4. If the manufacturer so requests, the Technical Service responsible for conducting the tests may allow the same vehicle as is used for tests prescribed by other Regulations (including tests capable of affecting its structure) to be used also for the tests prescribed by this Regulation.

1.5. Impact velocity

The impact velocity must be 50 +0/-2 km/h. However, if the test has been carried out at a higher impact velocity and the vehicle has satisfied the conditions prescribed, the test is considered satisfactory.

1.6. Measuring instruments

The instrument used to record the speed referred to in paragraph 1.5. above shall be accurate within 1 percent.

Annex 10

REAR IMPACT TEST PROCEDURE

1. Installations, procedures and measuring instruments

1.1. Testing ground

The test area shall be large enough to accommodate the propulsion system of the impactor and to permit after-impact displacement of the vehicle impacted and installation of the test equipment. The part in which vehicle impact and displacement occur shall be horizontal. (The slope shall be less than 3 percent measured over any length of one metre.)

1.2. Impactor

1.2.1. The impactor shall be of steel and of rigid construction.

1.2.2. The impacting surface shall be flat and at least 2,500 mm wide and 800 mm high. Its edges shall be rounded to a radius of curvature of between 40 and 50 mm. It shall be clad with a layer of plywood 20 ± 1 mm thick.

1.2.3. At the moment of impact the following requirements shall be met:

1.2.3.1. the impacting surface shall be vertical and perpendicular to the median longitudinal plane of the impacted vehicle;

1.2.3.2. the direction of movement of the impactor shall be substantially horizontal and parallel to the median longitudinal plane of the impacted vehicle;

1.2.3.3. the maximum lateral deviation permitted between the median vertical line of the surface of the impactor and the median longitudinal plane of the impacted vehicle shall be 300 mm. In addition, the impacting surface shall extend over the entire width of the impacted vehicle;

1.2.3.4. the ground clearance of the lower edge of the impacting surface shall be 175 ± 25 mm.

1.3. Propulsion of the impactor

The impactor may either be secured to a carriage (moving barrier) or form part of a pendulum.

1.4. Special provisions applicable where a moving barrier is used

1.4.1. If the impactor is secured to a carriage (moving barrier) by a restraining element, the latter must be rigid and be incapable of being deformed by the impact; the carriage shall, at the moment of impact, be capable of moving freely and no longer be subject to the action of the propelling device.

1.4.2. The combined mass of carriage and impactor shall be $1,100 \pm 20$ kg.

- 1.5. Special provisions applicable where a pendulum is used
- 1.5.1. The distance between the centre of the impacting surface and the axis of rotation of the pendulum shall be not less than 5 m.
- 1.5.2. The impactor shall be freely suspended by rigid arms, rigidly secured to it. The pendulum so constituted shall be substantially incapable of being deformed by the impact.
- 1.5.3. A stopping device shall be incorporated in the pendulum to prevent any secondary impact by the impactor on the test vehicle.
- 1.5.4. At the moment of impact, the velocity of the centre of percussion of the pendulum shall be between 30 and 32 km/h.
- 1.5.5. The reduced mass "m_r" at the centre of percussion of the pendulum is defined as a function of the total mass "m", of the distance "a"^{*} between the centre of percussion and the axis of rotation, and of the distance "l" between the centre of gravity and the axis of rotation, by the following equation:
- $$m_r = m \cdot \frac{l}{a}$$
- 1.5.6. The reduced mass "m_r" shall be 1,100 ± 20 kg.
- 1.6. General provisions relating to the mass and velocity of the impactor
- If the test has been conducted at an impact velocity higher than those prescribed in paragraph 1.5.4. and/or with a mass greater than those prescribed in paragraphs 1.5.3. or 1.5.6., and the vehicle has met the requirements prescribed, the test shall be considered satisfactory.
- 1.7. State of the vehicle during the test
- The vehicle being tested shall either be fitted with all the normal components and equipment included in its unladen service weight or be in such condition as to fulfil this requirement in so far as the distribution of the service weight of the vehicle as a whole is concerned.
- 1.8. The complete vehicle with the child restraint installed in accordance with the fitting instructions shall be placed on a hard, flat and level surface, with the handbrake off and in neutral gear. More than one child restraint may be tested in the same impact test.

Annex 11

* / The distance "a" is equal to the length of the synchronous pendulum under consideration.

