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Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

The titles of all other acts are printed in bold type and preceded by an asterisk.

II

(Non-legislative acts)

ACTS ADOPTED BY BODIES CREATED BY INTERNATIONAL AGREEMENTS

Only the original UN/ECE texts have legal effect under international public law. The status and date of entry into force of this Regulation should be checked in the latest version of the UN/ECE status document TRANS/WP.29/343, available at:

<http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29fdocsts.html>

Regulation No 44 of the Economic Commission for Europe of the United Nations (UNECE) — Uniform provisions concerning the approval of restraining devices for child occupants of power-driven vehicles ('Child Restraint Systems') [2016/1722]

Incorporating all valid text up to:

Supplement 10 to the 04 series of amendments — Date of entry into force: 18 June 2016

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1. SCOPE

- 1.1. This Regulation applies to child restraint systems which are suitable for installation in power-driven vehicles having three or more wheels, and which are not intended for use with folding (tip-up) or with side-facing seats.

2. DEFINITIONS

For the purpose of this Regulation:

- 2.1. Child restraint system ('restraint') 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 carrycot, 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.

'ISOFIX' is a system for the connection of child restraint systems to vehicles which has two vehicle rigid anchorages, two corresponding rigid attachments on the child restraint system and a mean to limit the pitch rotation of the child restraint system.

- 2.1.1. Child restraints fall into five 'mass groups':
- 2.1.1.1. Group 0 for children of a mass less than 10 kg;
- 2.1.1.2. Group 0+ for children of a mass less than 13 kg;
- 2.1.1.3. Group I for children of mass from 9 kg to 18 kg;
- 2.1.1.4. Group II for children of mass from 15 kg to 25 kg;
- 2.1.1.5. Group III for children of mass from 22 kg to 36 kg.

2.1.1.6. ISOFIX child restraint systems fall into 7 ISOFIX size classes described in Regulation No 16, Annex 17, Appendix 2:

- A — ISO/F3: Full Height Forward Facing toddler CRS
- B — ISO/F2: Reduced Height Forward Facing toddler CRS
- B1 — ISO/F2X: Reduced Height Forward Facing Toddler CRS
- C — ISO/R3: Full Size Rearward Facing toddler CRS
- D — ISO/R2: Reduced Size Rearward Facing toddler CRS
- E — ISO/R1: Rearward Facing infant CRS
- F — ISO/L1: Left Lateral Facing position CRS (carrycot)
- G — ISO/L2: Right Lateral Facing position CRS (carrycot)

Mass group		ISOFIX size category
0 — up to 10 kg	F	ISO/L1
	G	ISO/L2
	E	ISO/R1
0+ — up to 13 kg	C	ISO/R3
	D	ISO/R2
	E	ISO/R1
I — 9 to 18 kg	A	ISO/F3
	B	ISO/F2
	B1	ISO/F2X
	C	ISO/R3
	D	ISO/R2

2.1.2. Child restraints fall into four 'categories':

2.1.2.1. A 'universal' category for use as specified in paragraphs 6.1.1, 6.1.3.1, and 6.1.3.2 on most vehicle seat positions, and in particular those which have been assessed according to Regulation No 16, — as being compatible with such a category of child restraint;

2.1.2.2. A 'restricted' category for use as specified in paragraphs 6.1.1 and 6.1.3.1 in designated seat positions for particular vehicle types as indicated by either the child restraint manufacturer or the vehicle manufacturer;

2.1.2.3. A 'semi-universal' category for use as specified in paragraphs 6.1.1 and 6.1.3.2;

2.1.2.4. A 'specific vehicle' category for use either:

2.1.2.4.1. On specific vehicle types, in accordance with paragraphs 6.1.2 and 6.1.3.3; or

2.1.2.4.2. As a 'built in' child restraint.

- 2.1.3. The retention system of child restraint systems may be of two classes:
- An integral class if the retention of the child within the restraint system is independent of any means directly connected to the vehicle;
- A non-integral class if the retention of the child within the restraint system is dependent upon any means directly connected to the vehicle.
- 2.1.3.1. 'Partial restraint' means a device, such as a booster cushion, which, when used in conjunction with an adult seat belt, which passes around the body of the child or restrains the device in which the child is placed, forms a complete child restraint system.
- 2.1.3.2. 'Booster cushion' means a firm cushion, which can be used with an adult seat belt.
- 2.2. 'Child-safety chair' means a child restraint incorporating a chair in which the child is held.
- 2.3. 'Belt' means a child restraint comprising a combination of straps with a securing buckle, adjusting devices and attachments.
- 2.4. 'Chair' means a structure which is a constituent part of the child restraint and is intended to accommodate a child in a seated position.
- 2.4.1. 'Carrycot' 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.
- 2.4.2. 'Carrycot restraint' means a device used to restrain a carrycot to the structure of the vehicle.
- 2.4.3. '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.
- 2.5. 'Chair support' means that part of a child restraint by which the chair can be raised.
- 2.6. 'Child support' means that part of a child restraint by which the child can be raised within the child restraint.
- 2.7. '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.
- With reference to paragraph 2.1.3, these are divided in two classes:
- Class A: Integral
- Class B: Non integral.
- 2.8. 'Strap' means a flexible component designed to transmit forces.
- 2.8.1. '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, directly or not, the child's pelvis.
- 2.8.2. 'Shoulder restraint' means that part of a belt which restrains the child's upper torso.
- 2.8.3. '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.
- 2.8.4. 'Child-restraining strap' means a strap which is a constituent part of the belt and restrains only the body of the child.

- 2.8.5. 'Child-restraint attachment strap' means a strap which attaches the child restraint to the structure of the vehicle and may be a part of the vehicle-seat retaining device.
- 2.8.6. 'Harness belt' means a belt assembly comprising a lap belt, shoulder restraints and, where fitted, a crotch strap.
- 2.8.7. '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.
- 2.8.8. 'Guide strap' means a strap which constrains the shoulder strap of the adult seat belt in a position to suit the child and where the effective position at which the shoulder strap changes direction can be adjusted by means of a device which can be moved up and down the strap to locate the wearer's shoulder, and then locked into that position. This guide strap is not meant to carry a significant part of the dynamic load.
- 2.9. '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.
- 2.9.1. 'Enclosed buckle release button', a buckle release button such that it shall not be possible to release the buckle using a sphere having a diameter of 40 mm.
- 2.9.2. 'Non-enclosed buckle release button', a buckle release button such that it shall be possible to release the buckle using a sphere having a diameter of 40 mm.
- 2.10. 'Adjusting device' means a device enabling the restraint 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.
- 2.10.1. 'Quick adjuster' means an adjusting device which can be operated by one hand in one smooth movement.
- 2.10.2. 'Adjuster mounted directly on child restraint' means an adjuster for the integral harness which is directly mounted on the child restraint, as opposed to being directly supported by the webbing that it is designed to adjust.
- 2.11. 'Attachments' means parts of the child restraint, including securing components, which enable the child restraint to be firmly secured to the vehicle structure either directly or through the vehicle seat.
- 2.11.1. '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 support leg may be adjustable.
- 2.12. '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.
- 2.13. '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:
 - 2.13.1. 'An 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;
 - 2.13.2. 'An 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:
 - 2.13.2.1. Deceleration of the vehicle, extraction of the strap from the retractor, or any other automatic means (single sensitivity); or
 - 2.13.2.2. A combination of any of these means (multiple sensitivity).

- 2.14. 'Restraint anchorages' means these parts of the vehicle structure or seat structure to which the child-restraint attachments are secured.
- 2.14.1. 'Additional anchorage' means a part of the vehicle structure or of the vehicle seat structure, or any other part of the vehicle, to which a child restraint is intended to be secured and which is additional to the anchorages approved under Regulation No 14. This includes the trolley floor pan as described in Annex 6 or other structural features of a the specific vehicle(s) when loaded by a support leg.
- 2.14.2. '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.
- 2.14.3. 'ISOFIX anchorages system' means a system made up of two ISOFIX low anchorages fulfilling the requirements of Regulation No 14 which is designed for attaching an ISOFIX child restraint system in conjunction with an anti-rotation device.
- 2.14.4. 'Anti-rotation device'
- (a) An anti-rotation device for an ISOFIX universal child restraint system consists of the ISOFIX top-tether.
 - (b) 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.
 - (c) For ISOFIX, universal and semi-universal, child restraint systems the vehicle seat itself does not constitute an anti-rotation device.
- 2.14.5. '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. 'Forward-facing' means facing in the normal direction of travel of the vehicle.
- 2.16. 'Rearward-facing' means facing in the direction opposite to the normal direction of travel of the vehicle.
- 2.17. 'Inclined position' means a special position of the chair which allows the child to recline.
- 2.18. '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.
- 2.19. 'Child-restraint type' means child restraints which do not differ in such essential respects as:
- 2.19.1. 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;
 - 2.19.2. The geometry of the child restraint;
 - 2.19.3. The dimensions, mass, material and colour of:
 - (a) The seat;
 - (b) The padding; and
 - (c) The impact shield;
 - 2.19.4. The material, weave, dimensions and colour of the straps;
 - 2.19.5. The rigid components (buckle, attachments, etc.).

- 2.20. '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:
- 2.20.1. '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;
- 2.20.2. 'Vehicle bench seat' means a structure complete with trim and intended to seat more than one adult person;
- 2.20.3. '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;
- 2.20.4. 'Vehicle rear seats' are fixed, forward-facing seats situated behind another group of vehicle seats;
- 2.20.5. '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 ISOFIX child restraint system as defined in this Regulation.
- 2.21. '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:
- 2.21.1. Longitudinal displacement, and/or
- 2.21.2. Vertical displacement, and/or
- 2.21.3. Angular displacement.
- 2.22. '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.
- 2.23. 'Seat type' means a category of adult seats which do not differ in such essential respects as:
- 2.23.1. The shape, dimensions and materials of the seat structure;
- 2.23.2. The types and dimensions of the seat-lock adjustment and locking systems; and
- 2.23.3. 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.
- 2.24. '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.
- 2.25. 'Locking system' means a device ensuring that the adult seat and its parts are maintained in the position of use.

- 2.26. 'Lock-off device' is a device which locks and prevents movement of one section of the webbing of an adult safety belt relative to another section of the webbing of the same belt. Such devices may act upon either diagonal or lap section or secure together both lap and diagonal sections of the adult belt. The term covers the following classes:
- 2.26.1. 'Class A device', a device that prevents the child pulling webbing from the retractor through to the lap part of the belt, when the adult belt is used to restrain the child directly;
- 2.26.2. 'Class B device', a device that allows the retention of an applied tension in the lap part of an adult safety belt, when the adult belt is used to restrain the child restraint. The device is intended to prevent webbing slipping from the retractor through the device, which would release the tension and place the restraint in a non-optimal position.
- 2.27. 'Special Needs Restraint' is a child restraint system designed for children who have special needs as a result of either a physical or mental handicap; this device may in particular permit additional restraining devices for any part of the child, but it shall contain as a minimum a primary means of restraint which complies with the requirements of this Regulation.
- 2.28. '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.
- 2.29. 'ISOFIX child restraint system' means a child restraint system which has to be attached to an ISOFIX anchorage system fulfilling the requirement of Regulation No 14.
- 2.30. 'Seat bight' means the area close to the intersection of the surfaces of the vehicle seat cushion and the seat back.
- 2.31. 'Vehicle seat fixture (VSF)' means a fixture, according to ISOFIX size classes defined in paragraph 2.1.1.6 and whose dimension are given in Figures 1 to 6 of Annex 17, Appendix 2 to 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.
- 2.32. 'ISOFIX top tether connector' means a device intended to be attached to an ISOFIX top tether anchorage.
- 2.33. '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.
- 2.34. '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.
- 2.35. 'ISOFIX top tether attachment' is a device to secure the ISOFIX top tether strap to the ISOFIX child restraint system.
- 2.36. 'A tension relieving device' means a system which allows to release the device which adjusts and maintains the tension in the ISOFIX top tether strap.
- 2.37. 'Adult safety belt webbing guide' means a device through which the adult belt passes for its correct routing, that allows free webbing movement.
- 2.38. '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.
- 2.39. 'Production qualification 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.

- 2.40. 'Routine 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.
- 2.41. 'Child Restraint System Displacement system' means a device enabling the CRS or one of its parts to be displaced angularly or longitudinally.
- 2.42. 'Child Restraint System Locking system' means a device ensuring that the CRS and its parts are maintained in the position of use.
- 2.43. 'Load limiting device' means a device that can break or jam under specified loading conditions. The device shall be explicitly designed for these conditions and its behaviour shall be reproducible and objectively documented in the technical documentation.

3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a type of child restraint 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, shall be accompanied by:
 - 3.2.1. A technical description of the child restraint, specifying the straps and other materials used together with the predicted and reproducible behaviour of load limiting devices. It shall be accompanied by drawings of the parts making up the child restraint 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 shall 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;
 - 3.2.3. A 10-metre length of each category of strap used in the child restraint; 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 15 below;
 - 3.2.6. In case of carrycots, if the carrycot restraint may be used in combination with a number of types of carrycots, 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 shall stipulate the category of adult safety belt to be used, e.g. static lap belts.
- 3.4. The Type Approval Authority of a Contracting Party shall 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 device (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. Devices that can be installed rearward and forward facing without changing the belt routing (e.g. turnable system) shall use both colours. The same colours shall also be used on the labels on the device that illustrate the methods of use.

There shall 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 shall be clearly indicated. Belt route diagrams that do not show the vehicle seat are not acceptable.

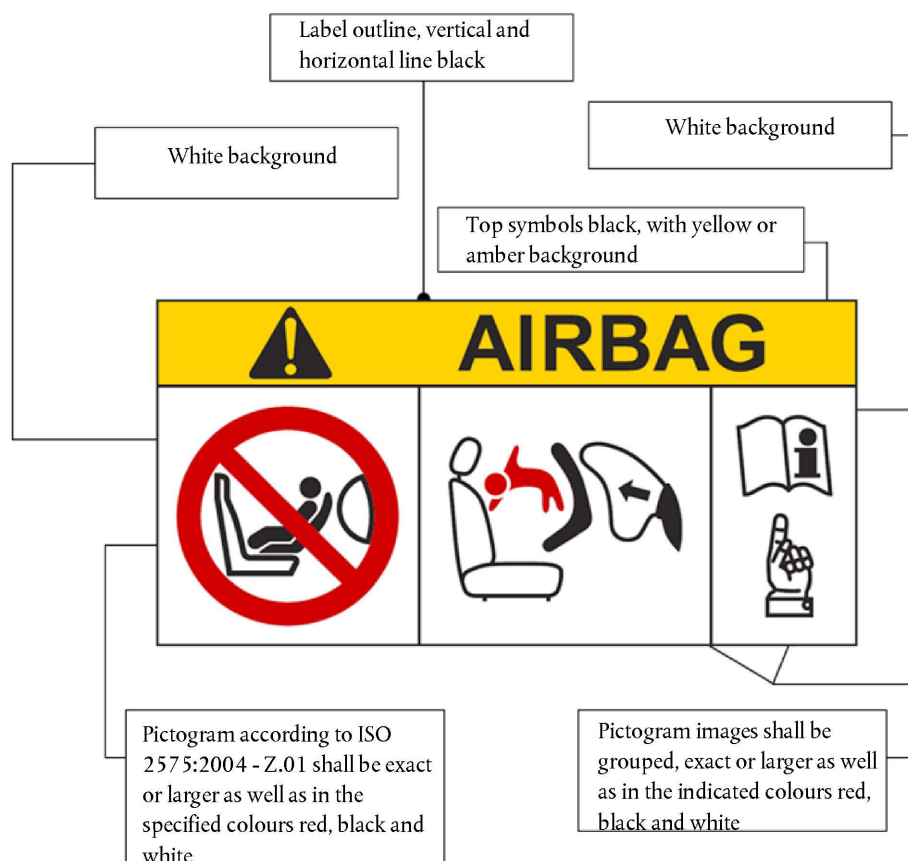
The marking defined in this paragraph shall be visible with the restraint in the vehicle. For group 0 restraints, this marking shall also be visible with the child in the restraint.

- 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 system, rearward facing restraints shall have the following label permanently attached (the information shown is a minimum).

Label minimum size: 60 × 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.

If sections of the restraint or any accessories supplied by the child restraint system 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 WEIGHT EXCEEDS (Refer to instructions)’

- 4.6. In the case of child restraints with alternative belt routes, the alternative load bearing contact points between the child restraint and the adult safety belt shall 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. ISOFIX marking

If the product includes ISOFIX attachments, the following information shall be permanently visible to someone installing the restraint in a vehicle:

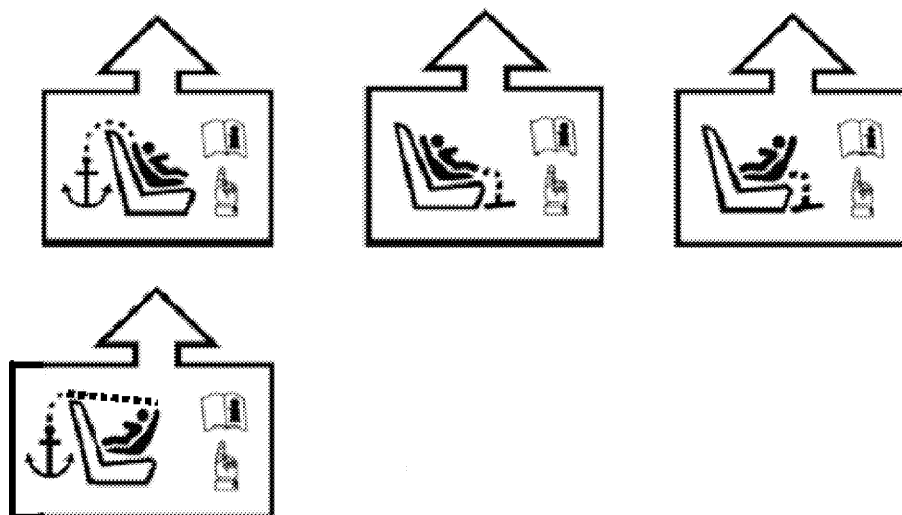
The ISO ISOFIX logo followed by the letter(s) that is/are appropriate for the ISOFIX size class(es) into which the product fits. As a minimum, a symbol consisting of a circle with a diameter of minimum 13 mm and containing a pictogram, the pictogram shall contrast with the background of the circle. The pictogram shall be clearly visible either by means of contrast colours or by adequate relief if it is moulded or embossed.



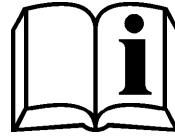
B, C and F

The following information may be conveyed by pictograms and/or text. The marking shall indicate:

- (a) The essential relevant steps needed for making the seat ready for installation. For example, the method of extending the ISOFIX latch system shall be explained;
- (b) The position, function, and interpretation of any indicator shall 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, shall 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 shall be indicated;
- (e) The marking shall 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 04 corresponding to the 04 series of amendments which entered into force on 12 September 1995) 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 covered by this Regulation.
- 5.3. Notice of approval or of extension or refusal of approval of a child restraint 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 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) 'universal', 'restricted', 'semi-universal' or 'vehicle specific' depending on the category of restraint;
 - 5.4.2.2. The mass 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.

⁽¹⁾ The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev. 3, Annex 3 — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

- 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.
- 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 'universal', 'semi-universal' and 'restricted' categories is permitted in the front and rear seat positions if the restraints are fitted in conformity with the manufacturer's instructions.
- 6.1.2. The use of child restraints in the 'specific vehicle' category is permitted in all seat positions and also in the luggage area if the restraints are fitted in conformity with the manufacturer's instructions. In the case of a rear-facing restraint, the design shall ensure that support for the child's head is provided whenever the restraint is ready to use. This is to be determined as a line perpendicular to the seat back through the eye line, the point of intersection shall be at least 40 mm below the start of radius of such a head support.
- 6.1.3. According to the category which it belongs to, the child restraint shall be secured to the vehicle structure or to the seat structure.

Possible configurations for approval

Groups/categories table

Group category		Universal (1)		Semi-universal (2)		Restricted		Specific vehicle	
		CRS	ISOFIX CRS	CRS	ISOFIX CRS	CRS	ISOFIX CRS	CRS	ISOFIX CRS
0	Carrycot	A	NA	A	A	A	NA	A	A
	Rearward facing	A	NA	A	A	A	NA	A	A
0+	Rearward facing	A	NA	A	A	A	NA	A	A
I	Rearward facing	A	NA	A	A	A	NA	A	A
	Forward facing (integral)	A	A	A	A	A	NA	A	A
	Forward facing (non-integral)	NA	NA	NA	NA	NA	NA	NA	NA
	Forward facing (non-integral — see paragraph 6.1.12)	A	NA	A	NA	A	NA	A	A
II	Rearward facing	A	NA	A	NA	A	NA	A	A
	Forward facing (integral)	A	NA	A	NA	A	NA	A	A
	Forward facing (non integral)	A	NA	A	NA	A	NA	A	A

Group category		Universal ⁽¹⁾		Semi-universal ⁽²⁾		Restricted		Specific vehicle	
		CRS	ISOFIX CRS	CRS	ISOFIX CRS	CRS	ISOFIX CRS	CRS	ISOFIX CRS
III	Rearward facing	A	NA	A	NA	A	NA	A	A
	Forward facing (integral)	A	NA	A	NA	A	NA	A	A
	Forward facing (non integral)	A	NA	A	NA	A	NA	A	A

With:

CRS: Child restraint system

A: Applicable

NA: Not Applicable

⁽¹⁾ ISOFIX universal CRS means forward facing restraints for use in vehicles with positions equipped with ISOFIX anchorages system and a top tether anchorage.

⁽²⁾ ISOFIX semi universal CRS means:

- Forward facing restraints equipped with support leg or
- Rearward facing restraints equipped with a support leg or a top tether strap for use in vehicles with positions equipped with ISOFIX anchorages system and a top tether anchorage if needed
- Or rearward facing restraints, supported by the vehicle dashboard, for use in the front passenger seat equipped with ISOFIX anchorages system,
- Or lateral facing position restraint equipped if needed with an anti-rotation device for use in vehicles with positions equipped with ISOFIX anchorages system and top tether anchorage if needed.

6.1.3.1. For the 'universal' and 'restricted' categories, by means of an adult safety belt (with or without a retractor) meeting the requirements of Regulation No 16 (or equivalent) fitted to anchorages meeting the requirements of Regulation No 14 (or equivalent).

6.1.3.2. For ISOFIX 'universal' child restraint systems by means of ISOFIX attachments and ISOFIX top tether strap meeting the requirements of this Regulation fitted to ISOFIX anchorages system and ISOFIX top tether anchorage meeting the requirements of Regulation No 14.

6.1.3.3. For the 'semi-universal' category: by means of the lower anchorages prescribed in Regulation No 14 and additional anchorages meeting the recommendation of Annex 11 to this Regulation.

6.1.3.4. For ISOFIX 'semi-universal' Child Restraint Systems by means of ISOFIX attachments and ISOFIX top tether strap or a support leg or vehicle dashboard, meeting the requirements of this Regulation fitted to ISOFIX anchorages and/or to ISOFIX top tether anchorage meeting the requirements of Regulation No 14.

6.1.3.5. For the 'specific vehicle' category: by means of the anchorages designed by the manufacturer of the vehicle or the manufacturer of the child restraint.

6.1.3.6. In the case of child restraining straps or child restraint attachment strap utilizing belt anchorages to which are already fitted an adult belt or belts, the Technical Service shall check that:

The effective adult anchorage position is as approved under Regulation No 14 or equivalent;

Effective operation of both devices is not hindered by the other;

The buckles of the adult and additional system shall not be interchangeable.

In the case of child restraining devices utilizing bars, or extra devices attached to the anchorages approved under Regulation No 14, which move the effective anchorage position outside the field of Regulation No 14, the following points shall apply:

Such devices will only be approved as semi-universal or specific vehicle devices;

The Technical Service shall apply the requirements of Annex 11 to this Regulation to the bar and the fastenings;

The bar will be included in the dynamic test, with the loading being applied to the mid-position and the bar and its greatest extension, if adjustable;

The effective position and operation of any adult anchorage by which the bar is fixed shall not be impaired.

6.1.3.7. Child restraints utilizing a support leg shall only be approved under the 'semi-universal' or the 'specific vehicle' category and the requirements of Annex 11 to this Regulation shall be applied. The manufacturer of the child restraint system shall take into account the needs of the support leg for their correct functioning in each vehicle and provide this information.

6.1.4. A booster cushion shall be restrained by either an adult belt, using the test as specified in paragraph 8.1.4, or by separate means.

6.1.5. 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 EN 71:2009, part 3. Tests confirming the validity of the declaration may be carried out at the discretion of the test authority. This paragraph does not apply to restraint devices of groups II and III.

6.1.6. 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 parts of EN 71:2009 part 2. Tests confirming the validity of the declaration may be carried out at the discretion of the test authority.

6.1.7. In the case of rearward-facing child restraints supported by the vehicle dashboard, for the purpose of approval to this Regulation the dashboard is assumed to be sufficiently rigid.

6.1.8. Child restraint systems of the 'universal' category, except ISOFIX universal child restraint systems, shall have a main load-bearing contact point, between the child restraint and the adult safety belt. This point shall not be less than 150 mm from the Cr axis when measured with the child restraint on the dynamic test bench installed in accordance with Annex 21 to this Regulation, without a dummy. This shall apply to all adjustment configurations. Additional alternative belt routes are allowed. Where an alternative belt route exists, the manufacturer shall make specific reference to the alternative route in the user instructions, as required in paragraph 15. When tested, using such alternative belt route(s), the restraint shall comply with all the requirements of the Regulation with the exception of this paragraph.

6.1.9. If the adult belt is required to secure a 'universal' category child restraint, its maximum length to be used on the dynamic test bench is defined in Annex 13 to this Regulation.

To check compliance with this requirement, the child restraint shall be secured onto the test bench using the appropriate standard seat belt described in Annex 13. The dummy shall not be installed unless the design of the restraint is such that the installation of a dummy would increase the amount of belt used. With the child restraint in the installed position there shall be no tension in the belt apart from that exerted by the standard retractor, where fitted. Where the retractor belt is used, this condition shall be met with at least 150 mm of belt remaining on the spool.

- 6.1.10. Child restraints of groups 0 and 0+ shall not be used forward facing.
- 6.1.11. Child restraint systems of groups 0 and 0+, with the exception of carrycots as defined in paragraph 2.4.1, shall belong to the integral class.
- 6.1.12. Child restraint systems of group I shall belong to the integral class unless they are fitted with an impact shield of Class B, as defined in paragraph 2.7 of this Regulation.
- 6.2. Configuration
 - 6.2.1. The configuration of the restraint shall be such that:
 - 6.2.1.1. The restraint gives the required protection in any intended position of the restraint system; for 'Special Needs Restraints' the primary means of restraint shall give the required protection in any intended position of the restraint system without the use of the additional restraining devices which may be present.
 - 6.2.1.2. The child is easily and quickly installed 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.

In these cases the belt assembly of the child restraint system 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 installed and removed. However, the additional devices shall be designed to release quickly so far as possible.
 - 6.2.1.3. If it is possible to change the inclination of the restraint, this change in inclination shall not require manual readjustment of the straps. A deliberate hand-action is required in order to change the inclination of the restraint.
 - 6.2.1.4. The groups 0, 0+ and I restraint systems shall keep the child so positioned as to give the required protection even when the child is asleep.
 - 6.2.1.5. For all forward-facing group I restraints incorporating an integral harness belt system to prevent submarining, either by impact or through restlessness, a crotch strap shall be required.
 - 6.2.2. For groups I, II and III, all restraint devices utilizing a 'lap strap' shall positively guide the 'lap strap' to ensure that the loads transmitted by the 'lap strap' are transmitted through the pelvis. The assembly shall not subject weak parts of the child's body (abdomen, crotch, etc.) to excessive stresses.
 - 6.2.2.1. 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 both the smallest and largest dummy within the mass groups covered by the approval. For all forward-facing restraints, it shall not be possible to adjust the lap strap to lie above the pelvis of both the smallest and largest dummy within the mass groups covered by the approval.
 - 6.2.2.2. During the dynamic test, as prescribed in paragraph 8.1.3, the lap belt shall not pass fully beyond the pelvic structure of the dummy, during the period prior to maximum horizontal head excursion. Assessment shall be carried out using high speed video imaging.
 - 6.2.3. All straps of the restraint shall be so placed that they cannot cause discomfort to the wearer in normal use or assume a dangerous configuration. The distance between the shoulder-straps in the vicinity of the neck should be at least the width of the neck of the appropriate manikin.
 - 6.2.4. 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.
 - 6.2.4.1. Y-shaped belts may only be used in rearward facing and lateral facing child restraint systems (carrycots).

- 6.2.5. The child restraint shall be so designed and installed as:
- 6.2.5.1. To minimize the danger of injury to the child or to other occupants of the vehicle through sharp edges or protrusions (as defined in Regulation No 21, for example);
 - 6.2.5.2. Not to exhibit sharp edges or protrusions liable to cause damage to vehicle-seat covers or to occupant's clothing;
 - 6.2.5.3. Not to subject weak parts of the child's body (abdomen, crotch, etc.) to supplementary inertial forces it sets up;
 - 6.2.5.4. 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.
- 6.2.6. Any part made separable to enable components to be fixed and detached shall be so designed as to avoid any risk of incorrect assembly and use so far as possible. '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.
- 6.2.7. Where the child restraint intended for group I, group II and groups I and II combined includes a chair back, the internal height of the latter, determined in accordance with the diagram in Annex 12, shall be not less than 500 mm.
- 6.2.8. Only automatically-locking retractors or emergency-locking retractors may be used.
- 6.2.9. For devices intended for use in Group I it shall not be possible for the child to easily slacken that part of the system that restrains the pelvis after the child has been installed; for this purpose the requirements of paragraph 7.2.5 (lock-off devices) shall be fulfilled; any device that is designed to obtain this shall be permanently attached to the child restraint system.
- 6.2.10. A child restraint may be designed for use in more than one mass group and/or by more than one child, provided that it is able to satisfy the requirements laid down for each of the groups concerned. A child restraint in the 'universal' category shall meet the requirements of that category for all mass groups for which it has been approved.
- 6.2.11. Child restraints with retractor
- In the case of a child restraint incorporating a retractor, the retractor shall have met the requirements of paragraph 7.2.3 below.
- 6.2.12. In case of booster cushions, the ease with which the straps and tongue of an adult belt pass through the fixture points shall be examined. This goes particularly for booster cushions which are designed for the front seats of cars, which may have long semi-rigid stalks. The fixed buckle should not be allowed to pass through the fixture points of booster seats, or to permit a lie of belt completely different from that of the test-trolley.
- 6.2.13. If the child restraint is designed for more than one child, each restraint system shall be fully independent with regard to load transfer and adjustments.
- 6.2.14. The child restraints incorporating inflatable elements shall be so designed that the conditions of use (pressure, temperature, humidity) have no influence on their ability to comply with the requirements of this Regulation.

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 shall engage are defined for the ISOFIX child restraint system manufacturer by the Vehicle Seat Fixture (VSF) defined by paragraph 2.31 of this Regulation.

6.3.1.2. Mass

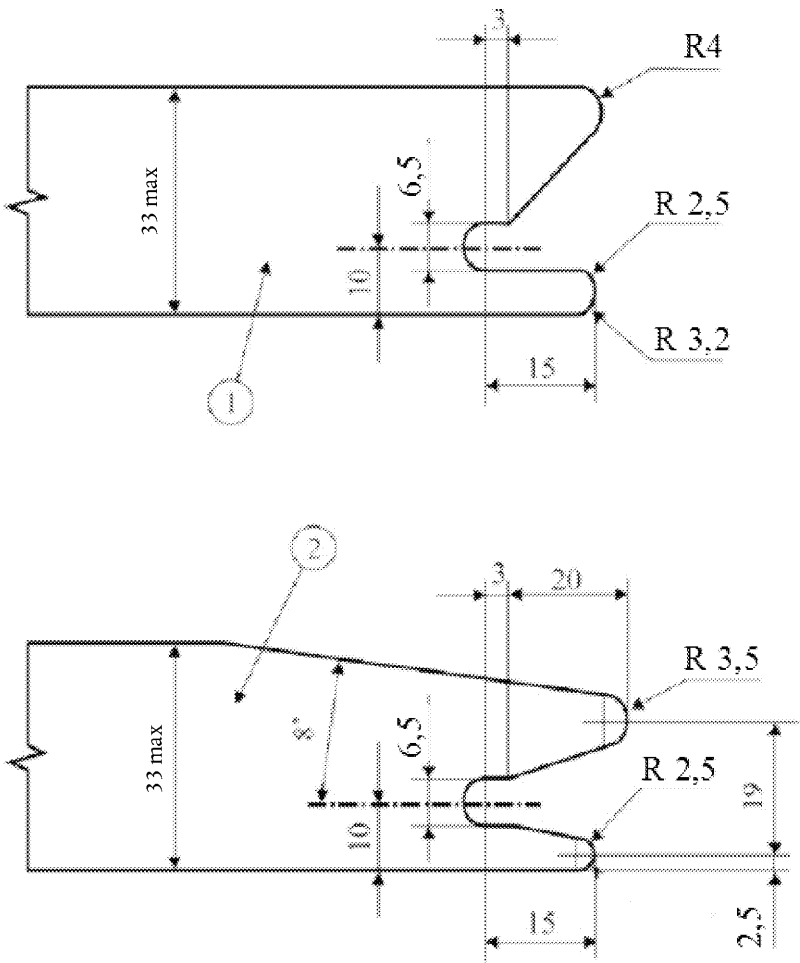
The mass of an ISOFIX child restraint system of universal and semi-universal categories and of mass group 0, 0+, 1 shall not exceed 15 kg.

6.3.2. ISOFIX attachments

6.3.2.1. Type

ISOFIX attachments may be according to examples shown in Figure 0 (a) below, 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.

Figure 0 (a)



Dimensions in mm

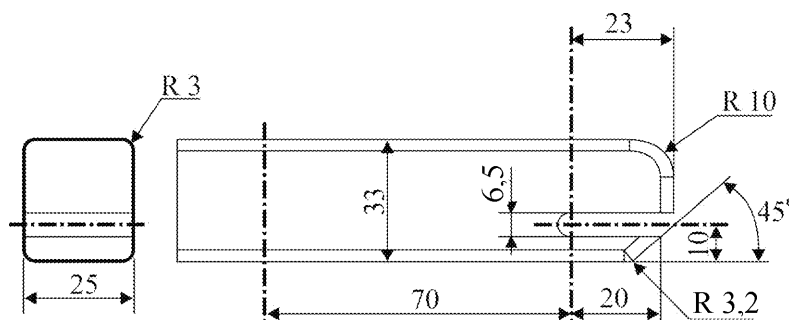
Key

- 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 shall not exceed the maximum dimensions given by the envelope in Figure 0 (b)

Figure 0 (b)



Dimensions in mm

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 shall 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

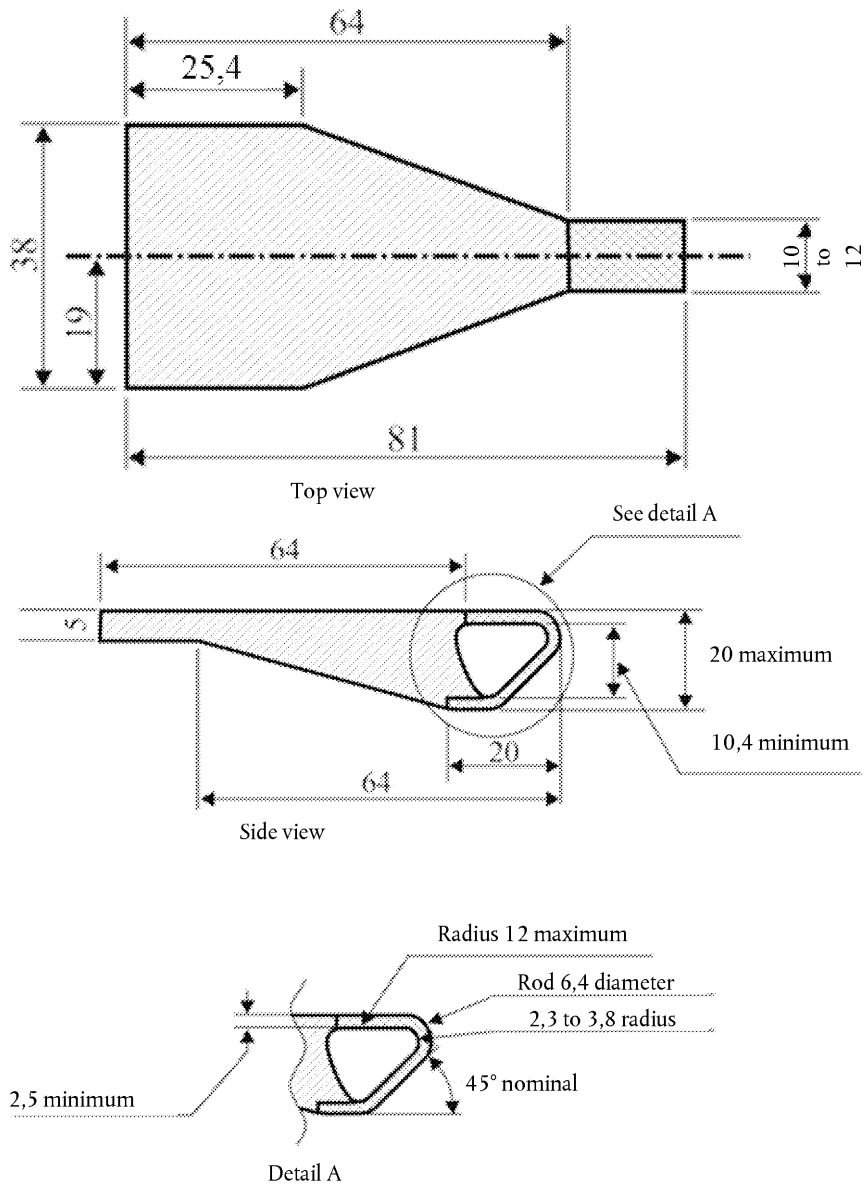
The ISOFIX top tether strap or the ISOFIX child seat shall be equipped with a device that will indicate that all slack has been removed from the strap. The device may be part of adjustment and tension relieving device.

6.3.3.2.3. Dimensions

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

Figure 0 (c)

ISOFIX top tether connector (hook type) dimensions



Dimensions in millimetres

Legend:

- Surrounding structure (if present)
- Area in which the tether strap hook interface profile must be wholly located

- 6.3.4. Adjustment provisions

The ISOFIX attachments, or the ISOFIX child restraint system itself, shall be adjustable to accommodate the range of ISOFIX anchorage locations described in Regulation No 14.
- 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 15.

- 7. PARTICULAR SPECIFICATIONS
- 7.1. Provisions applicable to the assembled restraint
 - 7.1.1. Resistance to corrosion
 - 7.1.1.1. A complete child restraint, or the parts thereof that are liable to corrosion, shall be subject to the corrosion test specified in paragraph 8.1.1 below.
 - 7.1.1.2. After the corrosion test as prescribed in paragraphs 8.1.1.1 and 8.1.1.2, no signs of deterioration likely to impair the proper functioning of the child restraint, and no significant corrosion, shall be visible to the unaided eye of a qualified observer.
 - 7.1.2. Energy absorption
 - 7.1.2.1. For all devices with backrests, the areas defined in Annex 18 to this Regulation, when tested according to Annex 17, shall give a peak acceleration of less than 60 g. This requirement applies also to areas of impact shields which are in the head strike area.
 - 7.1.2.2. In the case of child restraint systems with permanent mechanically attached adjustable head support devices, in which the height of either the adult safety belt or of the child harness is directly controlled by the adjustable head support, it is not necessary to demand energy absorption in areas as defined in Annex 18, which are not contactable by the manikin's head, i.e. behind the head support.
 - 7.1.3. Overturning
 - 7.1.3.1. The child restraint shall be tested as prescribed in paragraph 8.1.2; at no point during the whole test shall the manikin be fully ejected from the device, in addition 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.
 - 7.1.4. Dynamic test
 - 7.1.4.1. General. The child restraint shall be subjected to a dynamic test in conformity with paragraph 8.1.3 below.
 - 7.1.4.1.1. Child restraints of the 'universal', 'restricted' and 'semi-universal' categories shall be tested on the test trolley by means of the test seat prescribed in paragraph 6, and in conformity with paragraph 8.1.3.1.
 - 7.1.4.1.2. Child restraints of the 'specific vehicle' category shall be tested with each vehicle model for which the child restraint 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 7.1.4.1.2.3. The child restraint may be tested in one of the following ways:
 - 7.1.4.1.2.1. On a complete vehicle, as prescribed in paragraph 8.1.3.3;
 - 7.1.4.1.2.2. In a vehicle body shell on the test trolley, as prescribed in paragraph 8.1.3.2; or,
 - 7.1.4.1.2.3. In sufficient parts of the vehicle bodyshell to be representative of the vehicle structure and impact surfaces. If the child restraint 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 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 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 8.1.3.2.
 - 7.1.4.1.3. The dynamic test shall be performed on child restraints which have not previously been under load.

- 7.1.4.1.4. During the dynamic tests, no part of the child restraint actually helping to keep the child in position shall break, and no buckles or locking system or displacement system or support leg shall break or release or collapse, except where identified as a load limiting device. Any load limiting device shall be clearly identified in the manufacturer's technical descriptions as defined in paragraph 3.2.1 of this Regulation.
- 7.1.4.1.5. In the case of 'non-integral type' the seat belt used shall be the standard belt and its anchorage brackets prescribed in Annex 13 to this Regulation. This does not apply to 'specific vehicle' approvals where the actual belt of the vehicle shall be used.
- 7.1.4.1.6. 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 8.1.3.3.3 shall be performed. The other tests, including the conformity of production, may be done as prescribed in paragraph 8.1.3.2, if the manufacturer so wishes.
- 7.1.4.1.7. In the case of a 'Special Needs Restraint' every dynamic test specified by this Regulation for each mass group 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 6.2.3 and 6.2.4.
- 7.1.4.1.8. During the dynamic tests, the standard safety belt used to install an integral child restraint shall not become disengaged from any guide or locking device utilized for the test conducted.

During the dynamic tests, the standard safety belt used to install a non-integral child restraint, shall not become disengaged from any guide or locking device utilized for the test conducted; however, for the shoulder portion of the standard safety belt this shall be judged up to the moment that the maximum horizontal head excursion of the dummy is reached. Furthermore during the dynamic test of a non-integral child restraint, the limit of acceptable movement of the shoulder belt is that the lower edge of the shoulder portion of the standard safety belt shall not be lower than the dummy's elbow at the point of maximum horizontal head excursion of the dummy.

- 7.1.4.1.9. A child restraint with a support leg shall be tested as follows:
- (a) In the case of semi-universal category, the tests for frontal impact shall be conducted with the support leg adjusted to both its maximum and minimum adjustment compatible with the positioning of the trolley floor pan. The tests for rearward 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. If there is clearance between the shortest leg length and the highest floor pan level, the leg is adjusted to the floor pan level of 140 mm below Cr. If the maximum leg length is more than the lowest floor pan level would allow to be used, the leg is adjusted to that lowest floor pan level of 280 mm below Cr. In the case of support leg with adjustable steps, the support leg length shall be adjusted to the next adjustment position, in order to ensure the support leg is in contact with the floor.
 - (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 manufacturer.
- 7.1.4.1.10. In the case of a child restraint making use of an ISOFIX anchorage system and anti-rotation device, if any, the dynamic test shall be carried out:
- 7.1.4.1.10.1. For ISOFIX CRS of size Classes A, B and B1:
- 7.1.4.1.10.1.1. With the anti-rotation device in use, and

- 7.1.4.1.10.1.2. Without the anti-rotation device in use. If the anti-rotation device is a support leg and it can be completely recessed within the base or the shell of the CRS, the test is conducted with the device in its stowed position or with the leg removed respectively. If it cannot be completely recessed within the base, the test is performed with the device deployed in its shortest length with the trolley floor pan in its lowest position.

This requirement does not apply when a permanent and non-adjustable support leg is used as an anti-rotation device.

- 7.1.4.1.10.2. For ISOFIX child restraint system of other size classes with the anti-rotation device in use.

7.1.4.2. Chest acceleration ⁽¹⁾

- 7.1.4.2.1. The resultant chest acceleration shall not exceed 55 g except during periods whose sum does not exceed 3 ms.

- 7.1.4.2.2. The vertical component of the acceleration from the abdomen towards the head shall not exceed 30 g except during periods whose sum does not exceed 3 ms.

7.1.4.3. Abdominal penetration ⁽²⁾

- 7.1.4.3.1. During the verification described in Annex 8 — Appendix 1, paragraph 5.3, there shall be no visible signs of penetration of the modelling clay of the abdomen caused by any part of the restraining device.

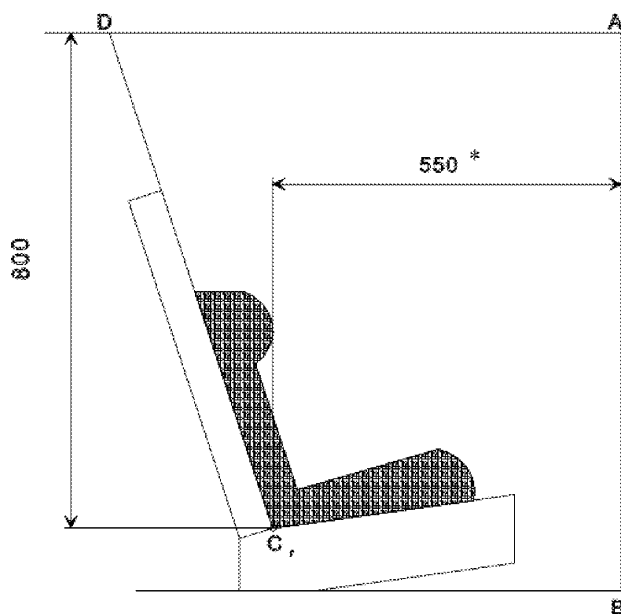
7.1.4.4. Manikin displacement

- 7.1.4.4.1. Child restraints of the 'universal', 'restricted' and 'semi-universal' categories:

- 7.1.4.4.1.1. Forward facing child restraints: the head of the manikin shall not pass beyond the planes BA and DA as defined in Figure 1 below, except for booster seats when using the largest dummy P10 where the value in relation to DA plane is 840 mm.

Figure 1

Arrangement for testing a forward-facing device



Dimensions in mm

* For the purpose of the test specified in paragraph 7.1.4.1.10.1.1, this dimension shall be 500 mm.

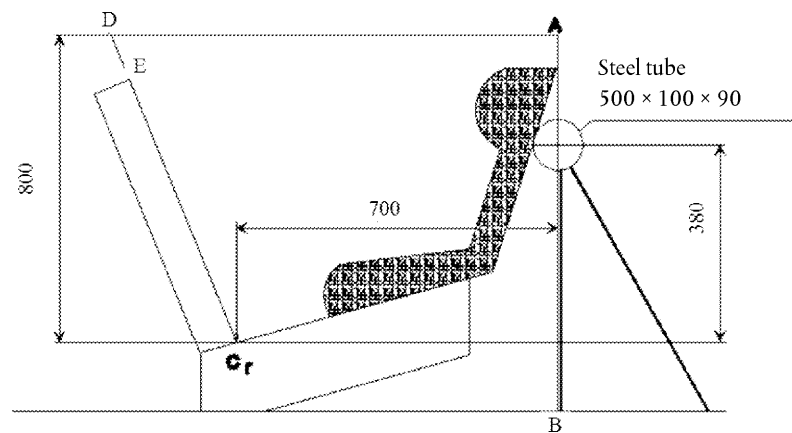
⁽¹⁾ Chest acceleration limits do not apply when using the 'new born' manikin as it is not instrumented.

⁽²⁾ The new-born manikin is not fitted with any abdominal insert. Therefore only a subjective analysis can be used as a guide to abdominal penetration.

7.1.4.4.1.2. Rear-facing child restraints

- 7.1.4.4.1.2.1. Child restraints supported by dashboard: the head of the manikin shall not pass beyond the planes AB, AD and DCr, as defined 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.

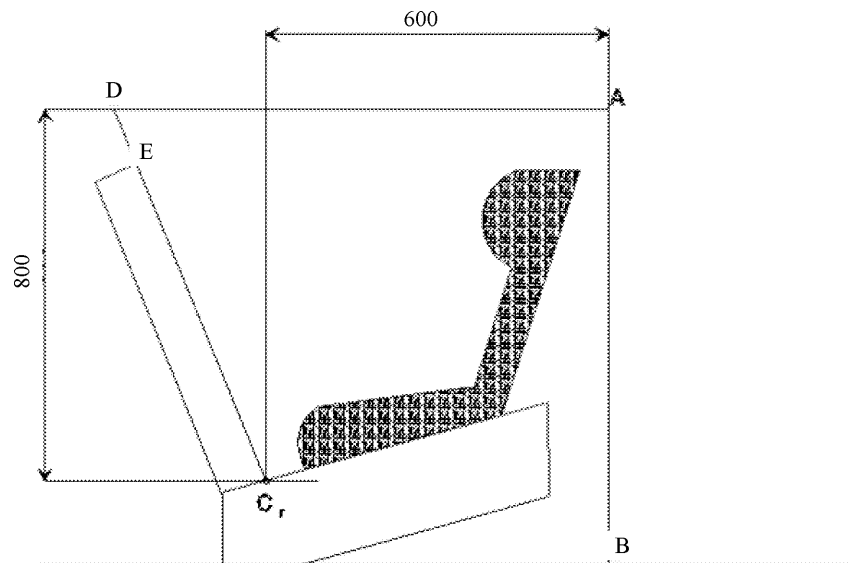
Figure 2

Arrangement for testing a rearward-facing device

Dimensions in mm

- 7.1.4.4.1.2.2. Child restraints in group 0 not supported by the dashboard, and carrycots: the head of the manikin shall not pass the planes AB, AD and DE as shown in Figure 3 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 3

Arrangement for testing child restraint devices group 0, not supported by the dashboard

Dimensions in mm

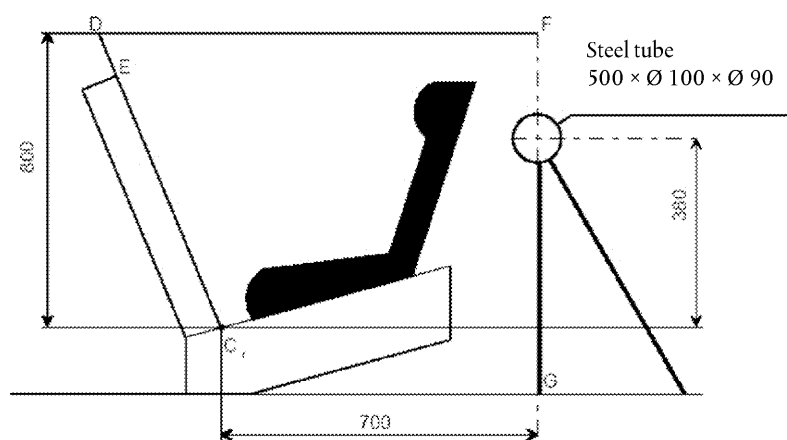
7.1.4.4.1.2.3. Child restraints other than group 0 not supported by the dashboard:

The head of the manikin shall not pass the planes FD, FG and DE, as shown in Figure 4 below and there shall be no direct contact of the manikin head with the bar. 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 with the 100 mm diameter bar and all performance criteria are met, there shall be one further dynamic test (front impact) with the heaviest dummy intended for such child restraint and without the 100 mm diameter bar; the requirements for this test are that all criteria other than forward displacement shall be met.