Annex 12

Annex 13

Annex 14

Annex 15

Annex 16

Annex 17

TEST OF ENERGY ABSORBING MATERIAL

1 Headform

- 1.1 The headform shall consist of a solid wooden hemisphere with an added smaller spherical segment as shown in Figure A below. It shall be constructed so that it can be dropped freely along the axis marked and it shall have provision for mounting an accelerometer in order to measure the acceleration along the direction of fall.
- 1.2 The headform shall have a total mass, including the accelerometer of 2.75 ± 0.05 kg.

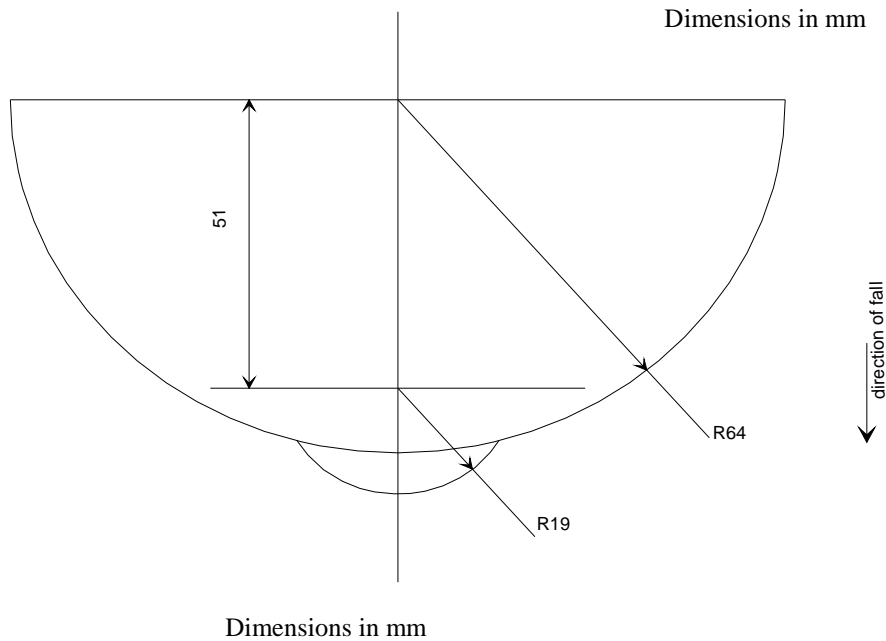


Figure A: Headform

2 Instrumentation

The acceleration shall be recorded during the test, using equipment in accordance with channel frequency class 1000 as specified in the latest version of ISO 6487.

3 Procedure

- 3.3 The test shall be conducted on a completely assembled child restraint with a minimum of modification only where necessary to ensure access for the support (directly beneath the

point of impact) and for the impactor device and such that there is minimal effect on the performance by the modification.

- 3.4** The assembled child restraint shall be fully supported on its outer surface in the region of impact and be supported directly beneath the point of impact on a smooth rigid base, for example a solid concrete plinth.
- 3.5** Raise the headform to a height of $100 -0/+5$ mm from the respective upper surfaces of the assembled child restraint to the lowest point on the headform, and allow it to fall. Record the acceleration experienced by the headform during impact.

Annex 18

METHOD OF DEFINING HEAD IMPACT AREA OF DEVICES WITH BACKRESTS AND FOR REARWARD-FACING DEVICES DEFINING THE MINIMUM SIZE OF SIDE WINGS

1. Place the device on the test seat described in Annex 6. Reclinable devices shall be set in the most upright position. Place the smallest manikin in the device in accordance with the manufacturer's instructions. Mark a point "A" on the backrest on the same horizontal level as the shoulder of the smallest manikin at a point 2 cm inside the outer edge of the arm. All internal surfaces above the horizontal plane passing through point A shall comprise special energy-absorbing material tested in accordance with Annex 17. This material shall cover the internal surfaces of the backrest and side wings, including the inner edges (zone of radius) of the side wings. The energy absorbing material may be an integral part of the child seat. In the case of carry cot devices where a symmetrical installation of the dummy is not possible according to the device and manufacturer instructions, the lower limit of area at which material complying with Annex 17 shall be used, shall be all areas beyond dummy's shoulder in the head direction, when measured with this dummy in the carry cot in its worst position consistent with the manufactures instructions and the carry cot positioned on the test bench.

If a symmetrical installation of the dummy in the carry-cot may be possible, the whole inner surfaces shall be covered with material complying with Annex 17; this material has to fulfill its purpose together with the inner side structure; the Technical Service may assess this aspect with further tests.

2. For rearward-facing devices there shall be side wings with a depth of minimum 90 mm measured from the median of the surface of the backrest. These side wings shall start at the horizontal plane passing through point "A" and continue to the top of the seat back. Starting from a point 90 mm below the top of the seat back, the depth of the side wing may be gradually reduced.