Figure 4

Arrangement for testing rearward-facing devices, except group 0, not supported by the dashboard



Dimensions in mm

7.1.4.4.2. Child restraints 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 speed of impact of the head shall be less than 24 km/h and the part contacted shall meet the requirements of the energy absorption test laid down in Regulation No 21, Annex 4. In tests with complete vehicles it shall be possible to remove the manikins from the child restraint without the use of tools after the test.

7.1.5. Resistance to temperature

7.1.5.1. 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 8.2.8 below.

7.1.5.2. After the temperature test as prescribed in paragraph 8.2.8.1, no signs of deterioration likely to impair the proper functioning of the child restraint, shall be visible to the unaided eye of a qualified observer.

7.2. Provisions applicable to individual components of the restraint

7.2.1. Buckle

7.2.1.1. The buckle shall be so designed as to preclude any possibility of incorrect manipulation. This means, inter alia, that it shall not be possible for the buckle to be left in a partially closed position; it shall not be possible to exchange the buckle parts inadvertently when the buckle is being locked; the buckle shall 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 7.2.4.1.1 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 this paragraph 7.2.1.1 to paragraph 7.2.1.9 inclusive.

- 7.2.1.2. 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: for enclosed devices, an area of not less than 4,5 cm² with a width of not less than 15 mm; 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.
- 7.2.1.3. The buckle release area shall be coloured red. No other part of the buckle shall be of this colour.
- 7.2.1.4. It shall be possible to release the child from the restraint by a single operation on a single buckle. For groups 0 and 0+ it is allowed to remove the child together with devices such as infant carrier/carrycot/carrycot restraints if the child restraint system can be released by operation of a maximum of two buckles.
 - 7.2.1.4.1. A clip connection between the shoulder straps of a harness belt is deemed not to comply with the single operation requirement given in paragraph 7.2.1.4 above.
- 7.2.1.5. For groups II and III the buckle shall be so placed that the child occupant can reach it. In addition it shall for all groups be so placed that its purpose and mode of operation are immediately obvious to a rescuer in an emergency.
- 7.2.1.6. 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.
- 7.2.1.7. The buckle shall be capable of withstanding the temperature test operation requirements given in paragraph 8.2.8.1 and repeated operation, and shall, before the dynamic tests prescribed in paragraph 8.1.3 undergo a test comprising 5 000 ± 5 opening and closing cycles under normal conditions for use.
- 7.2.1.8. The buckle shall be subjected to the following tests of opening:
 - 7.2.1.8.1. Test under load
 - 7.2.1.8.1.1. A child restraint having already undergone the dynamic test prescribed in paragraph 8.1.3 below shall be used for this test.
 - 7.2.1.8.1.2. The force required to open the buckle in the test prescribed in paragraph 8.2.1.1 below shall not exceed 80 N.
 - 7.2.1.8.2. No-load test
 - 7.2.1.8.2.1. 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 paragraph 8.2.1.2 below.
- 7.2.1.9. Strength
 - 7.2.1.9.1. During the test in accordance with paragraph 8.2.1.3.2 no part of the buckle or the adjacent straps or adjusters shall break or be detached.
 - 7.2.1.9.2. A harness buckle of mass groups 0 and 0+ shall withstand 4 000 N.
 - 7.2.1.9.3. A harness buckle of mass group I and higher shall withstand 10 000 N.
 - 7.2.1.9.4. The Type Approval Authority may dispense with the buckle strength test if information already available renders the test superfluous.

7.2.2. Adjusting device

7.2.2.1. The range of adjustment shall be sufficient to permit correct adjustment of the child restraint with all manikins of the weight group for which the device is intended and to permit satisfactory installation in all specified vehicle models.

7.2.2.2. 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.

7.2.2.3. 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.

7.2.2.4. 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 8.2.2.1, the force required to operate a manual adjusting device shall not exceed 50 N.

7.2.2.5. Two samples of the child-restraint adjusting devices shall be tested as prescribed by the temperature test operation requirements given in paragraph 8.2.8.1 and in paragraph 8.2.3 below.

7.2.2.5.1. The amount of strap slip shall not exceed 25 mm for one adjusting device or 40 mm for all adjusting devices.

7.2.2.6. The device shall not break or become detached when tested as prescribed in paragraph 8.2.2.1 below.

7.2.2.7. An adjuster mounted directly on the child restraint shall be capable of withstanding repeated operation and shall, before the dynamic test prescribed in paragraph 8.1.3 undergo a test comprising $5\,000 \pm 5$ cycles as specified in paragraph 8.2.7.

7.2.3. Retractors

7.2.3.1. Automatically-locking retractors

7.2.3.1.1. 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 shall either remain in its initial position or return to that position automatically on subsequent forward movement of the wearer.

7.2.3.1.2. 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 8.2.4.1 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.

7.2.3.1.3. The strap shall be repeatedly withdrawn from the retractor and allowed to retract, in the conditions prescribed in paragraph 8.2.4.2 below, until 5 000 cycles have been completed. The retractor shall then be subjected to the temperature test operation requirements given in paragraph 8.2.8.1 and corrosion test described in paragraph 8.1.1 and the dust-resistance test described in paragraph 8.2.4.5. 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 7.2.3.1.1 and 7.2.3.1.2 above.

7.2.3.2. Emergency-locking retractors

7.2.3.2.1. An emergency-locking retractor shall when tested as prescribed in paragraph 8.2.4.3 satisfy the conditions below:

7.2.3.2.1.1. It shall be locked when the deceleration of the vehicle reaches 0,45 g.

7.2.3.2.1.2. It shall not lock for strap accelerations of less than 0,8 g as measured in the axis of strap extraction.

- 7.2.3.2.1.3. 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.
- 7.2.3.2.1.4. It shall lock when its sensing device is tilted by more than 27° in any direction from the installation position specified by its manufacturer.
- 7.2.3.2.2. 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.
- 7.2.3.2.3. 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 shall have occurred at a strap acceleration of 1,5 g as measured in the axis of strap extraction.
- 7.2.3.2.4. In the tests referred to in paragraphs 7.2.3.2.1.1 and 7.2.3.2.3 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 8.2.4.3.1. In the test referred to in paragraph 7.2.3.2.1.2 above, locking shall not occur during the 50 mm of strap extraction starting at the length of unwinding specified in paragraph 8.2.4.3.1 below.
- 7.2.3.2.5. 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 8.2.4.1. 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.
- 7.2.3.2.6. The strap shall be repeatedly withdrawn from the retractor and allowed to retract, in the conditions prescribed in paragraph 8.2.4.2, until 40 000 cycles have been completed. The retractor shall then be subjected to the temperature test operation requirements given in paragraph 8.2.8.1 and corrosion test described in paragraph 8.1.1 and to the dust-resistance test described in paragraph 8.2.4.5. 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 7.2.3.2.1 to 7.2.3.2.5 above.
- 7.2.4. Straps
- 7.2.4.1. Width
- 7.2.4.1.1. The minimum width at the child-restraint straps which contact the dummy shall be 25 mm for groups 0, 0+ and I, and 38 mm for groups II and III. These dimensions shall be measured during the strap strength test prescribed in paragraph 8.2.5.1, without stopping the machine and under a load equal to 75 percent of the breaking load of the strap.
- 7.2.4.2. Strength after room conditioning
- 7.2.4.2.1. On two sample straps conditioned as prescribed in paragraph 8.2.5.2.1, the breaking load of the strap shall be determined as prescribed in paragraph 8.2.5.1.2 below.
- 7.2.4.2.2. The difference between the breaking loads of the two samples shall not exceed 10 percent of the greater of the two breaking loads measured.
- 7.2.4.3. Strength after special conditioning
- 7.2.4.3.1. On two straps conditioned as prescribed in one of the provisions of paragraph 8.2.5.2 (except paragraph 8.2.5.2.1), 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 8.2.5.1 below.
- 7.2.4.3.2. In addition, the breaking load shall be not less than 3,6 kN for the restraints of the groups 0, 0+ and I, 5 kN for those of group II, and 7,2 kN for those of group III.

- 7.2.4.3.3. The Type Approval 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.
- 7.2.4.3.4. The abrasion conditioning procedure of type 1 defined in paragraph 8.2.5.2.6 shall only be performed when the microslip test defined in paragraph 8.2.3 below gives a result above 50 percent of the limit prescribed in paragraph 7.2.2.5.1 above.
- 7.2.4.4. It shall not be possible to pull the complete strap through any adjusters, buckles or anchoring points.
- 7.2.5. Lock-off device
- 7.2.5.1. The lock-off device shall be permanently attached to the child restraint.
- 7.2.5.2. The lock-off device shall not impair the durability of the adult belt and undergo temperature test operation requirements given in paragraph 8.2.8.1.
- 7.2.5.3. The lock-off device shall not prevent the rapid release of the child.
- 7.2.5.4. Class A devices.
- The amount of slip of the webbing shall not exceed 25 mm after the test prescribed in paragraph 8.2.6.1 below.
- 7.2.5.5. Class B devices.
- The amount of slip of the webbing shall not exceed 25 mm after the test prescribed in paragraph 8.2.6.2 below.
- 7.2.6. ISOFIX attachment specifications
- 'ISOFIX attachments' and latching indicators shall be capable of withstanding repeated operations and shall, before the dynamic test prescribed in paragraph 8.1.3, undergo a test comprising $2\,000 \pm 5$ opening and closing cycles under normal conditions of use.
- 7.2.7. ISOFIX attachments shall have a locking mechanism which complies with the requirements specified in (a) or (b) as follows:
- (a) Release of the locking mechanism of the complete seat, shall require two consecutive actions, the first of which should be maintained while the second is carried out; or
- (b) The ISOFIX attachment opening force shall be at least 50 N when tested as prescribed in paragraph 8.2.9 below.
8. DESCRIPTION OF TESTS ⁽¹⁾
- 8.1. Tests of the assembled restraint
- 8.1.1. Corrosion
- 8.1.1.1. The metal items of the child restraint shall be positioned in a test chamber as prescribed in Annex 4. In the case of a child restraint 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 $50 \pm 0,5$ hours.

⁽¹⁾ Tolerances on dimensions unless otherwise stated, not valid for boundaries

Range of dimensions (mm)	less than 6	above 6 to 30	above 30 to 120	above 120 to 315	above 315 to 1 000	above 1 000
Tolerance (mm)	$\pm 0,5$	± 1	$\pm 1,5$	± 2	± 3	± 4

Angular tolerances unless otherwise stated: $\pm 1^\circ$

- 8.1.1.2. On completion of the exposure test the metal items of the child restraint 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 7.1.1.2 above.
- 8.1.2. Overturning
- 8.1.2.1. The manikin shall be equipped with either of the load application devices as appropriate and described in Annex 23. Place the manikin 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 8.1.3.6 below, applied for all systems identically.
- 8.1.2.2. 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 $540^\circ \pm 5^\circ$ at a speed of 2-5 degrees/second and stopped in this position. For the purposes of this test, devices intended for use in specific cars may be attached to the test seat described in Annex 6.
- 8.1.2.3. At this static inverted position a mass equivalent to 4 times that of the dummy shall be applied vertically downwards in a plane perpendicular to the axis of rotation in addition to the dummy utilizing the load application device described in Annex 23. The load shall be applied in a gradual controlled manner at a rate not exceeding gravitational acceleration or 400 mm/min. Maintain the prescribed maximum load for a duration of $30 - 0/+ 5$ seconds.
- 8.1.2.4. Remove the load at a rate not exceeding 400 mm/min and measure displacement.
- 8.1.2.5. Rotate the whole seat for 180° to return to the starting position.
- 8.1.2.6. This test cycle shall be carried out again rotating in the reverse direction. 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.
- 8.1.2.7. These tests shall be carried out using both the smallest and the largest appropriate manikin of the group or groups for which the restraining device is intended.

Any adjustment of the dummy or child restraint systems during the complete test cycle is not allowed.

8.1.3. Dynamic tests

8.1.3.1. Tests on the trolley and test seat

8.1.3.1.1. Forward-facing

8.1.3.1.1.1. 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.

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

8.1.3.1.1.3. Deceleration or acceleration devices

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

8.1.3.1.1.3.1. 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 8.1.3.4 and hereafter specified:

Calibration procedure:

The deceleration curve of the trolley, in the case of child restraint tests performed in accordance with paragraph 8.1.3.1, 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 8.1.3.2, 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, shall 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 to 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.

8.1.3.1.1.3.2. Acceleration test device:

Dynamic testing conditions:

For frontal impact, the trolley shall be so propelled that, during the test, its total velocity change DV is $52 \pm 0 - 2$ 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 (5 g, 10 ms) and (9 g, 20 ms). The start of the impact (T0) is defined, according to ISO 17373 for a level of acceleration of 0,5 g.

For rear impact, the trolley shall be so propelled that, during the test, its total velocity change DV is $32 \pm 2 - 0$ 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 (5 g, 5 ms) and (10 g, 10 ms). The start of the impact (T0) is defined, according to ISO 17373 for a level of acceleration of 0,5 g.

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.

8.1.3.1.1.4. The following measurements shall be made:

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

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

8.1.3.1.1.4.3. The displacement of the manikin's head in the vertical and horizontal planes for groups I, II and III and for group 0 and 0+ the displacement of the manikin without considering its limb,

8.1.3.1.1.4.4. The chest deceleration in three mutually perpendicular directions; except for new-born manikin,

8.1.3.1.1.4.5. Any visible signs of penetration of the modelling clay in the abdomen (see paragraph 7.1.4.3.1); except for new-born manikin,

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

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

8.1.3.1.2. Rearward-facing

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

8.1.3.1.2.2. When testing a rearward-facing child restraint intended for use in the front seating position, the vehicle fascia 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.

- 8.1.3.1.2.3. The deceleration conditions shall satisfy the requirements of paragraph 8.1.3.1.1.3.1.
- The acceleration conditions shall satisfy the requirements of paragraph 8.1.3.1.1.3.2.
- 8.1.3.1.2.4. The measurements to be made shall be similar to those listed in paragraphs 8.1.3.1.1.4 to 8.1.3.1.1.4.6 above.
- 8.1.3.2. Test on trolley and vehicle body shell
- 8.1.3.2.1. Forward-facing
- 8.1.3.2.1.1. 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.
- 8.1.3.2.1.2. 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.
- 8.1.3.2.1.3. 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°.
- 8.1.3.2.1.4. 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.
- 8.1.3.2.1.5. The deceleration conditions shall satisfy the requirements of paragraph 8.1.3.4 below. The test seat will be the seat of the actual vehicle.
- 8.1.3.2.1.6. The following measurements shall be made:
- 8.1.3.2.1.6.1. The trolley speed immediately before impact (only for deceleration sleds, needed for stopping distance calculation),
- 8.1.3.2.1.6.2. The stopping distance (only for deceleration sleds), which may be calculated by double integration of the recorded sled deceleration,
- 8.1.3.2.1.6.3. Any contact of the manikin's head with the interior of the vehicle body shell;
- 8.1.3.2.1.6.4. The chest deceleration in three mutually perpendicular directions; except for new-born manikin,
- 8.1.3.2.1.6.5. Any visible signs of penetration of the modelling clay in the abdomen (see paragraph 7.1.4.3.1) except for new-born manikin,
- 8.1.3.2.1.6.6. The trolley and vehicle body shell acceleration or deceleration for at least the first 300 ms.
- 8.1.3.2.1.7. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure.
- 8.1.3.2.2. Rearward-facing
- 8.1.3.2.2.1. For rear impact tests the vehicle body shell shall be rotated 180° on the test trolley.
- 8.1.3.2.2.2. Same requirements as for frontal impact.

- 8.1.3.3. Test with complete vehicle
- 8.1.3.3.1. The deceleration conditions shall satisfy the requirements of paragraph 8.1.3.4 below.
- 8.1.3.3.2. For frontal impact tests the procedure shall be that set out in Annex 9 to this Regulation.
- 8.1.3.3.3. For rear impact tests the procedure shall be that set out in Annex 10 to this Regulation.
- 8.1.3.3.4. The following measurements shall be made:
- 8.1.3.3.4.1. The speed of the vehicle/impactor immediately before impact;
- 8.1.3.3.4.2. Any contact of the manikin's head (in the case of group 0 the manikin without considering its limbs) with the interior of the vehicle;
- 8.1.3.3.4.3. The chest acceleration in three mutually perpendicular directions, except for new-born manikin;
- 8.1.3.3.4.4. Any visible signs of penetration of the modelling clay in the abdomen (see paragraph 7.1.4.3.1), except for new-born manikin.
- 8.1.3.3.5. 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°.
- 8.1.3.3.6. After impact, the child restraint shall be inspected visually, without opening the buckle, to determine whether there has been any failure or breakage.
- 8.1.3.4. The conditions for dynamic test are summarized in the table below:

Test	Restraint	FRONTAL IMPACT			REAR IMPACT		
		Speed (km/h)	Test pulse	Stopping distance during test (mm)	Speed (km/h)	Test pulse	Stopping distance during test (mm)
Trolley with test seat	Forward facing front and rear seats universal, semi-universal or restricted (*)	50 + 0 - 2	1	650 ± 50	—	—	—
	Rearward facing front and rear seats universal, semi-universal or restricted (**)	50 + 0 - 2	1	650 ± 50	30 + 2 - 0	2	275 ± 25
Vehicle body on trolley	Forward facing (*)	50 + 0 - 2	1 or 3	650 ± 50	—	—	—
	Rearward facing (**)	50 + 0 - 2	1 or 3	650 ± 50	30 + 2 - 0	2 or 4	275 ± 25
Whole vehicle barrier test	Forward facing	50 + 0 - 2	3	not specified	—	—	—
	Rearward facing	50 + 0 - 2	3	not specified	30 + 2 - 0	4	not specified

(*) During calibration, the stopping distance should be 650 ± 30 mm.

(**) During calibration, the stopping distance should be 275 ± 20 mm.

Note: All restraint systems for groups 0 and 0+ shall be tested according to 'Rearward-facing' conditions in frontal and rearwards impact.

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.

- 8.1.3.5. Child restraints incorporating the use of additional anchorages
- 8.1.3.5.1. In the case of child restraints intended for use as specified in paragraph 2.1.2.3 and incorporating the use of additional anchorages, the requirement for a frontal impact test, in accordance with paragraph 8.1.3.4, shall be carried out as follows:
- 8.1.3.5.2. For devices with short upper attachment straps, e.g. intended to be attached to the rear parcel shelf, the upper anchorage configuration on the test trolley shall be as prescribed in Annex 6, Appendix 3.
- 8.1.3.5.3. For devices with long upper attachment straps, e.g. intended for use where there is no rigid parcel shelf and where the upper anchorage straps are attached to the vehicle floor, the anchorages on the test trolley shall be as prescribed in Annex 6, Appendix 3.
- 8.1.3.5.4. For devices, intended for use in both configurations, the tests prescribed in paragraphs 8.1.3.5.2 and 8.1.3.5.3 shall be carried out with the exception that, in case of the test carried out in accordance with the requirements of paragraph 8.1.3.5.3 above, only the heavier manikin shall be used.
- 8.1.3.5.5. For rearward-facing devices, the lower anchorage of configuration on the test trolley shall be as prescribed in Annex 6, Appendix 3.
- 8.1.3.5.6. For carrycots utilizing additional straps that are attached to two adult safety belts, where the load path shall apply directly through the adult safety belt to the adult safety belt lower anchorage, the anchorage on the test trolley shall be as prescribed in Annex 6, Appendix 3, paragraph 7 (A1, B1). Installation on the test bench shall be as described in Annex 21, note 5. This system shall work correctly even with the adult safety belts unlocked, and is considered as Universal when complying with paragraph 6.1.8.
- 8.1.3.6. Test manikins
- 8.1.3.6.1. The child restraint and manikins shall be installed in such a way that the requirements of paragraph 8.1.3.6.3 are met.
- 8.1.3.6.2. The child restraint shall be tested using the manikins prescribed in Annex 8 to this Regulation.
- 8.1.3.6.3. Installation of the manikin
- 8.1.3.6.3.1. The manikin shall be placed so that the gap is between the rear of the manikin and the restraint. In the case of carrycots the manikin is placed in a straight horizontal position as close as possible to the centre line of the carrycot.
- 8.1.3.6.3.2. Place the child chair on the test seat.
- Place the manikin in the child chair.
- For restraints or straps acting directly on a retractor or adult three point safety belt, where no lock off device or any system able to inhibit the action of the retractor is used:
- (a) Fit the belt in accordance with the manufacturer's instructions.
- (b) Complete the installation of the child chair to the test seat in accordance with Annex 21 to this Regulation.
- For all other restraints:
- (a) 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.
- (b) 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.

- (c) Complete the installation of the child chair to the test seat in accordance with Annex 21 to this Regulation.
 - (d) Remove the flexible device.
- 8.1.3.6.3.3. 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 child restraints 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 up to 80 mm towards the side of anchorage point C with regard to the point midway between the two lower belt anchorages. The amount of this displacement shall be decided by the Technical Service in order to optimize the shoulder belt routing at the manikin.
- 8.1.3.6.3.4. In the case of devices requiring the use of a standard belt, the routing of the shoulder strap may be maintained on the manikin prior to the dynamic test by the use of a light-weight masking tape of a maximum length of 250 mm and a maximum width of 20 mm. In the case of rearward facing devices the head may be held against the backrest of the restraint system using a light-weight masking tape of sufficient length and a maximum width of 20 mm.
- 8.1.3.7. Category of manikin to be used:
- 8.1.3.7.1. Group 0 device: Test using the 'new-born' manikin and a manikin of 9 kg;
- 8.1.3.7.2. Group 0+ device: test using the new-born manikin and a manikin of 11 kg;
- 8.1.3.7.3. Group I device: Tests using a manikin of mass 9 kg and 15 kg respectively;
- 8.1.3.7.4. Group II device: Tests using a manikin of mass 15 kg and 22 kg respectively;
- 8.1.3.7.5. Group III device: Tests using a manikin of mass 22 kg and 32 kg respectively.
- 8.1.3.7.6. If the child restraint system is suitable for two or more mass groups, the tests shall be carried out using the lightest and heaviest manikins specified above for each of the groups concerned.
- 8.1.3.7.7. 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.
- 8.1.3.7.8. If a child restraint system in group 0 or 0+ offers different configurations depending on the mass of the child, each configuration shall be tested with both manikins of the respective mass group.
- 8.1.3.7.9. If the ISOFIX child restraint system shall 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.
- 8.1.3.7.10. The test specified in paragraph 7.1.4.1.10.1.2 above shall only be carried out with the largest manikin for which the child restraint is designed. Where multiple configurations of the child restraint system are possible (e.g. upright/reclined), the configuration which generates the worst case horizontal head excursion shall be used for this test.
- 8.1.4. 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 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.

- 8.2. Tests of individual components
 - 8.2.1. Buckle
 - 8.2.1.1. Opening test under load
 - 8.2.1.1.1. A child restraint already having been subjected to the dynamic tests specified in paragraph 8.1.3 shall be used for this test.
 - 8.2.1.1.2. The child restraint shall be removed from the test trolley or the vehicle without opening the buckle. A tension of 200 ± 2 N shall be applied to the buckle. If the buckle is attached to a rigid part, the force shall be applied reproducing the angle formed between the buckle and that rigid part during the dynamic test.
 - 8.2.1.1.3. A load shall be applied at a speed of 400 ± 20 mm/min to the geometric centre of the buckle-release button along a fixed axis running parallel to the initial direction of motion of the button; the geometric centre applies to that part of the surface of the buckle to which the release pressure is to be applied. The buckle shall be secured against a rigid support during the application of the opening force.
 - 8.2.1.1.4. The buckle opening force shall be applied, using a dynamometer or similar device in the manner and direction of normal use. The contact end shall be a polished metal hemisphere with radius $2,5 \pm 0,1$ mm.
 - 8.2.1.1.5. The buckle opening force shall be measured and any failure noted.
 - 8.2.1.2. Opening test under zero load
 - 8.2.1.2.1. A buckle assembly which has not previously been subjected to a load shall be mounted and positioned under a 'no load' condition.
 - 8.2.1.2.2. The method of measuring the buckle opening force shall be as prescribed in paragraphs 8.2.1.1.3 and 8.2.1.1.4.
 - 8.2.1.2.3. The buckle opening force shall be measured.
 - 8.2.1.3. Strength test
 - 8.2.1.3.1. For the strength test two samples have to be used. All adjusters, except for adjusters mounted directly on a child restraint are included in the test.
 - 8.2.1.3.2. Annex 20 shows a typical device for a buckle strength test. The buckle is placed on the upper round plate (A) within the relief. All adjacent straps have a length of at least 250 mm and are arranged hanging down from the upper plate respective to their position at the buckle. The free strap ends are then wound round the lower round plate (B) until they come out at the plate's inner opening. All straps have to be vertical between A and B. The round clamping plate (C) is then lightly clamped against the lower face of (B), still allowing a certain strap movement between them. With a small force at the tensile machine the straps are tensioned and pulled between (B) and (C) until all straps are loaded respective to their arrangement. The buckle shall stay free from plate (A) or any parts at (A) during this operation and the test itself. (B) and (C) are then clamped firmly together and the tensile force is increased at a traverse speed of 100 ± 20 mm/min until the required values are reached.
 - 8.2.2. Adjusting device
 - 8.2.2.1. Ease of adjustment
 - 8.2.2.1.1. When testing a manual adjusting device, the strap shall be drawn steadily through the adjusting device, having regard for the normal conditions of use, at a rate of 100 ± 20 mm/min and the maximum force measured to the nearest integer value of N after the first 25 ± 5 mm of strap movement.

- 8.2.2.1.2. The test shall be carried out in both directions of strap travel through the device, the strap being subjected to the full travel cycle 10 times prior to the measurement.
- 8.2.3. Microslip test (see Annex 5, Figure 3)
- 8.2.3.1. The components or devices to be subjected to the microslip test shall be kept for a minimum of 24 hours before testing in an atmosphere having a temperature of 20 ± 5 °C and a relative humidity of 65 ± 5 percent. The test shall be carried out at a temperature between 15 and 30 °C.
- 8.2.3.2. The free end of the strap shall be arranged in the same configuration as when the device is in use in the vehicle, and shall not be attached to any other part.
- 8.2.3.3. The adjusting device shall be placed on a vertical piece of strap one end of which bears a load of $50 \pm 0,5$ N (guided in a manner which prevents the load from swinging and the strap from twisting). The free end of the strap from the adjusting device shall be mounted vertically upwards or downwards as it is in the vehicle. The other end shall pass over a deflector roller with its horizontal axis parallel to the plane of the section of strap supporting the load, the section passing over the roller being horizontal.
- 8.2.3.4. The device being tested shall be arranged in such a way that its centre, in the highest position to which it can be raised, is 300 ± 5 mm from a support table, and the load of 50 N shall be 100 ± 5 mm from that support table.
- 8.2.3.5. 20 ± 2 pre-test cycles shall then be completed and $1\,000 \pm 5$ cycles shall then be completed at a frequency of 30 ± 10 cycles per minute, the total amplitude being 300 ± 20 mm or as specified in paragraph 8.2.5.2.6.2. The 50 N load shall be applied only during the time corresponding to a shift of 100 ± 20 mm for each half period. Microslip shall be measured from the position at the end of the 20 pre-test cycles.
- 8.2.4. Retractor
- 8.2.4.1. Retracting force
- 8.2.4.1.1. The retracting forces shall be measured with the safety belt assembly, fitted to a manikin as for the dynamic test prescribed in paragraph 8.1.3. The strap tension shall be measured at the point of contact with (but just clear of) the manikin while the strap is being retracted at the approximate rate of 0,6 m/min.
- 8.2.4.2. Durability of retractor mechanism
- 8.2.4.2.1. The strap shall be withdrawn and allowed to retract for the required number of cycles at a rate of not more than 30 cycles per minute. In the case of emergency-locking retractors, a jolt to lock the retractor shall be introduced at each fifth cycle. The jolts occur in equal numbers at each of five different extractions, namely, 90, 80, 75, 70 and 65 percent of the total length of the strap on the retractor. However, where the length of the strap exceeds 900 mm the above percentages shall be related to the final 900 mm of strap which can be withdrawn from the retractor.
- 8.2.4.3. Locking of emergency-locking retractors
- 8.2.4.3.1. The retractor shall be tested once for locking, when the strap has been unwound to its full length less 300 ± 3 mm.
- 8.2.4.3.2. In the case of a retractor actuated by strap movement, the extraction shall be in the direction in which it normally occurs when the retractor is installed in a vehicle.
- 8.2.4.3.3. When retractors are being tested for sensitivity to vehicle accelerations, they shall be tested at the above extraction length in both directions along two mutually perpendicular axes which are horizontal if the retractors are to be installed in a vehicle as specified by the child restraint manufacturer. When this position is not specified, the testing authority shall consult the child restraint manufacturer. One of these test directions shall be chosen by the Technical Service conducting the approval tests to give the most adverse conditions with respect to actuation of the locking mechanism.

- 8.2.4.3.4. The design of the apparatus used shall be such that the required acceleration is given at an average rate of increase of acceleration of at least 25 g/s. ⁽¹⁾
- 8.2.4.3.5. For testing compliance with the requirements of paragraphs 7.2.3.2.1.3 and 7.2.3.2.1.4 the retractor shall be mounted on a horizontal table and the table tilted at a speed not exceeding 2° per second until locking has occurred. The test shall be repeated with tilting in other directions to ensure that the requirements are fulfilled.
- 8.2.4.4. Corrosion test
- 8.2.4.4.1. The corrosion test is described in paragraph 8.1.1 above.
- 8.2.4.5. Dust resistance test
- 8.2.4.5.1. The retractor shall be positioned in a test chamber as described in Annex 3 to this Regulation. It shall be mounted in an orientation similar to that in which it is mounted in the vehicle. The test chamber shall contain dust as specified in paragraph 8.2.4.5.2 below. A length of 500 mm of the strap shall be extracted from the retractor and kept extracted, except that it shall be subjected to 10 complete cycles of retraction and withdrawal within one or two minutes after each agitation of the dust. For a period of five hours, the dust shall be agitated every 20 minutes for five seconds by compressed air free of oil and moisture at a gauge pressure of $5,5 \pm 0,5$ bars entering through an orifice $1,5 \pm 0,1$ mm in diameter.
- 8.2.4.5.2. The dust used in the test described in paragraph 8.2.4.5.1 shall consist of about 1 kg of dry quartz. The particle size distribution shall be as follows:
- (a) Passing 150 µm aperture, 104 µm wire diameter: 99 to 100 percent;
 - (b) Passing 105 µm aperture, 64 µm wire diameter: 76 to 86 percent;
 - (c) Passing 75 µm aperture, 52 µm wire diameter: 60 to 70 percent.
- 8.2.5. Static test for straps
- 8.2.5.1. Strap strength test
- 8.2.5.1.1. Each test shall be carried out on two new samples of strap, conditioned as specified in paragraph 7.2.4.
- 8.2.5.1.2. Each strap shall be gripped between the clamps of a tensile strength-testing machine. The clamps shall be so designed as to avoid breakage of the strap at or near them. The speed of traverse shall be 100 ± 20 mm/min. The free length of the specimen between the clamps of the machine at the start of the test shall be $200 \text{ mm} \pm 40 \text{ mm}$.
- 8.2.5.1.3. The tension shall be increased until the strap breaks and the breaking load noted.
- 8.2.5.1.4. If the strap slips or breaks at or within 10 mm of either of the clamps, the test shall be invalid and a new test shall be carried out on another specimen.
- 8.2.5.2. Samples out from straps, as referred to in paragraph 3.2.3, shall be conditioned as follows:
- 8.2.5.2.1. Room conditioning
- 8.2.5.2.1.1. The strap shall be kept for 24 ± 1 hours in an atmosphere having a temperature of $23 \pm 5^\circ$ and a relative humidity of 50 ± 10 percent. If the test is not carried out immediately after conditioning, the specimen shall be placed in a hermetically closed receptacle until the test begins. The breaking load shall be determined within five minutes after removal of the strap from the conditioning atmosphere or from the receptacle.
- 8.2.5.2.2. Light conditioning
- 8.2.5.2.2.1. The provisions of Recommendation ISO/105-B02(1978), shall apply. The strap shall be exposed to light for the time necessary to produce fading of Standard Blue Dye No 7 to a contrast equal to Grade 4 on the grey scale.

⁽¹⁾ $g = 9,81 \text{ m/s}^2$.

8.2.5.2.2.2. After exposure, the strap shall be kept for a minimum of 24 hours in an atmosphere having a temperature of 23 ± 5 °C and a relative humidity of 50 ± 10 percent. The breaking load shall be determined within five minutes after the removal of the strap from the conditioning installation.

8.2.5.2.3. Cold conditioning

8.2.5.2.3.1. The strap shall be kept for a minimum of 24 hours in an atmosphere having a temperature of 23 ± 5 °C and a relative humidity of 50 ± 10 percent.

8.2.5.2.3.2. The strap shall then be kept for 90 ± 5 minutes on a plain surface in a low-temperature chamber in which the air temperature is -30 ± 5 °C. It shall then be folded and the fold shall be loaded with a weight of $2 \pm 0,2$ kg previously cooled to -30 ± 5 °C. When the strap has been kept under load for 30 ± 5 minutes in the same low-temperature chamber, the weight shall be removed and the breaking load shall be measured within five minutes after removal of the strap from the low-temperature chamber.

8.2.5.2.4. Heat conditioning

8.2.5.2.4.1. The strap shall be kept for 180 ± 10 minutes in a heating-cabinet atmosphere having a temperature of 60 ± 5 °C and a relative humidity of 65 ± 5 percent.

8.2.5.2.4.2. The breaking load shall be determined within five minutes after removal of the strap from the heating cabinet.

8.2.5.2.5. Exposure to water

8.2.5.2.5.1. The strap shall be kept fully immersed for 180 ± 10 minutes in distilled water, at a temperature of 20 ± 5 °C, to which a trace of wetting agent has been added. Any wetting agent suitable for the fibre being tested may be used.

8.2.5.2.5.2. The breaking load shall be determined within 10 minutes after removal of the strap from the water.

8.2.5.2.6. Abrasion conditioning

8.2.5.2.6.1. The components or devices to be submitted to the abrasion test shall be kept for a minimum of 24 hours before testing in an atmosphere having a temperature of 23 ± 5 °C and a relative humidity of 50 ± 10 percent. The room temperature during the testing shall be between 15 and 30 °C.

8.2.5.2.6.2. The table below sets out the general conditions for each test:

	Load [N]	Cycles per minute	Cycles (No)
Type 1 procedure	$60 \pm 0,5$	30 ± 10	$1\ 000 \pm 5$
Type 2 procedure	$10 \pm 0,1$	30 ± 10	$5\ 000 \pm 5$

8.2.5.2.6.3. Particular test conditions

8.2.5.2.6.3.1. Type 1 procedure: for cases where the strap slides through the quick adjusting device. Apply a load of 10 N, if necessary the load may be increased by 10 N steps so as to permit correct sliding, but limited to a maximum of 60 N. This load shall be vertically and permanently applied on the straps. The part of the strap set horizontally shall pass through the quick adjuster it is fitted to and shall be attached to a device, giving the webbing a back and forth motion. The quick adjusting device shall be so placed that the horizontal strap of the webbing remains under tension (see Annex 5, Figure 1). Activate the quick adjuster while pulling the straps in the direction to slacken the harness and deactivate it while pulling the straps in the direction to tighten the harness.

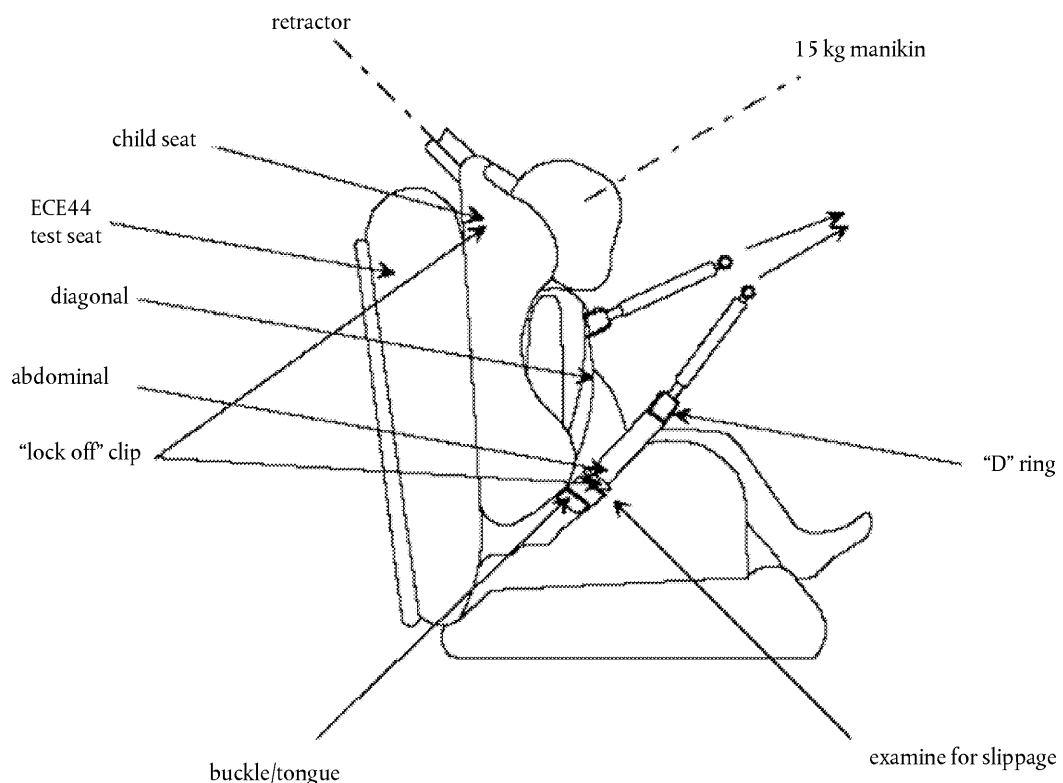
8.2.5.2.6.3.2. Type 2 procedure: for cases where the strap changes direction in passing through a rigid part. During this test, the webbing shall pass through the rigid part it is intended for and the test set up shall reproduce the angles as in the real installation (in three dimensions), see Annex 5, Figure 2 for examples. The 10 N load shall be permanently applied. For cases where the strap changes direction more than once in passing through a rigid part, the load of 10 N may be increased by 10 N steps so as to permit correct sliding and achieve the prescribed 300 mm of strap movement through that rigid part.

8.2.6. Lock-off devices

8.2.6.1. Class A devices

The child restraint and the largest manikin for which the child restraint is intended shall be set up as shown in Figure 5 below. The webbing used shall be as specified in Annex 13 to this Regulation. The lock-off shall be fully applied and a mark made on the belt where the belt enters the lock-off. The force gauges shall be attached to the belt via a D ring, and a force equal to twice (± 5 percent) the mass of the heaviest dummy of group I shall be applied for at least one second. The lower position shall be used for lock-offs in position A and the upper position shall be used for lock-offs in position B. The force shall be applied for a further 9 times. A further mark shall be made on the belt where it enters the lock-off and the distance between the two marks shall be measured. During this test, the retractor shall be unlocked.

Figure 5



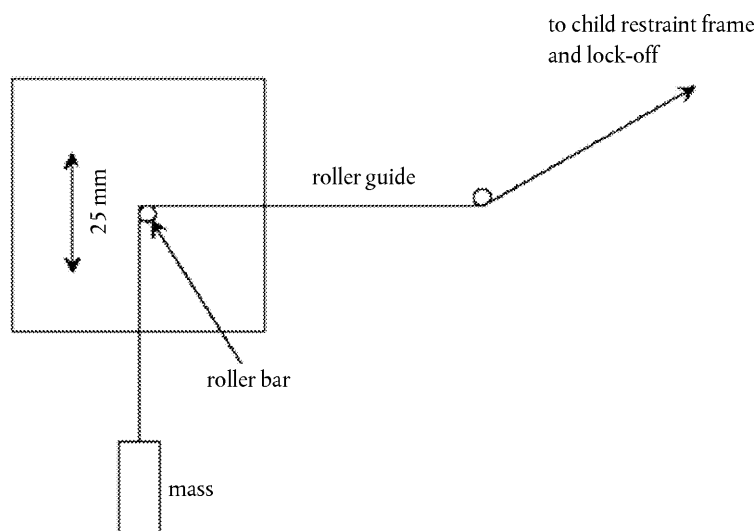
8.2.6.2. Class B devices.

The child restraint shall be firmly secured and webbing, as specified in Annex 13 to this Regulation, shall be passed through the lock-off and frame following the routing described in the manufacturer's instructions. The belt shall pass through the testing equipment as described in Figure 6 below and be attached to a mass of $5,25 \pm 0,05$ kg. There shall be 650 ± 40 mm of free webbing between the mass and the point where the webbing leaves the frame. The lock-off shall be fully applied and a mark made on the belt where it enters the lock-off. The mass shall be raised and released so that it falls freely over a distance of 25 ± 1 mm. This shall be repeated 100 ± 2 at a frequency of 60 ± 2 cycles per minute, to simulate the jerking action of a child restraint in a car. A further mark shall be made on the belt where it enters the lock-off and the distance between the two marks shall be measured.

The lock-off device shall cover the full width of the webbing in the installed condition with 15 kg dummy installed. This test is to be conducted using the same webbing angles as those formed in normal use. The free end of the lap belt portion shall be fixed. The test shall be conducted with the child restraint system firmly attached to the test bench used in the overturning or dynamic test. The loading strap can be attached to the simulated buckle.

Figure 6

Schematic layout of Class B lock-off test



Drop height of mass = 25 mm

Distance from roller bar to roller guide = 300 mm

Using strap of the webbing specified for the standard seat belt as defined in Annex 13

8.2.7. Conditioning test for adjusters mounted directly on a child restraint

Install the largest dummy for which the restraint is intended, as if for the dynamic test, including the standard slack as specified in paragraph 8.1.3.6. Mark a reference line on the webbing where the free end of the webbing enters the adjuster.

Remove the dummy and place the restraint in the conditioning rig shown in Figure 1, Annex 19.

The webbing shall be cycled for a total distance of not less than 150 mm through the adjuster. This movement shall be such that at least 100 mm of webbing on the side of the reference line towards the free end of the webbing and the remainder of the moving distance (approx. 50 mm) on the integral harness side of the reference line moves through the adjuster.

If the length of webbing from the reference line to the free end of the webbing is insufficient for the movement described above, the 150 mm of movement through the adjuster shall be from the fully extended harness position.

The frequency of cycling shall be 10 ± 1 cycles/minute, with a velocity on 'B' of 150 ± 10 mm/sec.

8.2.8. Temperature test

8.2.8.1. The components specified in paragraph 7.1.5.1 shall be exposed to an environment over a water surface within a closed space, the environment having a temperature of not less than 80 °C, for a continuous period of not less than 24 hours and then cooled in an environment having a temperature not exceeding 23 °C. The cooling period shall immediately be followed by three consecutive 24 hour cycles with each cycle comprising the following consecutive sequences:

- (a) An environment having a temperature of not less than 100 °C shall be maintained for a continuous period of 6 hours and this environment shall be attained within 80 minutes of commencement of the cycle; then
- (b) An environment having a temperature of not more than 0 °C shall be maintained for a continuous period of 6 hours and this environment shall be attained within 90 minutes; then
- (c) An environment having a temperature of not more than 23 °C shall be maintained during the remainder of the 24 hour cycle.

8.2.9. The complete seat, or the component fitted with ISOFIX attachments (e.g. ISOFIX base) if it has a release button, is attached rigidly to a test rig in such a way that ISOFIX connectors are vertically aligned as shown in Figure 7. A 6 mm diameter bar, 350 mm long, shall be attached to the ISOFIX connectors. A mass of 5 kg shall be attached to the extremities of the bar.

8.2.9.1. An opening force shall be applied to the release button or handle along a fixed axis running parallel to the initial direction of motion of the button/handle; the geometric centre applies to that part of the surface of the ISOFIX attachment to which the release pressure is to be applied.

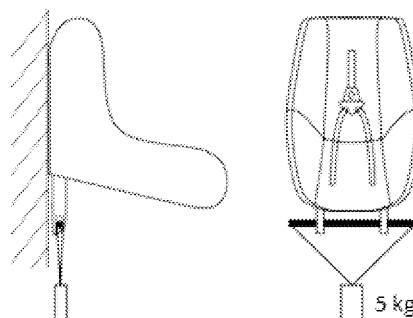
8.2.9.2. The ISOFIX attachment opening force shall be applied, using a dynamometer or similar device in, the normal manner and direction as indicated in the Manufacturers user manual. The contact end shall be a polished metal hemisphere with radius $2,5 \pm 0,1$ mm for a release button or a polished metal hook with a radius of 25 mm.

8.2.9.3. If the design of the child restraint prevents the application of the procedure described in paragraphs 8.2.9.1 and 8.2.9.2, an alternative method may be applied with the agreement of the Technical Service carrying out the test.

8.2.9.4. The ISOFIX attachment opening force to be measured shall be that needed to disengage the first connector.

8.2.9.5. The test shall be carried out on a new seat, and repeated on a seat that has been subjected to the cycling procedure specified in paragraph 7.2.6.

Figure 7



8.3. Certification of test bench cushion

8.3.1. The test seat cushion shall be certified when new to establish initial values for impact penetration and peak deceleration, and then after every 50 dynamic tests or at least every month, whichever is the sooner, or before each test if the test rig is used frequently.

8.3.2. The certification and measuring procedures shall correspond to those specified in the latest version of ISO 6487; the measuring equipment shall correspond to the specification of a data channel with a channel filter class (CFC) 60.

Using the test device defined in Annex 17 to this Regulation, conduct three tests, 150 ± 5 mm from the front edge of the cushion on the centre line and at 150 ± 5 mm in each direction from the centre line.

Place the device vertically on a flat rigid surface. Lower the impact mass until it contacts the surface and set the penetration marker to the zero position. Place the device vertically above the test point, raise the mass 500 ± 5 mm and allow it to fall freely to make impact on the seat surface. Record the penetration and the deceleration curve.

8.3.3. The peak values recorded shall not deviate by more than 15 percent from the initial values.

8.4. Registration of dynamic behaviour

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

8.4.1.1. Filming and recording conditions:

- (a) The frequency shall be at least 500 frames per second;
- (b) The test shall be recorded on cine film, video or digital data carrier;

8.4.1.2. 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.

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

Type of measurement	CFC(F_H)	Cut-off frequency (F_N)
Trolley acceleration	60	see ISO 6487:2002 Annex A
Belt loads	60	see ISO 6487:2002 Annex A
Chest acceleration	180	see ISO 6487:2002 Annex A
Head acceleration	1 000	1 650

The sampling rate should be a minimum of 10 times the channel frequency class (i.e. in installations with channel frequency class of 1 000, this corresponds to a minimum sampling rate of 10 000 samples per second per channel).

9. TEST REPORTS OF TYPE APPROVAL AND OF PRODUCTION QUALIFICATION
- 9.1. 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, and
 - (g) And any failure or breakage.
- 9.2. 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.
- 9.3. 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.
- 9.4. The test reports of type approval and of production qualification shall record the verification of markings and of instructions on installation and use.
10. MODIFICATIONS AND EXTENSION OF APPROVAL OF A TYPE OF CHILD RESTRAINT SYSTEM
- 10.1. Every modification of a child restraint shall be notified to the Type Approval Authority which approved the child restraint. This Authority may then either:
 - 10.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the child restraint still complies with the requirements; or
 - 10.1.2. Require a further test report from the Technical Service responsible for conducting the tests.
 - 10.1.3. If a further test report is required, compare the horizontal head excursion result with the worst case from all results previously recorded:
 - (a) If the excursion is greater, then new production qualification testing shall be carried out;
 - (b) If the excursion is less, production qualification tests do not need to be carried out.
- 10.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 5.3 above to the Parties to the Agreement applying this Regulation.
- 10.3. The Type Approval Authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.
11. PRODUCTION QUALIFICATION
- 11.1. In order to make sure that the manufacturer's production system is satisfactory, the Technical Service, which conducted the type approval tests, shall carry out tests to qualify production in accordance with paragraph 11.2.

11.2. Qualifying the production of child restraint systems

The production of each new approved type of child restraint system of categories 'universal', 'semi-universal' and 'restricted' shall be subjected to production qualification tests. Additional qualification of production may be prescribed following paragraph 10.1.3.

For this purpose, a random sample of 5 child restraint systems will be taken from the first production batch by the Technical Service who conducted the approval tests, or by a Technical Service appointed by the same Type Approval Authority who will grant the approval, or by the Type Approval Authority itself.

Six sample units may be selected randomly in case that the condition of paragraph 7.1.4.4.1.2.3 above is selected as the test condition of conducting a test described in 11.2.1.1).

The first production batch is considered to be the production of the first block containing a minimum of 50 child restraint systems and a maximum of 5 000 child restraint systems.

11.2.1. Dynamic tests

11.2.1.1. Five child restraint systems shall be subjected to the dynamic test described in paragraph 8.1.3. The Technical Service that conducted the type approval tests shall choose the conditions that produced the maximum horizontal head excursion during the type approval dynamic tests, excluding the conditions described in paragraphs 7.1.4.4.1.2.3 above, that refers to the test without 100 mm bar configuration only, and paragraph 7.1.4.1.10.1.2 above. All the five child restraint systems shall be tested under the same conditions.

If, during at least one of the five tests performed, the CRS touches the bar, a further test shall be performed in the condition described in paragraph 7.1.4.4.1.2.3 above which refers to the test without 100 mm bar. This further test shall not be used for the calculation described in paragraph 11.2.1.3, subparagraph (a) below.

11.2.1.2. For each test described in 11.2.1.1 the horizontal head excursion and chest accelerations shall be measured.

11.2.1.3. (a) The maximum horizontal head excursion results shall comply with the following two conditions:

No value shall exceed 1,05 L, and

$X + S$ shall not exceed L,

Where:

L = the limit value prescribed

X = the mean of the values

S = the standard deviation of the values

(b) The chest acceleration results shall comply with the requirements of paragraph 7.1.4.2.1 and, in addition, the $X + S$ condition in 11.2.1.3(a) shall be applied to the 3 ms clipped resultant chest acceleration results (as defined in paragraph 7.1.4.2.1) and recorded for information only.

11.2.2. Control of markings

11.2.2.1 The Technical Service that conducted the approval tests shall verify that the markings conform to the requirements of paragraph 4.

11.2.3. Control of instructions on installation and the instructions for use.

11.2.3.1. The Technical Service that conducted the approval tests shall verify that the instructions on installation and the instructions for use conform to paragraph 15.

12. CONFORMITY OF PRODUCTION AND ROUTINE TESTS

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2), with the following requirements:

- 12.1. Any child restraint system approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 6 to 8 above.
- 12.2. The minimum requirements for conformity of production control procedures set forth in Annex 16 to this Regulation shall be complied with.
- 12.3. The authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be twice a year.

13. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 13.1. The approval granted in respect of a child restraint pursuant to this Regulation may be withdrawn if a child restraint bearing the particulars referred to in paragraph 5.4 fails to pass the random checks described in paragraph 11 or does not conform to the type approved.
- 13.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

14. PRODUCTION DEFINITELY DISCONTINUED

- 14.1. If the holder of the approval completely ceases to manufacture a specific type of child restraint under this Regulation, he shall inform thereof the Type Approval Authority which granted the approval. Upon receiving the relevant communication, that authority shall inform the other Parties to the Agreement which apply this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

15. INSTRUCTIONS

- 15.1. Each child restraint shall be accompanied by instructions in the language of the country where the device is sold with the following content:
- 15.2. Instructions on installation shall include the following points:
- 15.2.1. For 'universal' category child restraints the following label shall be clearly visible at the point of sale without removing the packing:

Notice

This is a 'Universal' child restraint. It is approved to Regulation No 44, 04 series of amendments, for general use in vehicles and it will fit most, but not all, car seats.

A correct fit is likely if the vehicle manufacturer has declared in the vehicle handbook that the vehicle is capable of accepting a 'Universal' child restraint for this age group.

This child restraint has been classified as 'Universal' under more stringent conditions than those which applied to earlier designs which do not carry this notice.

If in doubt, consult either the child restraint manufacturer or the retailer.

- 15.2.2. For 'restricted' and 'semi-universal' category child restraints the following information shall be clearly visible at the point of sale without removing the packing:

This child restraint is classified for '(Restricted/Semi-universal)' use and is suitable for fixing into the seat positions of the following cars:

CAR	FRONT	REAR
	Outer	Centre
(Model)	Yes	Yes No

Seat positions in other cars may also be suitable to accept this child restraint. If in doubt, consult either the child restraint manufacturer or the retailer.

- 15.2.3. For 'Specific vehicle' category child restraints information on the applicable vehicle shall be clearly visible at the point of sale without removing the packing.

- 15.2.4. If the device requires an adult safety belt, the following wording should also be clearly visible at the point of sale without removing the packing:

'Only suitable if the approved vehicles are fitted with lap/3 point/static/with retractor safety belts, approved to UN/ECE Regulation No 16 or other equivalent standards.' (Strike out what does not apply.)

In the case of carrycot restraints a list of carrycots for which the device is suited should be included.

- 15.2.5. The child restraint manufacturer shall provide information on the packing box as to the address to which the customer can write to obtain further information on fitting the child restraint in specific cars.

- 15.2.6. The method of installation illustrated by photographs and/or very clear drawings;

- 15.2.7. The user shall be advised that the rigid items and plastic parts of a child restraint shall be so located and installed that they are not liable, during everyday use of the vehicle, to become trapped by a movable seat or in a door of the vehicle;

- 15.2.8. The user should be advised to use carrycots perpendicular to the longitudinal axis of the vehicle;

- 15.2.9. In the case of rearward facing systems the customer shall be advised not to use them in seating positions where an active frontal airbag installed. This information shall be clearly visible at the point of sale without removing the packaging;

- 15.2.10. For 'Special Needs Restraints' the following information shall be clearly visible at the point of sale without removing the packing:

This 'Special Needs Restraint' is designed to give extra support to children who have difficulty in sitting correctly in conventional seats. Always consult your doctor to make sure that this restraint system is suitable for your child.

- 15.2.11. For an ISOFIX child restraint system, the following label shall be clearly visible at the point of sale without removing the packing:

Notice

1. This is an ISOFIX CHILD RESTRAINT SYSTEM. It is approved to Regulation No 44, 04 series of amendments for general use in vehicles fitted with ISOFIX anchorages systems.
2. It will fit vehicles with positions approved as ISOFIX positions (as detailed in the vehicle handbook), depending on the category of the child seat and of the fixture.
3. The mass group and the ISOFIX size class for which this device is intended is:

- 15.3. The instructions for use shall include the following points:
- 15.3.1. The mass group and the fixture for which the device is intended:
- 15.3.2. When the device is used in combination with an adult safety belt to be used by means of the following wording: Only suitable for use in the listed vehicles fitted with lap/3 point/static/with retractor safety belts, approved to ECE Regulation No 16 or other equivalent standards. (Strike out what does not apply.)
- 15.3.3. The method of use shall be shown by photographs and/or very clear drawings. In the case of seats that can be used both forward and rear-facing, clear warning shall be given to keep the restraint rear-facing until the child's mass is greater than a stated limit, or some other dimensional criterion is exceeded.
- 15.3.4. The operation of the buckle and adjusting devices shall be explained clearly;
- 15.3.5. It shall be recommended that any straps holding the restraint to the vehicle should be tight, that any straps restraining the child should be adjusted to the child's body, and that straps should not be twisted.
- 15.3.6. The importance of ensuring that any lap strap is worn low down, so that the pelvis is firmly engaged, shall be stressed.
- 15.3.7. It shall be recommended that the device should be changed when it has been subject to violent stresses in an accident.
- 15.3.8. Instructions for cleaning shall be given.
- 15.3.9. A general warning shall be given to the user concerning the danger of making any alterations or additions to the device without the approval of the Type Approval Authority, and a danger of not following closely the installation instructions provided by the child restraint manufacturer.
- 15.3.10. When the chair is not provided with a textile cover, it shall be recommended that the chair should be kept away from sunlight, otherwise it may be too hot for the child's skin.
- 15.3.11. It shall be recommended that children are not left in their child restraint system unattended.
- 15.3.12. It shall be recommended that any luggage or other objects liable to cause injuries in the event of a collision shall be properly secured.
- 15.3.13. It shall be recommended that:
- (a) The child restraint shall not be used without the cover;
 - (b) The seat cover should not be replaced with any other than the one recommended by the manufacturer, because the cover constitutes an integral part of the restraint performance.
- 15.3.14. There shall be a text or a diagram indicating how a user can identify an unsatisfactory position of the adult safety belt buckle relative to the main load bearing contact points on the restraint. The user shall be advised to contact the child restraint manufacturer if in doubt about this point.
- 15.3.15. If the child restraint offers an alternative load bearing contact point, its use shall be described clearly. The user shall be informed about how to judge if use of this alternative route is satisfactory. The user shall be advised to contact the child restraint manufacturer if in doubt about this point. The user shall be clearly advised to begin the child restraint installation, in vehicle seating positions categorized as 'Universal' in the vehicle owner's manual, by using the primary belt route.
- 15.3.16. There shall be provisions made so that the instructions can be retained on the child restraint for its life period or in the vehicle handbook in the case of built-in restraints.

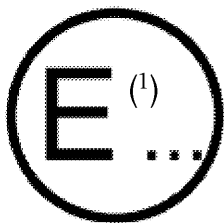
- 15.3.17. There shall be explicit warning not to use any load bearing contact points other than those described in the instructions and marked in the child restraint.
- 15.3.18. For an ISOFIX child restraint system, the instruction for use shall be given to read the car manufacturer's handbook.
16. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF TYPE APPROVAL AUTHORITIES
- 16.1. The Parties to the Agreement which apply 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 Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.
17. TRANSITIONAL PROVISIONS
- 17.1. As from the official date of entry into force of the 03 series of amendments, no Contracting Party applying this Regulation shall refuse to grant approval under this Regulation as amended by the 03 series of amendments.
- 17.2. As from 12 months after the date of entry into force, Contracting Parties applying this Regulation shall grant approvals only if the child restraint system type to be approved meets the requirements of this Regulation as amended by the 03 series of amendments.
- 17.3. During the 12-month period which follows the date of entry into force of the 03 series of amendments, Contracting Parties applying this Regulation can continue to grant type approvals to those child restraint systems which comply with the requirements of this Regulation as amended by the 02 series of amendments.
- 17.4. In the same period of 12 months, Contracting Parties applying this Regulation shall not refuse to grant extensions of approval to the preceding series of amendments to this Regulation.
- 17.5. As from the date of entry into force of the 03 series of amendments, the provisions of Annex 16 to this Regulation shall apply also to child restraint devices already type approved to the 02 series of amendments.
- 17.6. Starting from the date of entry into force of the 03 series of amendments, Contracting Parties applying this Regulation may refuse the sale of a type of child restraint which does not meet the requirements of paragraphs 6.2.2 and 6.2.14 of the 03 series of amendments.
- 17.7. Starting 36 months after the entry into force of the 03 series of amendments, Contracting Parties applying this Regulation may refuse the sale of child restraint systems which do not meet the requirements of the 03 series of amendments to this Regulation.
- 17.8. As from the date of entry into force of supplement 2 to the 03 series of amendments, the label required by paragraph 4.5 of this Regulation shall be affixed to all new child restraints manufactured in conformity with this Regulation.
- 17.9. As from the official date of entry into force of the 04 series of amendments, no Contracting Party applying this Regulation shall refuse to grant approval under this Regulation as amended by the 04 series of amendments.
- 17.10. As from 12-months after the date of entry into force of the 04 series of amendments, Contracting Parties applying this Regulation shall grant approvals only if the child restraint system type to be approved meets the requirements of this Regulation as amended by the 04 series of amendments.

- 17.11. During the 12-month period which follows the date of entry into force of the 04 series of amendments, Contracting Parties applying this Regulation can continue to grant type approvals to those child restraint systems which comply with the requirements of this Regulation as amended by the 03 series of amendments.
- 17.12. During the 36-month period which follows the date of entry into force of the 04 series of amendments, Contracting Parties applying this Regulation shall not refuse to grant extensions of approval to the preceding series of amendments to this Regulation.
- 17.13. Starting 48-months after the entry into force of the 04 series of amendments, Contracting Parties applying this Regulation may refuse the sale of child restraint systems which do not meet the requirements of the 04 series of amendments to this Regulation.
- 17.14. As from six months from the date of entry into force of Supplement 04 to the 04 series of Amendments approvals granted in accordance with the 03 or 04 series of amendments for child restraint systems belonging to groups 0, 0+ and I which do not comply with paragraph 6.1.11 or 6.1.12 shall cease to be valid.
- 17.15. From the date of entry into force of Supplement 4 to the 04 series of Amendments of this Regulation, by way of derogation to the obligations of Contracting Parties during the transitional period set out in paragraph 17.14 and based on the declaration made by the European Community at the time of its accession to the 1958 Agreement (Depositary Notification C.N.60.1998.TREATIES-28), Member States of the European Community may prohibit the placing on the market of child restraint systems which do not meet the requirements of Supplement 4 to the 04 series of Amendments of this Regulation.
-

ANNEX 1

COMMUNICATION

(Maximum format: A4 (210 × 297 mm))



issued by: Name of administration

.....

.....

.....

Concerning ⁽²⁾: Approval granted,
 Approval extended,
 Approval refused,
 Approval withdrawn,
 Production definitively discontinued,

of restraining devices for child occupants of power-driven vehicles, pursuant to Regulation No 44.

Approval No Extension No

- 1.1. Forward-facing child restraint/rearward-facing child restraint/carrycot;
- 1.2. Integral/non-integral/partial/booster cushion;
- 1.3. Belt type: (adult) three-point belt
 (adult) lap belt
 special type belt/retractor;
- 1.4. Other features: chair assembly/impact shield
2. Trade name or mark
3. Manufacturer's designation of the child restraint
4. Manufacturer's name
5. If applicable, name of his representative
6. Address
7. Submitted for approval on
8. Technical Service conducting approval tests
9. Type of device: deceleration/acceleration ⁽²⁾
10. Date of test report issued by that Service
11. Number of test report issued by that Service
12. Approval granted/extended/refused/withdrawn ⁽²⁾ for use in groups 0, 0+, I, II or III and for universal/semi-universal/restricted use or use in a specific vehicle or for use as a "special needs restraint", position in vehicle

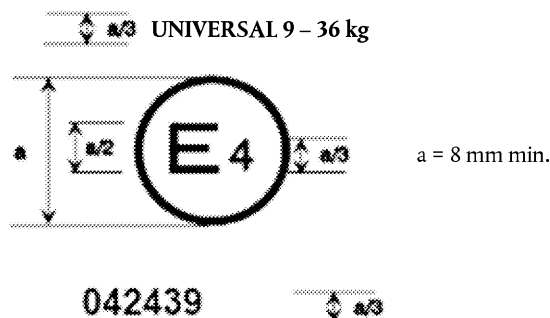
⁽¹⁾ Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation).

⁽²⁾ Strike out what does not apply.

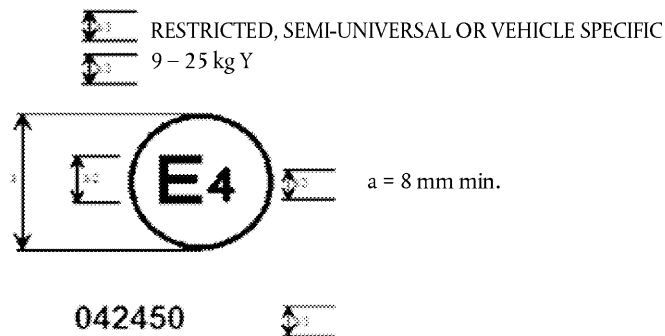
- 13. Position and nature of the marking
- 14. Place
- 15. Date
- 16. Signature
- 17. The following documents, bearing the approval number shown above, are attached to this communication:
 - (a) Drawings, diagrams and plans of the child restraint, including any retractor, chair assembly, impact shield fitted;
 - (b) Drawings, diagrams and plans of the vehicle structure and the seat structure, as well as of the adjustment system and the attachments, including any energy absorber fitted;
 - (c) Photographs of the child restraint and/or vehicle structure and seat structure;
 - (d) Instructions for fitting and use;
 - (e) List of vehicle models for which the restraint is intended.

ANNEX 2

ARRANGEMENTS OF THE APPROVAL MARKS



The child restraint system bearing the above approval mark is a device capable of being fitted in any vehicle and of being used for the 9 kg-36 kg mass range (Groups I to III); it is approved in the Netherlands (E 4) under the number 042439. The approval number indicates that the approval was granted in accordance with the requirements of the Regulation concerning the approval of restraining devices for child occupants of power-driven vehicles ('child restraint system') as amended by the 04 series of amendments.



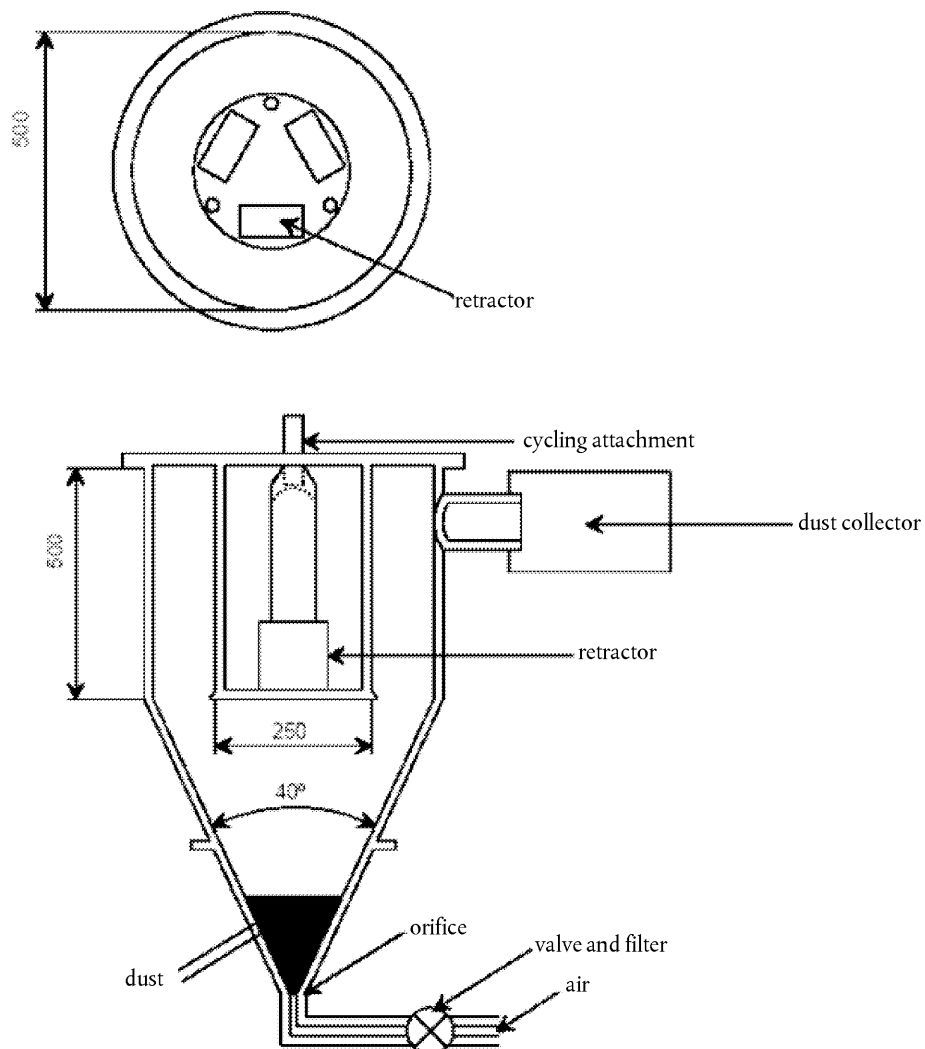
The child restraint system bearing the above approval mark is a device not capable of being fitted in every vehicle and of being used for the 9 kg-25 kg mass range (Groups I and II); it is approved in the Netherlands (E 4) under the number 042450. The approval number indicates that the approval was granted in accordance with the requirements of the Regulation concerning the approval of restraining devices for child occupants of power-driven vehicles ('child restraint system') as amended by the 04 series of amendments. The symbol 'Y' indicates that the system contains a crotch strap.

Note: The approval number and additional symbol(s) shall 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 shall be on the same side of the 'E' and oriented in the same direction. The additional symbol(s) shall 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

ARRANGEMENT OF APPARATUS FOR DUST RESISTANCE TEST

(dimensions in millimetres)



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/m² and 170 kN/m².

5. CONDITIONS IN THE MIST CHAMBER

- 5.1. The exposure zone of the mist chamber shall be maintained at 35 ± 5 °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 cm² 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.
-

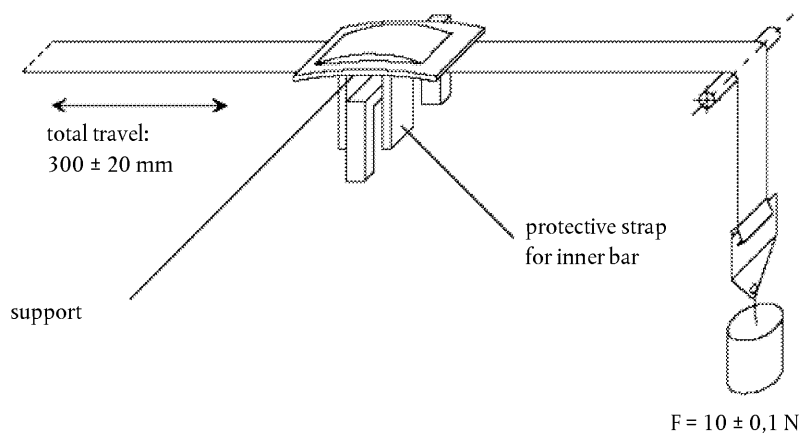
ANNEX 5

ABRASION AND MICROSLIP TEST

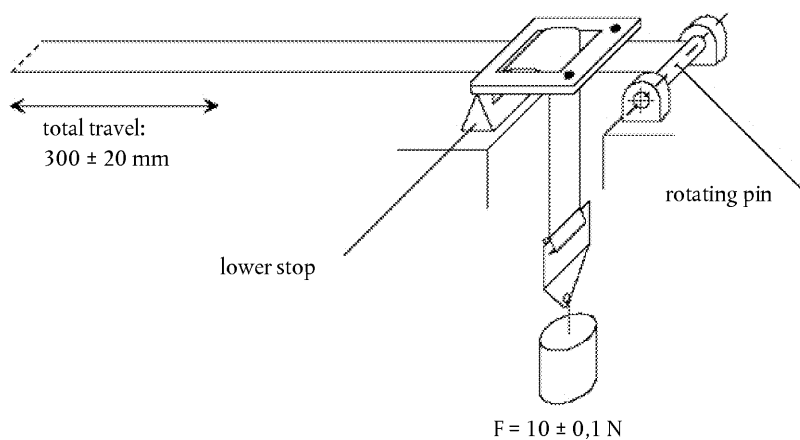
Figure 1

Procedure type 1

Examples of test arrangements corresponding to the type of adjusting device

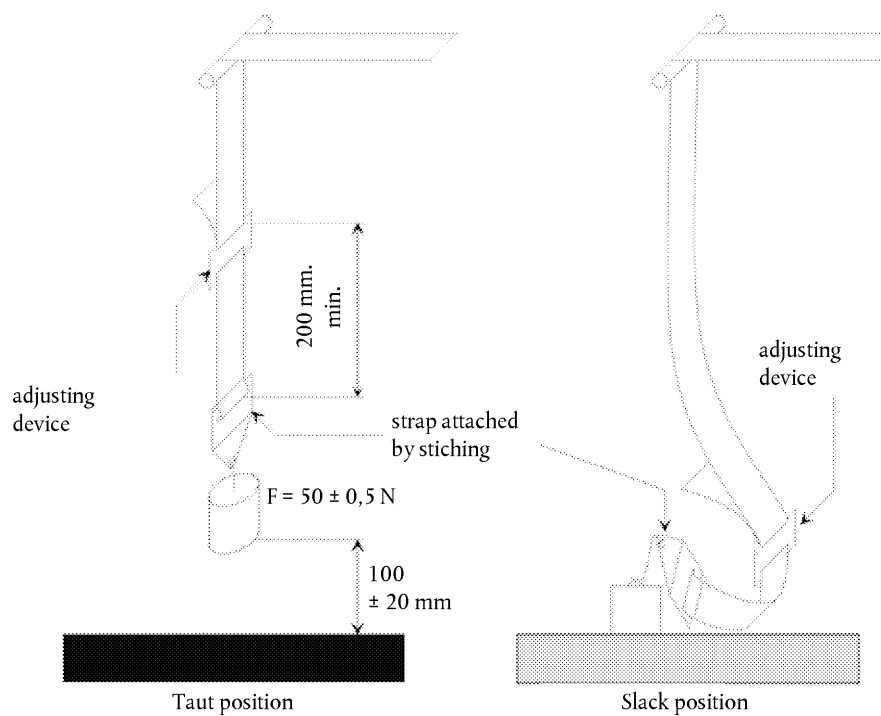


Example a



Example b

Remark. $F = 10 \pm 0,1$ N, can be increased up to $F = 60 \pm 0,5$ N



The load of 50 N on the testing device shall be vertically guided in such a way as to prevent load-swing and twisting of the strap. The attaching device shall be fixed to the load of 50 N in the same manner as in the vehicle.

ANNEX 6

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

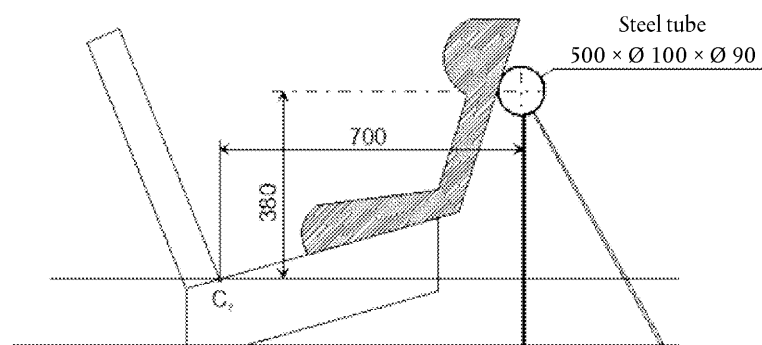
Specific mass (g/m ²)	290
Breaking strength according to DIN 53587 on test specimen 50 mm wide:	
lengthwise (kg):	120
breadthwise (kg):	80

- 3.1.7. Covering the seat and the seat back ⁽¹⁾
- 3.1.7.1. The seat foam cushion is produced out of a square foam block (800 × 575 × 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 (1 250 × 1 200 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 1 200 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)
- 3.1.7.5. 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 (1 250 × 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.

⁽¹⁾ Details of materials used in this process can be obtained from TNO (Research Institute for Road Vehicles), Schoemakerstraat 97, 2628 VK Delft, The Netherlands.

- 3.2. 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: $500 \times 100 \times 90$ mm.

Figure 1

Arrangement for testing a rearward-facing device

Dimensions in mm

- 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 Cr axis projection point, dimension X ⁽¹⁾ 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 Cr 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.
 - 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;

⁽¹⁾ The dimension X shall be of 210 mm with an adjustment range of ± 70 mm.

- 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 °C 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' ⁽¹⁾

(ASTM Method D 735 unless otherwise stated)		
Shore hardness A:		95 ± 2 at 20 ± 5 °C temperature
Breaking strength:		$R_o \geq 350$ kg/cm ²
Minimum elongation:		$A_o \geq 400$ percent
Module	at 100 percent elongation:	≥ 110 kg/cm ²
	at 300 percent elongation:	≥ 240 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

Immersion in distilled water:

	breaking strength: decrease < 35 percent of R_o
1 week at 70 °C:	
	elongation: increase < 20 percent of A_o

(¹) The address to obtain the relevant ASTM standards is: ASTM, 1916 Race Street, Philadelphia, USA PA 19 103.

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 ≥ 300 kg/cm ²
Minimum elongation:		A _o ≥ 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 ≤ 45 percent

Density at 25 °C:	1,08 to 1,12
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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

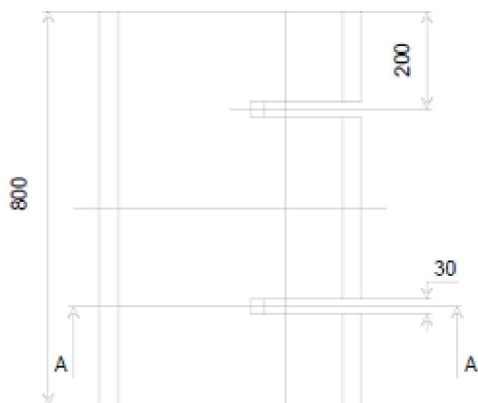
Immersion in distilled water:

	breaking strength: decrease < 35 percent of R_o
1 week at 70 °C:	
	elongation: increase < 20 percent of A_o

Appendix 1

Figure 1

Dimensions of the seat and the seat cushions



Square foam block, section A-A

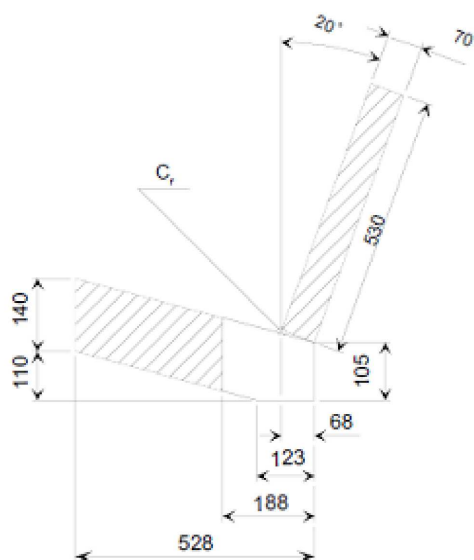
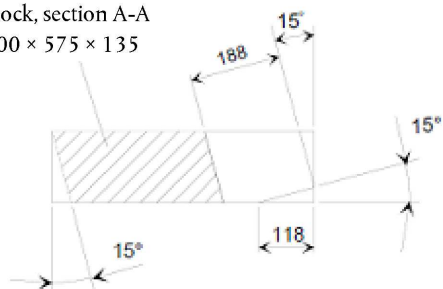
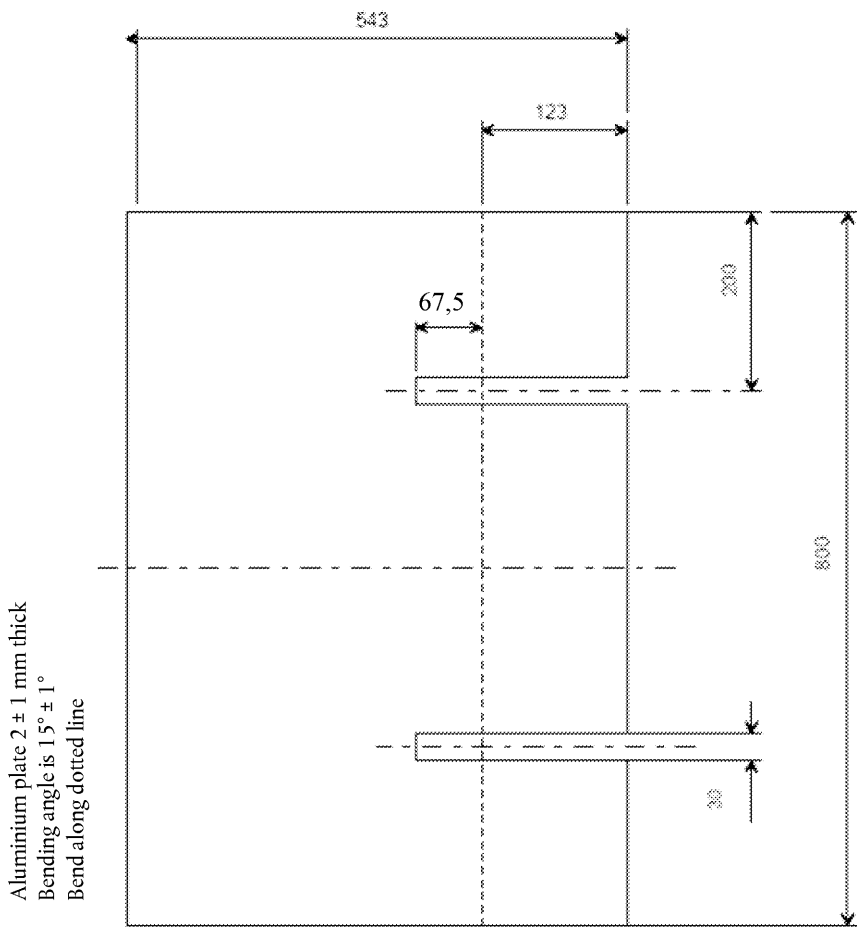
Dimensions: $800 \times 575 \times 135$ 

Figure 2

Dimensions of the aluminium bottom-plate

Aluminium plate before bending



Dimensions in mm

Figure 3

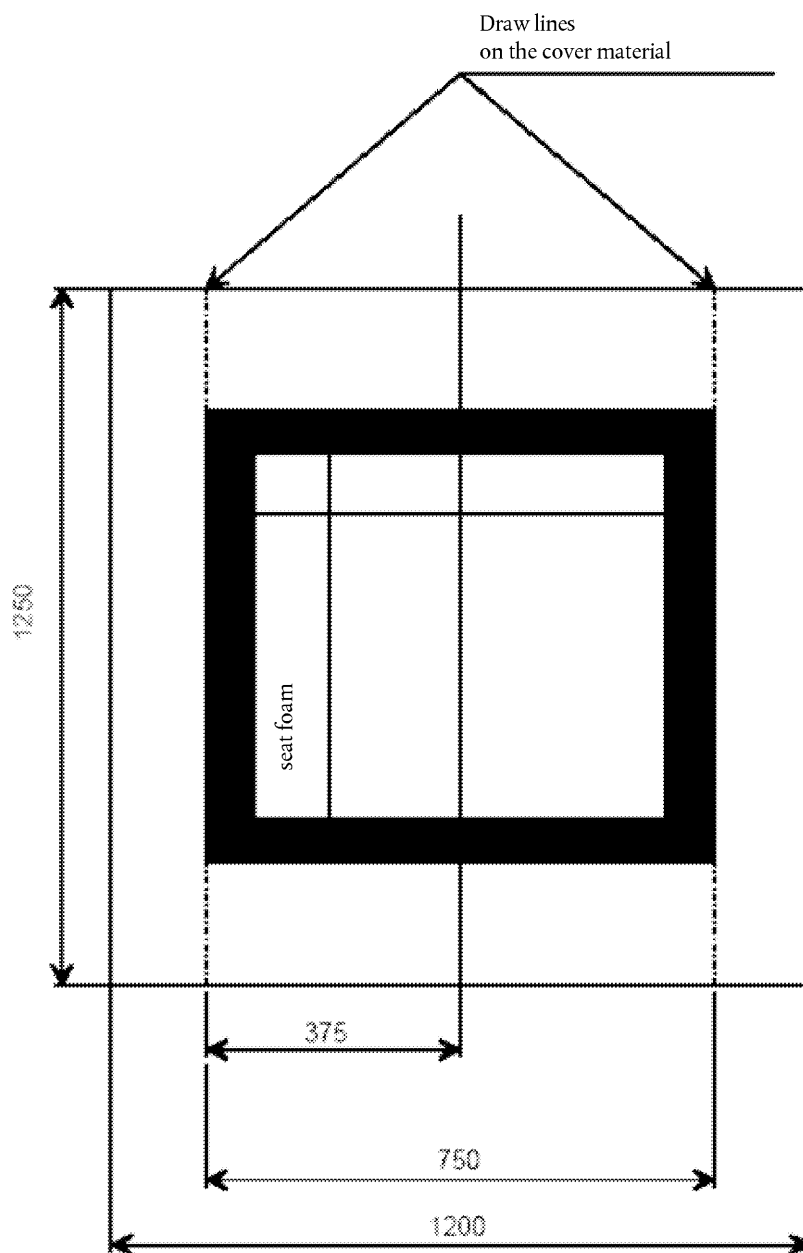
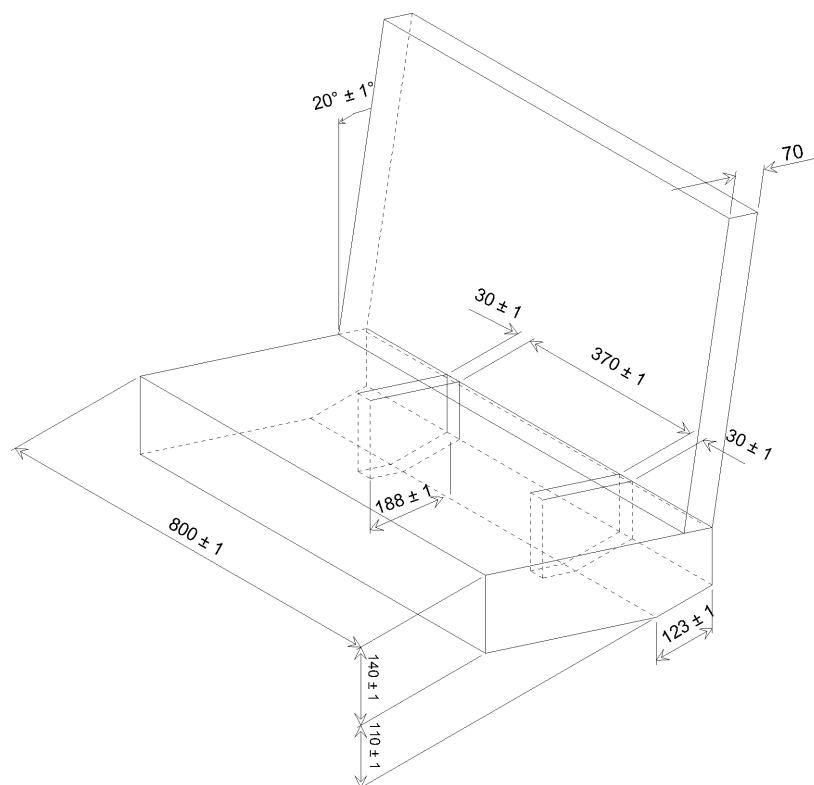
Dimensions of the cover material

Figure 4

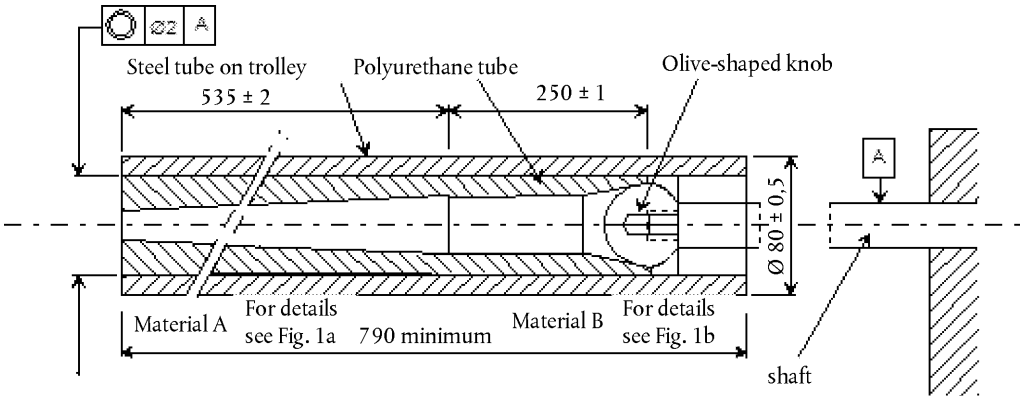
3-Dimensional view of seat

Appendix 2

STOPPING DEVICE

FRONTAL IMPACT DIMENSIONS (IN MM)

Figure 1



Play defined according to external diameter of polyurethane tube (light push fit)

3,2 $\sqrt{\text{surface finish}}$

Figure 1a

Material A

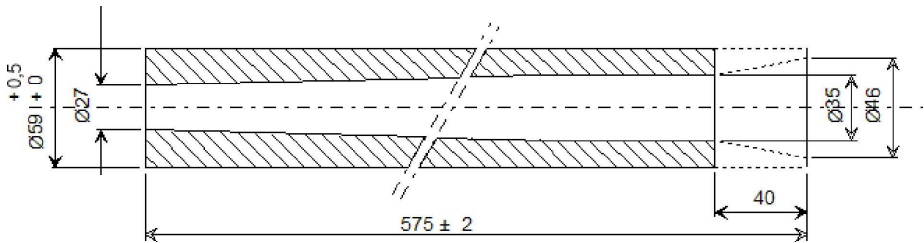


Figure 1b

Material B

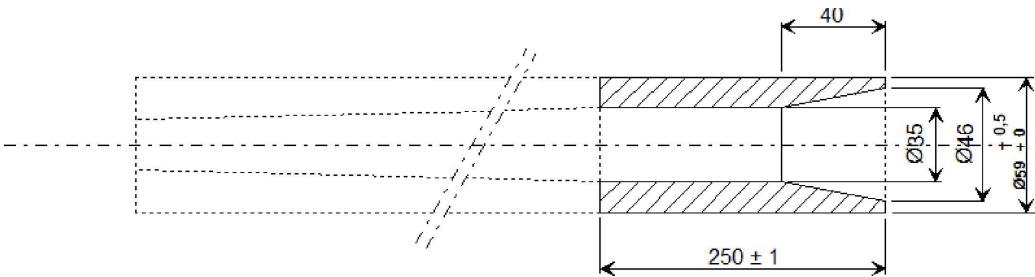
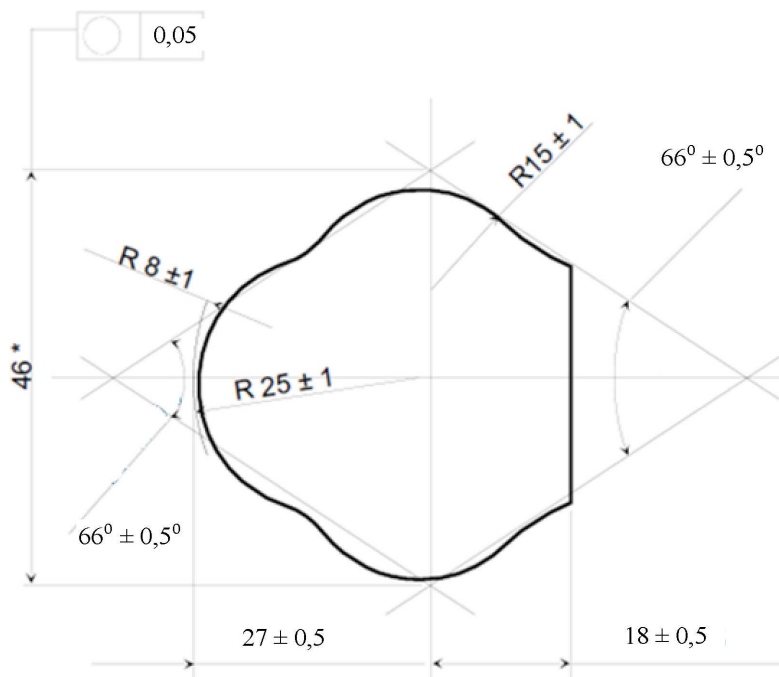


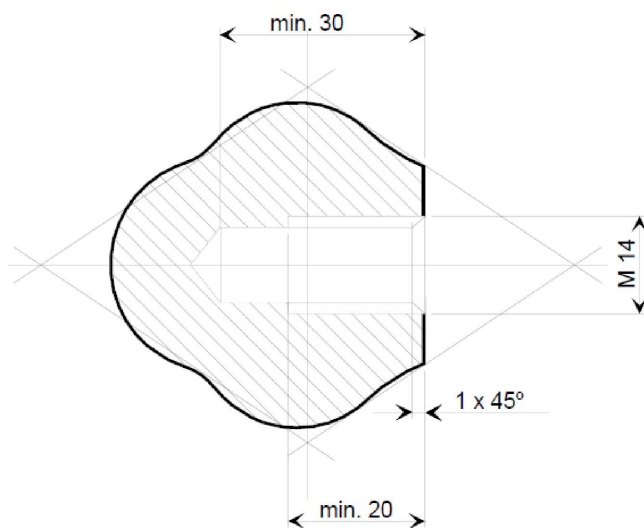
Figure 2

Stopping device olive-shaped knob

* This dimension can vary between 43 and 49 mm

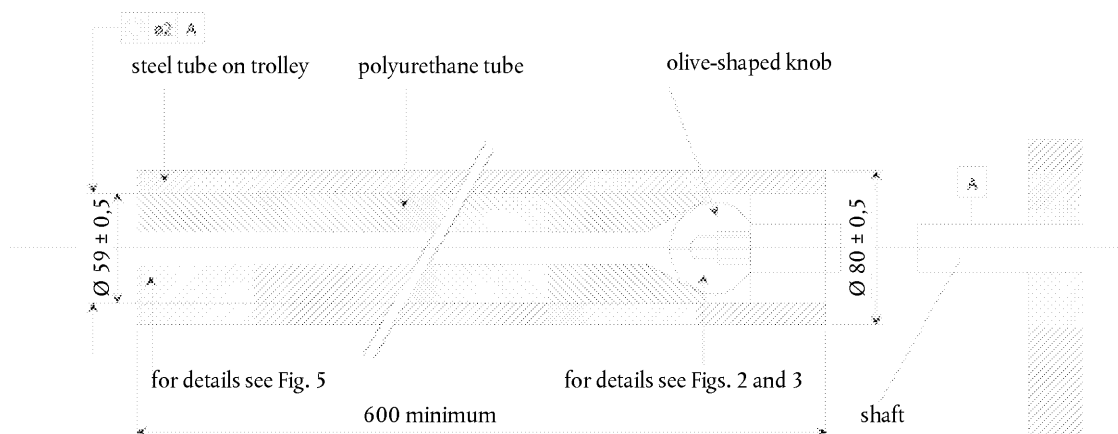
Dimensions in mm

Figure 3

Stopping device olive-shaped knob

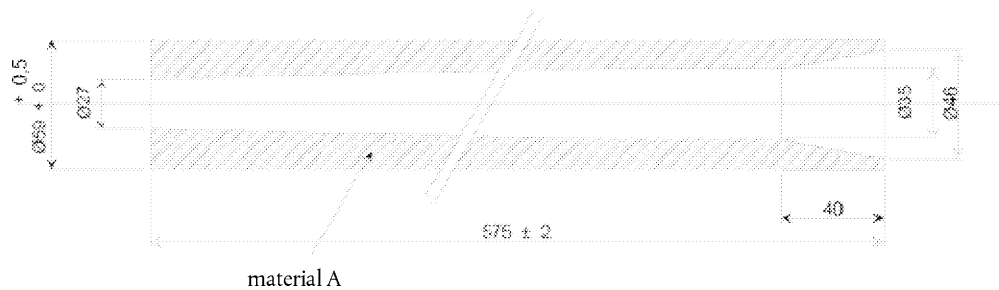
Dimensions in mm

Figure 4

Stopping device (assembled)**Rear impact****dimensions in mm**

Play defined according to external diameter of polyurethane tube (light push fit)

Figure 5

**Stopping device
polyurethane tube****Rear impact****dimensions in mm**

*Appendix 3***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 of this Regulation).
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 shall 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 carrycots in group 0, 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 of this Regulation.

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.

Appendix 1

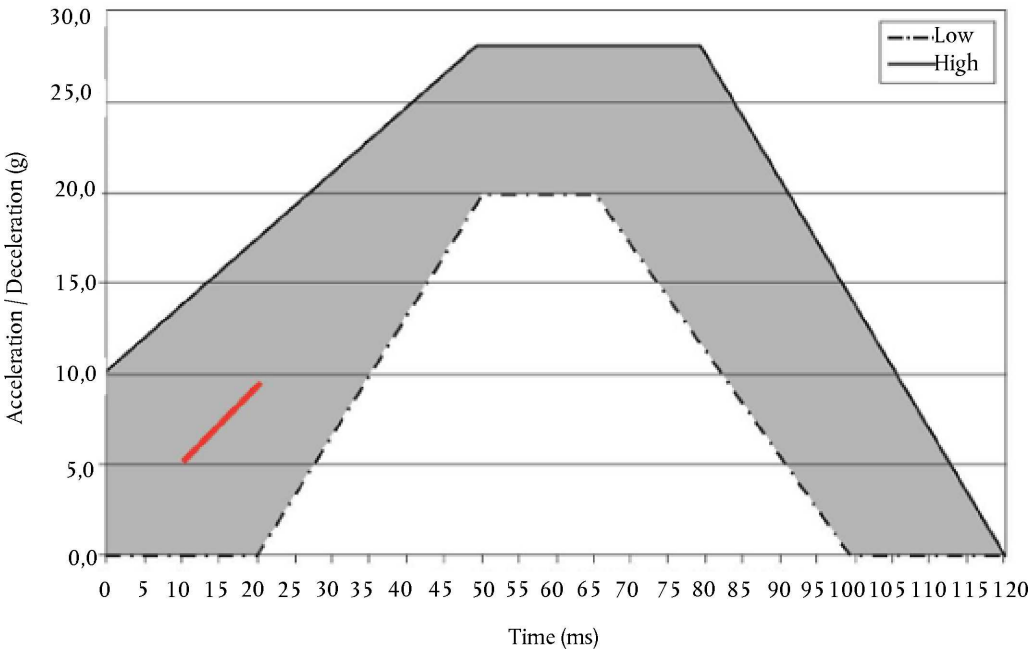
CURVE OF TROLLEY'S DECELERATION OR ACCELERATION, AS FUNCTION OF TIME

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

Regulation No 44 Frontal impact



The additional segment (see paragraph 8.1.3.1.1.3.2 of this Regulation) applies only for the acceleration sled

Appendix 2

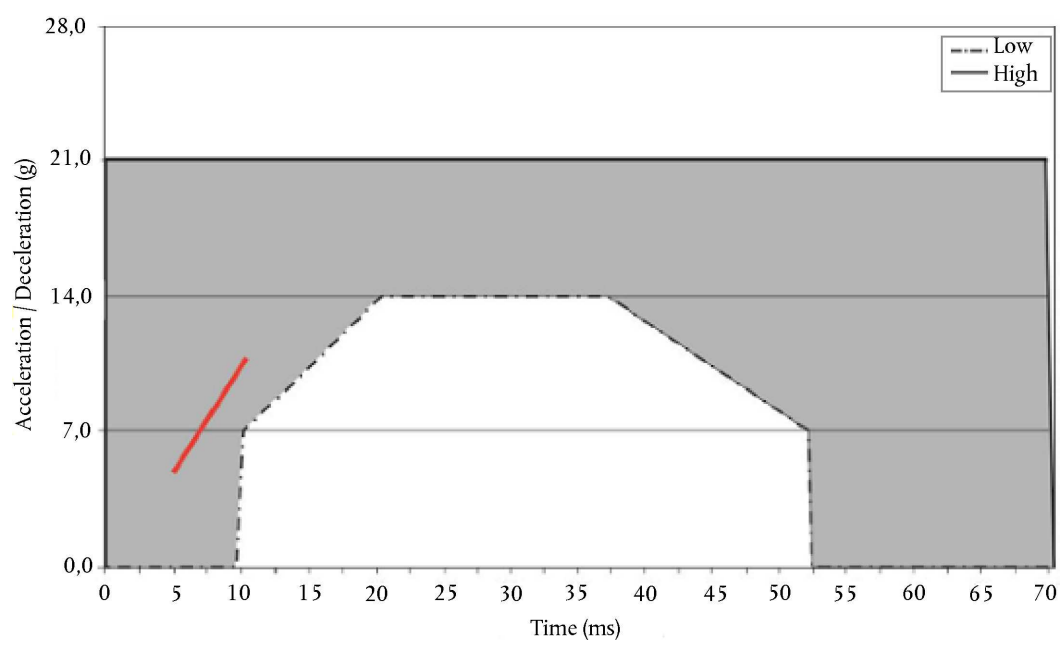
CURVE OF TROLLEY’S DECELERATION OR ACCELERATION, AS FUNCTION OF TIME

Rear impact

Definition of the different curves

Time (ms)	Acceleration (g) low corridor	Acceleration (g) 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 8.1.3.1.1.3.2 of this Regulation) applies only for the acceleration sled

ANNEX 8

DESCRIPTION OF MANIKINS

1. GENERAL

- 1.1. The manikins prescribed in this Regulation are described in Appendices 1 to 3 to this annex, and in technical drawings produced by the TNO (Research Institute for Road Vehicles), Schoemakerstraat 97, 2628 VK Delft, The Netherlands.
- 1.2. Alternative manikins may be used provided that:
 - 1.2.1. Their equivalence can be demonstrated to the satisfaction of the Type Approval 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.

*Appendix 1***DESCRIPTION OF THE 9 MONTHS AND 3, 6 AND 10-YEAR MANIKINS****1. GENERAL**

The dimensions and masses of the manikins described below are based on the anthropometry of 50th percentile children aged 9 months and 3, 6 and 10 years respectively.

1.2. The manikins consist of a metal and polyester skeleton with cast polyurethane body components.

1.3. For an exploded view of the manikin, see Figure 9.

2. CONSTRUCTION**2.1. Head**

2.1.1. The head is made of polyurethane and reinforced by metal strips. Inside the head it is possible to install measuring equipment on a polyamide block at the centre of gravity.

2.2. Vertebrae**2.2.1. Neck vertebrae**

2.2.1.1. The neck is made of 5 rings of polyurethane containing a core of polyamide elements. The Atlas-Axis block is made of polyamide.

2.2.2. Lumbar vertebrae

2.2.2.1. The five lumbar vertebrae are made of polyamide.

2.3. Chest

2.3.1. The skeleton of the chest consists of a tubular steel frame on which the arm joints are mounted. The spine consists of a steel cable with four threaded terminals.

2.3.2. The skeleton is coated with polyurethane. Measuring equipment can be housed in the chest cavity.

2.4. Limbs

2.4.1. The arms and legs are also made of polyurethane, reinforced by metal elements in the form of square tubes, strips and plates. The knees and elbows are provided with adjustable hinge joints. The joints of the upper arm and upper leg consist of adjustable ball and socket joints.

2.5. Pelvis

2.5.1. The pelvis is made of glass reinforced polyester also coated with polyurethane.

2.5.2. The shape of the upper side of the pelvis, which is important for determining sensitivity to abdominal loading, is simulated as far as possible from the shape of a child's pelvis.

2.5.3. The hip joints are situated just below the pelvis.

2.6. Assembly of the manikin

2.6.1. Neck-chest-pelvis

2.6.1.1. The lumbar vertebrae and the pelvis are threaded on to the steel cable and their tension is adjusted by a nut. The neck vertebrae are mounted and adjusted in the same way. Since the steel cable shall not be free to move through the chest, it shall not be possible to adjust the tension of lumbar vertebrae from the neck or vice-versa.

2.6.2. Head-neck

2.6.2.1. The head may be mounted and adjusted by means of a bolt and nut through the Atlas-Axis block.

2.6.3. Torso-limbs

2.6.3.1. The arms and legs may be mounted and adjusted to the torso by means of ball and socket joints.

2.6.3.2. For the arm joints the balls are connected to the torso; in the case of the leg joints, they are connected to the legs.

3. MAIN CHARACTERISTICS

3.1. Mass

Table 1

Component	Mass in kg by age group			
	9 months	3 years	6 years	10 years
Head + neck	2,20 ± 0,10	2,70 ± 0,10	3,45 ± 0,10	3,60 ± 0,10
Torso	3,40 ± 0,10	5,80 ± 0,15	8,45 ± 0,20	12,30 ± 0,30
Upper arm (2×)	0,70 ± 0,05	1,10 ± 0,05	1,85 ± 0,10	2,00 ± 0,10
Lower arm (2×)	0,45 ± 0,05	0,70 ± 0,05	1,15 ± 0,05	1,60 ± 0,10
Upper leg (2×)	1,40 ± 0,05	3,00 ± 0,10	4,10 ± 0,15	7,50 ± 0,15
Lower leg (2×)	0,85 ± 0,05	1,70 ± 0,10	3,00 ± 0,10	5,00 ± 0,15
Total	9,00 ± 0,20	15,00 ± 0,30	22,00 ± 0,50	32,00 ± 0,70

3.2. Principal dimensions

3.2.1. The principal dimensions, based on Figure 1 of this annex, are given in Table 2.

Figure 1

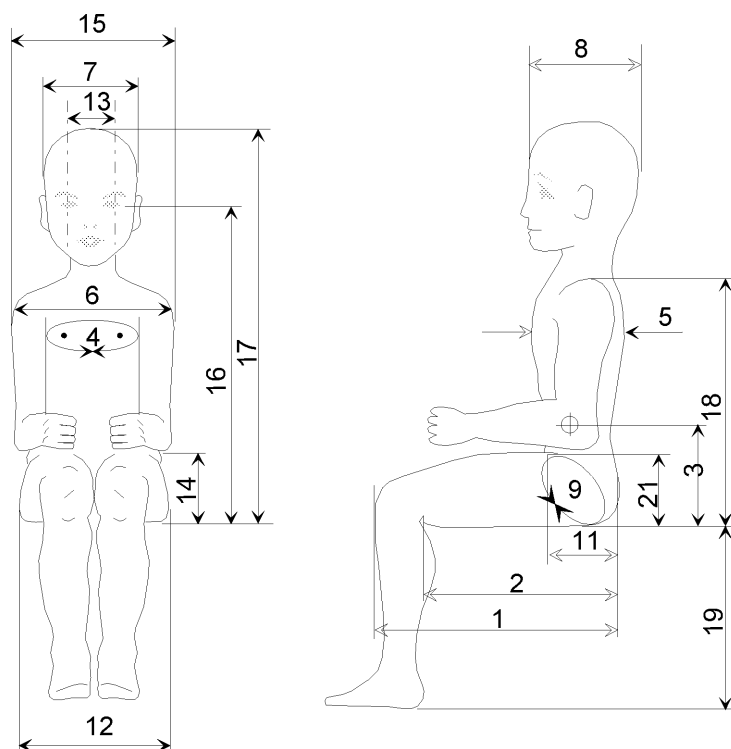
Principal dimensions of manikin

Table 2

No	Dimensions	Dimensions in mm by age group			
		9 months	3 years	6 years	10 years
1	Back of buttocks to front knee	195	334	378	456
2	Back of buttocks to popliteus, sitting	145	262	312	376
3	Centre of gravity to seat	180	190	190	200
4	Chest circumference	440	510	580	660
5	Chest depth	102	125	135	142
6	Distance between shoulder blades	170	215	250	295
7	Head width	125	137	141	141
8	Head length	166	174	175	181
9	Hip circumference, sitting	510	590	668	780
10	Hip circumference, standing (not shown)	470	550	628	740
11	Hip depth, sitting	125	147	168	180
12	Hip width, sitting	166	206	229	255

No	Dimensions	Dimensions in mm by age group			
		9 months	3 years	6 years	10 years
13	Neck width	60	71	79	89
14	Seat to elbow	135	153	155	186
15	Shoulder width	216	249	295	345
16	Eye height sitting	350	460	536	625
17	Height, sitting	450	560	636	725
18	Shoulder height, sitting	280	335	403	483
19	Sole to popliteus, sitting	125	205	283	355
20	Stature (not shown)	708	980	1 166	1 376
21	Thigh height, sitting	70	85	95	106

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.

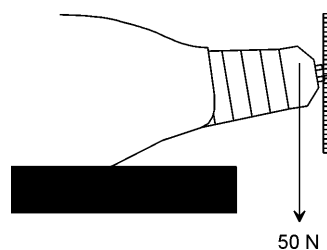
4.2.2. Mount the complete neck assembly without the head.

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).

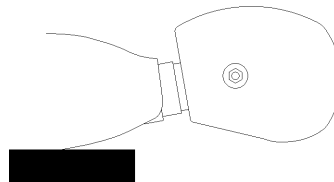
Figure 2



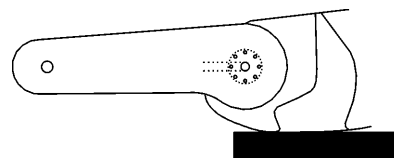
4.3. Atlas-Axis joint

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

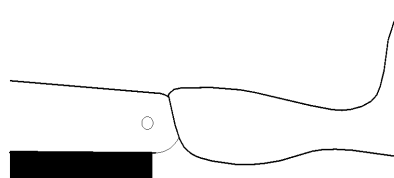
- 4.3.2. Mount the complete neck and head assembly.
- 4.3.3. Tighten the bolt and adjustment nut through the head and the Atlas-Axis block with the head in a horizontal position.
- 4.3.4. Loosen the adjustment nut until the head starts moving (see Figure 3).

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 4

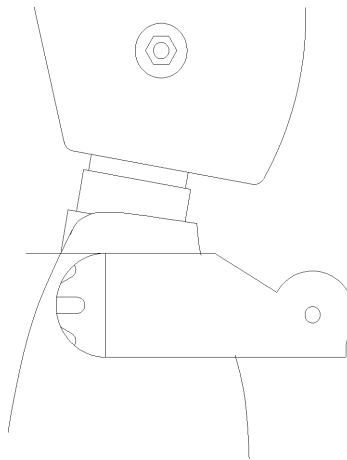
- 4.5. Knee joint
 - 4.5.1. Place the upper leg in a horizontal position.
 - 4.5.2. Mount the lower leg.
 - 4.5.3. Tighten the adjustment nut of the knee joint with the lower leg in a horizontal position.
 - 4.5.4. Loosen the adjustment nut until the lower leg starts moving (see Figure 5).

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.
- 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.

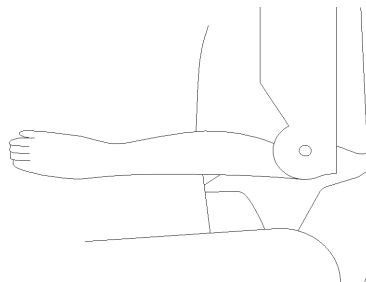
Figure 6



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.
- 4.7.4. Loosen the adjustment nut until the lower arm starts moving (see Figure 7).

Figure 7

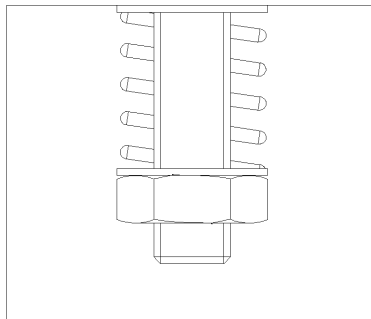


4.8. Lumbar cable

- 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).

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.

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

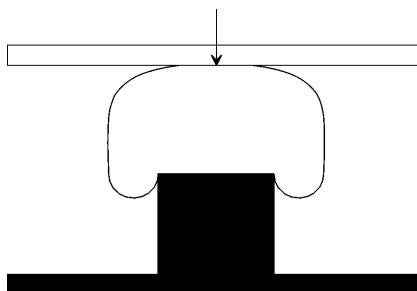
9 months dummy: $11,5 \pm 2,0$ mm

3 years dummy: $11,5 \pm 2,0$ mm

6 years dummy: $13,0 \pm 2,0$ mm

10 years dummy: $13,0 \pm 2,0$ mm

Figure 9



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.

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 ± 5 °C.

Appendix 2

DESCRIPTION OF THE 'NEW-BORN' MANIKIN

The manikin comprises a head, torso, arms and legs as a single unit. The torso, arms and legs are a single moulding of Sorbothane covered with a PVC skin and containing a steel spring spine. The head is a polyurethane foam moulding covered by a PVC skin and is permanently attached to the torso. The manikin is provided with a close fitting stretch cotton/polyester suit.

The dimensions and mass distribution of the dummy are based on those of a 50th percentile new-born baby and are given in Tables 1 and 2 and in Figure 1.

Table 1

Principal dimensions of the 'new-born' manikin

Dimension		mm	Dimension		mm
A	Rump-Crown	345	E	Shoulder width	150
B	Rump — Sole (with straight leg)	250	F	Chest width	105
			G	Chest depth	100
C	Head width	105	H	Hip width	105
D	Head depth	125	I	C of G from top of head	235

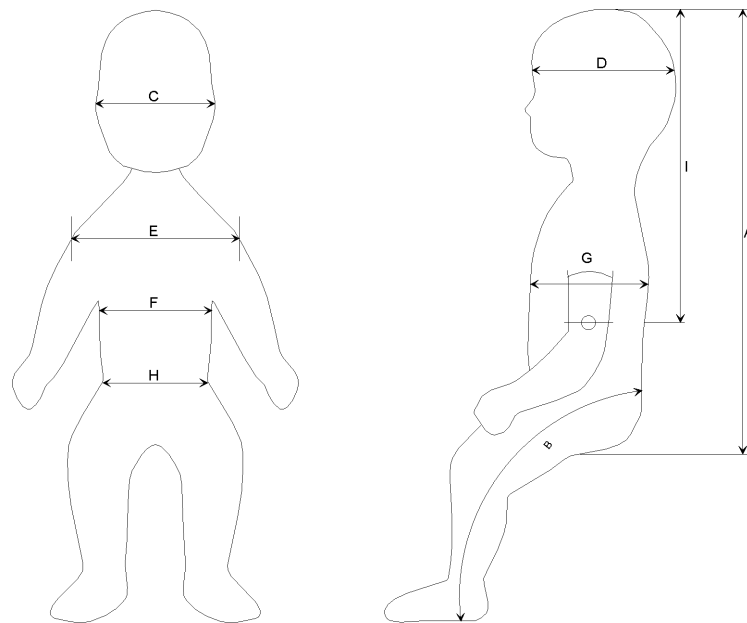
Table 2

Mass distribution of the 'new-born' manikin (*)

Head and neck	0,7 kg
Torso	1,1 kg
Arms	0,5 kg
Legs	1,1 kg
Total mass	3,4 kg

(*) The thickness of the PVC skin should be $1 + 0,5 \text{ mm} - 0$
The specific gravity should be $0,865 \pm 0,1$.

Figure 1

Calibration of infant manikin**1. SHOULDER STIFFNESS**

- 1.1. Place manikin on its back on a horizontal surface and support torso on one side, to prevent movement. (Figure 2)
- 1.2. Apply a load of 150 N, on a 40 mm diameter flat faced plunger, horizontally, in a direction perpendicular to the manikin's superior-inferior axis. The axis of the plunger should be in the centre of the manikin's shoulder and adjacent to point A on the shoulder (see Figure 2). The lateral deflection of the plunger from the point of first contact with the arm should be between 30 mm and 50 mm.
- 1.3. Repeat on the opposite shoulder — reversing the support.

2. LEG JOINT STIFFNESS

- 2.1. Place manikin on its back on a horizontal plane (Figure 3) and strap the two lower legs together, bringing the inside of the knee into contact.
- 2.2. Apply a vertical load over the knees with a 35 mm × 95 mm flat faced plunger with the centre line of the plunger over the highest point of the knees.
- 2.3. Apply sufficient force to the plunger to bend the hips until the face of the plunger is 85 mm above the support plane. This force should be between 30 N and 70 N. Ensure lower limbs do not contact any surface during the test.

3. TEMPERATURE

Calibration should be carried out of a temperature between 15 °C and 30 °C.

Figure 2

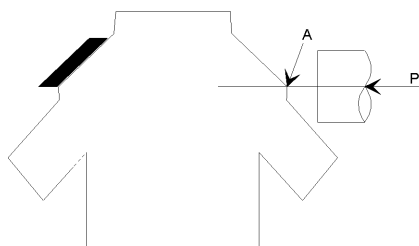
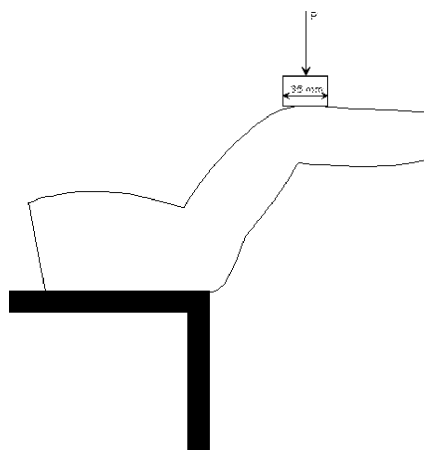


Figure 3



*Appendix 3***DESCRIPTION OF THE 18 MONTHS MANIKIN****1. GENERAL**

- 1.1. The dimensions and masses of the manikin are based on the anthropometry of 50th percentile child, 18 months old.

2. CONSTRUCTION**2.1. Head**

- 2.1.1. The head consists of a semi-rigid plastic skull covered with a head skin. The skull has a cavity which allows for the mounting of (optional) instrumentation.

2.2. Neck

- 2.2.1. The neck consists of three parts:

- 2.2.2. A solid rubber column,

- 2.2.3. An adjustable OC joint at the top of the rubber column, allowing rotation under adjustable friction around the lateral axis.

- 2.2.4. A non-adjustable spherical joint at the base of the neck.

2.3. Torso

- 2.3.1. The torso consists of a plastic skeleton, covered with a flesh/skin system. The torso has a cavity in front of the skeleton and accepts a foam filling to achieve the correct stiffness of the thorax. The torso has a cavity at the back which allows for the mounting of instrumentation.

2.4. Abdomen

- 2.4.1. The abdomen of the dummy is a one part deformable element which is inserted into the opening between the thorax and the pelvis.

2.5. Lumbar spine

- 2.5.1. The lumbar spine consists of a rubber column which is mounted between the thoracic skeleton and the pelvis. The stiffness of the lumbar spine is pre-set using a metal cable which runs through the hollow core of the rubber column.

2.6. Pelvis

- 2.6.1. The pelvis is made of a semi-rigid plastic, and is moulded in the shape of a child's pelvis. It is covered with a flesh skin system, simulating the flesh/skin around the pelvis and buttocks.

2.7. Hip joint

- 2.7.1. The hip joints mount to the lower part of the pelvis. The joint allows for rotation around a lateral axis as well as rotation around an axis at a right angle to the lateral axis using a gimbal joint. Adjustable friction applies to both axes.

2.8. Knee joint

- 2.8.1. The knee joint allows flexion and extension of the lower leg under adjustable friction.

2.9. Shoulder joint

2.9.1. The shoulder joint mounts to the thoracic skeleton. Click-stops allow the positioning of the arm in two initial positions.

2.10. Elbow joint

2.10.1. The elbow joint allows flexion and extension of the lower arm. Click-stops allow the positioning of the lower arm in two initial positions.

2.11. Assembly of the manikin

2.11.1. The spine cable is mounted in the lumbar spine.

2.11.2. The lumbar spine is mounted in the skeleton between the pelvis and the thoracic spine.

2.11.3. The abdominal insert is fitted between the thorax and the pelvis.

2.11.4. The neck is mounted on the top of the thorax.

2.11.5. The head is mounted on top of the neck using the interface plate.

2.11.6. The arms and legs are mounted.

3. MAIN CHARACTERISTICS

3.1. Mass

Table 1

Mass distribution of the 18 months manikin

Component	Mass (kg)
Head + neck	2,73
Torso	5,06
Upper arm	0,27
Lower arm	0,25
Upper leg	0,61
Lower leg	0,48
Total mass	11,01

3.2. Principal dimensions

3.2.1. The principal dimensions, based on Figure 1 of this annex (reproduced below), are given in Table 2.

Figure 1

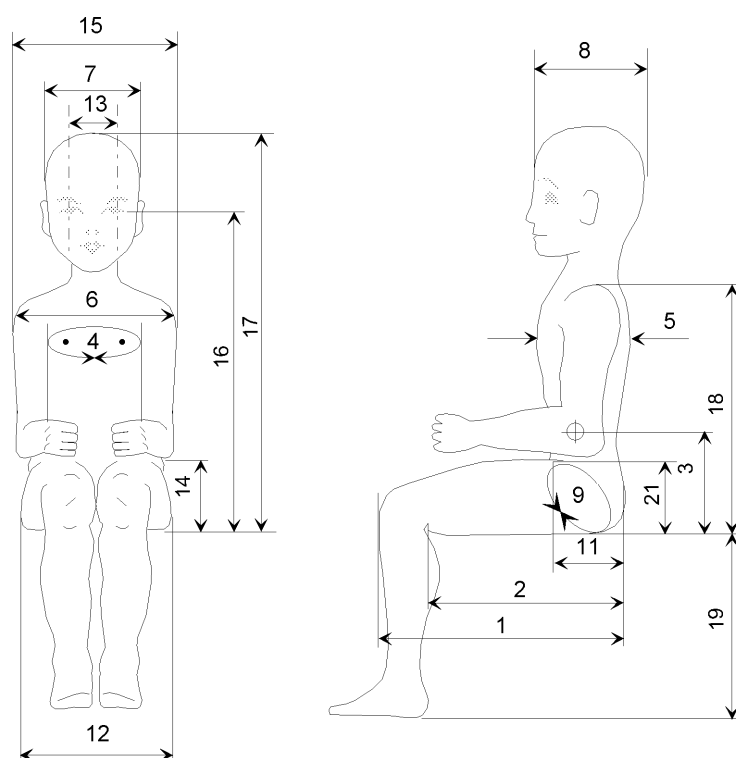
Principal dimensions of the 18 months manikin

Table 2

No	Dimension	Value (mm)
1	Back of buttocks to front of knee	239
2	Back of buttocks to popliteus, sitting	201
3	Centre of gravity to seat	193
4	Chest circumference	474
5	Chest depth	113
7	Head width	124
8	Head length	160
9	Hip circumference, sitting	510
10	Hip circumference, standing (not shown)	471
11	Hip depth, sitting	125
12	Hip width, sitting	174

No	Dimension	Value (mm)
13	Neck width	65
14	Seat to elbow	125
15	Shoulder width	224
17	Height, sitting	495 (*)
18	Shoulder height, sitting	305
19	Sole to popliteus, sitting	173
20	Stature (not shown)	820 (*)
21	Thigh height, sitting	66

(*) Manikin's buttocks, back and head resting against a vertical surface.

4. ADJUSTMENT OF JOINTS

4.1. General

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

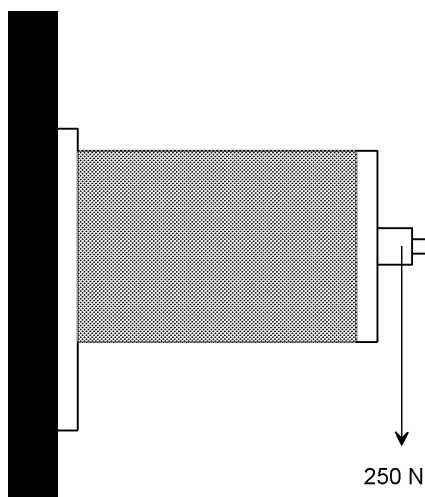
All parts shall be checked for damage prior to these instructions.

4.2. Lumbar spine

- 4.2.1. The lumbar spine is calibrated before it is mounted in the dummy.

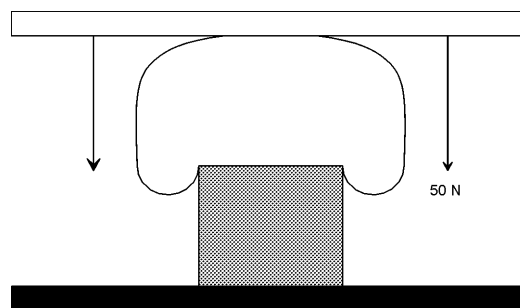
- 4.2.2. Attach the lower mounting plate of the lumbar spine to a setup such that the frontal side of the lumbar spine is located at the bottom (Figure 2).

Figure 2



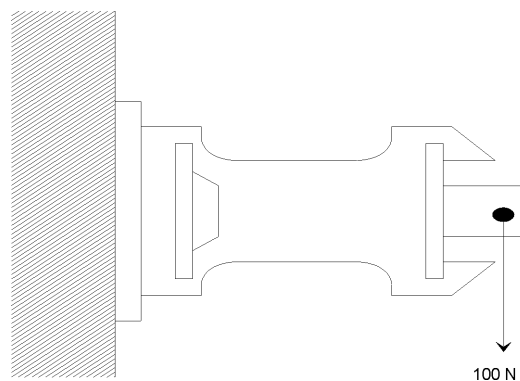
- 4.2.3. Apply a downward force of 250 N to the upper mounting plate. The resulting downward displacement should be recorded between 1 and 2 seconds after the onset of force application, and should be between 9 and 12 mm.
- 4.3. Abdomen
- 4.3.1. Mount the abdominal insert on a rigid block with the same length and width as the lumbar spine column. The thickness of this block shall be at least twice the thickness of the lumbar spine column (Figure 3).
- 4.3.2. An initial load of 20 N shall be applied.
- 4.3.3. A constant load of 50 N shall be applied.
- 4.3.4. The deflection of the abdominal insert after two minutes shall be 12 ± 2 mm.

Figure 3



- 4.4. Adjustment of the neck
- 4.4.1. Mount the complete neck, consisting of the rubber column, spherical base joint and OC joint against a vertical surface such that the frontal side is facing downward (Figure 4).

Figure 4



- 4.4.2. Apply a vertically directed force of 100 N on the axis of the OC joint. The position of the OC joint should display a downward displacement between 22 ± 2 mm.
- 4.5. OC Joint
- 4.5.1. Mount the complete neck and head assembly
- 4.5.2. Place the torso on its back in a horizontal plane.
- 4.5.3. Tighten the bolt and adjustment nut through the head and the OC joint using a torque wrench until the head is unable to move due to gravity.

4.6. Hip

- 4.6.1. Mount the upper leg, without the lower leg, to the pelvis.
- 4.6.2. Place the upper leg in a horizontal position.
- 4.6.3. Increase friction exerted on the lateral axis until the leg cannot move due to gravity.
- 4.6.4. Place the upper leg in a horizontal position, in the direction of the lateral axis.
- 4.6.5. Increase friction at the gimbal joint until the upper leg does not move due to gravity.

4.7. Knee

- 4.7.1. Mount the lower leg to the upper leg.
- 4.7.2. Place the upper and lower legs in a horizontal position, with the upper leg supported.
- 4.7.3. Tighten the adjustment nut at the knee until the lower leg cannot move due to gravity.

4.8. Shoulders

- 4.8.1. Extend the lower arm and place the upper arm in the highest position it will click into.
- 4.8.2. The click-stops in the shoulder should be serviced or replaced if the arm does not remain in this position.

4.9. Elbow

- 4.9.1. Place the upper arm in the lowest position it will click into, and the lower arm in the upper click stop position.
- 4.9.2. The click-stops in the elbow should be serviced or replaced if the lower arm does not remain in this position.

5. INSTRUMENTATION

5.1. General

- 5.1.1. Although provisions have been made to equip the 18 months manikin with a number of transducers, it is standard equipped with replacements of equal size and weight.
- 5.1.2. The calibration and measuring procedures shall be based upon the international standard ISO 6487:1980.

5.2. Installation of the accelerometer in the chest

- 5.2.1. The accelerometer shall be mounted in the cavity in the chest. This is done from the rear of the dummy.

5.3. Indication of abdominal penetration

- 5.3.1. The occurrence or absence of abdominal penetration shall be assessed using high speed photography.

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, shall 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 shall be of such thickness that it weighs at least 70 tonnes. The front face shall 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 shall no longer be subjected to the action of any additional steering or propelling device or devices. It shall 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 shall 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 shall 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.) shall be empty.

1.4.3. If the vehicle is driven by its own engine, the fuel tank shall 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 shall be 50 ± 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 shall 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.

(*) The distance 'a' is equal to the length of the synchronous pendulum under consideration.

ANNEX 11

ADDITIONAL ANCHORAGES REQUIRED FOR ATTACHING CHILD RESTRAINTS IN THE SEMI-UNIVERSAL CATEGORY TO MOTOR VEHICLES

1. This annex applies only to the additional anchorages for attaching child restraints in the 'semi-universal' category or to bars or other special items used to secure child restraining devices to the bodywork, whether or not they make use of the Regulation No 14 anchorages.
2. The anchorages shall be determined by the manufacturer of the child restraint and details shall be submitted for approval to the Technical Service conducting the tests.

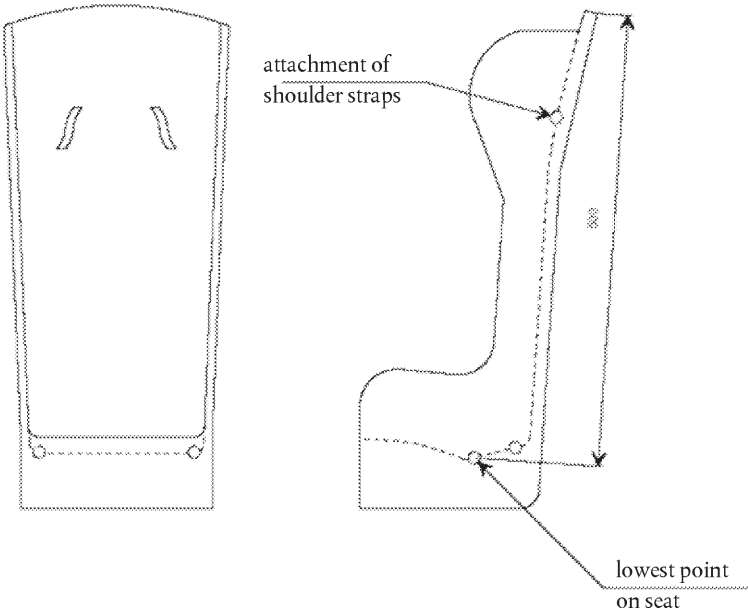
The Technical Services may take into account information obtained from the vehicle manufacturer.

3. The manufacturer of the child restraint shall provide the necessary parts for fitting the anchorages and a special plan for each vehicle showing their exact location.
4. The child restraint manufacturer shall indicate if the anchorages required for attaching the restraint to the car structure are in accordance with the position and strength requirements of paragraph 3 onwards in the recommendation given to Governments intending to adopt specific requirements relating to anchorages for child restraints used in passenger cars ⁽¹⁾.

⁽¹⁾ See text of Regulation No 16.

ANNEX 12

CHAIR



Dimensions in mm

ANNEX 13

STANDARD SAFETY BELT

1. The safety belt for the dynamic test and for the maximum length requirement shall be made to one of the two configurations shown in Figure 1. These are a three-point retracting belt and a two-point static belt.
2. The three-point retracting belt has the following rigid parts: a retractor (R), a pillar loop (P), two anchorage points (A1 and A2) (see Figure 1b), and a central part (N, in detail in Figure 3). The retractor shall comply with the requirements of Regulation No 16 for retraction force. The retractor spool diameter is $33 \pm 0,5$ mm.
3. The retracting belt shall be fitted to the anchorages on the test seat, described in Annex 6, Appendices 1 and 4, as follows:

Belt anchorage A1 shall be fitted to trolley anchorage B0 (outboard)

Belt anchorage A2 shall be fitted to trolley anchorage A (inboard)

Belt pillar loop P shall be fitted to trolley anchorage C.

Belt retractor R shall be fitted to trolley anchorage such that the spool centre-line is positioned on Re.

The value of X in Figure 1b below is 200 ± 5 mm. The effective strap length between A1 and the centre-line of the retractor spool Re (when the webbing is fully extracted including the minimum length of 150 mm for testing of universal and semi-universal categories shall be $2\,820 \pm 5$ mm when measured in a straight line without load and on a horizontal surface; this length may be increased for testing of restricted category; for all categories with the child restraint installed there shall be a minimum of 150 mm of strap length on the retractor spool.

4. The strap requirements for the belt are as follows:

Material: polyester spinnblack

(a) width:	48 ± 2 mm at 10 000 N
(b) thickness:	$1,0 \pm 0,2$ mm
(c) elongation:	8 ± 2 percent at 10 000 N

5. The two-point static belt as shown in Figure 1a consists of two standard anchorage plates as shown in Figure 2 and a strap fulfilling the requirements of paragraph 4 above.
6. The two-point belt anchorage plates shall be fitted to trolley anchorages A and B. The value of Y in Figure 1a is $1\,300 \pm 5$ mm. This is the maximum length requirement for the approval of universal child restraints with two-point belts (see para. 6.1.9 of this Regulation)

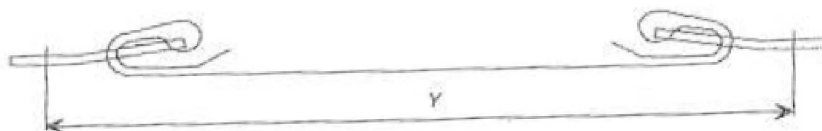
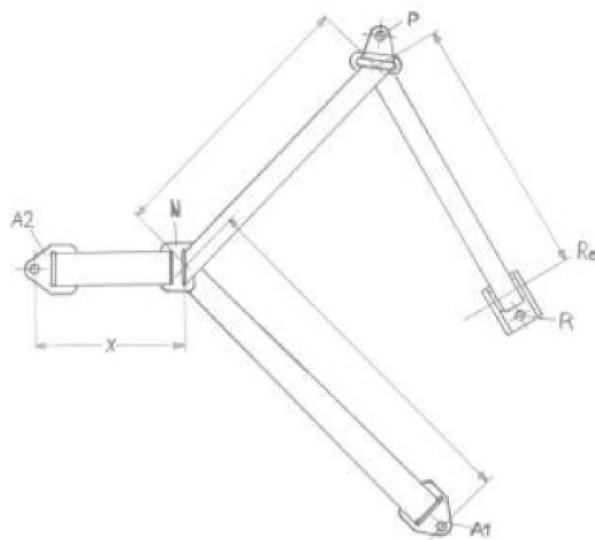
*Figures 1a and 1b***Standard seat belt configurations***Figure 1a***Two-point static belt***Figure 1b***Three-point retracting belt**

Figure 2

Typical standard anchorage plate

Dimensions in mm

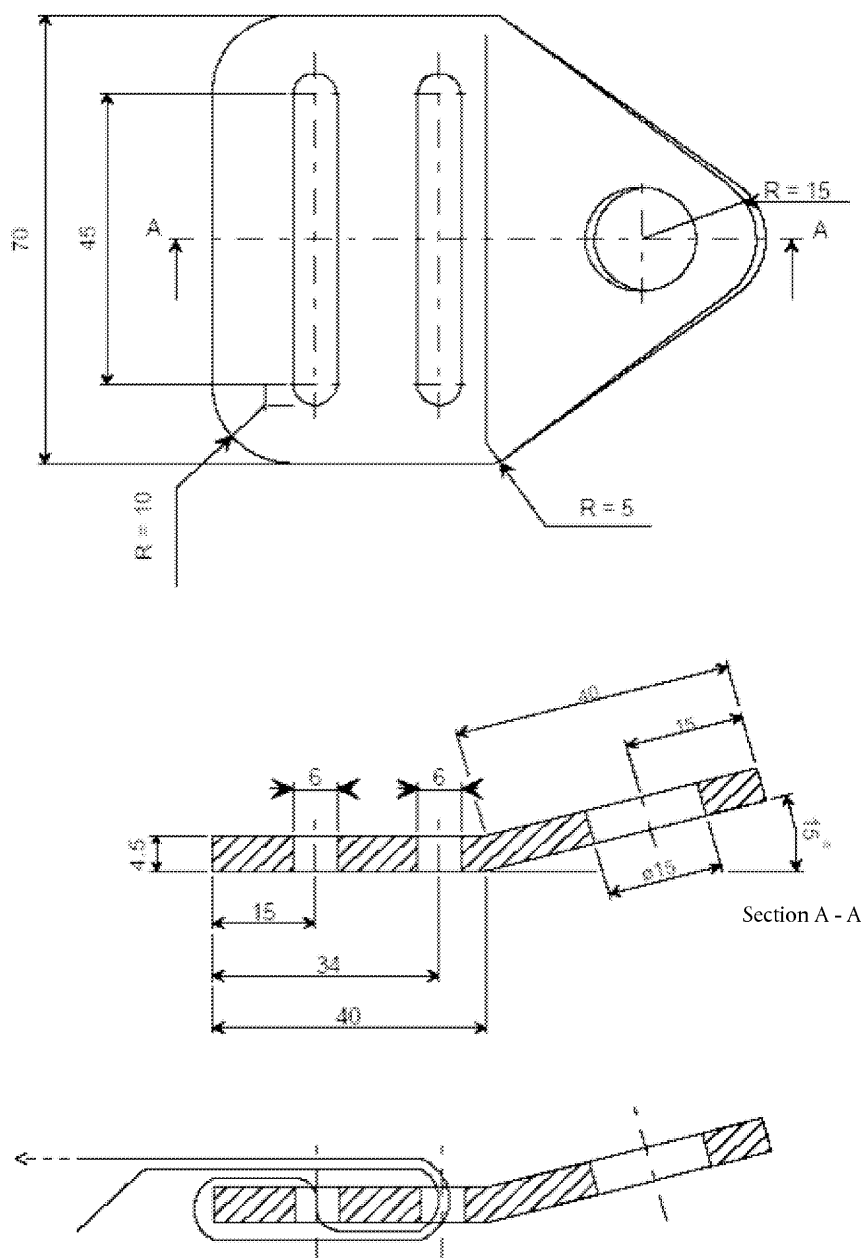
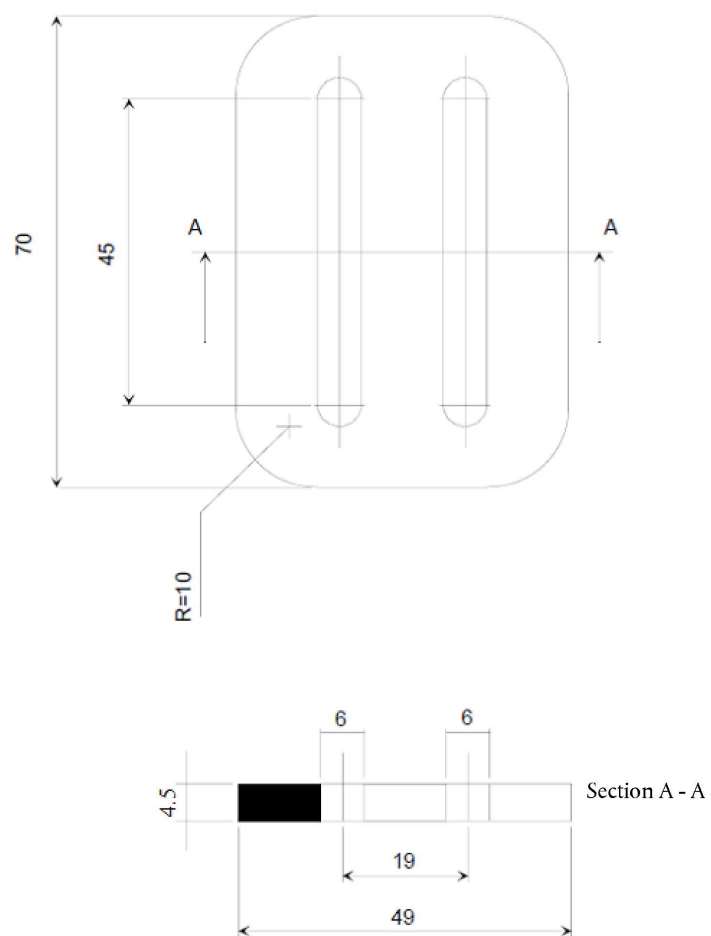


Figure 3

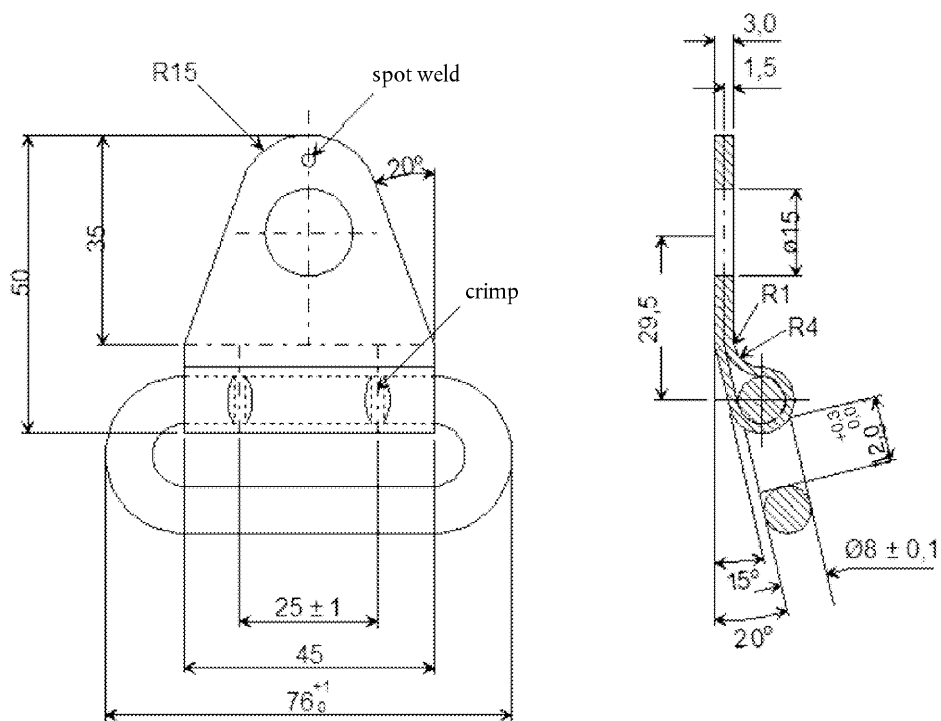
Central part of the standard belt configuration

Dimensions in mm

Figure 4

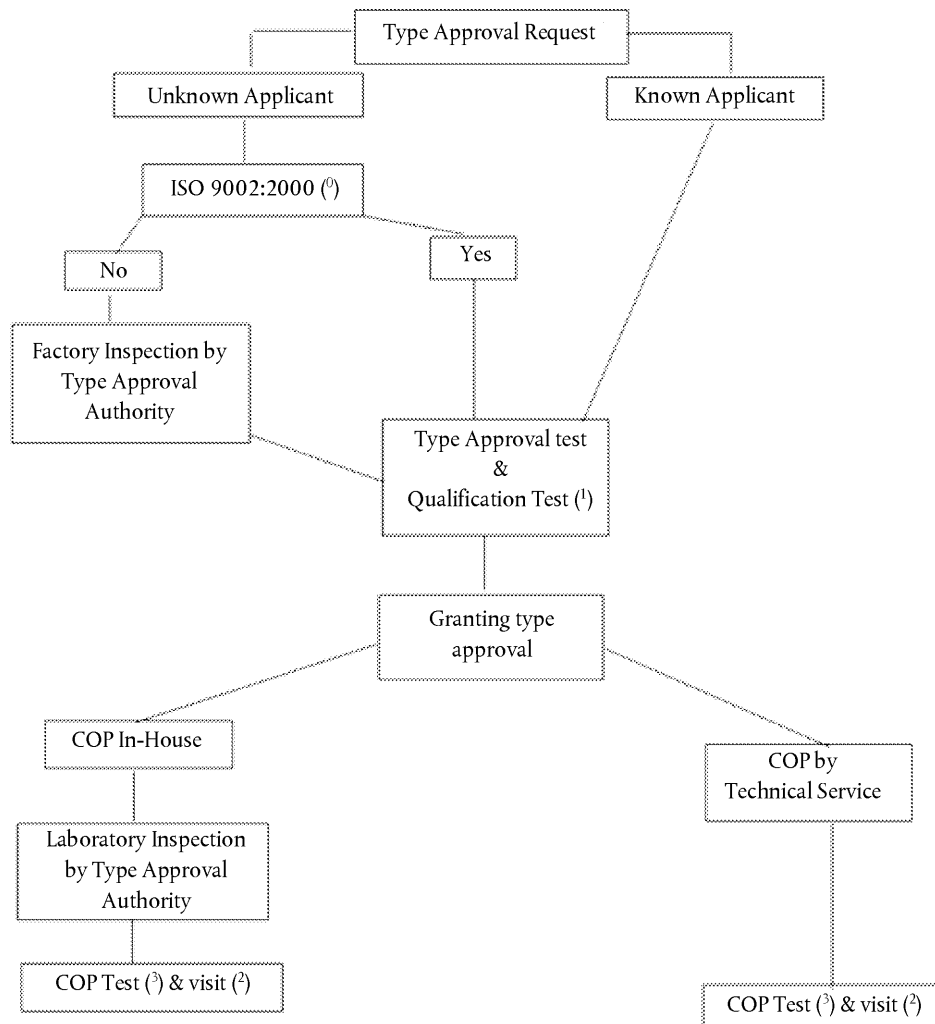
Pillar loop

Finish: Chromium plated



ANNEX 14

TYPE APPROVAL SCHEME (FLOW CHART ISO 9002:2000)



Notes:

- (0) Or an equivalent standard to this one with the permissible exclusion of the requirements related to the concepts of design and development, point 7.3 of ISO 9002:2000 'Customer satisfaction and continual improvement'
- (1) These tests shall be done by Technical Service
- (2) Tests in accordance with Annex 16
- (a) If there is no ISO 9002:2000:
- (i) Of the Authority or Technical Service during the visit indicated in note 3a
 - (ii) Of the manufacturer between the visits indicated in note 3b
- (b) If there is an ISO 9002:2000: taken by the manufacturer, procedure checked during visit indicated in note 3b.
- (3) Visit to the manufacturer for inspection and random sampling by the Authority or Technical Service
- (a) If there is no ISO 9002:2000: 2 times a year
- (b) If there is an ISO 9002:2000: 1 time a year

ANNEX 15

EXPLANATORY NOTES

The explanatory notes given in this annex concern interpretation difficulties of some paragraphs of the Regulation. They are meant as a guide for the Technical Services performing the tests.

Paragraph 2.10.1.

A quick adjuster can also be a device with a rotation shaft and spring similar to a retractor with a manual release. The adjuster should be tested to the requirements of paragraphs 7.2.2.5 and 7.2.3.1.3.

Paragraph 2.19.2.

A semi-universal restraint specified for fitting to the rear seat in both a saloon and an estate type vehicle in which the whole belt assembly is identical is one 'type'.

Paragraph 2.19.3.

The significance of changes in the dimensions and/or mass of the seat, padding or impact shield and the energy-absorbing characteristics or colour of the material are to be considered when deciding whether a new type has been created.

Paragraphs 2.19.4 and 2.19.5.

These paragraphs shall not apply to any safety belts separately approved in accordance with Regulation No 16 which is necessary to anchor the child restraint to the vehicle or to restrain the child.

Paragraph 6.1.2.

For rearward-facing child restraints the correct position of the top of the restraint relative to the child dummy head is ensured by installing the largest dummy, for which the device was specified, in the most reclined configuration, and making sure that a horizontal line at the eye height passes below the top of the seat.

Paragraph 6.1.8.

The 150 mm requirement also applies to carrycots.

Paragraph 6.2.4.

The limit of acceptable movement of the shoulder belt is that the lower edge of the shoulder portion of the standard safety belt shall not be lower than the dummy's elbow at the point of maximum excursion of the dummy.

Paragraph 6.2.9.

Common understanding is that it applies also to devices that have such a lock-off even if they are not required for that group. Thus the test would be applied to a group 2 only device, but at the prescribed force, i.e. twice the mass of group I dummy.

Paragraph 7.1.3.

The overturning test will be conducted using the same installation procedure and parameters as those defined for the dynamic test.

Paragraph 7.1.3.1.

Stopping of the rig during the overturning is not allowed.

Paragraph 7.1.4.1.4.

The paragraph aims to ensure that the CRS will sustain all imposed loads during the dynamic test, keeping the child in position, by maintaining the original position and configuration. Any change in the original configuration, including change in the reclining position or in the support leg length shall be considered a failure. Any load bearing part or component failure, like adult safety belt contact points (identified as a belt route), anti-rotation device or CRS chair shell shall be considered a failure, except where such behaviour is clearly identified as load limiting device function.

Paragraph 7.1.4.1.10.1.2.

Completely recessed means that with the leg in the stowed position, no part of the leg protrudes beyond the surface of the base or shell, such that it has no effect on the position of the CRS on the test bench. See the following figures for clarification examples.

Figure 1

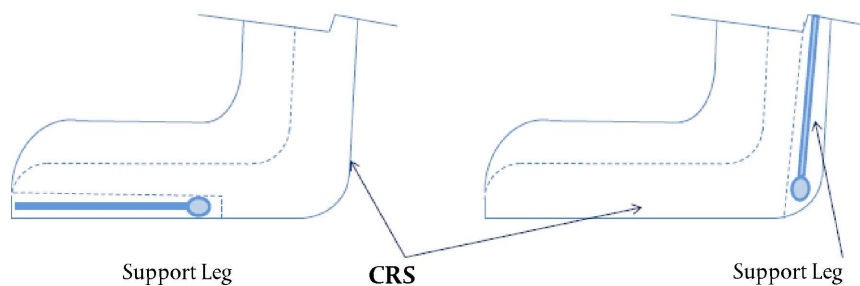
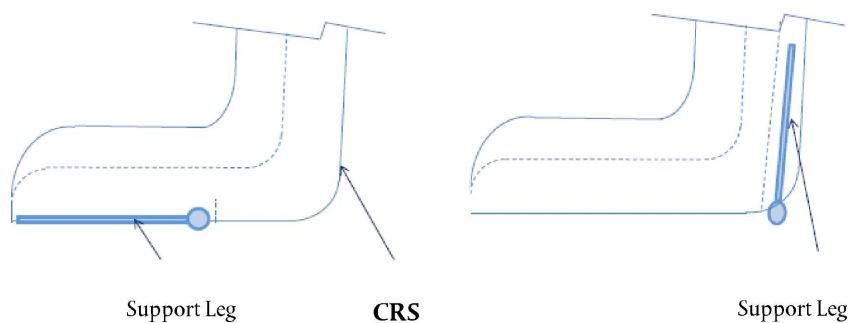
Examples of completely recessed support leg

Figure 2

Examples of not completely recessed support leg

Paragraph 7.1.4.2.2.

The wording of this paragraph refers to accelerations representing tensile loads in the spine of the dummy.

Paragraph 7.1.4.3.1.

Visible signs of penetration means penetration of the clay by the abdominal insert (under pressure from the restraint) but not bending of the clay without compression in a horizontal direction as for instance is brought about by simple bending of the spine. See also interpretation of paragraph 6.2.4.

Paragraph 7.2.1.5.

The first sentence is complied with if the hand of the dummy could reach the buckle.

Paragraph 7.2.2.1.

This shall be used to ensure that separately approved guide-straps shall be easily attached and detached.

Paragraph 7.2.4.1.1.

Two straps are required. Measure the breaking load of the first strap. Measure the width of the second strap at 75 percent of this load.

Paragraph 7.2.4.4.

Items which may be disassembled or unthreaded and where incorrect reassembly is probable for an untrained user and could result in a dangerous configuration shall not be allowed.

Paragraph 8.1.2.2.

'Fastened to the seat' means the test seat as prescribed in Annex 6. 'Specific devices may' means that a 'specific' restraint would normally be tested for overturning when installed in the test seat, but that testing in the vehicle seat was allowed.

Paragraph 8.1.3.6.3.2.

The hinged board or similar flexible device is intended to simulate the removal of clothing from the child and a failure to re-adjust the harness system. Where the child is restrained by a system that adjusts to fit the child's physique without external intervention (where the adult belt is used or the harness contains automatic or emergency locking retractors), it shall not be necessary to use the hinged board. For child restraint systems where the length of the straps can be fixed (for example a harness without retractors or the adult belt is used with a lock-off), the use of the hinged board is required. The hinged board must be used for the setup of CRS using belted impact shields.

Paragraph 8.2.2.1.1.

'Having regard to normal conditions of use' means that this test should be performed with the restraint mounted on the test or vehicle seat but without the dummy.

The dummy shall be used only to position the adjusting device. In the first instance the straps should be adjusted in accordance with paragraphs 8.1.3.6.3.2 or 8.1.3.6.3.3 (whichever is appropriate). The test should then be conducted after removal of the dummy.

Paragraph 8.2.5.2.6.

This paragraph shall not apply to guide straps which are approved separately under this Regulation.

Paragraph 10.1.3.

In the case of extensions where the modifications affect only one CRS group, perform extension test only for that group, and if the excursion result is worse than for the previous worst case for the CRS (from any group from the original approval or previous extensions) then conduct new production qualification tests. If the head excursion is no worse than any other previous approval or extension testing (excluding PQ tests) further production qualification testing is not required.

In cases where the extension modifications affect more than one group, for example if extending a group 2/3 CRS to add group 1, but the modification can affect group 2/3 (e.g.: strengthening), then perform group 1 tests and the worst case group 2/3 (original approval). If any result is worse than the original approval or previous extension (excluding PQ tests) then perform production qualification tests on the new worst case.

Always compare to the worst case from all approval and extension testing (excluding any PQ tests).

ANNEX 16

CONTROL OF CONFORMITY OF PRODUCTION**1. TESTS**

Child restraint systems shall be required to demonstrate compliance with the requirements on which the following tests are based:

1.1. Verification of the locking threshold and durability of emergency locking retractors

According to the provisions of paragraph 8.2.4.3 in the most unfavourable direction as appropriate after having undergone the durability testing detailed in paragraphs 8.2.4.2, 8.2.4.4 and 8.2.4.5 as a requirement of paragraph 7.2.3.2.6.

1.2. Verification of the durability of automatically locking retractors

According to the provisions of paragraph 8.2.4.2 supplemented by the tests in paragraphs 8.2.4.4 and 8.2.4.5 as a requirement of paragraph 7.2.3.1.3.

1.3. Test for strength of straps after conditioning

According to the procedure described in paragraph 7.2.4.2 after conditioning according to the requirements of paragraphs 8.2.5.2.1 to 8.2.5.2.5.

1.3.1. Test for strength of straps after abrasion

According to the procedure described in paragraph 7.2.4.2 after conditioning according to the requirements described in paragraph 8.2.5.2.6.

1.4. Microslip test

According to the procedure described in paragraph 8.2.3 of this Regulation.

1.5. Energy absorption

According to the provisions of paragraph 7.1.2 of this Regulation.

1.6. Verification of the performance requirements of the child restraint system when subjected to the appropriate dynamic test

According to the provisions set out in paragraph 8.1.3 with any buckle having been pre-conditioned according to the requirements of paragraph 7.2.1.7 such that the appropriate requirements of paragraph 7.1.4 (for the overall performance of the child restraint) and paragraph 7.2.1.8.1 (for the performance of any buckle under load) are complied with.

1.7. Temperature test

According to the provisions of paragraph 7.1.5 of this Regulation.

2. TEST FREQUENCY AND RESULTS**2.1. The frequency of testing to the requirements of paragraphs 1.1 to 1.5 and 1.7 above shall be on a statistically controlled and random basis in accordance with one of the regular quality assurance procedure, and shall be conducted at least once per year.**

- 2.2. Minimum conditions for the control of conformity of child restraint systems of categories 'Universal', 'Semi Universal' and 'Restricted', in relation to the dynamic tests according to paragraph 1.6 above.

In accordance with the relevant authorities, the holder of an approval will supervise the control of conformity following the method of batch control (paragraph 2.2.1) or following the method of continuous control (paragraph 2.2.2).

2.2.1. Batch control for the child restraint systems

- 2.2.1.1. The holder of an approval shall divide the child restraint systems into batches which are as uniform as possible in regard to raw material or intermediate products involved in their manufacture (different colour of shell, different manufacture of harness) and in regard to production conditions. The numbers in a batch shall not exceed 5 000 units.

In agreement with the relevant authorities the tests can be carried out by the Technical Service authorities or under the responsibility of the holder of an approval.

- 2.2.1.2. A sample shall be taken in each batch in accordance with the provisions of paragraph 2.2.1.4 from a minimum of 20 percent of the batch quantity, which has to be produced of the actual batch.

- 2.2.1.3. The characteristics of the child restraint systems and the number of dynamic tests to be conducted are given in paragraph 2.2.1.4.

- 2.2.1.4. In order to be accepted, a batch of child restraint systems shall satisfy the following conditions:

Number in the batch	Number of samples/child restraint systems characteristics	Combined number of samples	Acceptance criteria	Rejection criteria	Degree of control rigour
N < 500	1st = 1MH	1	0	—	Normal
	2nd = 1MH	2	1	2	
500 < N < 5 000	1st = 1MH + 1LH	2	0	2	Normal
	2nd = 1MH + 1LH	4	1	2	
N < 500	1st = 2MH	2	0	2	Strengthened
	2nd = 2MH	4	1	2	
500 < N < 5 000	1st = 2MH + 2LH	4	0	2	Strengthened
	2nd = 2MH + 2LH	8	1	2	

Note:

MH signifies harder configuration (the least good results obtained in approval or extension of approval)

LH signifies a less hard configuration

This dual sampling plan functions as follows:

For a normal control, if the first sample does not contain any defective units the batch is accepted without testing a second sample. If it contains two defective units the batch is rejected. Finally, if it contains one defective unit a second sample is extracted and it is the cumulative number, which shall satisfy the condition of column 5 of the table above.

There is a change from normal control to strengthened control if, out of 5 consecutive batches, two are rejected. Normal control is resumed if 5 consecutive batches are accepted.

If any batch is rejected, the production is considered to be non-conforming and the batch shall not be released.

If two consecutive batches subjected to the strengthened control are rejected, the provisions of paragraph 13 are applied.

2.2.1.5. The control of child restraint systems conformity is undertaken starting with the batch manufactured after the first batch which was subjected to production qualification.

2.2.1.6. The test results described in paragraph 2.2.1.4 shall not exceed L, where L is the limit value prescribed for each approval test.

2.2.2. Continuous control

2.2.2.1. The holder of an approval shall be obliged to carry out continuous quality control of his manufacturing process on a statistical basis and by sampling. In agreement with the relevant authorities, the tests can be carried out by the Technical Service authorities or under the responsibility of the holder of an approval which is responsible for the traceability of the product.

2.2.2.2. The samples shall be taken in accordance with the provisions of paragraph 2.2.2.4.

2.2.2.3. The characteristic of the child restraint systems is taken at random and the tests to be carried out are described in paragraph 2.2.2.4.

2.2.2.4. Control shall meet the following requirements.

Child restraint systems taken	Degree of control rigour
0,02 percent means one child restraint system taken from every 5 000 manufactured	Normal
0,05 percent means one child restraint system taken from every 2 000 manufactured	Strengthened

This dual sampling plan functions as follows:

If the child restraint system is considered to conform, the production conforms.

If the child restraint system does not meet the requirements, a second child restraint system shall be taken,

If the second child restraint system meets the requirements, the production conforms,

If both (the first and the second) child restraint systems do not meet the requirements, the production does not conform and child restraint systems that are likely to present the same failure shall be withdrawn and necessary steps shall be taken to re-establish the conformity of the production.

Strengthened control will replace normal control if, out of 10 000 child restraint systems manufactured consecutively, the production has to be withdrawn twice.

Normal control is resumed if 10 000 child restraint systems manufactured consecutively are considered to conform.

If production subjected to the strengthened control has been withdrawn on two consecutive occasions, the provisions of paragraph 13 are applied.

2.2.2.5. The continuous control of child restraint systems is undertaken starting after the production qualification.

2.2.2.6. The test results described in paragraph 2.2.2.4 shall not exceed L, where L is the limit value prescribed for each approval test.

- 2.3. For 'built-in' vehicle specific devices, the following test frequencies shall apply:

Child restraints, except booster cushions:	Once every 8 weeks
Booster cushions:	Once every 12 weeks

At each test all requirements according to paragraphs 7.1.4 and 7.2.1.8.1 shall be fulfilled. If all tests during one year show satisfactory results, the manufacturer may, after agreement with the Type Approval Authority, reduce the frequencies as follows:

Child restraints, except booster cushions:	Once every 16 weeks
Booster cushions:	Once every 24 weeks

However, a minimum frequency of one test per year shall be permitted where annual production is 1 000 child restraint systems or less.

- 2.3.1. For vehicle-specific devices according to paragraph 2.1.2.4.1, the child restraint manufacturer may choose Conformity of Production procedures according to either paragraph 2.2 above, on a test seat, or paragraph 2.3 above, in a vehicle body shell.
- 2.3.2. Where a test sample fails a particular test to which it has been subjected, a further test to the same requirement shall be carried out on at least three other samples. In the case of dynamic tests if one of the latter fails, the production is considered to be non-conforming and the frequency shall be raised to the higher one if the lower one was used according to paragraph 2.3 and necessary steps shall be taken to re-establish the conformity of the production.
- 2.4. When production is found to be non-conforming according to paragraphs 2.2.1.4, 2.2.2.4 or 2.3.2, the holder of the approval or his duly accredited representative shall:
- 2.4.1. Notify the Type Approval Authority which has granted type approval indicating what steps have been taken to re-establish the conformity of production.
- 2.5. The manufacturer shall advise the Type Approval Authority on a quarterly basis, the volume of products produced against each approval number, providing a means of identifying which products correspond to that approval number.
-

ANNEX 17

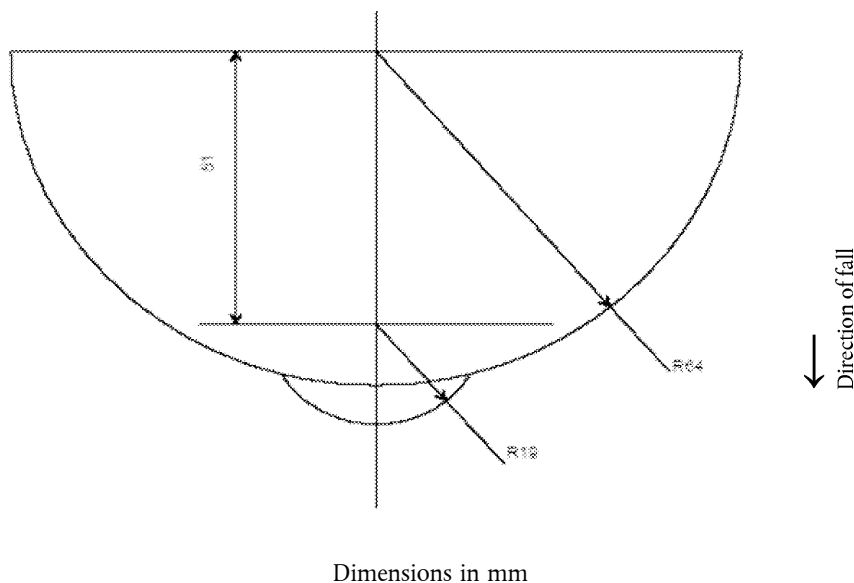
TEST OF ENERGY ABSORBING MATERIAL

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 $2,75 \pm 0,05$ 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

- 3.1. The assembled child restraint shall be placed in the region of impact on a rigid flat surface, whose minimum dimensions are 500×500 mm, so that the direction of impact is perpendicular to the inner surface of the child restraint system in the area of impact.
- 3.2. 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 be tested in accordance with Annex 17. This area shall include the backrest and side wings, including the inner edges (zone of radius) of the side wings. In the case of carrycot devices where a symmetrical installation of the dummy is not possible according to the device and manufacturer instructions, the area complying with Annex 17 shall be all internal surfaces above a point 'A', as previously defined, in the head direction, when measured with this dummy in the carrycot in its worst position consistent with the manufacturer instructions and the carrycot positioned on the test bench.

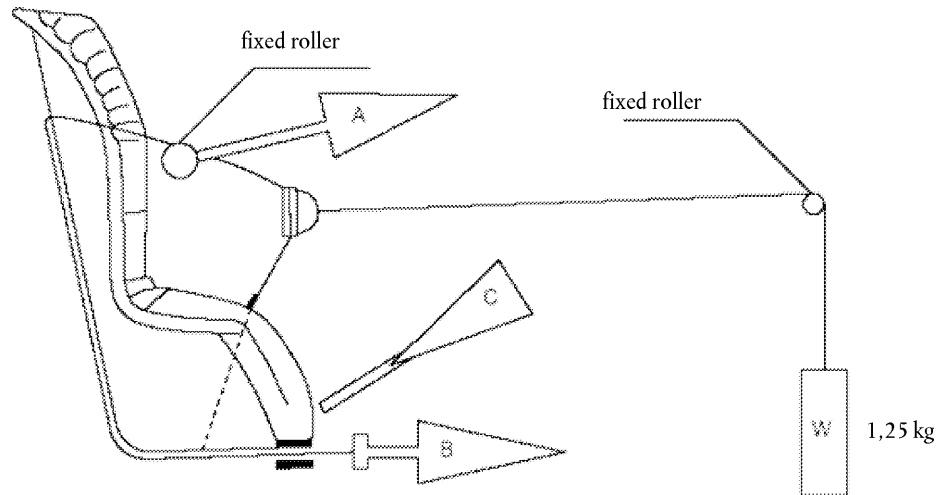
If a symmetrical installation of the dummy in the carrycot may be possible, the whole inner area shall comply with Annex 17.

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.
 3. The requirement in paragraph 2 above for a minimum size of side wings does not apply to child restraints of mass groups II and III in the specific vehicle category to be used in the luggage area according to paragraph 6.1.2 of this Regulation.
-

ANNEX 19

DESCRIPTION OF CONDITIONING OF ADJUSTERS MOUNTED DIRECTLY ON CHILD RESTRAINTS

Figure 1



1. METHOD

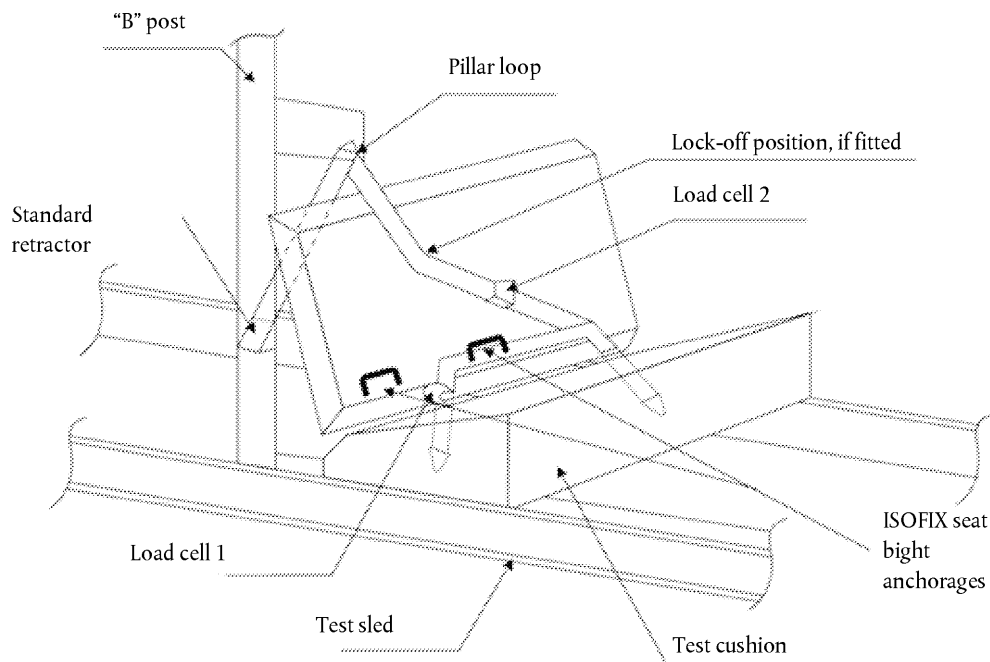
- 1.1. With the webbing set at the reference position described in paragraph 8.2.7, withdraw at least 50 mm of webbing from the integral harness by pulling on the free end of the webbing.
- 1.2. Attach the adjusted part of the integral harness to the pulling device A.
- 1.3. Activate the adjuster and pull at least 150 mm of webbing into the integral harness. This represents half of one cycle and puts pulling device A to the maximum webbing extraction position.
- 1.4. Connect free end of webbing to pulling device B.

2. THE CYCLE IS:

- 2.1. Pull B at least 150 mm whilst A exerts no tension on the integral harness.
- 2.2. Activate the adjusters and pull A whilst B exerts no tension on the free end of the webbing.
- 2.3. At the end of stroke, de-activate the adjuster.
- 2.4. Repeat cycle as specified in paragraph 7.2.2.7 of this Regulation.

ANNEX 21

DYNAMIC CRASH TEST INSTALLATION



1. METHOD

1.1. Lap belt only

Fit load cell 1 to the outboard position as shown above. Install the child restraint and tension the reference belt at the outboard position to achieve a load of $75 \text{ N} \pm 5 \text{ N}$ at the outboard position.

1.2. Lap and diagonal belt

1.2.1. Fit load cell 1 to the outboard position as shown above. Install the child restraint into the correct position. If a lock-off device is fitted to the child restraint and acts upon the diagonal belt, place load cell 2 at a convenient position behind the child restraint between the lock-off device and the buckle as shown above. If no lock-off device is fitted or if the lock-off device is fitted at the buckle, position load cell at a convenient position between the pillar loop and the child restraint.

1.2.2. Adjust the lap portion of the reference belt to achieve a tension load of $50 \text{ N} \pm 5 \text{ N}$ at load cell 1. Make a chalk mark on the webbing where it passes through the simulated buckle. Whilst maintaining the belt at this position adjust the diagonal to achieve a tension of $50 \text{ N} \pm 5 \text{ N}$ at load cell 2 by either locking the webbing at the child restraint webbing locker or by pulling the belt close to the standard retractor.

1.2.3. Extract all webbing from the retractor spool and rewind with a tension in the belt of $4 \pm 3 \text{ N}$ between the retractor and pillar loop. The spool shall be locked before the dynamic test. Conduct the dynamic crash test.

1.2.4. Before commencing the set-up, check the child restraint to determine compliance with paragraph 6.2.1.3. If there is a change in installation tension due to the change of angle function, then test for the condition which creates the slackest installation, conduct the set-up and tension in the tightest position and then reposition the child restraint to the worst case without re-tensioning the adult belt. Conduct the dynamic test.

1.3. ISOFIX attachment

For an ISOFIX child restraint system with adjustable position seat bight ISOFIX anchorages. Attach the unladen ISOFIX child restraint system onto the seat bight anchorages H1-H2 in the appropriate test position. Allow the ISOFIX child restraint latch mechanisms to pull the unladen ISOFIX child restraint system towards the seat bight. Apply an additional force of $135 \pm 15 \text{ N}$ in a plane parallel to the test bench seat cushion surface in the direction

of the seat bight to overcome frictional forces between the ISOFIX child restraint system and the seat cushion, assisting the self-tensioning effects of the latch mechanism. The force shall be applied on or equally about the centreline of the ISOFIX child restraint and at a height not more than 100 mm above the test bench cushion surface. If needed, adjust the top tether to achieve a tension load of 50 ± 5 N (*). Place appropriate test dummy in child restraint when the ISOFIX child restraint system has been so adjusted.

Note

1. Installation is conducted after fitting the manikin into the restraint, for paragraphs 1.1 and 1.2.
2. Because the foam test cushion will compress after installation of the child restraint, the dynamic test shall be conducted no more than 10 minutes after installation as possible. To allow the cushion to recover, the minimum period between two tests using the same cushion shall be 20 minutes.
3. Load cells fitted directly onto the belt webbing may be disconnected electrically, but shall be left in place during the dynamic test. The mass of each cell is not to exceed 250 grams. Alternatively the lap belt webbing load cell may be replaced by a load cell fixed at the anchorage point.
4. In the case of restraints fitted with devices intended to increase the adult safety belt tension, the test method shall be:

Install the child restraint system as required in this annex and then apply the tensioner device as stated in the manufacturer's instructions. If the device cannot be applied due to excess tension then it is deemed to be an unacceptable device.
5. No additional force shall be applied to the child restraint system other than the minimum required to achieve the correct installation forces as specified in paragraphs 1.1 and 1.2.2 above.
6. In case of carrycot installed as described in paragraph 8.1.3.5.6 of this Regulation, the connection between the adult safety belt and the restraint shall be simulated. A 500 mm free end length adult safety belt (measured as described in Annex 13) is connected by the anchoring plate described in Annex 13 to the prescribed anchoring points. The restraint is then connected to the free end adult safety belts. The tension on the adult safety belt, measured between the anchoring point and the restraint shall be 50 ± 5 N.

(*) In the case of restraints fitted with devices intended to increase the top tether tension, the test method shall be:
Install the ISOFIX child restraint system as required in this annex and then apply the tensioner device as stated in the manufacturer's instructions. If the device cannot be applied due to excess tension then it is deemed to be an unacceptable device.

ANNEX 22

LOWER TORSO BODY BLOCK TEST

Figure 1

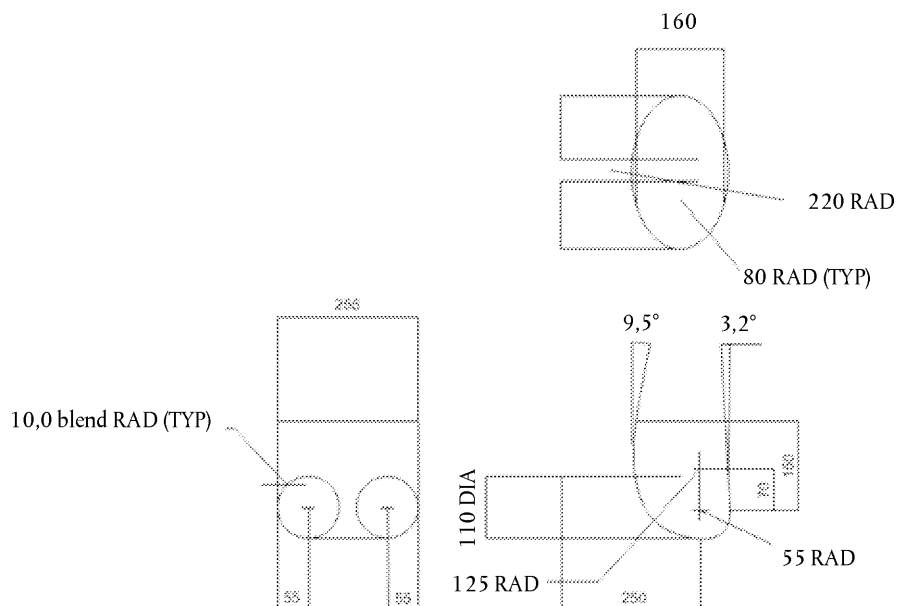
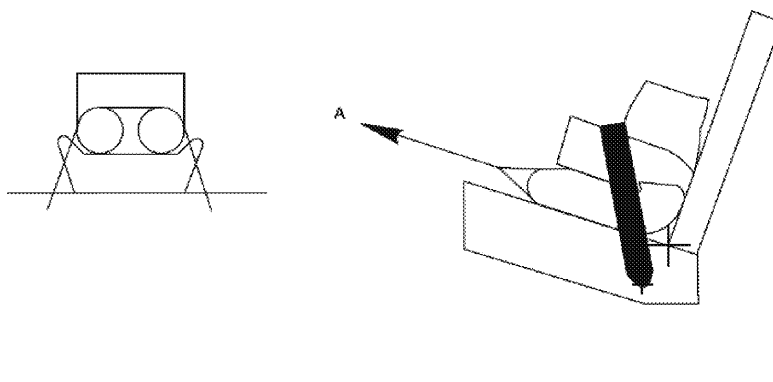
Truncated P10 manikin block**Material: EPS (40 to 45 g/l)**

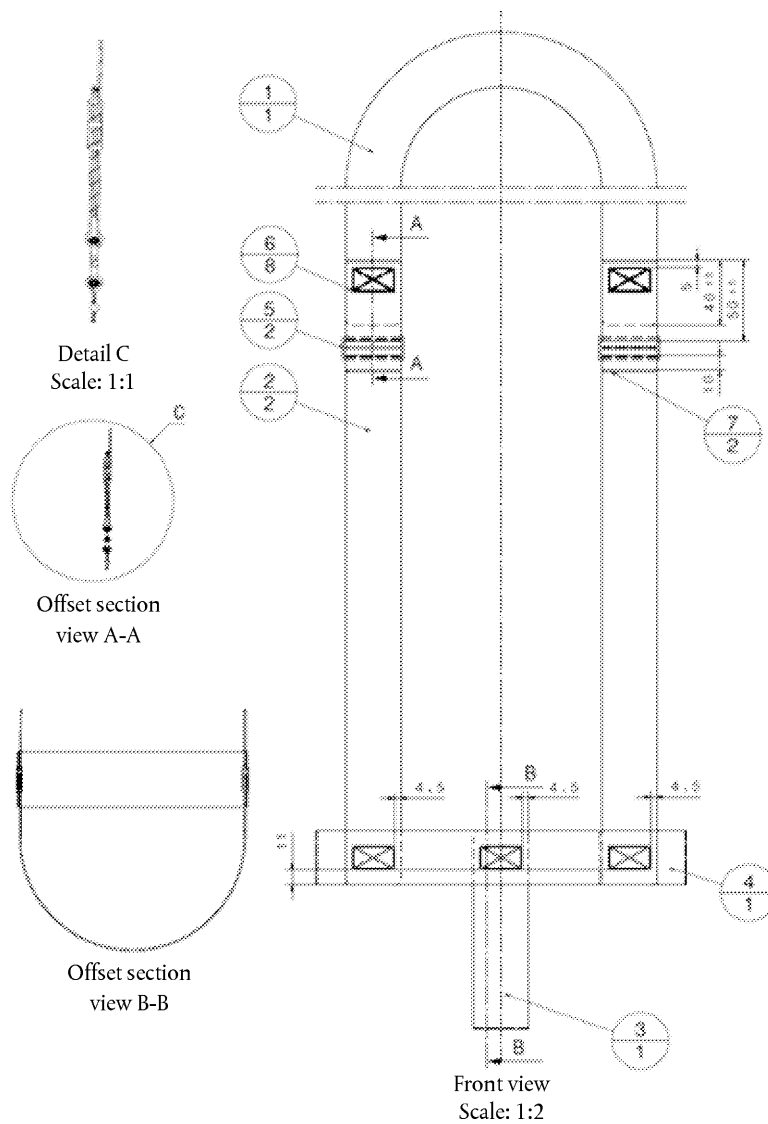
Figure 2

Booster pull test using manikin block

ANNEX 23

LOAD APPLICATION DEVICES

Load application device I

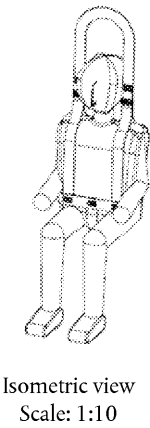
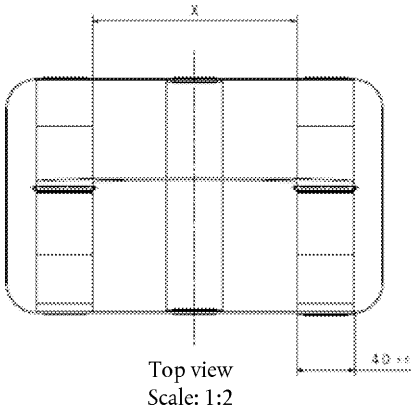


Stretch length	(+/- 5 mm)					
	Dummy P/Q 0	Dummy P/Q 3/4	P/Q 1,5	P/Q 3	P/Q 6	P/Q 10
Head belt	1 000 mm	1 000 mm	1 000 mm	1 200 mm	1 200 mm	1 200 mm
Shoulder belt	750 mm	850 mm	950 mm	1 000 mm	1 100 mm	1 300 mm
Crotch belt	300 mm	350 mm	400 mm	400 mm	450 mm	570 mm
Hip belt	400 mm	500 mm	550 mm	600 mm	700 mm	800 mm
Dimension X	120 mm	130 mm	140 mm	140 mm	150 mm	160 mm

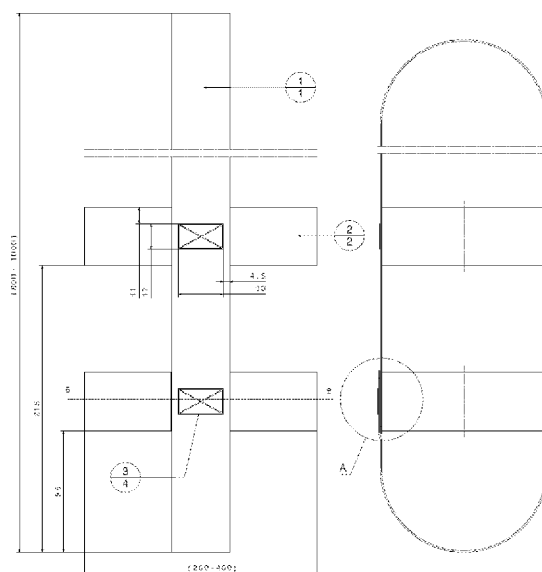
No	Name	Information	Quantity
1	Head belt — 39 mm	—	1
2	Shoulder belt lh-rh — 39 mm	—	2
3	Crotch belt — 39 mm	—	1
4	Hip belt — 39 mm	—	1
5	Stitch pattern (30 × 17)	Stitch: 77, thread: 30	8
6	Plastic buckle		2
7	Stitch pattern (2 × 37)	Stitch: 77, thread: 30	2

Stitch pattern	Min. required force
12 × 12 mm	3,5 kN
30 × 12 mm	5,3 kN
30 × 17 mm	5,3 kN
30 × 30 mm	7,0 kN

all belt radius = 5 mm



Load application device II

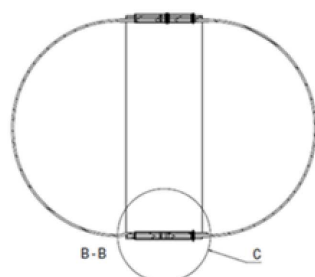
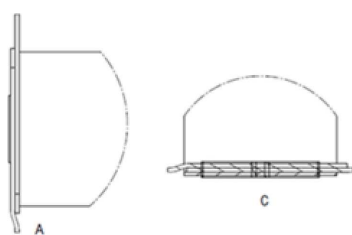


No	Name	Information	Quantity
1	Main belt — 39 mm	—	1
2	Hip belt (upper/lower)– 39 mm	—	2
3	Stitch pattern (30 × 17)	Stitch: 77, thread: 30-	4

Stretch length	(+/- 5 mm)					
	Dummy P/Q 0	Dummy P/Q 3/4	P/Q 1,5	P/Q 3	P/Q 6	P/Q 10
Main belt	1 600 mm	1 600 mm	1 600 mm	2 000 mm	2 000 mm	2 000 mm
Hip belt	440 mm	540 mm	640 mm	740 mm	740 mm	840 mm

Stitch pattern	Min. required force
12 × 12 mm	3,5 kN
30 × 12 mm	5,3 kN
30 × 17 mm	5,3 kN
30 × 30 mm	7,0 kN

all belt radius = 5 mm



Top view
Scale: 1:2



Isometric view
Scale: 1:10

Only the original UN/ECE texts have legal effect under international public law. The status and date of entry into force of this Regulation should be checked in the latest version of the UN/ECE status document TRANS/WP.29/343, available at:

<http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29docstts.html>

**Regulation No 48 of the Economic Commission for Europe of the United Nations (UNECE) —
Uniform provisions concerning the approval of vehicles with regard to the installation of lighting
and light-signalling devices [2016/1723]**

Incorporating all valid text up to:

Supplement 7 to the 06 series of amendments — Date of entry into force 8 October 2016

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1. SCOPE

This Regulation applies to vehicles of categories M, N, and to their trailers (category O) ⁽¹⁾ with regard to the installation of lighting and light-signalling devices.

2. DEFINITIONS

For the purpose of this Regulation:

- 2.1. 'Approval of a vehicle' means the approval of a vehicle type with regard to the number and mode of installation of the lighting and light-signalling devices.
- 2.2. 'Vehicle type with regard to the installation of lighting and light-signalling devices' means vehicles which do not differ in the essential respects mentioned in paragraphs 2.2.1 to 2.2.4.

The following are likewise considered not to be 'vehicles of a different type': vehicles which differ within the meaning of paragraphs 2.2.1 to 2.2.4, but not in such a way as to entail a change in the kind, number, positioning and geometric visibility of the lamps and the inclination of the dipped-beam prescribed for the vehicle type in question, and vehicles on which optional lamps are fitted or are absent:

- 2.2.1. The dimension and the external shape of the vehicle;
- 2.2.2. The number and positioning of the devices;
- 2.2.3. The headlamp-levelling system;
- 2.2.4. The suspension system.
- 2.3. 'Transverse plane' means a vertical plane perpendicular to the median longitudinal plane of the vehicle.
- 2.4. 'Unladen vehicle' means a vehicle without driver, crew, passengers and load, but with a full supply of fuel, spare wheel and the tools normally carried.

⁽¹⁾ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.3, para. 2 — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

- 2.5. 'Laden vehicle' means a vehicle loaded to its technically permissible maximum mass, as stated by the manufacturer, who shall also fix the distribution of this mass between the axles in accordance with the method described in Annex 5.
- 2.6. 'Device' means an element or an assembly of elements used to perform one or more functions.
- 2.6.1. 'Lighting function' means the light emitted by a device to illuminate the road and objects in the direction of vehicle movement.
- 2.6.2. 'Light-signalling function' means the light emitted or reflected by a device to give to other road users visual information on the presence, identification and/or the change of movement of the vehicle.
- 2.7. 'Lamp' means a device designed to illuminate the road or to emit a light signal to other road users. Rear registration plate lamps and retro-reflectors are likewise to be regarded as lamps. For the purpose of this Regulation, light-emitting rear registration plates and the service-door-lighting system according to the provisions of Regulation No 107 on vehicles of categories M₂ and M₃ are not considered as lamps.
- 2.7.1. Light source
- 2.7.1.1. 'Light source' means one or more elements for visible radiation, which may be assembled with one or more transparent envelopes and with a base for mechanical and electrical connection.
- 2.7.1.1.1. 'Replaceable light source' means a light source which is designed to be inserted in and removed from the holder of its device without tool.
- 2.7.1.1.2. 'Non-replaceable light source' means a light source which can only be replaced by replacement of the device to which this light source is fixed.
- (a) In case of a light source module: a light source which can only be replaced by replacement of the light source module to which this light source is fixed;
- (b) In case of adaptive front-lighting systems (AFS): a light source which can only be replaced by replacement of the lighting unit to which this light source is fixed.
- 2.7.1.1.3. 'Light source module' means an optical part of a device which is specific to that device. It contains one or more non-replaceable light sources and it may optionally contain one or more holders for approved replaceable light sources.
- 2.7.1.1.4. 'Filament light source' (filament lamp) means a light source where the element for visible radiation is one or more heated filaments producing thermal radiation.
- 2.7.1.1.5. 'Gas-discharge light source' means a light source where the element for visible radiation is a discharge arc producing electro-luminescence/fluorescence.
- 2.7.1.1.6. 'Light-emitting diode (LED) light source' means a light source where the element for visible radiation is one or more solid state junctions producing injection-luminescence/fluorescence.
- 2.7.1.1.7. 'LED module' means a light source module containing as light sources only LEDs. However it may optionally contain one or more holders for approved replaceable light sources.
- 2.7.1.2. 'Electronic light source control gear' means one or more components between supply and light source, whether or not integrated with the light source or the applied lamp, to control voltage and/or electrical current of the light source.
- 2.7.1.2.1. 'Ballast' means an electronic light source control gear between supply and light source, whether or not integrated with the light source or applied lamp, to stabilise the electrical current of a gas-discharge light source.

- 2.7.1.2.2. 'Ignitor' means an electronic light source control gear to start the arc of a gas-discharge light source.
- 2.7.1.3. 'Variable intensity control' means the device which automatically controls rear light-signalling devices producing variable luminous intensities to assure the unvarying perception of their signals. The variable intensity control is part of the lamp, or part of the vehicle, or split between the said lamp and the vehicle.
- 2.7.2. 'Equivalent lamps' means lamps having the same function and authorized in the country in which the vehicle is registered; such lamps may have different characteristics from those installed on the vehicle when it is approved on condition that they satisfy the requirements of this Regulation.
- 2.7.3. 'Independent lamps' means devices having separate apparent surfaces in the direction of the reference axis ⁽¹⁾, separate light sources and separate lamp bodies.
- 2.7.4. 'Grouped lamps' means devices having separate apparent surfaces in the direction of the reference axis ⁽¹⁾ and separate light sources, but a common lamp body.
- 2.7.5. 'Combined lamps' means devices having separate apparent surfaces in the direction of the reference axis ⁽¹⁾, but a common light source and a common lamp body.
- 2.7.6. 'Reciprocally incorporated lamps' means devices having separate light sources or a single light source operating under different conditions (for example, optical, mechanical, electrical differences), totally or partially common apparent surfaces in the direction of the reference axis ⁽¹⁾ and a common lamp body ⁽²⁾.
- 2.7.7. 'Single-function lamp' means a part of a device which performs a single lighting or light-signalling function.
- 2.7.8. 'Concealable lamp' means a lamp capable of being partly or completely hidden when not in use. This result may be achieved by means of a movable cover, by displacement of the lamp or by any other suitable means. The term 'retractable' is used more particularly to describe a concealable lamp the displacement of which enables it to be inserted within the bodywork.
- 2.7.9. 'Driving-beam (main-beam) headlamp' means the lamp used to illuminate the road over a long distance ahead of the vehicle.
- 2.7.10. 'Passing-beam (dipped-beam) headlamp' means the lamp used to illuminate the road ahead of the vehicle without causing undue dazzle or discomfort to oncoming drivers and other road-users.
- 2.7.10.1. 'Principal passing-beam (principal dipped-beam)' means the dipped-beam produced without the contribution of infrared (IR) emitter and/or additional light sources for bend lighting.
- 2.7.11. 'Direction-indicator lamp' means the lamp used to indicate to other road-users that the driver intends to change direction to the right or to the left.
- A direction-indicator lamp or lamps may also be used according to the provisions of Regulation No 97 or Regulation No 116.
- 2.7.12. 'Stop lamp' means a lamp used to indicate to other road users to the rear of the vehicle that the longitudinal movement of the vehicle is intentionally retarded.

⁽¹⁾ In the case of lighting devices for the rear registration plate and direction-indicators of categories 5 and 6, the 'light-emitting surface' shall be used.

⁽²⁾ Examples to enable a decision regarding reciprocal incorporation of lamps can be found in Annex 3, Part 7.

- 2.7.13. 'Rear-registration plate illuminating device' means the device used to illuminate the space reserved for the rear registration plate; such a device may consist of several optical components.
- 2.7.14. 'Front position lamp' means the lamp used to indicate the presence and the width of the vehicle when viewed from the front.
- 2.7.15. 'Rear position lamp' means the lamp used to indicate the presence and width of the vehicle when viewed from the rear.
- 2.7.16. 'Retro-reflector' means a device used to indicate the presence of a vehicle by the reflection of light emanating from a light source not connected to the vehicle, the observer being situated near the source.

For the purposes of this Regulation the following are not considered as retro-reflectors:

- 2.7.16.1. Retro-reflecting number plates;
- 2.7.16.2. The retro-reflecting signals mentioned in the ADR (European Agreement concerning the international carriage of dangerous goods by road);
- 2.7.16.3. Other retro-reflective plates and signals which shall be used to comply with national requirements for use as regards certain categories of vehicles or certain methods of operation;
- 2.7.16.4. Retro-reflecting materials approved as Class D or E or F according to UN Regulation No 104 and used for other purposes in compliance with national requirements.
- 2.7.17. 'Conspicuity marking' means a device intended to increase the conspicuity of a vehicle, when viewed from the side or rear (or in the case of trailers, additionally from the front), by the reflection of light emanating from a light source not connected to the vehicle, the observer being situated near the source.
- 2.7.17.1. 'Contour marking' means a conspicuity marking intended to indicate the horizontal and vertical dimensions (length, width and height) of a vehicle.
- 2.7.17.1.1. 'Full contour marking' means a contour marking that indicates the outline of the vehicle by a continuous line.
- 2.7.17.1.2. 'Partial contour marking' means a contour marking that indicates the horizontal dimension of the vehicle by a continuous line, and the vertical dimension by marking the upper corners.
- 2.7.17.2. 'Line marking' means a conspicuity marking intended to indicate the horizontal dimensions (length and width) of a vehicle by a continuous line.
- 2.7.18. 'Hazard warning signal' means the simultaneous operation of all of a vehicle's direction-indicator lamps to show that the vehicle temporarily constitutes a special danger to other road-users.
- 2.7.19. 'Front fog lamp' means a lamp used to improve the illumination of the road ahead of the vehicle in case of fog or any similar condition of reduced visibility.
- 2.7.20. 'Rear fog lamp' means a lamp used to make the vehicle more easily visible from the rear in dense fog.
- 2.7.21. 'Reversing lamp' means the lamp used to illuminate the road to the rear of the vehicle and to warn other road-users that the vehicle is reversing or about to reverse.
- 2.7.22. 'Parking lamp' means a lamp which is used to draw attention to the presence of a stationary vehicle in a built-up area. In such circumstances it replaces the front and rear position lamps.

- 2.7.23. 'End-outline marker lamp' means the lamp fitted near to the extreme outer edge and as close as possible to the top of the vehicle and intended to indicate clearly the vehicle's overall width. This lamp is intended, for certain vehicles and trailers, to complement the vehicle's front and rear position lamps by drawing particular attention to its bulk.
- 2.7.24. 'Side marker lamp' means a lamp used to indicate the presence of the vehicle when viewed from the side.
- 2.7.25. 'Daytime running lamp' means a lamp facing in a forward direction used to make the vehicle more easily visible when driving during daytime.
- 2.7.26. 'Cornering lamp' means a lamp used to provide supplementary illumination of that part of the road which is located near the forward corner of the vehicle at the side towards which the vehicle is going to turn.
- 2.7.27. 'Objective luminous flux' means:
- (a) In the case of a light source:
- The value of the objective luminous flux, not including any tolerances, as indicated in the relevant data sheet of the applicable light source Regulation according to which the light source is approved;
- (b) In the case of an LED module:
- The value of the objective luminous flux as indicated in the technical specification submitted with the LED module for approval of the lamp of which the LED module is a part;
- 2.7.28. 'Adaptive front lighting system' (or 'AFS') means a lighting device type-approved according to Regulation No 123, providing beams with differing characteristics for automatic adaptation to varying conditions of use of the dipped-beam (passing-beam) and, if it applies, the main-beam (driving-beam).
- 2.7.28.1. 'Lighting unit' means a light-emitting component designed to provide or contribute to one or more front lighting function(s) provided by the AFS.
- 2.7.28.2. 'Installation unit' means an indivisible housing (lamp body) which contains one or more lighting unit(s).
- 2.7.28.3. 'Lighting mode' or 'mode' means a state of a front lighting function provided by the AFS, as specified by the manufacturer and intended for adaptation to specific vehicle and ambient conditions.
- 2.7.28.4. 'System control' means that part(s) of the AFS receiving the AFS control signals from the vehicle and controlling the operation of the lighting units automatically.
- 2.7.28.5. 'AFS control signal' (V, E, W, T) means the input to the AFS in accordance with the paragraph 6.22.7.4 of this Regulation.
- 2.7.28.6. 'Neutral state' means the state of the AFS when a defined mode of the class C passing-beam ('basic passing-beam') or of the main beam in the maximum condition of activation, if any, is produced, and no AFS control signal applies.
- 2.7.28.7. 'Adaptive main-beam' means a main-beam of the AFS that adapts its beam pattern to the presence of oncoming and preceding vehicles in order to improve the long-range visibility for the driver without causing discomfort, distraction or glare to other road users.
- 2.7.29. 'Exterior courtesy lamp' means a lamp used to provide supplementary illumination to assist the entry and exit of the vehicle driver and passenger or in loading operations;

- 2.7.30. 'Interdependent lamp system' means an assembly of two or three interdependent lamps providing the same function.
- 2.7.30.1. 'Interdependent lamp marked "Y"' means a device operating as part of an interdependent lamp system. Interdependent lamps operate together when activated, have separate apparent surfaces in the direction of the reference axis and separate lamp bodies, and may have separate light source(s).
- 2.7.31. 'Manoeuvring lamp' means a lamp used to provide supplementary illumination to the side of the vehicle to assist during slow manoeuvres.
- 2.7.32. 'Lamps marked "D"' means independent lamps, approved as separate devices in such a way that they are allowed to be used either independently or in an assembly of two lamps to be considered as a 'single lamp'.

- 2.8. 'Light emitting surface' of a 'lighting device', 'light-signalling device' or a retro-reflector means the surface as declared in the request for approval by the manufacturer of the device on the drawing, see Annex 3 (see e.g. Parts 1 and 4).

This shall be declared according to one of the following conditions:

- (a) In the case where the outer lens is textured, the declared light emitting surface shall be all or part of the exterior surface of the outer lens;
- (b) In the case where the outer lens is non-textured the outer lens may be disregarded and the light emitting surface shall be as declared on the drawing, see Annex 3 (see e.g. Part 5).
- 2.8.1. 'Textured outer lens' or 'Textured outer lens area' means all or part of an outer lens, designed to modify or influence the propagation of light from the light source(s), such that the light rays are significantly diverted from their original direction.

- 2.9. 'Illuminating surface' (see Annex 3).

- 2.9.1. 'Illuminating surface of a lighting device' (paragraphs 2.7.9, 2.7.10, 2.7.19, 2.7.21 and 2.7.26) means the orthogonal projection of the full aperture of the reflector, or in the case of headlamps with an ellipsoidal reflector of the 'projection lens', on a transverse plane. If the lighting device has no reflector, the definition of paragraph 2.9.2 shall be applied. If the light emitting surface of the lamp extends over part only of the full aperture of the reflector, then the projection of that part only is taken into account.

In the case of a dipped-beam headlamp, the illuminating surface is limited by the apparent trace of the cut-off on to the lens. If the reflector and lens are adjustable relative to one another, the mean adjustment should be used.

In the case of AFS being installed: where a lighting function is produced by two or more simultaneously operated lighting units on a given side of the vehicle, the individual illuminating surfaces, taken together, constitute the illuminating surface to be considered (for example, in the figure of paragraph 6.22.4 below, the individual illuminating surfaces of the lighting units 8, 9 and 11, regarded together and taking into account their respective location, constitute the illuminating surface to be considered for the right hand side of the vehicle).

- 2.9.2. 'Illuminating surface of a light-signalling device other than a retro-reflector' (paragraphs 2.7.11 to 2.7.15, 2.7.18, 2.7.20 and 2.7.22 to 2.7.25) means the orthogonal projection of the lamp in a plane perpendicular to its axis of reference and in contact with the exterior light-emitting surface of the lamp, this projection being bounded by the edges of screens situated in this plane, each allowing only 98 per cent of the total luminous intensity of the light to persist in the direction of the axis of reference.

To determine the lower, upper and lateral limits of the illuminating surface only screens with horizontal or vertical edges shall be used to verify the distance to the extreme edges of the vehicle and the height above the ground.

For other applications of the illuminating surface, e.g. distance between two lamps or functions, the shape of the periphery of this illuminating surface shall be used. The screens shall remain parallel, but other orientations are allowed to be used.

In the case of a light-signalling device whose illuminating surface encloses either totally or partially the illuminating surface of another function or encloses a non-lighted surface, the illuminating surface may be considered to be the light emitting surface itself (see e.g. Annex 3, Parts 2, 3, 5 and 6).

2.9.3. 'Illuminating surface of a retro-reflector' (paragraph 2.7.16) means, as declared by the applicant during the component approval procedure for the retro-reflectors, the orthogonal projection of a retro-reflector in a plane perpendicular to its axis of reference and delimited by planes contiguous to the declared outermost parts of the retro-reflectors' optical system and parallel to that axis. For the purposes of determining the lower, upper and lateral edges of the device, only horizontal and vertical planes shall be considered.

2.10. The 'apparent surface' for a defined direction of observation means, at the request of the manufacturer or his duly accredited representative, the orthogonal projection of:

Either the boundary of the illuminating surface projected on the exterior surface of the lens;

Or the light-emitting surface;

Only in the case of a light-signalling device producing variable luminous intensities, its apparent surface that may be variable as specified in paragraph 2.7.1.3 shall be considered under all conditions permitted by the variable intensity control, if applicable.

In a plane perpendicular to the direction of observation and tangential to the most exterior point of the lens. Different examples of the application of apparent surface can be found in Annex 3 to this Regulation.

2.11. 'Axis of reference' (or 'reference axis') means the characteristic axis of the lamp determined by the manufacturer (of the lamp) for use as the direction of reference ($H = 0^\circ$, $V = 0^\circ$) for angles of field for photometric measurements and for installing the lamp on the vehicle.

2.12. 'Centre of reference' means the intersection of the axis of reference with the exterior light-emitting surface; it is specified by the manufacturer of the lamp.

2.13. 'Angles of geometric visibility' means the angles which determine the field of the minimum solid angle in which the apparent surface of the lamp is visible. That field of the solid angle is determined by the segments of the sphere of which the centre coincides with the centre of reference of the lamp and the equator is parallel with the ground. These segments are determined in relation to the axis of reference. The horizontal angles β correspond to the longitude and the vertical angles α to the latitude.

2.14. 'Extreme outer edge' on either side of the vehicle, means the plane parallel to the median longitudinal plane of the vehicle and touching its lateral outer edge, disregarding the projection:

2.14.1. Of tyres near their point of contact with the ground, and of connections for tyre-pressure gauges;

2.14.2. Of any anti-skid devices mounted on the wheels;

2.14.3. Of devices for indirect vision;

2.14.4. Of side direction-indicator lamps, end-outline marker lamps, front and rear position lamps, parking lamps, retro-reflectors and side-marker lamps.

2.14.5. Of customs seals affixed to the vehicle, and of devices for securing and protecting such seals.

2.14.6. Of service-door lighting systems on vehicles of categories M_2 and M_3 as specified in paragraph 2.7.

- 2.15. 'Overall dimensions' means the distance between the two vertical planes defined in paragraph 2.14 above.
- 2.15.1. 'Overall width' means the distance between the two vertical planes defined in paragraph 2.14 above.
- 2.15.2. 'Overall length' means the distance between the two vertical planes perpendicular to the median longitudinal plane of the vehicle and touching its front and rear outer edge, disregarding the projection:
- (a) Of devices for indirect vision;
 - (b) Of end-outline marker lamps;
 - (c) Of coupling devices, in the case of motor vehicles.
- For trailers in the 'overall length' and in any measurement in length the drawbar shall be included, except when specifically excluded.
- 2.16. 'Single and multiple lamps'
- 2.16.1. 'A single lamp' means:
- (a) A device or part of a device having one lighting or light-signalling function, one or more light source(s) and one apparent surface in the direction of the reference axis, which may be a continuous surface or composed of two or more distinct parts; or
 - (b) Any assembly of two lamps marked 'D', whether identical or not, having the same function; or
 - (c) Any assembly of two independent retro-reflectors, whether identical or not, that have been approved separately; or
 - (d) Any interdependent lamp system composed of two or three interdependent lamps marked 'Y' approved together and providing the same function.
- 2.16.2. 'Two lamps' or 'an even number of lamps' in the shape of a band or strip, means two lamps with a single light emitting surface, providing such a band or strip is placed symmetrically in relation to the median longitudinal plane of the vehicle.
- 2.17. 'Distance between two lamps' which face in the same direction means the shortest distance between the two apparent surfaces in the direction of the reference axis. Where the distance between the lamps clearly meets the requirements of the Regulation, the exact edges of apparent surfaces need not be determined.
- 2.18. 'Operating tell-tale' means a visual or auditory signal (or any equivalent signal) indicating that a device has been switched on and is operating correctly or not.
- 2.19. 'Closed-circuit tell-tale' means a visual (or any equivalent signal) indicating that a device has been switched on, but not indicating whether it is operating correctly or not.
- 2.20. 'Optional lamp' means a lamp, the installation of which is left to the discretion of the manufacturer.
- 2.21. 'Ground' means the surface on which the vehicle stands which should be substantially horizontal.
- 2.22. 'Movable components' of the vehicle mean those body panels or other vehicle parts the position(s) of which can be changed by tilting, rotating or sliding without the use of tools. They do not include tiltable driver cabs of trucks.
- 2.23. 'Normal position of use of a movable component' means the position(s) of a movable component specified by the vehicle manufacturer for the normal condition of use and the park condition of the vehicle.

- 2.24. 'Normal condition of use of a vehicle' means:
- 2.24.1. For a motor vehicle, when the vehicle is ready to move with its propulsion engine running and its movable components in the normal position(s) as defined in paragraph 2.23;
- 2.24.2. And for a trailer, when the trailer is connected to a drawing motor vehicle in the conditions as prescribed in paragraph 2.24.1 and its movable components are in the normal position(s) as defined in paragraph 2.23.
- 2.25. 'Park condition of a vehicle' means:
- 2.25.1. For a motor vehicle, when the vehicle is at standstill and its propulsion engine is not running and its movable components are in the normal position(s) as defined in paragraph 2.23;
- 2.25.2. And for a trailer, when the trailer is connected to a drawing motor vehicle in the condition as described in paragraph 2.25.1 and its movable components are in the normal position(s) as defined in paragraph 2.23.
- 2.26. 'Bend lighting' means a lighting function to provide enhanced illumination in bends.
- 2.27. 'Pair' means the set of lamps of the same function on the left- and right-hand side of the vehicle.
- 2.27.1. 'Matched pair' means the set of lamps of the same function on the left- and right-hand side of the vehicle, which, as a pair, complies with the photometric requirements.
- 2.28. 'Emergency stop signal' means a signal to indicate to other road users to the rear of the vehicle that a high retardation force has been applied to the vehicle relative to the prevailing road conditions.
- 2.29. Colour of the light emitted from a device
- 2.29.1. 'White' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light emitted that lie inside the chromaticity areas defined by the boundaries:

W_{12}	green boundary	$y = 0,150 + 0,640 x$
W_{23}	yellowish green boundary	$y = 0,440$
W_{34}	yellow boundary	$x = 0,500$
W_{45}	reddish purple boundary	$y = 0,382$
W_{56}	purple boundary	$y = 0,050 + 0,750 x$
W_{61}	blue boundary	$x = 0,310$

With intersection points:

	x	y
W_1	0,310	0,348
W_2	0,453	0,440
W_3	0,500	0,440
W_4	0,500	0,382
W_5	0,443	0,382
W_6	0,310	0,283

⁽¹⁾ CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.

2.29.2. 'Selective-yellow' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light emitted that lie inside the chromaticity areas defined by the boundaries:

SY_{12}	green boundary	$y = 1,290 x - 0,100$
SY_{23}	the spectral locus	
SY_{34}	red boundary	$y = 0,138 + 0,580 x$
SY_{45}	yellowish white boundary	$y = 0,440$
SY_{51}	white boundary	$y = 0,940 - x$

With intersection points:

	x	y
SY_1	0,454	0,486
SY_2	0,480	0,519
SY_3	0,545	0,454
SY_4	0,521	0,440
SY_5	0,500	0,440

2.29.3. 'Amber' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light emitted that lie inside the chromaticity areas defined by the boundaries:

A_{12}	green boundary	$y = x - 0,120$
A_{23}	the spectral locus	
A_{34}	red boundary	$y = 0,390$
A_{41}	white boundary	$y = 0,790 - 0,670 x$

With intersection points:

	x	y
A_1	0,545	0,425
A_2	0,560	0,440
A_3	0,609	0,390
A_4	0,597	0,390

2.29.4. 'Red' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light emitted that lie inside the chromaticity areas defined by the boundaries:

R_{12}	yellow boundary	$y = 0,335$
R_{23}	the spectral locus	
R_{34}	the purple line	(its linear extension across the purple range of colours between the red and the blue extremities of the spectral locus).
R_{41}	purple boundary:	$y = 0,980 - x$

⁽¹⁾ CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.

With intersection points:

	x	y
R ₁	0,645	0,335
R ₂	0,665	0,335
R ₃	0,735	0,265
R ₄	0,721	0,259

2.30. Night-time Colour of the light retro-reflected from a device excluding retro-reflective tires according to Regulation No 88

2.30.1. 'White' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

W ₁₂	blue boundary:	$y = 0,843 - 1,182 x$
W ₂₃	purple boundary	$y = 0,489 x + 0,146$
W ₃₄	yellow boundary	$y = 0,968 - 1,010 x$
W ₄₁	green boundary	$y = 1,442 x - 0,136$

With intersection points:

	x	y
W ₁	0,373	0,402
W ₂	0,417	0,350
W ₃	0,548	0,414
W ₄	0,450	0,513

2.30.2. 'Yellow' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

Y ₁₂	green boundary	$y = x - 0,040$
Y ₂₃	the spectral locus	
Y ₃₄	red boundary	$y = 0,200 x + 0,268$
Y ₄₁	white boundary	$y = 0,970 - x$

With intersection points:

	x	y
Y ₁	0,505	0,465
Y ₂	0,520	0,480
Y ₃	0,610	0,390
Y ₄	0,585	0,385

⁽¹⁾ CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.

- 2.30.3. 'Amber' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

A ₁₂	green boundary	$y = 1,417 x - 0,347$
A ₂₃	the spectral locus	
A ₃₄	red boundary	$y = 0,390$
A ₄₁	white boundary	$y = 0,790 - 0,670 x$

With intersection points:

	x	y
A ₁	0,545	0,425
A ₂	0,557	0,442
A ₃	0,609	0,390
A ₄	0,597	0,390

- 2.30.4. 'Red' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

R ₁₂	yellow boundary	$y = 0,335$
R ₂₃	the spectral locus	
R ₃₄	the purple line	
R ₄₁	purple boundary	$y = 0,978 - x$

With intersection points:

	x	y
R ₁	0,643	0,335
R ₂	0,665	0,335
R ₃	0,735	0,265
R ₄	0,720	0,258

- 2.31. Daytime Colour of the light reflected from a device

- 2.31.1. 'White' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

W ₁₂	purple boundary	$y = x - 0,030$
W ₂₃	yellow boundary	$y = 0,740 - x$
W ₃₄	green boundary	$y = x + 0,050$
W ₄₁	blue boundary	$y = 0,570 - x$

⁽¹⁾ CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.

With intersection points:

	x	y
W_1	0,300	0,270
W_2	0,385	0,355
W_3	0,345	0,395
W_4	0,260	0,310

- 2.31.2. 'Yellow' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

Y_{12}	red boundary	$y = 0,534 x + 0,163$
Y_{23}	white boundary	$y = 0,910 - x$
Y_{34}	green boundary	$y = 1,342 x - 0,090$
Y_{41}	the spectral locus	

With intersection points:

	x	y
Y_1	0,545	0,454
Y_2	0,487	0,423
Y_3	0,427	0,483
Y_4	0,465	0,534

- 2.31.3. 'Red' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

R_{12}	red boundary	$y = 0,346 - 0,053 x$
R_{23}	purple boundary	$y = 0,910 - x$
R_{34}	yellow boundary	$y = 0,350$
R_{41}	the spectral locus	

With intersection points:

	x	y
R_1	0,690	0,310
R_2	0,595	0,315
R_3	0,560	0,350
R_4	0,650	0,350

⁽¹⁾ CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.

2.32. Daytime Colour of the fluorescent a device

2.32.1. 'Red' means the chromaticity coordinates (x,y) ⁽¹⁾ of the light reflected that lie inside the chromaticity areas defined by the boundaries:

FR₁₂ red boundary $y = 0,346 - 0,053 x$

FR₂₃ purple boundary $y = 0,910 - x$

FR₃₄ yellow boundary $y = 0,315 + 0,047 x$

FR₄₁ the spectral locus

With intersection points:

	x	y
FR ₁	0,690	0,310
FR ₂	0,595	0,315
FR ₃	0,569	0,341
FR ₄	0,655	0,345

2.33. 'Rear-end collision alert signal (RECAS)' means an automatic signal given by the leading vehicle to the following vehicle. It warns that the following vehicle needs to take emergency action to avoid a collision.

2.34. 'Gonio(photo)meter system (if not otherwise specified in a particular Regulation)' means a system used for the photometric measurements specified by the angular coordinates in degrees on a sphere with a vertical polar axis according to CIE publication No 70, Vienna 1987, i.e. corresponding to a gonio(photo)meter system with a horizontal ('elevation') axis fixed to the ground and a second, moveable ('rotation') axis perpendicular to the fixed horizontal axis (see Annex 14 to this Regulation). *Note:* The above mentioned CIE publication specifies a procedure to correct the angular coordinates in the case where an alternative gonio(photo)meter system is used.

2.35. 'H plane' means the horizontal plane containing the centre of reference of the lamp.

2.36. 'Sequential activation' means an electrical connection where the individual light sources of a lamp are wired such that they are activated in a predetermined sequence.

3. APPLICATION FOR APPROVAL

3.1. The application for approval of a vehicle type with regard to the installation of its lighting and light-signalling devices shall be submitted by the manufacturer or his duly accredited representative.

3.2. It shall be accompanied by the following documents and particulars in triplicate:

3.2.1. A description of the vehicle type with regard to the items mentioned in paragraphs 2.2.1 to 2.2.4 above, together with the restrictions on loading, particularly the maximum permissible load in the boot;

⁽¹⁾ CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.

- 3.2.2. A list of the devices prescribed by the manufacturer for the lighting and light-signalling assembly. The list may include several types of device for each operation. Each type shall be duly identified (component, type-approval mark, name of manufacturer, etc.), in addition the list may include in respect of each function the additional annotation 'or equivalent devices';
- 3.2.3. A layout drawing of the lighting and light-signalling equipment as a whole, showing the position of the various devices on the vehicle;
- 3.2.4. If necessary, in order to verify the conformity to the prescriptions of the present Regulation, layout drawing(s) for each individual lamp showing the illuminating surface as defined in paragraph 2.9, the light-emitting surface as defined in paragraph 2.8, the axis of reference as defined in paragraph 2.11 and the centre of reference as defined in paragraph 2.12. This information is not necessary in the case of the rear registration plate lamp (paragraph 2.7.13);
- 3.2.5. The application shall include a statement of the method used for the definition of the apparent surface (see paragraph 2.10).
- 3.2.6. Where an AFS is fitted on the vehicle, the applicant shall submit a detailed description providing the following information:
 - 3.2.6.1. The lighting functions and modes for which the AFS has been approved;
 - 3.2.6.2. The related AFS control signals and their technical characteristics as defined according to Annex 10 to Regulation No 123;
 - 3.2.6.3. The provisions being applied to adapt automatically the front lighting functions and modes according to paragraph 6.22.7.4 of this Regulation;
 - 3.2.6.4. Special instruction, if any, for the inspection of the light sources and the visual observation of the beam;
 - 3.2.6.5. The documents according to paragraph 6.22.9.2 of this Regulation;
 - 3.2.6.6. The lamps that are grouped or combined with or reciprocally incorporated in the AFS;
 - 3.2.6.7. Lighting units which are designed to comply with the requirements of paragraph 6.22.5 of this Regulation.
- 3.2.7. For vehicles of M and N categories a description of the electric power supply conditions for the devices indicated in paragraphs 2.7.9, 2.7.10, 2.7.12, 2.7.14 and 2.7.15 above, including, if applicable, information on a special power supply/electronic light source control gear, or variable intensity control.
- 3.3. An unladen vehicle fitted with a complete set of lighting and light-signalling equipment, as prescribed in paragraph 3.2.2 above, and representative of the vehicle type to be approved shall be submitted to the Technical Service responsible for conducting approval tests.
- 3.4. The document provided in Annex 1 to this Regulation shall be attached to the type-approval documentation.
- 4. APPROVAL
 - 4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of the Regulation in respect of all the devices specified in the list, approval of that vehicle type shall be granted.
 - 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 06, corresponding to the 06 series of amendments) 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 this number to another vehicle type or to the same vehicle type submitted with equipment not specified in the list referred to in paragraph 3.2.2 above, subject to the provisions of paragraph 7 of this Regulation.

- 4.3. Notice of approval or of extension or refusal of approval or production definitively discontinued of a vehicle type/part pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation, by means of a form conforming to the model in Annex 1 to this Regulation.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark consisting of:
- 4.4.1. A circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval ⁽¹⁾;
- 4.4.2. The number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle prescribed in paragraph 4.4.1.
- 4.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not to be repeated, in such a case the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. GENERAL SPECIFICATIONS
- 5.1. The lighting and light-signalling devices shall be so fitted that under normal conditions of use as defined in paragraphs 2.24, 2.24.1 and 2.24.2 and notwithstanding any vibrations to which they may be subjected, they retain the characteristics prescribed by this Regulation and enable the vehicle to comply with the requirements of this Regulation. In particular, it shall not be possible for the lamps to be inadvertently maladjusted.
- 5.2. The illuminating lamps described in paragraphs 2.7.9, 2.7.10 and 2.7.19 shall be so installed that correct adjustment of their orientation can easily be carried out.
- 5.2.1. In the case of headlamps fitted with measures to prevent discomfort to other road-users in a country where traffic operates on the side of the road opposite to that of the country for which the headlamp was designed, such measures shall be achieved automatically or by the vehicle user with the vehicle in the park condition without the need for special tools (other than those provided with the vehicle ⁽²⁾). Detailed instructions shall be provided by the vehicle manufacturer with the vehicle.
- 5.3. For all light-signalling devices, including those mounted on the side panels, the reference axis of the lamp when fitted to the vehicle shall be parallel to the bearing plane of the vehicle on the road; in addition it shall be perpendicular to the median longitudinal plane of the vehicle in the case of side retro-reflectors and of side-marker lamps and parallel to that plane in the case of all other signalling devices. In each direction a tolerance of $\pm 3^\circ$ shall be allowed. In addition, any specific instructions as regards fitting laid down by the manufacturer shall be complied with.
- 5.4. In the absence of specific instructions, the height and orientation of the lamps shall be verified with the vehicle unladen and placed on a flat, horizontal surface, in the condition defined in paragraphs 2.24, 2.24.1 and 2.24.2 and, in the case where an AFS is installed, with the system in its neutral state.

⁽¹⁾ The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev. 3 — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

⁽²⁾ This does not apply to dedicated objects that may be added to the exterior of the headlamp.

- 5.5. In the absence of specific instructions lamps constituting a pair shall:
- 5.5.1. Be fitted to the vehicle symmetrically in relation to the median longitudinal plane (this estimate to be based on the exterior geometrical form of the lamp and not on the edge of its illuminating surface referred to in paragraph 2.9);
 - 5.5.2. Be symmetrical to one another in relation to the median longitudinal plane, this requirement is not valid with regard to the interior structure of the lamp;
 - 5.5.3. Satisfy the same colorimetric requirements and have substantially identical photometric characteristics. This shall not apply to a matched pair of Class F3 front fog lamps;
 - 5.5.4. Have substantially identical photometric characteristics.
- 5.6. On vehicles whose external shape is asymmetrical the above requirements shall be satisfied so far as is possible.
- 5.7 Grouped, combined or reciprocally incorporated or single lamps
- 5.7.1. Lamps may be grouped, combined or reciprocally incorporated with one another provided that all requirements regarding colour, position, orientation, geometric visibility, electrical connections and other requirements, if any, are fulfilled.
 - 5.7.1.1. The photometric and colorimetric requirements of a lamp shall be fulfilled when all other functions with which this lamp is grouped, combined or reciprocally incorporated are switched OFF.

However, when a front or rear position lamp is reciprocally incorporated with one or more other function(s) which can be activated together with them, the requirements regarding colour of each of these other functions shall be fulfilled when the reciprocally incorporated function(s) and the front or rear position lamps are switched ON.
 - 5.7.1.2. Stop lamps and direction-indicator lamps are not permitted to be reciprocally incorporated.
 - 5.7.1.3. Where stop lamps and direction-indicator lamps are grouped, the following conditions shall be met:
 - 5.7.1.3.1. Any horizontal or vertical straight line passing through the projections of the apparent surfaces of these functions on a plane perpendicular to the reference axis, shall not intersect more than two borderlines separating adjacent areas of different colour;
 - 5.7.1.3.2. Their apparent surfaces in the direction of the reference axis, based upon the areas bounded by the outline of their light emitting surfaces, do not overlap.
 - 5.7.2. Single lamps
 - 5.7.2.1. Single lamps as defined in paragraph 2.16.1(a), composed of two or more distinct parts, shall be installed in such a way that:
 - (a) Either the total area of the projection of the distinct parts on a plane tangent to the exterior surface of the outer lens and perpendicular to the reference axis shall occupy not less than 60 per cent of the smallest quadrilateral circumscribing the said projection; or
 - (b) The minimum distance between the facing edges of two adjacent/tangential distinct parts shall not exceed 75 mm when measured perpendicularly to the reference axis.

These requirements shall not apply to a single retro-reflector.

- 5.7.2.2. Single lamps as defined in paragraph 2.16.1(b) or (c), composed of two lamps marked 'D' or two independent retro reflectors, shall be installed in such a way that:
- (a) Either the projection of the apparent surfaces in the direction of the reference axis of the two lamps or retro reflectors occupies not less than 60 per cent of the smallest quadrilateral circumscribing the projections of the said apparent surfaces in the direction of the reference axis; or
 - (b) The minimum distance between the facing edges of the apparent surfaces in the direction of the reference axis of two lamps or two independent retro reflectors does not exceed 75 mm when measured perpendicularly to the reference axis.

- 5.7.2.3. Single lamps as defined in paragraph 2.16.1(d) shall fulfil the requirements of paragraph 5.7.2.1.

Where two or more lamps and/or two or more separate apparent surfaces are included into the same lamp body and/or have a common outer lens these shall not be considered as an interdependent lamp system.

However, a lamp in the shape of a band or strip may be part of an interdependent lamp system.

- 5.7.2.4. Two lamps or an even number of lamps in the shape of a band or strip shall be placed symmetrically in relation to the median longitudinal plane of the vehicle, extending on both sides to within at least 0,4 m of the extreme outer edge of the vehicle, and are not less than 0,8 m long; the illumination of such a surface shall be provided by not less than two light sources placed as close as possible to the ends; the light-emitting surface may be constituted by a number of juxtaposed elements on condition that these individual light-emitting surfaces, when projected on a transverse plane fulfil the requirements of paragraph 5.7.2.1.

- 5.8. The maximum height above the ground shall be measured from the highest point and the minimum height from the lowest point of the apparent surface in the direction of the reference axis.

Where the (maximum and minimum) height above the ground clearly meets the requirements of the Regulation, the exact edges of any surface need not be determined.

- 5.8.1. For the purposes of reducing the geometric visibility angles, the position of a lamp with regard to height above the ground, shall be measured from the H plane.
- 5.8.2. In the case of dipped-beam headlamp, the minimum height in relation to the ground is measured from the lowest point of the effective outlet of the optical system (e.g. reflector, lens, projection lens) independent of its utilization.
- 5.8.3. The position, as regards width, will be determined from that edge of the apparent surface in the direction of the reference axis which is the furthest from the median longitudinal plane of the vehicle when referred to the overall width, and from the inner edges of the apparent surface in the direction of the reference axis when referred to the distance between lamps.

Where the position, as regards width, clearly meets the requirements of the Regulation, the exact edges of any surface need not be determined.

- 5.9. In the absence of specific instructions, the photometric characteristics (e.g. intensity, colour, apparent surface, etc.) of a lamp shall not be intentionally varied during the period of activation of the lamp.
- 5.9.1. Direction-indicator lamps, the vehicle-hazard warning signal, amber side-marker lamps complying with paragraph 6.18.7 below, and the emergency stop signal shall be flashing lamps.

- 5.9.2. The photometric characteristics of any lamp may vary:
- (a) In relation to the ambient light;
 - (b) As a consequence of the activation of other lamps; or
 - (c) When the lamps is being used to provide another lighting function;
- provided that any variation in the photometric characteristics is in compliance with the technical provisions for the lamp concerned.
- 5.9.3. The photometric characteristics of a direction indicator lamp of categories 1, 1a, 1b, 2a or 2b may be varied during a flash by sequential activation of light sources as specified in paragraph 5.6 of Regulation No 6.
- This provision shall not apply when direction indicator lamps of categories 2a and 2b are operated as emergency stop signal according to paragraph 6.23.1 of this Regulation.
- 5.10. No red light which could give rise to confusion shall be emitted from a lamp as defined in paragraph 2.7 in a forward direction and no white light which could give rise to confusion, shall be emitted from a lamp as defined in paragraph 2.7 in a rearward direction. No account shall be taken of lighting devices fitted for the interior lighting of the vehicle. In case of doubt, this requirement shall be verified as follows:
- 5.10.1. For the visibility of red light towards the front of a vehicle, with the exception of a red rearmost side-marker lamp, there shall be no direct visibility of the apparent surface of a red lamp if viewed by an observer moving within Zone 1 as specified in Annex 4;
- 5.10.2. For the visibility of white light towards the rear, with the exception of reversing lamps and white side conspicuity markings fitted to the vehicle, there shall be no direct visibility of the apparent surface of a white lamp if viewed by an observer moving within Zone 2 in a transverse plane situated 25 m behind the vehicle (see Annex 4);
- 5.10.3. In their respective planes, the zones 1 and 2 explored by the eye of the observer are bounded:
- 5.10.3.1. In height, by two horizontal planes 1 m and 2,2 m respectively above the ground;
- 5.10.3.2. In width, by two vertical planes which, forming to the front and to the rear respectively an angle of 15° outwards from the vehicle's median longitudinal plane, pass through the point or points of contact of vertical planes parallel to the vehicle's median longitudinal plane delimiting the vehicle's overall width; if there are several points of contact, the foremost shall correspond to the forward plane and the rearmost to the rearward plane.
- 5.11. The electrical connections shall be such that the front and rear position lamps, the end-outline marker lamps, if they exist, the side-marker lamps, if they exist, and the rear registration plate lamp can only be switched ON and OFF simultaneously.
- 5.11.1. This condition does not apply:
- 5.11.1.1. When front and rear position lamps are switched ON, as well as side-marker lamps when combined or reciprocally incorporated with said lamps, as parking lamps; or
- 5.11.1.2. When side-marker lamps flash in conjunction with direction indicators; or
- 5.11.1.3. When light signalling system operates according to 6.2.7.6.2.
- 5.11.2. To front position lamps when their function is substituted under the provisions of paragraph 5.12.1 below.
- 5.11.3. In the case of an interdependent lamp system, all light sources shall be switched ON and OFF simultaneously.

- 5.12. The electrical connections shall be such that the main-beam and dipped-beam headlamps and the front fog lamps cannot be switched on unless the lamps referred to in paragraph 5.11 are also switched on. This requirement shall not apply, however, to main-beam or dipped-beam headlamps when their luminous warnings consist of the intermittent lighting up at short intervals of the main-beam headlamp or the intermittent lighting up at short intervals of the dipped-beam headlamp or the alternate lighting up at short intervals of the main-beam and dipped-beam headlamps.
- 5.12.1. The dipped-beam headlamps and/or the main-beam headlamps and/or the front fog lamps may substitute the function of the front position lamps, provided that:
- 5.12.1.1. Their electrical connections are such that in case of failure of any of these lighting devices the front position lamps are automatically re-activated; and
- 5.12.1.2. The substituting lamp/function meets, for the respective position lamp, the requirements concerning:
- (a) The geometric visibility prescribed for the front position lamps in 6.9.5; and
- (b) The minimum photometric values according to the angles of light distribution; and
- 5.12.1.3. Appropriate evidence demonstrating compliance with the requirements indicated in paragraph 5.12.1.2 above is provided in the test reports of the substituting lamp.
- 5.13. Tell-tale
- Where a closed-circuit tell-tale is prescribed by this Regulation it may be replaced by an 'operating' tell-tale.
- 5.14. Concealable lamps
- 5.14.1. The concealment of lamps shall be prohibited, with the exception of the main-beam headlamps, the dipped-beam headlamps and the front fog lamps, which may be concealed when they are not in use.
- 5.14.2. In the event of any failure affecting the operation of the concealment device(s) the lamps shall remain in the position of use, if already in use, or shall be capable of being moved into the position of use without the aid of tools.
- 5.14.3. It shall be possible to move the lamps into the position of use and to switch them on by means of a single control, without excluding the possibility of moving them into the position of use without switching them on. However, in the case of grouped main-beam and dipped-beam headlamps, the control referred to above is required only to activate the dipped-beam headlamps.
- 5.14.4. It shall not be possible deliberately, from the driver's seat, to stop the movement of switched-on lamps before they reach the position of use. If there is a danger of dazzling other road users by the movement of the lamps, they may light up only when they have reached their position of use.
- 5.14.5. When the concealment device has a temperature of – 30 °C to + 50 °C the headlamps shall be capable of reaching the position of use within 3 seconds of initial operation of the control.
- 5.15. The colours of the light emitted by the lamps ⁽¹⁾ are the following:
- | | |
|-----------------------|-------|
| Main-beam headlamp: | White |
| Dipped-beam headlamp: | White |

⁽¹⁾ Measurement of the chromaticity coordinates of the light emitted by the lamps is not part of this regulation.

Front fog lamp:	White or selective yellow
Reversing lamp:	White
Direction-indicator lamp:	Amber
Hazard warning signal:	Amber
Stop lamp:	Red
Emergency stop signal:	Amber or red
Rear-end collision alert signal:	Amber
Rear registration plate lamp:	White
Front position lamp:	White
Rear position lamp:	Red
Front fog lamp	White or selective yellow
Rear fog lamp:	Red
Parking lamp:	White in front, red at the rear, amber if reciprocally incorporated in the side direction-indicator lamps or in the side-marker lamps.
Side-marker lamp:	Amber; however the rearmost side- marker lamp can be red if it is grouped or combined or reciprocally incorporated with the rear position lamp, the rear end-outline marker lamp, the rear fog lamp, the stop lamp or is grouped or has part of the light emitting surface in common with the rear retro-reflector.
End-outline marker lamp:	White in front, red at the rear
Daytime running lamp:	White
Rear retro-reflector, non- triangular:	Red
Rear retro-reflector, triangular:	Red
Front retro-reflector, non- triangular:	Identical to incident light ⁽¹⁾
Side retro-reflector, non- triangular:	Amber; however the rearmost side retro-reflector can be red if it is grouped or has part of the light emitting surface in common with the rear position lamp, the rear end outline marker lamp, the rear fog lamp, the stop-lamp, the red rearmost side-marker lamp or the rear retro-reflector, non- triangular.
Cornering lamp:	White
Conspicuity marking:	White to the front; White or yellow to the side; Red or yellow to the rear ⁽²⁾ .
Adaptive front-lighting systems (AFS):	White
Exterior courtesy lamp:	White
Manoeuvring lamp:	White

⁽¹⁾ Also known as white or colourless retro-reflector.

⁽²⁾ Nothing in this Regulation shall preclude the Contracting Parties applying this Regulation from allowing the use of white conspicuity markings to the rear in their territories.

- 5.16. Number of lamps
- 5.16.1. The number of lamps mounted on the vehicle shall be equal to the number indicated in the individual specifications of this Regulation.
- 5.17. Any lamp may be installed on movable components provided that the conditions specified in paragraphs 5.18, 5.19 and 5.20 are fulfilled.
- 5.18. Rear position lamps, rear direction-indicators and rear retro-reflectors, triangular as well as non-triangular, may be installed on movable components only:
- 5.18.1. If at all fixed positions of the movable components the lamps on the movable components meet all the position, geometric visibility, colorimetric and photometric requirements for those lamps.
- 5.18.2. In the case where the functions referred to in paragraph 5.18 are obtained by an assembly of two lamps marked 'D' (see paragraph 2.16.1), only one of the lamps needs to meet the position, geometric visibility and photometric requirements for those lamps at all fixed positions of the movable components.
- or
- 5.18.3. Where additional lamps for the above functions are fitted and are activated, when the movable component is in any fixed open position, provided that these additional lamps satisfy all the position, geometric visibility and photometric requirements applicable to the lamps installed on the movable component.
- 5.18.4. In the case where the functions referred to in paragraph 5.18 are obtained by an interdependent lamp system either of the following conditions shall apply:
- (a) Should the complete interdependent lamp system be mounted on the moving component(s), the requirements of paragraph 5.18.1 shall be satisfied. However, additional lamps for the above functions may be activated, when the movable component is in any fixed open position, provided that these additional lamps satisfy all the position, geometric visibility, colorimetric and photometric requirements applicable to the lamps installed on the movable component, or
- (b) Should the interdependent lamp system be partly mounted on the fixed component and partly mounted on a movable component, with the exception of direction indicator lamps, the interdependent lamp(s) specified by the Applicant during the device approval procedure shall meet all the position, outwards geometric visibility, colorimetric and photometric requirements for those lamps, at all fixed positions of the movable component(s).
- The inwards geometric visibility requirement(s) is(are) deemed to be satisfied if this(these) interdependent lamp(s) still conform(s) to the photometric values prescribed in the field of light distribution for the approval of the device, at all fixed positions of the movable component(s).
- For direction indicator lamps, the interdependent lamp(s) specified by the Applicant during the device approval procedure shall meet all the position, geometric visibility, photometric and colorimetric requirements at all fixed positions of the movable component(s). This does not apply where, to fulfil or complete the geometric visibility angle, additional lamps are activated when the movable component is in any fixed open position, provided that these additional lamps satisfy all the position, photometric and colorimetric requirements applicable to the direction indicator lamps installed on the movable component.
- 5.19. When the movable components are in a position other than a 'normal position of use', the devices installed on them shall not cause undue discomfort to road users.
- 5.20. When a lamp is installed on a movable component and the movable component is in the 'normal position(s) of use', the lamp shall always return to the position(s) specified by the manufacturer in accordance with this Regulation. In the case of dipped-beam headlamps and front fog lamps, this requirement shall be considered satisfied if, when the movable components are moved and returned to

the normal position 10 times, no value of the angular inclination of these lamps, relative to its support, measured after each operation of the movable component, differs by more than 0,15 per cent from the average of the 10 measured values. If this value is exceeded each limit specified in paragraph 6.2.6.1.1 shall then be modified by this excess to decrease the allowed range of inclinations when checking the vehicle according to Annex 6.

- 5.21. The apparent surface in the direction of the reference axis of front and rear position lamps, front and rear direction-indicator lamps and retro-reflectors shall not be hidden more than 50 per cent by any movable component, with or without a light-signalling device installed on it, in any fixed position different from the 'normal position of use'.

Fixed position of a movable component means the stable or natural rest position(s) of the movable component specified by the vehicle manufacturer, whether locked or not.

If the above requirement is not practicable:

- 5.21.1. Additional lamps satisfying all the position, geometric visibility, colorimetric and photometric requirements for the above indicated lamps shall be activated when the apparent surface in the direction of the reference axis of these lamps is more than 50 per cent hidden by the movable component; or

- 5.21.2. A remark in the communication form (item 10.1 of Annex 1) shall inform other Administrations that more than 50 per cent of the apparent surface in the direction of the reference axis can be hidden by the movable components; and

A notice in the vehicle shall inform the user that in certain position(s) of the movable components other road users shall be warned of the presence of the vehicle on the road; for example by means of a warning triangle or other devices according to national requirements for use on the road.

- 5.21.3. Paragraph 5.21.2 does not apply to retro-reflectors.

- 5.22. With the exception of retro-reflectors, a lamp even bearing an approval mark is deemed not to be present when it cannot be made to operate by the sole installation of a light source and/or a fuse.

- 5.23. Lamps approved with light source(s) according to Regulation No 37, except when such light sources are used as non-replaceable light source(s) as defined in paragraph 2.7.1.1.2 of this Regulation, shall be fitted in a vehicle in such a way that the light source can be correctly replaced without the need for expert assistance and without the need for special tools, other than those provided with the vehicle by the manufacturer. The vehicle manufacturer shall provide with the vehicle a detailed description of the procedure for replacement.

- 5.23.1. In the case where a light source module includes a holder for an approved replaceable light source according to Regulation No 37, this light source shall be replaceable as required in paragraph 5.23 above.

- 5.24. Any temporary fail-safe replacement of the light-signalling function of a rear position lamp is allowed, provided that the replacement function in case of a failure is similar in colour, main intensity and position to the function that has ceased to operate and provided that the replacement device remains operational in its original safety function. During replacement, a tell-tale on the dashboard (paragraph 2.18 of this Regulation) shall indicate occurrence of a temporary replacement and need for repair.

- 5.25. Where an AFS is fitted, it shall be considered equivalent to a pair of dipped-beam headlamps and, if it provides main-beam function(s), it shall be considered equivalent to a pair of main-beam headlamps.

- 5.26. Rear direction-indicator lamps, rear position lamps, stop lamps (except stop lamps of category S4) and rear fog lamps with variable luminous intensity control are allowed, which respond simultaneously to at least one of the following external influences: ambient lighting, fog, snowfall, rain, spray, dust clouds, contamination of the light emitting surface, provided that their prescribed intensity relationship is maintained throughout variation transitions. No sharp variation of intensity shall be observed during transition. Stop lamps of category S4 may produce variable luminous intensity independent from the other lamps. It may be possible for the driver to set the functions above to luminous intensities corresponding to their steady category and to return them to their automatic variable category.

- 5.27. For vehicles of M and N categories, the applicant shall demonstrate to the Technical Service responsible for type approval testing that the electric power supply conditions for the devices indicated in paragraphs 2.7.9, 2.7.10, 2.7.12, 2.7.14 and 2.7.15 above comply, when the electrical system of the vehicle is in a constant voltage operating condition, representative for the relevant category of powered vehicle as specified by the applicant, with the following provisions:
- 5.27.1. The voltage supplied at the terminals of devices which, according to their type approval documentation, have been tested by the application of a special power supply/electronic light source control gear, or in a secondary operating mode or at a voltage requested by the applicant, shall not exceed the voltage specified for the relevant devices or functions as they have been approved.
- 5.27.2. In all cases of electric power supply conditions not covered by paragraph 5.27.1, the voltage at the terminals of the device(s) or function(s) shall not exceed 6,75 V (6 Volt-Systems), 13,5 V (12 Volt-Systems) or 28 V (24 Volt-Systems) by more than 3 per cent. The means of controlling the maximum voltage at the terminals of the device may, for convenience, be located within the body of the device.
- 5.27.3. The provisions of paragraphs 5.27.1 and 5.27.2 shall not apply to devices which include an electronic light source control gear or a variable intensity control being part of the device.
- 5.27.4. A report shall be attached to the approval documentation describing the methods used to demonstrate compliance and the results obtained.
- 5.28. General provisions relating to geometric visibility
- 5.28.1. There shall be no obstacle on the inside of the angles of geometric visibility to the propagation of light from any part of the apparent surface of the lamp observed from infinity. However, no account is taken of obstacles, if they were already presented when the lamp was type-approved.
- 5.28.2. If measurements are taken closer to the lamp, the direction of observation shall be shifted parallel to achieve the same accuracy.
- 5.28.3. If, when the lamp is installed, any part of the apparent surface of the lamp is hidden by any further parts of the vehicle, proof shall be furnished that the part of the lamp not hidden by obstacles still conforms to the photometric values prescribed for the approval of the device.
- 5.28.4. When the vertical angle of geometric visibility below the horizontal may be reduced to 5° (lamp at less than 750 mm above the ground measured according to the provisions of paragraph 5.8.1 above) the photometric field of measurements of the installed optical unit may be reduced to 5° below the horizontal.
- 5.28.5. In the case of an interdependent lamp system the geometric visibility requirements shall be fulfilled when all its interdependent lamps are operated together.
- 5.29. A LED module does not need to be replaceable, if so stated in the communication sheet of the component type approval.
6. INDIVIDUAL SPECIFICATIONS
- 6.1. Main-beam headlamp (Regulations Nos 98 and 112)
- 6.1.1. Presence
- Mandatory on motor vehicles. Prohibited on trailers.

6.1.2. Number

Two or four, type approved according to Regulations Nos 98 or 112, excluding Class A headlamp.

For vehicles of the category N₃: Two extra main-beam headlamps may be installed.

Where a vehicle is fitted with four concealable headlamps the installation of two additional headlamps shall only be authorized for the purpose of light-signalling, consisting of intermittent illumination, at short intervals (see paragraph 5.12 above) in daylight.

6.1.3. Arrangement

No individual specifications.

6.1.4. Position

6.1.4.1. In width: No individual specifications.

6.1.4.2. In height: No individual specifications.

6.1.4.3. In length: At the front of the vehicle. This requirement shall be deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.

6.1.5. Geometric visibility

The visibility of the illuminating surface, including its visibility in areas which do not appear to be illuminated in the direction of observation considered, shall be ensured within a divergent space defined by generating lines based on the perimeter of the illuminating surface and forming an angle of not less than 5° with the axis of reference of the headlamp. The origin of the angles of geometric visibility is the perimeter of the projection of the illuminating surface on a transverse plane tangent to the foremost part of the lens of the headlamp.

6.1.6. Orientation

Towards the front.

Not more than one main-beam headlamp on each side of the vehicle may swivel to produce bend lighting.

6.1.7. Electrical connections

6.1.7.1. Except when they are used to give intermittent luminous warnings at short intervals the main-beam headlamps may be switched ON, only when the master light switch is in headlamps ON position or in 'AUTO' (automatic) position and the conditions for automatic activation of dipped-beam exist. In the latter case, the main beam headlamps shall be switched off automatically when the conditions for automatic activation of dipped-beam ceased to exist.

6.1.7.2. The control of the main-beam headlamps may be automatic regarding their activation and deactivation, the control signals being produced by a sensor system which is capable of detecting and reacting to each of the following inputs:

(a) Ambient lighting conditions;

- (b) The light emitted by the front lighting devices and front light-signalling devices of oncoming vehicles;
- (c) The light emitted by the rear light-signalling devices of preceding vehicles.

Additional sensor functions to improve performance are allowed.

For the purpose of this paragraph, 'vehicles' means vehicles of categories L, M, N, O, T, as well as bicycles, such vehicles being equipped with retro-reflectors, with lighting and light-signalling devices, which are switched ON.

- 6.1.7.3. It shall always be possible to switch the main-beam headlamps ON and OFF manually and to manually switch OFF the automatic control of the main-beam headlamps.

Moreover, the switching OFF, of the main-beam headlamps and of their automatic control, shall be by means of a simple and immediate manual operation; the use of sub-menus is not allowed.

- 6.1.7.4. The main-beam headlamps may be switched on either simultaneously or in pairs. In case the extra two main-beam headlamps are installed, as permitted under paragraph 6.1.2 for vehicles of the category N₃ only, no more than two pairs may be simultaneously lit. For changing over from the dipped to the main beam at least one pair of main-beam headlamps shall be switched on. For changing over from the main-beam to the dipped-beam all main-beam headlamps shall be switched off simultaneously.

- 6.1.7.5. The dipped-beams may remain switched on at the same time as the main beams.

- 6.1.7.6. Where four concealable headlamps are fitted their raised position shall prevent the simultaneous operation of any additional headlamps fitted, if these are intended to provide light signals consisting of intermittent illumination at short intervals (paragraph 5.12) in daylight.

- 6.1.8. Tell-tale

Circuit-closed tell-tale mandatory.

- 6.1.8.1. If the control of the main-beam headlamps is automatic as described in paragraph 6.1.7.1 above an indication shall be provided to the driver that the automatic control of the main-beam function is activated. This information shall remain displayed as long as the automatic operation is activated.

- 6.1.9. Other requirements

- 6.1.9.1. The aggregate maximum intensity of the main-beam headlamps which can be switched on simultaneously shall not exceed 430 000 cd, which corresponds to a reference value of 100.

- 6.1.9.2. This maximum intensity shall be obtained by adding together the individual reference marks which are indicated on the several headlamps. The reference mark '10' shall be given to each of the headlamps marked 'R' or 'CR'.

- 6.1.9.3. Automatic activation and deactivation of the main-beam headlamps:

- 6.1.9.3.1. The sensor system used to control the automatic activation and deactivation of the main-beam headlamps, as described in paragraph 6.1.7.1, shall comply with the following requirements:

- 6.1.9.3.1.1. The boundaries of the minimum fields in which the sensor is able to detect light emitted from other vehicles defined in paragraph 6.1.7.1 above are defined by the angles indicated below.

6.1.9.3.1.1.1. Horizontal angles: 15° to the left and 15° to the right.

Vertical angles:

Upward angle	5°		
Mounting height of the sensor (centre of sensor aperture above the ground)	Less than 2 m	Between 1,5 m and 2,5 m	Greater than 2,0 m
Downward angle	2°	2° to 5°	5°

These angles are measured from the centre of the sensor aperture relative to a horizontal straight line through its centre and parallel to the longitudinal median plane of the vehicle.

6.1.9.3.1.2. The sensor system shall be able to detect on a straight level road:

- (a) An oncoming power driven vehicle at a distance extending to at least 400 m;
- (b) A preceding power driven vehicle or a vehicle-trailers combination at a distance extending to at least 100 m;
- (c) An oncoming bicycle at a distance extending to at least 75 m, its illumination represented by a white lamp with a luminous intensity of 150 cd with a light emitting area of $10 \text{ cm}^2 \pm 3 \text{ cm}^2$ and a height above a ground of 0,8 m.

To verify compliance with (a) and (b) above, the oncoming and preceding power driven vehicle (or vehicle-trailer combination) shall have position lamps (if applicable) and dipped-beam headlamps switched ON.

6.1.9.3.2. The transition from main-beam to dipped-beam and vice versa according to the conditions indicated in paragraph 6.1.7.1 above may be performed automatically and shall not cause discomfort, distraction or glare.

6.1.9.3.3. The overall performance of the automatic control shall be verified by:

6.1.9.3.3.1. Means of simulation or other means of verification accepted by the Type Approval Authority, as provided by the applicant.

6.1.9.3.3.2. A test drive according to paragraph 1 in Annex 12. The performance of the automatic control shall be documented and checked against the applicant's description. Any obvious malfunctioning shall be contested (e.g. excessive angular movement or flicker).

6.1.9.3.4. The control of the main-beam headlamps may be such that the main-beam headlamps are switched ON automatically only when:

- (a) No vehicles, as mentioned in paragraph 6.1.7.1 above, are detected within the fields and distances according to paragraphs 6.1.9.3.1.1 and 6.1.9.3.1.2; and

- (b) The detected ambient lighting levels are as prescribed in paragraph 6.1.9.3.5 below.

6.1.9.3.5. In the case where main-beam headlamps are switched ON automatically, they shall be switched OFF automatically when oncoming or preceding vehicles, as mentioned in paragraph 6.1.7.1 above, are detected within the fields and distances according to paragraphs 6.1.9.3.1.1 and 6.1.9.3.1.2.

Moreover, they shall be switched OFF automatically when the illuminance produced by ambient lighting conditions exceeds 7 000 lx.

Compliance with this requirement shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority. If necessary the illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the Type Approval Authority.

6.2. Dipped-beam headlamp (Regulations Nos 98 and 112)

6.2.1. Presence

Mandatory on motor vehicles. Prohibited on trailers.

6.2.2. Number

Two, type approved according to Regulations Nos 98 or 112, excluding Class A headlamp.

6.2.3. Arrangement

No special requirement.

6.2.4. Position

6.2.4.1. In width: that edge of the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall be not more than 400 mm from the extreme outer edge of the vehicle.

The inner edges of the apparent surfaces in the direction of the reference axes shall be not less than 600 mm apart. This does not apply, however, for M₁ and N₁ category vehicles; for all other categories of motor vehicles this distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

6.2.4.2. In height: not less than 500 mm and not more than 1 200 mm above the ground. For category N₃G (off-road) vehicles ⁽¹⁾ the maximum height may be increased to 1 500 mm.

6.2.4.3. In length: at the front of the vehicle. This requirement shall be deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly, or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.

6.2.5. Geometric visibility

Defined by angles α and β as specified in paragraph 2.13:

α = 15° upwards and 10° downwards,

β = 45° outwards and 10° inwards.

The presence of partitions or other items of equipment near the headlamp shall not give rise to secondary effects causing discomfort to other road users.

⁽¹⁾ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.3, para. 2 — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

6.2.6. Orientation

Towards the front

6.2.6.1. Vertical orientation

- 6.2.6.1.1. The initial downward inclination of the cut-off of the dipped-beam to be set in the unladen vehicle state with one person in the driver's seat shall be specified within an accuracy of 0,1 per cent by the manufacturer and indicated in a clearly legible and indelible manner on each vehicle close to either headlamp or the manufacturer's plate by the symbol shown in Annex 7.

The value of this indicated downward inclination shall be defined in accordance with paragraph 6.2.6.1.2.

- 6.2.6.1.2. Depending on the mounting height in metres (h) of the lower edge of the apparent surface in the direction of the reference axis of the dipped-beam headlamp, measured on the unladen vehicles, the vertical inclination of the cut-off of the dipped-beam shall, under all the static conditions of Annex 5, remain between the following limits and the initial aiming shall have the following values:

$h < 0,8$

Limits: between – 0,5 per cent and – 2,5 per cent

Initial aiming: between – 1,0 per cent and – 1,5 per cent

$0,8 < h < 1,0$

Limits: between – 0,5 per cent and – 2,5 per cent

Initial aiming: between – 1,0 per cent and – 1,5 per cent

Or, at the discretion of the manufacturer,

Limits: between – 1,0 per cent and – 3,0 per cent

Initial aiming: between – 1,5 per cent and – 2,0 per cent

The application for the vehicle type-approval shall, in this case, contain information as to which of the two alternatives is to be used.

$h > 1,0$

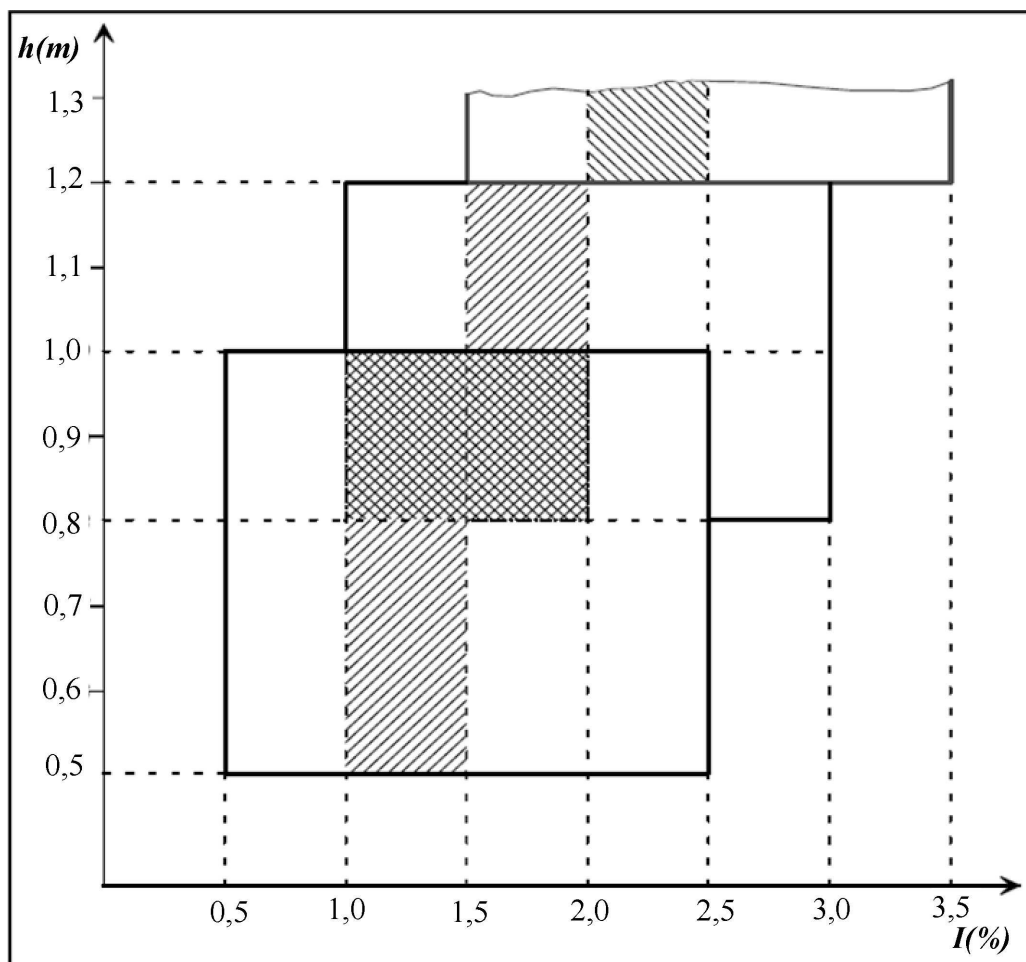
Limits: between – 1,0 per cent and – 3,0 per cent

Initial aiming: between – 1,5 per cent and – 2,0 per cent

The above limits and the initial aiming values are summarized in the diagram below.

For category N₃G (off-road) vehicles where the headlamps exceed a height of 1 200 mm, the limits for the vertical inclination of the cut-off shall be between: – 1,5 per cent and – 3,5 per cent.

The initial aim shall be set between: – 2 per cent and – 2,5 per cent.



6.2.6.2. Headlamp-levelling device

6.2.6.2.1. In the case where a headlamp-levelling device is necessary to satisfy the requirements of paragraphs 6.2.6.1.1 and 6.2.6.1.2, the device shall be automatic.

6.2.6.2.2. However, devices which are adjusted manually, either continuously or non-continuously, shall be permitted, provided they have a stop position at which the lamps can be returned to the initial inclination defined in paragraph 6.2.6.1.1 by means of the usual adjusting screws or similar means.

These manually adjustable devices shall be operable from the driver's seat.

Continually adjustable devices shall have reference marks indicating the loading conditions that require adjustment of the dipped-beam.

The number of positions on devices which are not continuously adjustable shall be such as to ensure compliance with the range of values prescribed in paragraph 6.2.6.1.2 in all the loading conditions defined in Annex 5.

For these devices also, the loading conditions of Annex 5 that require adjustment of the dipped-beam shall be clearly marked near the control of the device (Annex 8).

6.2.6.2.3. In the event of a failure of devices described in paragraphs 6.2.6.2.1 and 6.2.6.2.2, the dipped-beam shall not assume a position in which the dip is less than it was at the time when the failure of the device occurred.

6.2.6.3. Measuring procedure

6.2.6.3.1. After adjustment of the initial inclination, the vertical inclination of the dipped-beam, expressed in per cent, shall be measured in static conditions under all the loading conditions defined in Annex 5.

- 6.2.6.3.2. The measurement of the variation of dipped-beam inclination as a function of load shall be carried out in accordance with the test procedure set out in Annex 6.
- 6.2.6.4. Horizontal orientation
- The horizontal orientation of one or both dipped-beam headlamps may be varied to produce bend lighting, provided that if the whole beam or the kink of the elbow of the cut-off is moved, the kink of the elbow of the cut-off shall not intersect the line of the trajectory of the centre of gravity of the vehicle at distances from the front of the vehicle which are larger than 100 times the mounting height of the respective dipped-beam headlamps.
- 6.2.7. Electrical connections
- 6.2.7.1. The control for changing over to the dipped-beam shall switch off all main-beam headlamps simultaneously.
- 6.2.7.2. The dipped-beam may remain switched on at the same time as the main beams.
- 6.2.7.3. In the case of dipped-beam headlamps according to Regulation No 98, the gas-discharge light sources shall remain switched on during the main-beam operation.
- 6.2.7.4. One additional light source or one or more LED module(s), located inside the dipped-beam headlamps or in a lamp (except the main-beam headlamp) grouped or reciprocally incorporated with the respective dipped-beam headlamps, may be activated to produce bend lighting, provided that the horizontal radius of curvature of the trajectory of the centre of gravity of the vehicle is 500 m or less. This may be demonstrated by the manufacturer by calculation or by other means accepted by the Type Approval Authority.
- 6.2.7.5. Dipped-beam headlamps may be switched ON or OFF automatically. However, it shall be always possible to switch these dipped-beam headlamps ON and OFF manually.
- 6.2.7.6. If daytime running lamps are present and operate according to paragraph 6.19, either
- 6.2.7.6.1. The dipped-beam headlamps shall be switched ON and OFF automatically relative to the ambient light conditions (e.g. switch ON during night-time driving conditions, tunnels, etc.) according to the requirements of Annex 13; or
- 6.2.7.6.2. Daytime running lamps operate in conjunction with the lamps listed in paragraph 5.11 where, as a minimum requirement, at least the rear position lamps shall be activated; or
- 6.2.7.6.3. Distinctive means are provided to inform the driver that the headlamps, position lamps and if so equipped end outline marker lamps and side marker lamps are not illuminated. Such means are:
- 6.2.7.6.3.1. Two distinctly different levels of instrument panel illumination intensity are provided during night and day, indicating to the driver that the dipped-beam headlamps shall be switched ON; or
- 6.2.7.6.3.2. Non-illuminated indicators and identification of hand controls that are required by Regulation No 121 to be illuminated when the headlamps are activated; or
- 6.2.7.6.3.3. A tell-tale visual, auditory or both, shall be activated only in reduced ambient lighting conditions as defined in Annex 13 to inform the driver that the dipped-beam headlamps should be switched ON. Once the tell-tale is activated, it shall only be extinguished when the dipped-beam headlamps have been switched on or the device which starts and/or stops the engine (propulsion system) is set in a position which makes it impossible for the engine (propulsion system) to operate.

6.2.7.7. Without prejudice to paragraph 6.2.7.6.1, the dipped-beam headlamps may switch ON and OFF automatically relative to other factors such as time or ambient conditions (e.g. time of the day, vehicle location, rain, fog, etc.)

6.2.8. Tell-tale

6.2.8.1. Tell-tale optional

6.2.8.2. A visual tell-tale whether flashing or not is mandatory:

- (a) In the case where the whole beam or the kink of the elbow of the cut-off is moved to produce bend lighting; or
- (b) If one or more LED modules are used to produce the principal dipped-beam, except when they are wired so that the failure of any one LED module causes all of them to stop emitting light.

It shall be activated:

- (a) In the event of a malfunction of the displacement of the kink of the elbow of the cut-off; or
- (b) In case of a failure of any one of the LED module(s) producing the principal dipped-beam, except when they are wired so that the failure of any one LED module causes all of them to stop emitting light.

It shall remain activated while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the device, which starts and stops the engine, is switched on and off.

6.2.9. Other requirements

The requirements of paragraph 5.5.2 shall not apply to dipped-beam headlamps.

Dipped-beam headlamps with a light source or LED module(s) producing the principal dipped beam and having a total objective luminous flux which exceeds 2 000 lumens shall only be installed in conjunction with the installation of headlamp cleaning device(s) according to Regulation No 45 ⁽¹⁾.

With respect to vertical inclination the provisions of paragraph 6.2.6.2.2 above shall not be applied for dipped-beam headlamps with a light source or LED module(s) producing the principal dipped beam and having an objective luminous flux which exceeds 2 000 lumens.

In the case of filament lamps for which more than one test voltage is specified, the objective luminous flux which produces the principal dipped beam, as indicated in the communication form for the type approval of the device, is applied.

In the case of dipped-beam headlamps equipped with an approved light source, the applicable objective luminous flux is the value at the relevant test voltage as given in the relevant data sheet in the Regulation, according to which the applied light source was approved, without taking into account the tolerances to the objective luminous flux specified on this datasheet.

Only dipped-beam headlamps according to Regulation Nos 98 or 112 may be used to produce bend lighting.

If bend lighting is produced by a horizontal movement of the whole beam or the kink of the elbow of the cut-off, it shall be activated only if the vehicle is in forward motion; this shall not apply if bend lighting is produced for a right turn in right hand traffic (left turn in left hand traffic).

⁽¹⁾ Contracting Parties to the respective regulations can still prohibit the use of mechanical cleaning systems when headlamps with plastic lenses, marked 'PL', are installed.

- 6.3. Front fog lamp (Regulation No 19)
- 6.3.1. Presence
- Optional on motor vehicles. Prohibited on trailers.
- 6.3.2. Number
- Two; complying with the requirements of the 03 and subsequent series of amendments to Regulation No 19.
- 6.3.3. Arrangement
- No special requirement.
- 6.3.4. Position
- 6.3.4.1. In width: that point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.
- 6.3.4.2. In height:
- Minimum: Not less than 250 mm above the ground.
- Maximum: For M_1 and N_1 category vehicles: not more than 800 mm above the ground.
- For all other categories except N_3G (off-road) ⁽¹⁾ vehicles: not more than 1 200 mm above the ground.
- For category N_3G vehicles: the maximum height may be increased to 1 500 mm.
- No point on the apparent surface in the direction of the reference axis shall be higher than the highest point on the apparent surface in the direction of the reference axis of the dipped-beam headlamp.
- 6.3.4.3. In length: at the front of the vehicle. This requirement shall be deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly, or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.
- 6.3.5. Geometric visibility
- Defined by angles α and β as specified in paragraph 2.13,
- α = 5° upwards and downwards,
- β = 45° outwards and 10° inwards.
- The presence of partitions or other items of equipment near the front fog lamp shall not give rise to secondary effects causing discomfort to other road users ⁽²⁾.
- 6.3.6. Orientation
- Toward the front.

⁽¹⁾ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.3, para. 2 — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

⁽²⁾ New vehicle types which do not comply with this provision may continue to be approved until 18 months after the entry into force of Supplement 4 to the 03 series of amendments.

6.3.6.1. Vertical orientation

6.3.6.1.1. In the case of class 'B' front fog lamps the vertical inclination of the cut-off to be set in the unladen vehicle state with one person in the driver's seat shall be – 1,5 per cent or lower ⁽¹⁾.

6.3.6.1.2. In the case of class 'F3' front fog lamps:

6.3.6.1.2.1. When the total objective luminous flux of the light source does not exceed 2 000 lumens:

6.3.6.1.2.1.1. The vertical inclination of the cut-off to be set in the unladen vehicle state with one person in the driver's seat shall be — 1,0 per cent or lower

6.3.6.1.2.2. When the total objective luminous flux of the light source exceeds 2 000 lumens:

6.3.6.1.2.2.1. Depending on the mounting height in metres (h) of the lower edge of the apparent surface in the direction of the reference axis of the front fog lamp, measured on the unladen vehicles, the vertical inclination of the cut-off shall under all the static conditions of Annex 5 automatically remain between the following values:

$$h \leq 0,8$$

Limits: between – 1,0 per cent and – 3,0 per cent

Initial aiming: between – 1,5 per cent and – 2,0 per cent

$$h > 0,8$$

Limits: between – 1,5 per cent and – 3,5 per cent

Initial aiming: between – 2,0 per cent and – 2,5 per cent.

6.3.6.1.2.2.2. The initial downward inclination of the cut-off to be set in the unladen vehicle state with one person in the driver's seat shall be specified within an accuracy of one decimal place by the manufacturer and indicated in a clearly legible and indelible manner on each vehicle close to either the front fog lamp or the manufacturer's plate or in combination with the indication referred to in paragraph 6.2.6.1.1 by the symbol shown in Annex 7 to this Regulation. The value of this indicated downward inclination shall be defined in accordance with paragraph 6.3.6.1.2.2.1.

6.3.6.2. Front fog lamp levelling device

6.3.6.2.1. Where a levelling device is fitted for a front fog lamp, independent or grouped with other front lighting and light-signalling functions, it shall be such that the vertical inclination, under all the static loading conditions of Annex 5 to this Regulation, shall remain between the limits prescribed in paragraph 6.3.6.1.2.2.1.

6.3.6.2.2. In the case where the front fog lamp of category 'F3' is part of the dipped-beam headlamp or is part of an AFS system, the requirements of paragraph 6.2.6 shall be applied during the use of the front fog beam as part of the dipped-beam.

In this case the levelling limits defined in paragraph 6.2.6 may be applied also when this front fog lamp is used as such.

⁽¹⁾ New vehicle types which do not comply with this provision may continue to be approved until 18 months after the entry into force of Supplement 4 to the 03 series of amendments.

- 6.3.6.2.3. The levelling device may also be used to automatically adapt the inclination of the front fog beam in relation to the prevailing ambient conditions, provided that the limits for the downward inclination specified in paragraph 6.3.6.1.2.2.1 are not exceeded.
- 6.3.6.2.4. In the case of a failure of the levelling device, the front fog beam shall not assume a position in which the cut off is less inclined than it was at the time when the failure of the device occurred.
- 6.3.7. Electrical connections
- It shall be possible to switch the front fog lamps ON and OFF independently of the main-beam headlamps, the dipped-beam headlamps or any combination of main- and dipped-beam headlamps, unless:
- (a) The front fog lamps are used as part of another lighting function in an AFS; however, the switching ON of the front fog lamps function shall have the priority over the function for which the front fog lamps are used as a part, or
 - (b) The front fog lamps cannot be simultaneously lit with any other lamps with which they are reciprocally incorporated as indicated by the relevant symbol ('/') according to paragraph 10.1 of Annex 1 to Regulation No 19.
- 6.3.8. Tell-tale
- Circuit-closed tell-tale mandatory. An independent non-flashing warning light.
- 6.3.9. Other requirements
- In the case where there is a positive indication in the communication form in item 10.9 of Annex 1 to Regulation No 19 the alignment and the luminous intensities of the class 'F3' front fog beam may be automatically adapted in relation to the prevailing ambient conditions. Any variations of the luminous intensities or alignment shall be performed automatically and in such a way that no discomfort, neither for the driver nor to other road users, is caused.
- 6.4. Reversing lamp (Regulation No 23)
- 6.4.1. Presence
- Mandatory on motor vehicles and on trailers of categories O₂, O₃ and O₄. Optional on trailers of category O₁.
- 6.4.2. Number
- 6.4.2.1. One device mandatory and a second device optional on motor vehicles of category M₁ and on all other vehicles with a length not exceeding 6 000 mm.
- 6.4.2.2. Two devices mandatory and two devices optional on all vehicles with a length exceeding 6 000 mm, except vehicles of category M₁.
- 6.4.3. Arrangement
- No special requirement.
- 6.4.4. Position
- 6.4.4.1. In width: no special requirement.
- 6.4.4.2. In height: not less than 250 mm and not more than 1 200 mm above the ground.

6.4.4.3. In length: at the rear of the vehicle

However, if installed, the two optional devices mentioned in paragraph 6.4.2.2 may be fitted on the side of the vehicle, provided that the requirements of paragraphs 6.4.5.2 and 6.4.6.2 below are fulfilled.

6.4.5. Geometric visibility

6.4.5.1. Devices installed at the rear of the vehicle:

Defined by angles α and β , as specified in paragraph 2.13:

$\alpha = 15^\circ$ upwards and 5° downwards,

$\beta = 45^\circ$ to right and to left if there is only one device,

45° outwards and 30° inwards if there are two.

6.4.5.2. Two optional devices mentioned in paragraph 6.4.2.2 if fitted on the side of the vehicle:

The geometric visibility is considered to be ensured if the reference axis of the respective device is directed outwards with an angle β not exceeding 15° relative to the median longitudinal plane of the vehicle. The vertical aim of the two optional devices may be directed downwards.

6.4.6. Orientation

6.4.6.1. Rearwards

6.4.6.2. In addition, if the two optional devices mentioned in paragraph 6.4.2.2, are fitted on the side of the vehicle, the provisions of paragraph 6.4.5.2 above shall apply.

6.4.7. Electrical connections

6.4.7.1. They shall be such that the lamp can light up only if the reverse gear is engaged and if the device which controls the starting and stopping of the engine is in such a position that operation of the engine is possible. It shall not light up or remain lit if either of the above conditions is not satisfied.

6.4.7.2. Moreover, the electrical connections of the two optional devices mentioned in paragraph 6.4.2.2 shall be such that these devices cannot illuminate unless the lamps referred to in paragraph 5.11 are switched on.

The devices fitted on the side of the vehicle may be switched on for slow manoeuvres in forward motion of the vehicle up to a maximum speed of 10 km/h, provided that the following conditions are fulfilled:

(a) The devices shall be activated and deactivated manually by a separate switch;

(b) If so activated, they may remain illuminated after reverse gear is disengaged;

(c) They shall be automatically switched off if the forward speed of the vehicle exceeds 10 km/h, regardless of the position of the separate switch; in this case they shall remain switched off until deliberately being switched on again.

6.4.8. Tell-tale

Tell-tale optional.

6.4.9. Other requirements

None.

6.5. Direction-indicator lamp (Regulation No 6)

6.5.1. Presence (see figure below)

Mandatory. Types of direction-indicator lamps fall into categories (1, 1a, 1b, 2a, 2b, 5 and 6) the assembly of which on one vehicle constitutes an arrangement ('A' and 'B').

Arrangement 'A' shall apply to all motor vehicles.

Arrangement 'B' shall apply to trailers only.

6.5.2. Number

According to the arrangement.

6.5.3. Arrangements (see figure below)

A: Two front direction-indicator lamps of the following categories:

1 or 1a or 1b,

If the distance between the edge of the apparent surface in the direction of the reference axis of this lamp and that of the apparent surface in the direction of the reference axis of the dipped-beam headlamp and/or the front fog lamp, if there is one, is at least 40 mm;

1a or 1b,

If the distance between the edge of the apparent surface in the direction of the reference axis of this lamp and that of the apparent surface in the direction of the reference axis of the dipped-beam headlamp and/or the front fog lamp, if there is one, is greater than 20 mm and less than 40 mm;

1b,

If the distance between the edge of the apparent surface in the direction of the reference axis of this lamp and that of the apparent surface in the direction of the reference axis of the dipped-beam headlamp and/or the front fog lamp, if there is one, is less than or equal to 20 mm;

Two rear direction-indicator lamps (category 2a or 2b);

Two optional lamps (category 2a or 2b) on all vehicles in categories M₂, M₃, N₂, N₃.

Two side direction-indicator lamps of the categories 5 or 6 (minimum requirements):

5

For all M₁ vehicles;

For N₁, M₂ and M₃ vehicles not exceeding 6 metres in length.

6

For all N₂ and N₃ vehicles;

For N₁, M₂ and M₃ vehicles exceeding 6 metres in length.

It is permitted to replace category 5 side direction-indicator lamps by category 6 side direction-indicator lamps in all instances

Where lamps combining the functions of front direction-indicator lamps (categories 1, 1a, 1b) and side direction-indicator lamps (categories 5 or 6) are fitted, two additional side direction-indicator lamps (categories 5 or 6) may be fitted to meet the visibility requirements of paragraph 6.5.5.

B: two rear direction-indicator lamps (Categories 2a or 2b)

Two optional lamps (category 2a or 2b) on all vehicles in categories O₂, O₃ and O₄.

A maximum of three optional category 5 or one optional category 6 device per side on vehicles of type O₂ exceeding 9 m in length.

Where an AFS is fitted, the distance to be considered for the choice of the category is the distance between the front direction-indicator lamp and the closest lighting unit in its closest position contributing to or performing a passing-beam mode.

6.5.3.1. In addition, for vehicles of categories:

- (a) M₂, M₃, N₂ and N₃ of above 6 m and up to including 9 m in length one additional category 5 device is optional;
- (b) M₂, M₃, N₂ and N₃ exceeding 9 m in length three additional category 5 devices distributed as evenly as practicable along each side are mandatory;
- (c) O₃ and O₄ three category 5 devices distributed as evenly as practicable along each side are mandatory.

These requirements do not apply if there are at least three amber side marker lamps that flash in phase and simultaneously with the direction indicator lamps on the same side of the vehicle.

6.5.4. Position

6.5.4.1. In width: the edge of the apparent surface in the direction of the reference axis farthest from the median longitudinal plane of the vehicle shall not be more than 400 mm from the extreme outer edge of the vehicle. This condition shall not apply to the optional rear lamps.

The distance between the inner edges of the two apparent surfaces in the direction of the reference axes shall not be less than 600 mm.

This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

6.5.4.2. In height: above the ground.

6.5.4.2.1. The height of the light-emitting surface of the side direction-indicator lamps of categories 5 or 6 shall not be:

Less than: 350 mm for M₁ and N₁ category of vehicles, and 500 mm for all other categories of vehicles, both measured from the lowest point; and

More than: 1 500 mm, measured from the highest point.

6.5.4.2.2. The height of the direction-indicator lamps of categories 1, 1a, 1b, 2a and 2b, measured in accordance with paragraph 5.8, shall not be less than 350 mm and not more than 1 500 mm.

6.5.4.2.3. If the structure of the vehicle does not permit these upper limits, measured as specified above, to be respected, and if the optional rear lamps are not installed, they may be increased to 2 300 mm for side direction-indicator lamps of categories 5 and 6, and to 2 100 mm for the direction-indicator lamps of categories 1, 1a, 1b, 2a and 2b.

6.5.4.2.4. If optional rear lamps are installed, they shall be placed at a height compatible with the applicable requirements of paragraph 6.5.4.1, the symmetry of the lamps, and at a vertical distance as large as the shape of the bodywork makes it possible, but not less than 600 mm above the mandatory lamps.

6.5.4.3. In length (see figure below)

The distance between the light-emitting surface of the side direction-indicator lamp (categories 5 and 6) and the transverse plane which marks the forward boundary of the vehicle's overall length, shall not exceed 1 800 mm.

However, this distance shall not exceed 2 500 mm:

(a) For M_1 and N_1 category vehicles;

(b) For all other categories of vehicles if the structure of the vehicle makes it impossible to comply with the minimum angles of visibility.

Optional category 5 side direction indicator lamps, shall be fitted, spaced evenly, along the length of the vehicle.

Optional category 6 side direction indicator lamp shall be fitted in the area between the first and last quartiles of the length of a trailer.

6.5.5. Geometric visibility

6.5.5.1. Horizontal angles: (see figure below)

Vertical angles: 15° above and below the horizontal for direction indicator lamps of categories 1, 1a, 1b, 2a, 2b and 5.

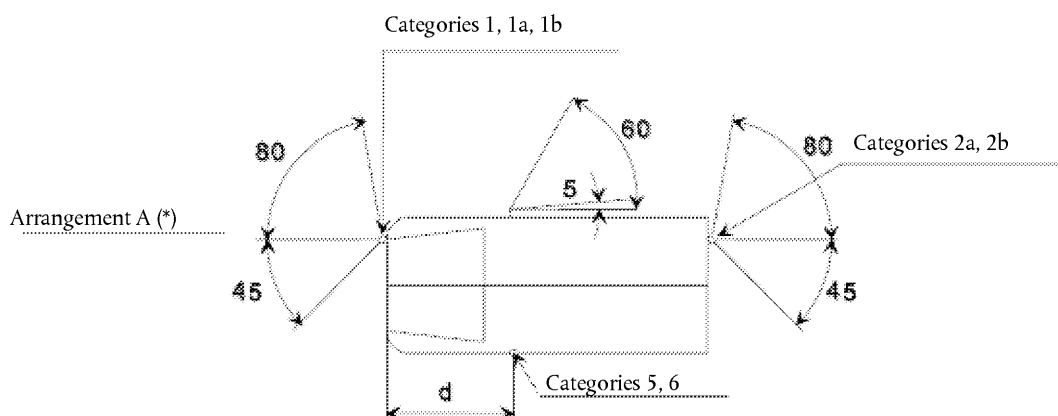
However:

(a) Where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1), the downward angle of 15° may be reduced to 5°;

(b) Where an optional rear lamp is mounted above 2 100 mm (measured according to the provisions of paragraph 5.8.1 above) the upward angle of 15° may be reduced to 5°.

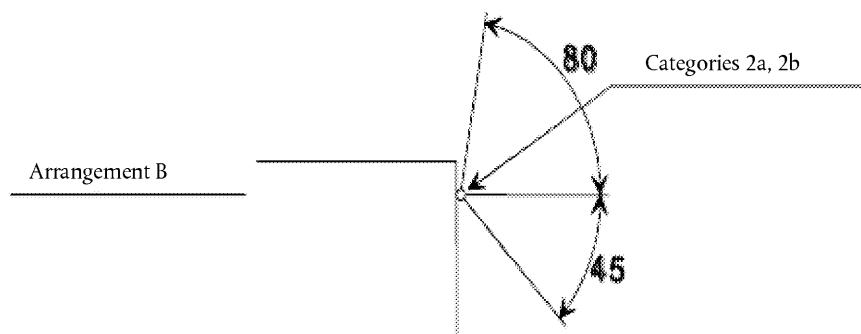
30° above and 5° below the horizontal for direction indicator lamps of category 6.

Figure (see paragraph 6.5)



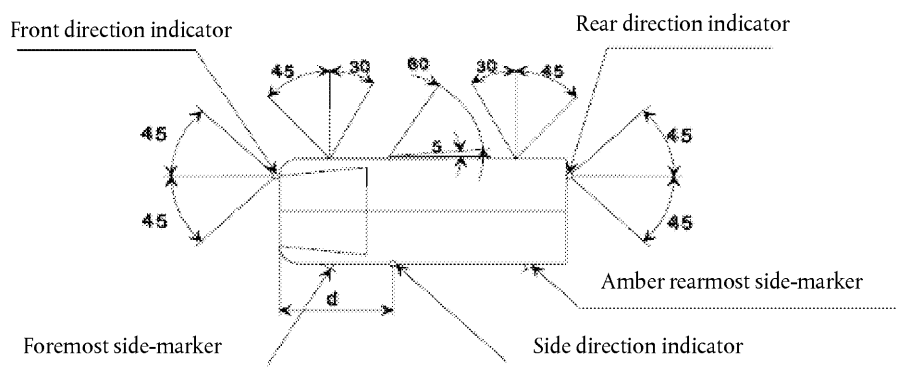
(*) The value of 5° given for dead angle of visibility to the rear of the side direction-indicator is an upper limit $d \leq 1,80$ m (for M_1 and N_1 category vehicles $d \leq 2,50$ m).

For the direction indicator lamps of categories 1, 1a, 1b, 2a and 2b mounted below 750 mm (measured according to the provisions of paragraph 5.8.1), the inward angle of 45° may be reduced to 20° under the H plane.



6.5.5.2. Or, at the discretion of the manufacturer, for M_1 and N_1 category vehicles: Front and rear direction indicator lamps, as well as side-marker lamps (**).

Horizontal angles: (see figure below)



(**) The value of 5° given for the dead angle of visibility to the rear of the side direction-indicator is an upper limit. $d \leq 2,50$ m

However, for the direction indicator lamps of categories 1, 1a, 1b, 2a and 2b mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the inward angle of 45° may be reduced to 20° under the H plane.

Vertical angles: 15° above and below the horizontal. However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1), the downward angle of 15° may be reduced to 5°.

To be considered visible, the lamp shall provide an unobstructed view of the apparent surface of at least 12,5 square centimetres, except for side direction-indicators of categories 5 and 6. The illuminating surface area of any retro-reflector that does not transmit light shall be excluded.

6.5.6. Orientation

According to the specifications for installation by the manufacturer, if any.

6.5.7. Electrical connections

Direction-indicator lamps shall switch on independently of the other lamps. All direction-indicator lamps on one side of a vehicle shall be switched on and off by means of one control and shall flash in phase.

On M₁ and N₁ vehicles less than 6 m in length, with an arrangement complying with paragraph 6.5.5.2 above, the amber side-marker lamps, when mounted, shall also flash at the same frequency (in phase) with the direction-indicator lamps.

6.5.8. Tell-tale

Operating tell-tale mandatory for direction-indicator lamps of categories 1, 1a, 1b, 2a and 2b. It may be visual or auditory or both. If it is visual it shall be a flashing light which, at least in the event of the malfunction of any of these direction-indicator lamps, is either extinguished, or remains alight without flashing, or shows a marked change of frequency. If it is entirely auditory it shall be clearly audible and shall show a marked change of frequency, at least in the event of the malfunction of any of these direction-indicator lamps.

It shall be activated by the signal produced according to paragraph 6.2.2 of Regulation No 6 or another suitable way ⁽¹⁾.

If a motor vehicle is equipped to draw a trailer, it shall be fitted with a special visual operational tell-tale for the direction-indicator lamps on the trailer unless the tell-tale of the drawing vehicle allows the failure of any one of the direction-indicator lamps on the vehicle combination thus formed to be detected.

For the optional direction-indicator lamps on motor vehicles and trailers, operating tell-tale shall not be mandatory.

6.5.9. Other requirements

The light shall be a flashing light flashing 90 ± 30 times per minute.

Operation of the light-signal control shall be followed within not more than one second by the emission of light and within not more than one and one-half seconds by its first extinction. If a motor vehicle is equipped to draw a trailer, the control of the direction-indicator lamps on the drawing vehicle shall also operate the indicator lamps of the trailer. In the event of failure, other than short-circuit, of one direction-indicator lamp, the others shall continue to flash, but the frequency in this condition may be different from that prescribed.

6.6. Hazard warning signal

6.6.1. Presence

Mandatory.

The signal shall be given by simultaneous operation of the direction-indicator lamps in accordance with the requirements of paragraph 6.5 above.

6.6.2. Number

As specified in paragraph 6.5.2.

6.6.3. Arrangement

As specified in paragraph 6.5.3.

6.6.4. Position

6.6.4.1. Width: As specified in paragraph 6.5.4.1.

⁽¹⁾ New vehicle types which do not comply with this provision may continue to be approved until 18 months after the entry into force of Supplement 4 to the 03 series of amendments.

- 6.6.4.2. Height: As specified in paragraph 6.5.4.2.
- 6.6.4.3. Length: As specified in paragraph 6.5.4.3.
- 6.6.5. Geometric visibility
As specified in paragraph 6.5.5.
- 6.6.6. Orientation
As specified in paragraph 6.5.6.
- 6.6.7. Electrical connections
- 6.6.7.1. The signal shall be operated by means of a separate manual control enabling all the direction-indicator lamps to flash in phase.
- 6.6.7.2. The hazard warning signal may be activated automatically in the event of a vehicle being involved in a collision or after the de-activation of the emergency stop signal, as specified in paragraph 6.23. In such cases, it may be turned 'off' manually.
- In addition, the hazard warning signal may be switched on automatically to indicate to other road-users the risk of imminent danger as defined by Regulations; in this case, the signal shall remain switched 'on' until it is manually or automatically switched 'off'.
- 6.6.7.3. On M₁ and N₁ vehicles less than 6 m in length, with an arrangement complying with paragraph 6.5.5.2 above, the amber side-marker lamps, when mounted, shall also flash at the same frequency (in phase) with the direction-indicator lamps.
- 6.6.8. Tell-tale
Flashing circuit-closed tell-tale mandatory.
- 6.6.9. Other requirements
As specified in paragraph 6.5.9, if a power-driven vehicle is equipped to draw a trailer the hazard warning signal control shall also be capable of bringing the direction-indicator lamps on the trailer into action. The hazard warning signal shall be able to function even if the device which starts or stops the engine is in a position which makes it impossible to start the engine.
- 6.7. Stop lamp (Regulation No 7)
- 6.7.1. Presence
Devices of S1 or S2 categories: mandatory on all categories of vehicles.
- Devices of S3 or S4 category: mandatory on M₁ and N₁ categories of vehicles, except for chassis-cabs and those N₁ category vehicles with open cargo space; optional on other categories of vehicles.
- 6.7.2. Number
Two S1 or S2 category devices and one S3 or S4 category device on all categories of vehicles.
- 6.7.2.1. Except in the case where a category S3 or S4 device is installed, two optional category S1 or S2 devices may be installed on vehicles in categories M₂, M₃, N₂, N₃, O₂, O₃, and O₄.

- 6.7.2.2. Only, when the median longitudinal plane of the vehicle is not located on a fixed body panel but separates one or two movable parts of the vehicle (e.g. doors), and lacks sufficient space to install a single device of the S3 or S4 category on the median longitudinal plane above such movable parts, either:

Two devices of the S3 or S4 category type 'D' may be installed; or

One device of the S3 or S4 category may be installed offset to the left or to the right of the median longitudinal plane, or

An interdependent lamp system of category S3 or S4 may be installed.

- 6.7.3. Arrangement

No special requirement.

- 6.7.4. Position

- 6.7.4.1. In width:

For M₁ and N₁ category vehicles:

For S1 or S2 categories devices that point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle;

For the distance in between the inner edges of the apparent surfaces in the direction of the reference axes there is no special requirement.

For all other categories of vehicles:

For S1 or S2 categories devices the distance in between the inner edges of the apparent surfaces in the direction of the reference axes shall be not less than 600 mm. This distance may be reduced to 400 mm if the overall width of the vehicle is less than 1 300 mm.

For S3 or S4 category devices: the centre of reference shall be situated on the median longitudinal plane of the vehicle. However, in the case where the two devices of the S3 or S4 category are installed, according to paragraph 6.7.2, they shall be positioned as close as possible to the median longitudinal plane, one on each side of this plane.

In the case where one S3 or S4 category lamp offset from the median longitudinal plane is permitted according to paragraph 6.7.2, this offset shall not exceed 150 mm from the median longitudinal plane to the centre of reference of the lamp.

- 6.7.4.2. In height:

- 6.7.4.2.1. For S1 or S2 categories devices:

Above the ground, not less than 350 mm nor more than 1 500 mm (2 100 mm if the shape of the bodywork makes it impossible to keep within 1 500 mm and if the optional lamps are not installed).

If the optional lamps are installed, they shall be positioned at a height compatible with the requirements of the width and the symmetry of the lamps, and at a vertical distance as large as the shape of the bodywork makes it possible, but not less than 600 mm above the mandatory lamps.

- 6.7.4.2.2. For S3 or S4 categories devices:

The horizontal plane tangential to the lower edge of the apparent surface shall: either not be more than 150 mm below the horizontal plane tangential to the lower edge of the exposed surface of the glass or glazing of the rear window, or not be less than 850 mm above the ground.

However, the horizontal plane tangential to the lower edge of the apparent surface of a S3 or S4 category device shall be above the horizontal plane tangential to the upper edge of the apparent surface of S1 or S2 categories devices.

6.7.4.3. In length:

6.7.4.4. For S1 or S2 categories devices: at the rear of the vehicle.

6.7.4.5. For S3 or S4 categories devices: no special requirement.

6.7.5. Geometric visibility

Horizontal angle:

For S1 or S2 categories devices: 45° to the left and to the right of the longitudinal axis of the vehicle.

However, for the stop lamps of categories S1 and S2 mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the inward angle of 45° may be reduced to 20° under the H plane.

For S3 or S4 categories devices: 10° to the left and to the right of the longitudinal axis of the vehicle;

Vertical angle:

For S1 or S2 categories devices: 15° above and below the horizontal.

However,

(a) Where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°;

(b) Where an optional lamp is mounted above 2 100 mm (measured according to the provisions of paragraph 5.8.1 above) the upward angle of 15° may be reduced to 5°.

For S3 or S4 categories devices: 10° above and 5° below the horizontal.

6.7.6. Orientation

Towards the rear of the vehicle.

6.7.7. Electrical connections

6.7.7.1. All stop lamps shall light up simultaneously when the braking system provides the relevant signal defined in Regulations Nos 13 and 13-H.

6.7.7.2. The stop lamps need not function if the device, which starts and/or stops the engine, is in a position that makes it impossible for the engine to operate.

6.7.8. Tell-tale

Tell-tale optional; where fitted, this tell-tale shall be an operating tell-tale consisting of a non-flashing warning light which comes on in the event of the malfunctioning of the stop lamps.

6.7.9. Other requirements

6.7.9.1. The S3 or S4 category device may not be reciprocally incorporated with any other lamp.

6.7.9.2. The S3 or S4 category device may be installed outside or inside the vehicle.

6.7.9.2.1. In the case where it is installed inside the vehicle:

The light emitted shall not cause discomfort to the driver through the devices for indirect vision and/or other surfaces of the vehicle (i.e. rear window).

6.8. Rear registration plate lamp (Regulation No 4)

6.8.1. Presence

Mandatory.

6.8.2. Number

Such that the device illuminates the site of the registration plate.

6.8.3. Arrangement

Such that the device illuminates the site of the registration plate.

6.8.4. Position

6.8.4.1. In width: such that the device illuminates the site of the registration plate.

6.8.4.2. In height: such that the device illuminates the site of the registration plate.

6.8.4.3. In length: such that the device illuminates the site of the registration plate.

6.8.5. Geometric visibility

Such that the device illuminates the site of the registration plate.

6.8.6. Orientation

Such that the device illuminates the site of the registration plate.

6.8.7. Electrical connections

In accordance with paragraph 5.11.

6.8.8. Tell-tale

Tell-tale optional. If it exists, its function shall be carried out by the tell-tale required for the front and rear position lamps.

6.8.9. Other requirements

When the rear registration plate lamp is combined with the rear position lamp, reciprocally incorporated in the stop lamp or in the rear fog lamp, the photometric characteristics of the rear registration plate lamp may be modified during the illumination of the stop lamp or the rear fog lamp.

6.9. Front position lamp (Regulation No 7)

6.9.1. Presence

Mandatory on all motor vehicles.

Mandatory on trailers over 1 600 mm wide.

Optional on trailers which are not more than 1 600 mm wide.

6.9.2. Number

Two.

6.9.3. Arrangement

No special requirement.

6.9.4. Position

6.9.4.1. In width: that point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.

In the case of a trailer, that point on the apparent surface in the direction of the reference axis which is farthest from the median longitudinal plane shall not be more than 150 mm from the extreme outer edge of the vehicle.

The distance between the inner edges of the two apparent surfaces in the direction of the reference axes shall:

For M_1 and N_1 category vehicles: No special requirement;

For all other categories of vehicles: Not less than 600 mm. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

6.9.4.2. In height: above the ground, not less than 250 mm nor more than 1 500 mm (2 100 mm for O_1 and O_2 categories of vehicles, or if for any other categories of vehicles the shape of the bodywork makes it impossible to keep within 1 500 mm).

6.9.4.3. In length: no individual specification.

6.9.4.4. Where the front position lamp and another lamp are reciprocally incorporated, the apparent surface in the direction of the reference axis of the other lamp shall be used to verify compliance with the positioning requirements (paragraphs 6.9.4.1 to 6.9.4.3).

6.9.5. Geometric visibility

6.9.5.1. Horizontal angle: 45° inwards and 80° outwards.

However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the inward angle of 45° may be reduced to 20° under the H plane.

In the case of trailers, the angle inwards may be reduced to 5°.

Vertical angle: 15° above and below the horizontal. However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°.

- 6.9.5.2. For M₁ and N₁ category vehicles, as an alternative to paragraph 6.9.5.1 above, at the discretion of the manufacturer or his duly accredited representative, and only if a front side-marker lamp is installed on the vehicle:

Horizontal angle: 45° outwards to 45° inwards.

However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the inward angle of 45° may be reduced to 20° under the H plane.

Vertical angle: 15° above and below the horizontal.

However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°.

To be considered visible, the lamp shall provide an unobstructed view of the apparent surface of at least 12,5 cm². The illuminating surface area of any retro-reflector that does not transmit light shall be excluded.

- 6.9.6. Orientation

Forwards.

- 6.9.7. Electrical connections

In accordance with paragraph 5.11.

However, if a front position lamp is reciprocally incorporated with a direction-indicator the electrical connection of the front position lamp on the relevant side of the vehicle or the reciprocally incorporated part of it may be such that it is switched off during the entire period (both ON and OFF cycle) of activation of the direction-indicator lamp.

- 6.9.8. Tell-tale

Circuit-closed tell-tale mandatory. This tell-tale shall be non-flashing and shall not be required if the instrument panel lighting can only be turned on simultaneously with the front position lamps.

This requirement does not apply when light signalling system operates according to paragraph 6.2.7.6.2.

- 6.9.9. Other requirements

- 6.9.9.1. If one or more infrared radiation generator(s) is (are) installed inside the front position lamp, it (they) is (are) allowed to be activated only when the headlamp on the same side of the vehicle is switched on and the vehicle is in forward motion. In the event that the front position lamp or the headlamp on the same side fails, the infrared radiation generator(s) shall be automatically switched off.

- 6.9.9.2. In case an AFS providing a bending mode is installed, the front position lamp may be swivelled together with a lighting unit to which it is reciprocally incorporated.

- 6.10. Rear position lamp (Regulation No 7)

- 6.10.1. Presence

Devices of R or R1 or R2 categories: Mandatory

6.10.2. Number

Two.

- 6.10.2.1. Except the case where end-outline marker lamps are installed, two optional position lamps may be installed on all vehicles in categories M₂, M₃, N₂, N₃, O₂, O₃, and O₄.

6.10.3. Arrangement

No special requirement.

6.10.4. Position

- 6.10.4.1. In width: that point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle. This condition shall not apply to the optional rear lamps.

The distance between the inner edges of the two apparent surfaces in the direction of the reference axes shall:

For M₁ and N₁ category vehicles: have no special requirement;

For all other categories of vehicles: be not less than 600 mm. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

- 6.10.4.2. In height: above the ground, not less than 350 mm nor more than 1 500 mm (2 100 mm if the shape of the bodywork makes it impossible to keep within 1 500 mm and if the optional lamps are not installed). If the optional lamps are installed, they shall be placed at a height compatible with the applicable requirements of paragraph 6.10.4.1, the symmetry of the lamps, and at a vertical distance as large as the shape of the bodywork makes it possible, but not less than 600 mm above the mandatory lamps.

- 6.10.4.3. In length: The rear of the vehicle.

6.10.5. Geometric visibility

- 6.10.5.1. Horizontal angle: 45° inwards and 80° outwards.

However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1. above), the inward angle of 45° may be reduced to 20° under the H plane.

Vertical angle: 15° above and below the horizontal.

However,

- (a) Where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°;
- (b) Where an optional lamp is mounted above 2 100 mm (measured according to the provisions of paragraph 5.8.1 above) the upward angle of 15° may be reduced to 5°.

- 6.10.5.2. For M₁ and N₁ category vehicles, as an alternative to paragraph 6.10.5.1 above, at the discretion of the manufacturer or his duly accredited representative, and only if a rear side-marker lamp is installed on the vehicle,

Horizontal angle: 45° outwards to 45° inwards. However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the inward angle of 45° may be reduced to 20° under the H plane.

Vertical angle: 15° above and below the horizontal.

However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°.

To be considered visible, the lamp shall provide an unobstructed view of the apparent surface of at least 12,5 square centimetres. The illuminating surface area of any retro-reflector that does not transmit light shall be excluded.

6.10.6. Orientation

Rearwards.

6.10.7. Electrical connections

In accordance with paragraph 5.11.

However, if a rear position lamp is reciprocally incorporated with a direction-indicator, the electrical connection of the rear position lamp on the relevant side of the vehicle or the reciprocally incorporated part of it may be such that it is switched OFF during the entire period (both ON and OFF cycle) of activation of the direction-indicator lamp.

6.10.8. Tell-tale

Circuit-closed tell-tale mandatory. It shall be combined with that of the front position lamps.

This requirement does not apply when light signalling system operates according to paragraph 6.2.7.6.2.

6.10.9. Other requirements

None.

6.11. Rear fog lamp (Regulation No 38)

6.11.1. Presence

Devices of F or F1 or F2 categories: Mandatory.

6.11.2. Number

One or two.

6.11.3. Arrangement

No special requirement.

6.11.4. Position

6.11.4.1. In width: if there is only one rear fog-lamp, it shall be on the opposite side of the median longitudinal plane of the vehicle to the direction of traffic prescribed in the country of registration, the centre of reference may also be situated on the median longitudinal plane of the vehicle.

- 6.11.4.2. In height: not less than 250 mm nor more than 1 000 mm above the ground. For rear fog lamps grouped with any rear lamp or for category N₃G (off-road) vehicles, the maximum height may be increased to 1 200 mm.
- 6.11.4.3. In length: at the rear of the vehicle.
- 6.11.5. Geometric visibility
Defined by angles α and β as specified in paragraph 2.13:
 α = 5° upwards and 5° downwards;
 β = 25° to right and to left.
- 6.11.6. Orientation
Rearwards.
- 6.11.7. Electrical connections
These shall be such that:
- 6.11.7.1. The rear fog-lamp(s) cannot be switched on unless the main beams, dipped-beams or front fog-lamps are lit;
- 6.11.7.2. The rear fog-lamp(s) can be switched off independently of any other lamp;
- 6.11.7.3. Either of the following applies:
- 6.11.7.3.1. The rear fog lamp(s) may continue to operate until the position lamps are switched off, and the rear fog lamp(s) shall then remain off until deliberately switched on again;
- 6.11.7.3.2. A warning, at least audible, additional to the mandatory tell-tale (paragraph 6.11.8) shall be given if the ignition is switched off or the ignition key is withdrawn and the driver's door is opened, whether the lamps in (paragraph 6.11.7.1) are on or off, whilst the rear fog lamp switch is in the 'on' position.
- 6.11.7.4. Except as provided in paragraphs 6.11.7.1, 6.11.7.3 and 6.11.7.5, the operation of the rear fog lamp(s) shall not be affected by switching on or off any other lamps.
- 6.11.7.5. The rear fog lamp(s) of a drawing motor vehicle may be automatically switched off while a trailer is connected and the rear fog lamp(s) of the trailer is (are) activated.
- 6.11.8. Tell-tale
Circuit-closed tell-tale mandatory. An independent non-flashing warning light.
- 6.11.9. Other requirements
In all cases, the distance between the rear fog-lamp and each stop-lamp shall be greater than 100 mm.
- 6.12. Parking lamp (Regulation No 77 or 7)
- 6.12.1. Presence
On motor vehicles not exceeding 6 m in length and not exceeding 2 m in width, optional.
On all other vehicles, prohibited.

- 6.12.2. Number
- According to the arrangement.
- 6.12.3. Arrangement
- Either two lamps at the front and two lamps at the rear, or one lamp on each side.
- 6.12.4. Position
- 6.12.4.1. In width: that point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.
- Furthermore, if there are two lamps, they shall be on the sides of the vehicle.
- 6.12.4.2. In height:
- For M₁ and N₁ category vehicles: no special requirement;
- For all other categories of vehicles: above the ground, not less than 350 mm nor more than 1 500 mm (2 100 mm if the shape of the bodywork makes it impossible to keep within 1 500 mm).
- 6.12.4.3. In length: no special requirement.
- 6.12.5. Geometric visibility
- Horizontal angle: 45° outwards, forwards and rearwards.
- However, where a front or rear parking lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the inward angle of 45° may be reduced to 20° under the H plane.
- Vertical angle: 15° above and below the horizontal.
- However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°.
- 6.12.6. Orientation
- Such that the lamps meet the requirements for visibility forwards and rearwards.
- 6.12.7. Electrical connections
- The connection shall allow the parking lamp(s) on the same side of the vehicle to be lit independently of any other lamps.
- The parking lamp(s) and, if applicable, the front and rear position lamps according to paragraph 6.12.9 below, shall be able to operate even if the device which starts the engine is in a position which makes it impossible for the engine to operate. A device which automatically deactivates these lamps as a function of time is prohibited.
- 6.12.8. Tell-tale
- Circuit-closed tell-tale optional. If there is one, it shall not be possible to confuse it with the tell-tale for the front and rear position lamps.

6.12.9. Other requirements

The functioning of this lamp may also be performed by simultaneously switching on the front and rear position lamps on the same side of the vehicle. In this case, lamps that meet the requirements of front or rear position lamps are deemed to meet the requirements of parking lamps.

6.13. End-outline marker lamp (Regulation No 7)

6.13.1. Presence

Devices of A or AM categories (visible from the front), and devices of R, R₁, R₂, RM₁ or RM₂ Categories (visible from the rear):

Mandatory on vehicles exceeding 2,10 m in width. Optional on vehicles between 1,80 and 2,10 m in width. On chassis-cabs the rear end-outline marker lamps are optional.

6.13.2. Number

Two visible from the front and two visible from the rear.

Additional lamps may be fitted as follows:

- (a) Two visible from the front;
- (b) Two visible from the rear.

6.13.3. Arrangement

No special requirement.

6.13.4. Position

6.13.4.1. In width:

Front and rear: as close as possible to the extreme outer edge of the vehicle. This condition is deemed to have been met when the point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane is not more than 400 mm from the extreme outer edge of the vehicle.

6.13.4.2. In height:

Front: Motor vehicles — the horizontal plane tangential to the upper edge of the apparent surface in the direction of the reference axis of the device shall not be lower than the horizontal plane tangential to the upper edge of the transparent zone of the wind-screen.

Trailers and semi-trailers — at the maximum height compatible with the requirements relating to the width, design and operational requirements of the vehicle and to the symmetry of the lamps.

Rear: At the maximum height compatible with the requirements relating to the width, design and operational requirements of the vehicle and to the symmetry of the lamps.

The additional lamps, as specified in paragraph 6.13.2(b), shall be fitted as far separated in height as practicable in respect to the mandatory ones, provided that their position is compatible with design/operational requirements of the vehicle and symmetry of the lamps.

6.13.4.3. In length, no special requirement.

The additional lamps, as specified in paragraph 6.13.2(a), shall be fitted as close as practicable to the rear; this requirement shall be deemed to be satisfied if the distance between the additional lamps and the rear of the vehicle does not exceed 400 mm.

6.13.5. Geometric visibility

Horizontal angle: 80° outwards.

Vertical angle: 5° above and 20° below the horizontal.

6.13.6. Orientation

Such that the lamps meet the requirements for visibility forwards and rearwards.

6.13.7. Electrical connections

In accordance with paragraph 5.11.

6.13.8. Tell-tale

Tell-tale optional. If it exists, its function shall be carried out by the tell-tale required for the front and rear position lamps.

6.13.9. Other requirements

Provided that all other requirements are met, the mandatory or optional lamps, visible from the front and the mandatory or optional lamps visible from the rear on the same side of the vehicle may be combined into one device.

Two of the lamps visible from the rear may be grouped, combined or reciprocally incorporated in accordance with paragraph 5.7.

The position of an end-outline marker lamp in relation to corresponding position lamp shall be such that the distance between the projections on a transverse vertical plane of the points nearest to one another on the apparent surfaces in the direction of the respective reference axes of the two lamps considered is not less than 200 mm.

The additional lamps, as specified in paragraph 6.13.2(a), used to mark the rear end outline of the vehicle, the trailer or the semi-trailer shall be fitted in such a way to make it visible within the fields of vision of the approved main rear-view devices for indirect vision.

6.14. Rear retro-reflector, non-triangular (Regulation No 3)

6.14.1. Presence

Mandatory on motor vehicles.

Provided that they are grouped together with the other rear light-signalling devices, optional on trailers.

6.14.2. Number

Two, the performances of which shall conform to the requirements concerning Class IA or IB retro-reflectors in Regulation No 3. Additional retro-reflecting devices and materials (including two retro-reflectors not complying with paragraph 6.14.4 below), are permitted provided they do not impair the effectiveness of the mandatory lighting and light-signalling devices.

6.14.3. Arrangement

No special requirement.

6.14.4. Position

6.14.4.1. In width: that point on the illuminating surface which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.

The distance between the inner edges of the two apparent surfaces in the direction of the reference axes shall:

For M₁ and N₁ category vehicles: have no special requirement;

For all other categories of vehicles: be not less than 600 mm. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

6.14.4.2. In height: Above the ground, not less than 250 mm nor more than 900 mm (not more than 1 200 mm if grouped with any rear lamp(s), 1 500 mm if the shape of the bodywork makes it impossible to keep within 900 mm or 1 200 mm respectively).

6.14.4.3. In length: at the rear of the vehicle.

6.14.5. Geometric visibility

Horizontal angle: 30° inwards and outwards.

Vertical angle: 10° above and below horizontal.

However, where a retro-reflector is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 10° may be reduced to 5°

6.14.6. Orientation

Rearwards.

6.14.7. Other requirements

The illuminating surface of the retro-reflector may have parts in common with the apparent surface of any other lamp situated at the rear.

6.15. Rear retro-reflector, triangular (Regulation No 3)

6.15.1. Presence

Mandatory on trailers.

Prohibited on motor vehicles.

6.15.2. Number

Two, the performances of which shall conform to the requirements concerning Class IIIA or Class IIIB retro-reflectors in Regulation No 3. Additional retro-reflecting devices and materials (including two retro-reflectors not complying with paragraph 6.15.4 below), are permitted provided they do not impair the effectiveness of the mandatory lighting and light-signalling devices.

6.15.3. Arrangement

The apex of the triangle shall be directed upwards.

6.15.4. Position

6.15.4.1. In width: that point on the illuminating surface which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.

The inner edges of the retro-reflectors shall not be less than 600 mm apart. This distance may be reduced to 400 mm if the overall width of the vehicle is less than 1 300 mm.

6.15.4.2. In height: Above the ground, not less than 250 mm nor more than 900 mm (not more than 1 200 mm if grouped with any rear lamp(s), 1 500 mm if the shape of the bodywork makes it impossible to keep within 900 mm or 1 200 mm respectively).

6.15.4.3. In length: at the rear of the vehicle.

6.15.5. Geometric visibility

Horizontal angle: 30° inwards and outwards.

Vertical angle: 15° above and below the horizontal. However, where a retro-reflector is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 15° may be reduced to 5°.

6.15.6. Orientation

Rearwards.

6.15.7. Other requirements

The illuminating surface of the retro-reflector may have parts in common with the apparent surface of any other lamp situated at the rear.

6.16. Front retro-reflector, non-triangular (Regulation No 3)

6.16.1. Presence

Mandatory on trailers.

Mandatory on motor vehicles having all forward facing lamps with reflectors concealable.

Optional on other motor vehicles.

6.16.2. Number

Two, the performances of which shall conform to the requirements concerning Class IA or IB retro-reflectors in Regulation No 3. Additional retro-reflecting devices and materials (including two retro-reflectors not complying with paragraph 6.16.4 below), are permitted provided they do not impair the effectiveness of the mandatory lighting and light-signalling devices.

6.16.3. Arrangement

No special requirement.

6.16.4. Position

- 6.16.4.1. In width: that point on the illuminating surface which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.

In the case of a trailer, the point of the illuminating surface which is farthest from the vehicle's median longitudinal plane shall not be farther than 150 mm from the extreme outer edge of the vehicle.

The distance between the inner edges of the two apparent surfaces in the direction of the reference axes shall:

For M₁ and N₁ category vehicles: have no special requirement;

For all other categories of vehicles: be not less than 600 mm. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

- 6.16.4.2. In height: above the ground, not less than 250 mm nor more than 900 mm (1 500 mm if the shape of the bodywork makes it impossible to keep within 900 mm).

- 6.16.4.3. In length: at the front of the vehicle.

6.16.5. Geometric visibility

Horizontal angle: 30° inwards and outwards. In the case of trailers, the angle inwards may be reduced to 10°. If because of the construction of the trailers this angle cannot be met by the mandatory retro-reflectors, then additional (supplementary) retro-reflectors shall be fitted, without the width limitation (paragraph 6.16.4.1 above), which shall, in conjunction with the mandatory retro-reflectors, give the necessary visibility angle.

Vertical angle: 10° above and below the horizontal. However, where a retro-reflector is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 10° may be reduced to 5°.

6.16.6. Orientation

Towards the front.

6.16.7. Other requirements

The illuminating surface of the retro-reflector may have parts in common with the apparent surface of any other lamp situated at the front.

6.17. Side retro-reflector, non-triangular (Regulation No 3)

6.17.1. Presence

Mandatory: On all motor vehicles the length of which exceeds 6 m.

On all trailers.

Optional: On motor vehicles the length of which does not exceed 6 m.

6.17.2. Number

Such that the requirements for longitudinal positioning are complied with. The performances of these devices shall conform to the requirements concerning Class IA or IB retro-reflectors in Regulation No 3. Additional retro-reflecting devices and materials (including two retro-reflectors not complying with paragraph 6.17.4 below), are permitted provided they do not impair the effectiveness of the mandatory lighting and light-signalling devices.

6.17.3. Arrangement

No special requirement.

6.17.4. Position

6.17.4.1. In width: no special requirement.

6.17.4.2. In height: Above the ground, not less than 250 mm nor more than 900 mm (not more than 1 200 mm if grouped with any lamp(s), 1 500 mm if the shape of the bodywork makes it impossible to keep within 900 mm or 1 200 mm respectively or if the presence of the device is not mandatory according to paragraph 6.17.1).

6.17.4.3. In length: at least one side retro-reflector shall be fitted to the middle third of the vehicle, the foremost side retro-reflector being not further than 3 m from the front;

The distance between two adjacent side retro-reflectors shall not exceed 3 m. This does not, however, apply to M₁ and N₁ category vehicles.

If the structure, design or the operational use of the vehicle makes it impossible to comply with such a requirement, this distance may be increased to 4 m. The distance between the rearmost side retro-reflector and the rear of the vehicle shall not exceed 1 m. However, for motor vehicles the length of which does not exceed 6 m, it is sufficient to have one side retro-reflector fitted within the first third and/or one within the last third of the vehicle length.

For M₁ vehicles the length of which exceeds 6 m but does not exceed 7 m it is sufficient to have one side retro-reflector fitted not further than 3 m from the front and one within the last third of the vehicle length.

6.17.5. Geometric visibility

Horizontal angle: 45° to the front and to the rear.

Vertical angle: 10° above and below the horizontal. However, where a retro-reflector is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 10° may be reduced to 5°.

6.17.6. Orientation

Towards the side.

6.17.7. Other requirements

The illuminating surface of the side retro-reflector may have parts in common with the apparent surface of any other side lamp.

6.18. Side-marker lamps (Regulation No 91)

6.18.1. Presence

Mandatory: On all vehicles the length of which exceeds 6 m, except for chassis-cabs.

The SM1 type of side-marker lamp shall be used on all categories of vehicles; however the SM2 type of side-marker lamps may be used on the M₁ category of vehicles.

In addition, on M_1 and N_1 category vehicles less than 6 m in length, side-marker lamps shall be used, if they supplement the reduced geometric visibility requirements of front position lamps conforming to paragraph 6.9.5.2 and rear position lamps conforming to paragraph 6.10.5.2.

Optional: On all other vehicles.

The SM1 or SM2 types of side-marker lamps may be used.

6.18.2. Minimum number per side

Such that the rules for longitudinal positioning are complied with.

6.18.3. Arrangement

No individual specifications.

6.18.4. Position

6.18.4.1. In width: no individual specifications.

6.18.4.2. In height: Above the ground, not less than 250 mm nor more than 1 500 mm (2 100 mm if the shape of the bodywork makes it impossible to keep within 1 500 mm).

6.18.4.3. In length: at least one side-marker lamp shall be fitted to the middle third of the vehicle, the foremost side-marker lamp being not further than 3 m from the front. The distance between two adjacent side-marker lamps shall not exceed 3 m. If the structure, design or the operational use of the vehicle make it impossible to comply with such a requirement, this distance may be increased to 4 m.

The distance between the rearmost side-marker lamp and the rear of the vehicle shall not exceed 1 m.

However, for vehicles the length of which does not exceed 6 m and for chassis-cabs it is sufficient to have one side-marker lamp fitted within the first third and/or within the last third of the vehicle length. For M_1 vehicles the length of which exceeds 6 m but does not exceed 7 m it is sufficient to have one side-marker lamp fitted not further than 3 m from the front and one within the last third of the vehicle length.

6.18.5. Geometric visibility

Horizontal angle: 45° to the front and to the rear; however for vehicles on which the installation of the side-marker lamps is optional this value can be reduced to 30°.

If the vehicle is equipped with side-marker lamps used to supplement the reduced geometric visibility of front and rear direction indicator lamps conforming to paragraph 6.5.5.2 above and/or position lamps conforming to paragraphs 6.9.5.2 and 6.10.5.2 above, the angles are 45° towards the front and rear ends of the vehicle and 30° towards the centre of the vehicle (see the figure in paragraph 6.5.5.2 above).

Vertical angle: 10° above and below the horizontal. However, where a lamp is mounted below 750 mm (measured according to the provisions of paragraph 5.8.1 above), the downward angle of 10° may be reduced to 5°.

6.18.6. Orientation

Towards the side.

6.18.7. Electrical connections

On M₁ and N₁ category vehicles less than 6 m in length amber side-marker lamps may be wired to flash, provided that this flashing is in phase and at the same frequency with the direction-indicator lamps at the same side of the vehicle.

On M₂, M₃, N₂, N₃, O₃ and O₄ vehicles mandatory amber side marker lamps may flash simultaneously with the direction-indicator lamps on the same side of the vehicle. However, where there are direction indicator lamps of category 5 installed according to paragraph 6.5.3.1 on the side of the vehicle these amber side marker lamps shall not flash.

6.18.8. Tell-tale

Tell-tale optional. If it exists its function shall be carried out by the tell-tale required for the front and rear position lamps.

6.18.9. Other requirements

When the rearmost side-marker lamp is combined with the rear position lamp reciprocally incorporated with the rear fog-lamp or stop lamp, the photometric characteristics of the side-marker lamp may be modified during the illumination of the rear fog lamp or stop lamp.

Rear side-marker lamps shall be amber if they flash with the rear direction-indicator lamp.

6.19. Daytime running lamp (Regulation No 87) ⁽¹⁾

6.19.1. Presence

Mandatory on motor vehicles. Prohibited on trailers.

6.19.2. Number

Two.

6.19.3. Arrangement

No special requirement.

6.19.4. Position

6.19.4.1. In width: the distance between the inner edges of the apparent surfaces in the direction of the reference axes shall not be less than 600 mm.

This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

6.19.4.2. In height: above the ground not less than 250 mm nor more than 1 500 mm.

6.19.4.3. In length: at the front of the vehicle. This requirement shall be deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.

⁽¹⁾ The Contracting Parties not applying Regulation No 87 may prohibit the presence of DRL (as specified in paragraph 5.22.) on the basis of national regulations.

- 6.19.5. Geometric visibility
- Horizontal: outwards 20° and inwards 20°.
- Vertical: upwards 10° and downwards 10°.
- 6.19.6. Orientation
- Towards the front.
- 6.19.7. Electrical connections
- 6.19.7.1. The daytime running lamps shall be switched ON automatically when the device which starts and/or stops the engine (propulsion system) is set in a position which makes it possible for the engine (propulsion system) to operate. However, the daytime running lamps may remain OFF while the following conditions exist:
- 6.19.7.1.1. The automatic transmission control is in the park position; or
- 6.19.7.1.2. The parking brake is in the applied position; or
- 6.19.7.1.3. Prior to the vehicle being set in motion for the first time after each manual activation of the propulsion system.
- 6.19.7.2. The daytime running lamps may be switched OFF manually when the vehicle speed does not exceed 10 km/h provided they switch ON automatically when the vehicle speed exceeds 10 km/h or when the vehicle has travelled more than 100 m and they remain ON until deliberately switched off again.
- 6.19.7.3. The daytime running lamp shall switch OFF automatically when the device which starts and/or stops the engine (propulsion system) is set in a position which makes it impossible for the engine (propulsion system) to operate or the front fog lamps or headlamps are switched ON, except when the latter are used to give intermittent luminous warnings at short intervals ⁽¹⁾.
- 6.19.7.4. The lamps referred to in paragraph 5.11 may be switched ON when the daytime running lamps are switched ON, except if daytime running lamps are operating according to paragraph 6.2.7.6.2, where at least the rear position lamps shall be activated.
- 6.19.7.5. If the distance between the front direction-indicator lamp and the daytime running lamp is equal or less than 40 mm, the electrical connections of the daytime running lamp on the relevant side of the vehicle may be such that either:
- (a) It is switched OFF; or
- (b) Its luminous intensity is reduced during the entire period (both ON and OFF cycle) of activation of a front direction-indicator lamp.
- 6.19.7.6. If a direction-indicator lamp is reciprocally incorporated with a daytime running lamp, the electrical connections of the daytime running lamp on the relevant side of the vehicle shall be such that the daytime running lamp is switched OFF during the entire period (both ON and OFF cycle) of activation of the direction-indicator lamp.
- 6.19.8. Tell-tale
- Closed-circuit tell-tale optional.

⁽¹⁾ New vehicle types which do not comply with this provision may continue to be approved until 18 months after the entry into force of Supplement 4 to the 03 series of amendments.

6.19.9. Other prescriptions

No prescription.

6.20. Cornering lamp (Regulation No 119)

6.20.1. Presence

Optional on motor vehicles.

6.20.2. Number

Two.

6.20.3. Arrangement

No special requirement.

6.20.4. Position

6.20.4.1. In width: one cornering lamp shall be located on each side of the vehicle's median longitudinal plane.

6.20.4.2. In length: not further than 1 000 mm from the front.

6.20.4.3. In height: minimum: Not less than 250 mm above the ground;
maximum: Not more than 900 mm above the ground.

However, no point on the apparent surface in the direction of the reference axis shall be higher than the highest point on the apparent surface in the direction of the reference axis of the dipped-beam headlamp.

6.20.5. Geometric visibility

Defined by angles α and β as specified in paragraph 2.13:

α = 10° upwards and downwards,

β = 30° to 60° outwards.

6.20.6. Orientation

Such that the lamps meet the requirements for geometric visibility.

6.20.7. Electrical connections

The cornering lamps shall be so connected that they cannot be activated unless the main-beam headlamps or the dipped-beam headlamps are switched ON at the same time.

6.20.7.1. The cornering lamp on one side of the vehicle may only be switched ON automatically when the direction-indicators on the same side of the vehicle are switched ON and/or when the steering angle is changed from the straight-ahead position towards the same side of the vehicle.

The cornering lamp shall be switched OFF automatically when the direction-indicator is switched OFF and/or the steering angle has returned in the straight-ahead position.

- 6.20.7.2. When the reversing lamp is switched ON, both cornering lamps may be switched on simultaneously, independently from the steering wheel or direction-indicator position. If so activated, both cornering lamps shall be switched OFF either:
- (a) When the reversing lamp is switched OFF; or
 - (b) When the forward speed of the vehicle exceeds 10 km/h.
- 6.20.8. Tell-tale
- None.
- 6.20.9. Other requirements
- The cornering lamps shall not be activated at vehicle speeds above 40 km/h.
- 6.21. Conspicuity markings (Regulation No 104)
- 6.21.1. Presence
- 6.21.1.1. Prohibited: on vehicles of categories M₁ and O₁.
- 6.21.1.2. Mandatory:
- 6.21.1.2.1. To the rear:
- Full contour marking on vehicles exceeding 2 100 mm in width of the following categories:
- (a) N₂ with a maximum mass exceeding 7,5 tonnes and N₃ (with the exception of chassis-cabs, incomplete vehicles and tractors for semi-trailers);
 - (b) O₃ and O₄ (with the exception of incomplete vehicles)
- 6.21.1.2.2. To the side:
- 6.21.1.2.2.1. Partial contour marking on vehicles exceeding 6 000 mm in length (including the drawbar for trailers) of the following categories:
- (a) N₂ with a maximum mass exceeding 7,5 tonnes and N₃ (with the exception of chassis-cabs, incomplete vehicles and tractors for semi-trailers);
 - (b) O₃ and O₄ (with the exception of incomplete vehicles)
- 6.21.1.2.3. A line marking may be installed instead of the mandatory contour marking if the shape, structure, design or operational requirements of the vehicle make it impossible to install the mandatory contour marking.
- 6.21.1.2.4. If the exterior surfaces of the bodywork are partially constituted of flexible material, this line marking shall be installed on (a) rigid part(s) of the vehicle. The remaining portion of conspicuity markings may be fitted on the flexible material. However, if the exterior surfaces of the bodywork are fully constituted of flexible material, requirements of paragraph 6.21 shall be met.
- 6.21.1.2.5. In cases where the manufacturer, after verification by the Technical Service, can prove to the satisfaction of the Type Approval Authority that it is impossible, due to the operational requirements which may require special shape, structure or design of the vehicle, to comply with the requirements contained in paragraphs 6.21.2 to 6.21.7.5 below, then partial fulfilment of some of these requirements is acceptable. This is conditional upon a portion of the requirements being met where possible, and the application of conspicuity markings that partially meet requirements maximised on the vehicle structure. This may include fitting of additional brackets or plates containing material compliant with Regulation No 104 where structure is available to ensure clear and uniform signalling compatible with the objective of conspicuity.

Where partial fulfilment is deemed acceptable, retro-reflective devices like retro-reflectors of class IVA of Regulation No 3 or brackets containing retro-reflecting material compliant with photometric requirements of Class C of Regulation No 104 may substitute part of the required conspicuity markings. In this case, at least one of these retro-reflective devices shall be installed per 1 500 mm.

The necessary information shall be indicated in the communication form.

6.21.1.3. Optional:

6.21.1.3.1. To the rear and to the side:

On all other categories of vehicles, not otherwise specified in paragraphs 6.21.1.1 and 6.21.1.2 above, including the cab of tractor units for semi-trailers and the cab of chassis-cabs.

Partial or full contour marking may be applied instead of mandatory line markings, and full contour marking may be applied instead of mandatory partial contour marking.

6.21.1.3.2. To the front:

Line marking on vehicles of categories O₂, O₃ and O₄.

Partial or full contour marking may not be applied to the front.

6.21.2. Number

According to the presence.

6.21.3. Arrangement

The conspicuity markings shall be as close as practicable to horizontal and vertical, compatible with the shape, structure, design and operational requirements of the vehicle; if this is not possible, the full or partial contour markings, when fitted, shall follow as close as practicable the contour of the outer shape of the vehicle.

Furthermore, the conspicuity markings shall be spaced as evenly as possible over the horizontal dimensions of the vehicle such that the total length and/or width of the vehicle can be identified.

6.21.4. Position

6.21.4.1. Width

6.21.4.1.1. The conspicuity marking shall be as close as practicable to the edge of the vehicle.

6.21.4.1.2. The cumulative horizontal length of the conspicuity marking elements, as mounted on the vehicle, shall equate to at least 70 per cent of the overall width of the vehicle, excluding any horizontal overlap of individual elements.

6.21.4.2. Length

6.21.4.2.1. The conspicuity marking shall be as close as practicable to the ends of the vehicle and reach to within 600 mm of each end of the vehicle.

- 6.21.4.2.1.1. For motor vehicles, each end of the vehicle, or in the case of tractors for semi-trailers each end of the cab;

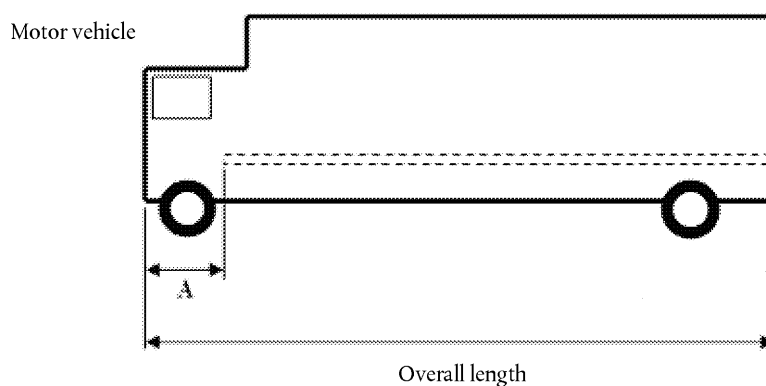
However, an alternative marking mode within 2 400 mm from the front end of the motor vehicle is allowed where a series of retro-reflectors of Class IVA of Regulation No 3 or Class C of Regulation No 104 are mounted followed by the required conspicuity marking as follows:

- (a) Retro-reflector size minimum 25 cm²;
- (b) One retro-reflector mounted not more than 600 mm from the front end of the vehicle;
- (c) Additional retro-reflectors spaced not more than 600 mm apart;
- (d) The distance between the last retro-reflector and the start of the conspicuity marking shall not exceed 600 mm;

- 6.21.4.2.1.2. For trailers, each end of the vehicle (excluding the drawbar).

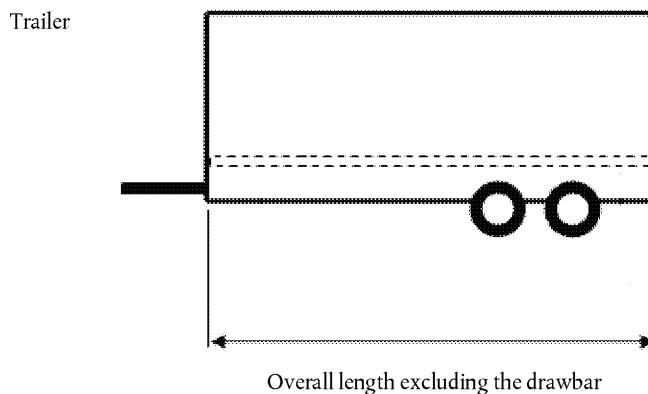
- 6.21.4.2.2. The cumulative horizontal length of the conspicuity marking elements, as mounted on the vehicle, excluding any horizontal overlap of individual elements, shall equate to at least 70 per cent of:

- 6.21.4.2.2.1. For motor vehicles, length of vehicle, or in the case of tractors for semi-trailers, if fitted, the length of the cab; however, when using the alternative marking mode per paragraph 6.21.4.2.1.1, the distance beginning within 2 400 mm from the front end of vehicle to its rear end.



A is the distance between the foremost conspicuity marking and the front end of the vehicle. The maximum value of A is 2 400 mm (see paragraph 6.21.4.2.1.1).

- 6.21.4.2.2.2. For trailers, the overall length of the vehicle (excluding the drawbar).



6.21.4.3. Height

6.21.4.3.1. Line markings and contour markings lower element(s)

As low as practicable within the range:

Minimum: not less than 250 mm above the ground.

Maximum: not more than 1 500 mm above the ground.

However, a maximum mounting height of 2 500 mm may be accepted where the shape, structure, design or operational conditions of the vehicle prevent compliance with the maximum value of 1 500 mm or, if necessary, to fulfil the requirements of paragraphs 6.21.4.1.2, and 6.21.4.2.2, or the horizontal positioning of the line marking or the lower element(s) of the contour marking.

The necessary justification for installation of conspicuity material higher than 1 500 mm shall be indicated in the communication form.

6.21.4.3.2. Contour markings upper element(s):

As high as practicable, but within 400 mm of the upper extremity of the vehicle.

6.21.5. Visibility

The conspicuity marking shall be considered visible, if at least 70 per cent of the illuminating surface of the installed marking is visible when viewed by an observer positioned at any point within the observation planes defined below:

6.21.5.1. For rear and front conspicuity markings (see Annex 11, Figures 1a and 1b) the observation plane is perpendicular to the longitudinal axis of the vehicle situated 25 m from the extreme end of the vehicle and bounded by:

6.21.5.1.1. In height, by two horizontal planes 1 m and 3,0 m respectively above the ground;

6.21.5.1.2. In width, by two vertical planes which form an angle of 4° outwards from the vehicle's median longitudinal plane and which pass through the intersection of the vertical planes parallel to the vehicle's median longitudinal plane delimiting the vehicle's overall width, and the plane perpendicular to the longitudinal axis of the vehicle that delimits the end of the vehicle.

6.21.5.2. For side conspicuity markings (see Annex 11, Fig. 2) the observation plane is parallel to the longitudinal median plane of the vehicles situated 25 m from the extreme outer edge of the vehicle and bounded by:

6.21.5.2.1. In height, by two horizontal planes 1,0 m and 1,5 m respectively above the ground;

6.21.5.2.2. In width, by two vertical planes which form an angle of 4° outwards from a plane perpendicular to the vehicle's longitudinal axis and which pass through the intersection of the vertical planes perpendicular to the vehicle's longitudinal axis delimiting the vehicle's overall length and the extreme outer edge of the vehicle.

6.21.6. Orientation

6.21.6.1. To the side:

As close as practicable to being parallel to the median longitudinal plane of the vehicle, compatible with the shape, structure, design and operation requirements of the vehicle; if this is not possible, it shall follow as close as practicable the contour of the outer shape of the vehicle.

6.21.6.2. To the rear and to the front:

As close as practicable to being parallel to the transverse plane of the vehicle, compatible with the shape, structure, design and operation requirements of the vehicle, if this is not possible, it shall follow as close as practicable the contour of the outer shape of the vehicle.

6.21.7. Other requirements

6.21.7.1. Conspicuity markings shall be considered continuous if the distance between adjacent elements are as small as possible and do not exceed 50 per cent of the shortest adjacent element length. However, if the manufacturer can prove to the satisfaction of the Type Approval Authority that it is impossible to respect the value of 50 per cent, the distance between adjacent elements may be larger than 50 per cent of the shortest adjacent element, and it shall be as small as possible and not exceed 1 000 mm.

6.21.7.2. In the case of a partial contour marking, each upper corner shall be described by two lines at 90°, to each other and each at least 250 mm in length; if this is not possible, the marking shall follow as close as practicable the contour of the outer shape of the vehicle.

6.21.7.3. The distance between the conspicuity marking fitted to the rear of a vehicle and each mandatory stop lamp should be greater than 200 mm.

6.21.7.4. Where rear marking plates conforming to the 01 series of amendments to Regulation No 70 are installed these may be considered, at the discretion of the manufacturer, as part of the conspicuity marking to the rear, for the purposes of calculating the length of the conspicuity marking and its proximity to the side of the vehicle.

6.21.7.5. The locations on the vehicle designated for conspicuity markings shall allow for the installation of markings of at least 60 mm in width.

6.22. Adaptive front lighting system (AFS) (Regulation No 123)

Where not otherwise specified below, the requirements for main-beam headlamps (paragraph 6.1) and for dipped-beam headlamps (paragraph 6.2) of this Regulation apply to the relevant part of the AFS.

6.22.1. Presence

Optional on motor vehicles. Prohibited on trailers.

6.22.2. Number

One.

6.22.3. Arrangement

No special requirements.

6.22.4. Position

The AFS shall, prior to the subsequent test procedures, be set to the neutral state;

6.22.4.1. In width and height:

For a given lighting function or mode the requirements indicated in the paragraphs 6.22.4.1.1 through 6.22.4.1.4 below shall be fulfilled by those lighting units which are energized simultaneously for that lighting function or mode of a function, according to the applicant's description.

All dimensions refer to the nearest edge of the apparent surface(s) observed in the direction of the reference axis, of the lighting unit(s).

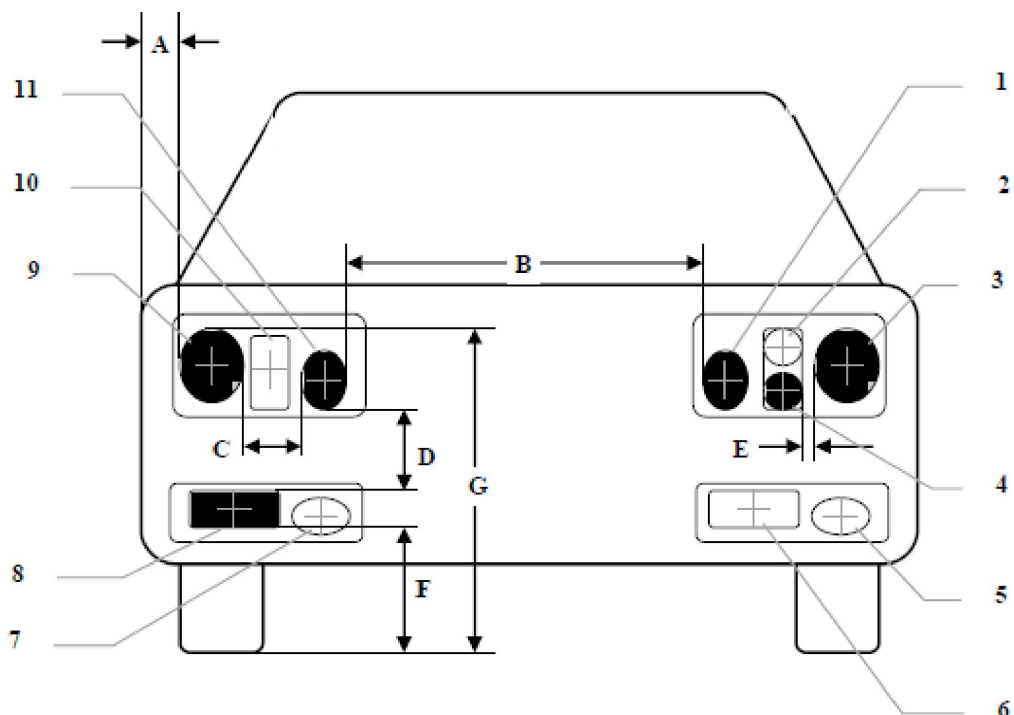
- 6.22.4.1.1. Two symmetrically placed lighting units shall be positioned at a height in compliance with the requirements of the relevant paragraphs 6.1.4 and 6.2.4, where 'Two symmetrically placed lighting units' shall be understood to be two lighting units, one on each side of the vehicle, positioned such that the (geometric) centres of gravity of their apparent surfaces are at the same height and at the same distance from the vehicle's longitudinal median plane within a tolerance of 50 mm, each; their light emitting surfaces, illuminating surfaces, and light outputs, however, may differ.
- 6.22.4.1.2. Additional lighting units, if any, on either side of the vehicle shall be positioned at a distance not exceeding 140 mm ⁽¹⁾ in horizontal direction (E in the figure) and 400 mm in vertical direction above or below (D in the figure) from the nearest lighting unit;
- 6.22.4.1.3. None of the additional lighting units described in paragraph 6.22.4.1.2 above shall be positioned lower than 250 mm (F in the figure) nor higher than indicated in paragraph 6.2.4.2 of this Regulation (G in the figure) above the ground;
- 6.22.4.1.4. Additionally, in width:

For each mode of the passing-beam lighting:

The outer edge of the apparent surface of at least one lighting unit on each side of the vehicle shall not be more than 400 mm from the extreme outer edge of the vehicle (A in the figure); and,

The inner edges of the apparent surfaces in the direction of the reference axes shall be not less than 600 mm apart. This does not apply, however, for M₁ and N₁ category vehicles; for all other categories of motor vehicles this distance may be reduced to 400 mm where the overall width of the vehicle is less than 1 300 mm.

Apparent surfaces of lighting units 1 through 11 of an AFS (example)



⁽¹⁾ In case of additional 'two symmetrically placed lighting units' the horizontal distance may be 200 mm (C in the figure).

Lighting units being simultaneously energized for a given lighting mode: 

No 3 and 9: (two symmetrically placed lighting units)

No 1 and 11: (two symmetrically placed lighting units)

No 4 and 8: (two additional lighting units)

Lighting units not being energized for said lighting mode: 

No 2 and 10: (two symmetrically placed lighting units)

No 5: (additional lighting unit)

No 6 and 7: (two symmetrically placed lighting units)

Horizontal dimensions in mm:

$A \leq 400$

$B \geq 600$, or, ≥ 400 if vehicle overall width $< 1\,300$ mm, however no requirement for category M_1 and N_1 vehicles

$C \leq 200$

$E \leq 140$

Vertical dimensions in mm:

$D \leq 400$

$F \geq 250$

$G \leq 1\,200$

6.22.4.2. In length:

All lighting units of an AFS shall be mounted at the front. This requirement is deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.

6.22.5. Geometric visibility

On each side of the vehicle, for each lighting function and mode provided:

The angles of geometric visibility prescribed for the respective lighting functions according to paragraphs 6.1.5 and 6.2.5 of this Regulation, shall be met by at least one of the lighting units that are simultaneously energized to perform said function and mode(s), according to the description of the applicant. Individual lighting units may be used to comply with the requirements for different angles.

6.22.6. Orientation

Towards the front.

The AFS shall, prior to the subsequent test procedures, be set to the neutral state, emitting the basic passing-beam.

6.22.6.1. Vertical orientation:

6.22.6.1.1. The initial downward inclination of the cut-off of the basic passing-beam to be set in the unladen vehicle state with one person in the driver's seat shall be specified with a precision of 0,1 per cent by the manufacturer and indicated in clearly legible and indelible manner on each vehicle, close to either the front lighting system or the manufacturer's plate, by the symbol shown in Annex 7.

Where differing initial downward inclinations are specified by the manufacturer for different lighting units that provide or contribute to the cut-off of the basic passing-beam, these values of downward inclination shall be specified with a precision of 0,1 per cent by the manufacturer and indicated in clearly legible and indelible manner on each vehicle, close to either the relevant lighting units or on the manufacturers plate, in such a way that all the lighting units concerned can be unambiguously identified.

6.22.6.1.2. The downward inclination of the horizontal part of the 'cut-off' of the basic passing-beam shall remain between the limits indicated in paragraph 6.2.6.1.2 of this Regulation under all the static loading conditions of the vehicle of Annex 5 to this Regulation; and the initial aiming shall be within the specified values.

6.22.6.1.2.1. In case the passing-beam is generated by several beams from different lighting units, the provisions according to paragraph 6.22.6.1.2 above apply to each said beam's 'cut-off' (if any), which is designed to project into the angular zone, as indicated under item 9.4 of the communication form conforming to the model in Annex 1 to Regulation No 123.

6.22.6.2. Headlamp-levelling device

6.22.6.2.1. In the case where a headlamp-levelling device is necessary to satisfy the requirements of paragraph 6.22.6.1.2, the device shall be automatic.

6.22.6.2.2. In the event of a failure of this device, the passing-beam shall not assume a position in which the dip is less than it was at the time when the failure of the device occurred.

6.22.6.3. Horizontal orientation:

For each lighting unit the kink of the elbow of the cut-off line, if any, when projected on the screen, shall coincide with the vertical line through the reference axis of said lighting unit. A tolerance of 0,5 degree to that side which is the side of the traffic direction shall be allowed. Other lighting units shall be adjusted according to the applicant's specification, as defined according to Annex 10 to Regulation No 123.

6.22.6.4. Measuring procedure:

After adjustment of the initial setting of beam orientation, the vertical inclination of the passing-beam or, when applicable, the vertical inclinations of all the different lighting units that provide or contribute to the cut-off(s) according to paragraph 6.22.6.1.2.1 above of the basic passing-beam, shall be verified for all loading conditions of the vehicle in accordance with the specifications in paragraphs 6.2.6.3.1 and 6.2.6.3.2 of this Regulation.

6.22.7. Electrical connections

6.22.7.1. Main-beam lighting (if provided by the AFS)

6.22.7.1.1. The lighting units for the main-beam may be activated either simultaneously or in pairs. For changing over from the dipped-beam to the main-beam at least one pair of lighting units for the main-beam shall be activated. For changing over from the main-beam to the dipped-beam all lighting units for the main-beam shall be de-activated simultaneously.

6.22.7.1.2. The main-beam may be designed to be adaptive, subject to the provisions in paragraph 6.22.9.3, the control signals being produced by a sensor system which is capable of detecting and reacting to each of the following inputs:

(a) Ambient lighting conditions;

(b) The light emitted by the front lighting devices and front light-signalling devices of oncoming vehicles;

(c) The light emitted by the rear light-signalling of preceding vehicles;

Additional sensor functions to improve performance are allowed.

For the purpose of this paragraph, 'vehicles' means vehicles of categories L, M, N, O, T, as well as bicycles, such vehicles being equipped with retro-reflectors, with lighting and light-signalling devices, which are switched ON.

- 6.22.7.1.3. It shall always be possible to switch the main-beam headlamps, adaptive or non-adaptive, ON and OFF manually and to manually switch OFF the automatic control.

Moreover, the switching OFF, of the main-beam headlamps and of their automatic control, shall be by means of a simple and immediate manual operation; the use of sub-menus is not allowed.

- 6.22.7.1.4. The dipped-beams may remain switched ON at the same time as the main beams.

- 6.22.7.1.5. Where four concealable lighting units are fitted their raised position shall prevent the simultaneous operation of any additional headlamps fitted, if these are intended to provide light signals consisting of intermittent illumination at short intervals (see paragraph 5.12) in day-light.

- 6.22.7.2. Passing-beam lighting:

- (a) The control for changing over to the dipped-beam shall switch off all main-beam headlamps or deactivate all AFS lighting units for the main-beam simultaneously;
- (b) The dipped-beam may remain switched on at the same time as the main-beams;
- (c) In the case of lighting units for the dipped-beam being equipped with gas discharge light sources, the gas-discharge light sources shall remain switched on during the main-beam operation.

- 6.22.7.3. Switching ON and OFF the passing-beam may be automatic, however subject to the requirements for 'Electrical connection' in paragraph 5.12 of this Regulation.

- 6.22.7.4. Automatic operation of the AFS

The changes within and between the provided classes and their modes of the AFS lighting functions as specified below, shall be performed automatically without causing discomfort, distraction or glare, neither for the driver nor for other road users.

The following conditions apply for the activation of the classes and their modes of the passing-beam and, where applicable, of the main-beam and/or the adaptation of the main-beam.

- 6.22.7.4.1. The class C mode(s) of the passing-beam shall be activated if no mode of another passing-beam class is activated.

- 6.22.7.4.2. The class V mode(s) of the passing-beam shall not operate unless one or more of the following conditions is/are automatically detected (V-signal applies):

- (a) Roads in built-up areas and the vehicle's speed not exceeding 60 km/h;
- (b) Roads equipped with a fixed road illumination, and the vehicle's speed not exceeding 60 km/h;
- (c) A road surface luminance of 1 cd/m² and/or a horizontal road illumination of 10 lx being exceeded continuously;
- (d) The vehicle's speed not exceeding 50 km/h.

6.22.7.4.3. The class E mode(s) of the passing-beam shall not operate unless the vehicle's speed exceeds 60 km/h and one or more of the following conditions is/are automatically detected:

- (a) The road characteristics correspond to motorway conditions ⁽¹⁾ or the vehicle's speed exceeds 110 km/h (E-signal applies);
- (b) In case of a class E mode of the passing-beam which, according to the system's approval documents/communication sheet, complies with a 'data set' of Regulation No 123, Annex 3, Table 6, only.

Data set E1: the vehicle's speed exceeds 100 km/h (E1-signal applies);

Data set E2: the vehicle's speed exceeds 90 km/h (E2-signal applies);

Data set E3: the vehicle's speed exceeds 80 km/h (E3-signal applies).

6.22.7.4.4. The class W-mode(s) of the passing-beam shall not operate unless the front fog lamps, if any, are switched OFF and one or more of the following conditions is/are automatically detected (W-signal applies):

- (a) The wetness of the road has been detected automatically;
- (b) The windshield wiper is switched ON and its continuous or automatically controlled operation has occurred for a period of at least 2 minutes.

6.22.7.4.5. A mode of a class C, V, E, or W passing-beam shall not be modified to become a bending mode of said class (T-signal applies in combination with the signal of said passing-beam class according to paragraphs 6.22.7.4.1 through 6.22.7.4.4 above) unless at least one of the following characteristics (or equivalent indications) are evaluated:

- (a) The angle of lock of the steering;
- (b) The trajectory of the centre of gravity of the vehicle.

In addition the following provisions apply:

- (i) A horizontal movement of the asymmetric cut-off side-wards from the longitudinal axis of the vehicle, if any, is allowed only when the vehicle is in forward motion ⁽²⁾ and shall be such that the longitudinal vertical plane through the kink of the elbow of the cut-off does not intersect the line of the trajectory of the centre of gravity of the vehicle at distances from the front of the vehicle which are larger than 100 times the mounting height of the respective lighting unit;
- (ii) One or more lighting units may be additionally energized only when the horizontal radius of curvature of the trajectory of the centre of gravity of the vehicle is 500 m or less.

6.22.7.5. It shall always be possible for the driver to set the AFS to the neutral state and to return it to its automatic operation.

6.22.8. Tell-tale:

6.22.8.1. The provisions of paragraphs 6.1.8 (for the main-beam headlamp) and 6.2.8 (for the dipped-beam headlamp) of this Regulation apply to the respective parts of an AFS.

6.22.8.2. A visual failure tell-tale for AFS is mandatory. It shall be non-flashing. It shall be activated whenever a failure is detected with respect to the AFS control signals or when a failure signal is received in accordance with paragraph 5.9 of Regulation No 123. It shall remain activated while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the device which starts and stops the engine is switched on and off.

⁽¹⁾ Traffic directions being separated by means of road construction, or, a corresponding lateral distance of opposing traffic is identified. This implies a reduction of undue glare from vehicles headlamps in opposing traffic.

⁽²⁾ This provision does not apply for passing-beam lighting when bend lighting is produced for a right turn in right hand traffic (left turn in left-hand traffic).

- 6.22.8.3. If the main-beam is adaptive, a visual tell-tale shall be provided to indicate to the driver that the adaptation of the main beam is activated. This information shall remain displayed as long as the adaptation is activated.
- 6.22.8.4. A tell-tale to indicate that the driver has set the system into a state according to paragraph 5.8 of Regulation No 123 is optional.
- 6.22.9. Other requirements
- 6.22.9.1. An AFS shall be permitted only in conjunction with the installation of headlamp cleaning device(s) according to Regulation No 45 ⁽¹⁾ for at least those lighting units, which are indicated under item 9.3 of the communication form conforming to the model in Annex 1 to Regulation No 123, if the total objective luminous flux of the light sources of these units exceeds 2,000 lm per side, and which contribute to the class C (basic) passing-beam.
- 6.22.9.2. Verification of compliance with AFS automatic operating requirements
- 6.22.9.2.1. The applicant shall demonstrate with a *concise description* or other means acceptable to the Type Approval Authority:
- (a) The correspondence of the *AFS control signals*
 - (i) To the description required in paragraph 3.2.6 of this Regulation; and
 - (ii) To the respective AFS control signals specified in the AFS type approval documents; and
 - (b) Compliance with the *automatic operating* requirements according to paragraphs 6.22.7.4.1 through 6.22.7.4.5 above.
- 6.22.9.2.2. To verify, whether, according to the paragraph 6.22.7.4, the AFS automatic operation of the passing-beam functions does not cause any discomfort, the technical service shall perform a test drive which comprises any situation relevant to the system control on the basis of the applicants description; it shall be notified whether all modes are activated, performing and de-activated according to the applicant's description; obvious malfunctioning, if any, shall be contested (e.g. excessive angular movement or flicker).
- 6.22.9.2.3. The overall performance of the automatic control shall be demonstrated by the applicant by documentation or by other means accepted by the Type Approval Authority. Furthermore the manufacturer shall provide a documentation package which gives access to the design of 'the safety concept' of the system. This 'safety concept' is a description of the measures designed into the system, for example within the electronic units, so as to address system integrity and thereby ensure safe operation even in the event of mechanical or electrical failure which could cause any discomfort, distraction or glare, either to the driver or to oncoming and preceding vehicles. This description shall also give a simple explanation of all the control functions of the 'system' and the methods employed to achieve the objectives, including a statement of the mechanism(s) by which control is exercised.

A list of all input and sensed variables shall be provided and the working range of these shall be defined. The possibility of a fall-back to the basic passing-beam (class C) function shall be a part of the safety concept.

The functions of the system and the safety concept, as laid down by the manufacturer, shall be explained. The documentation shall be brief, yet provide evidence that the design and development has had the benefit of expertise from all the system fields which are involved.

For periodic technical inspections, the documentation shall describe how the current operational status of the 'system' can be checked.

⁽¹⁾ Contracting Parties to the respective Regulations can still prohibit the use of mechanical cleaning systems when headlamps with plastic lenses, marked 'PL', are installed.

For Type Approval purposes this documentation shall be taken as the basic reference for the verification process.

- 6.22.9.2.4. To verify, that the adaptation of the main-beam does not cause any discomfort, distraction or glare, neither to the driver nor to oncoming and preceding vehicles, the technical service shall perform a test drive according to paragraph 2 in Annex 12. This shall include any situation relevant to the system control on the basis of the applicant's description. The performance of the adaptation of the main-beam shall be documented and checked against the applicant's description. Any obvious malfunctioning shall be contested (e.g. excessive angular movement or flicker).

6.22.9.3. Adaptation of the main-beam

- 6.22.9.3.1. The sensor system used to control the adaptation of the main-beam, as described in paragraph 6.22.7.1.2, shall comply with the following requirements:

- 6.22.9.3.1.1. The boundaries of the minimum fields in which the sensor is able to detect light emitted from other vehicles as defined in paragraph 6.22.7.1.2 above are given by the angles indicated in paragraph 6.1.9.3.1.1 of this Regulation.

- 6.22.9.3.1.2. The sensor system sensitivity shall comply with the requirements in paragraph 6.1.9.3.1.2 of this Regulation.

- 6.22.9.3.1.3. The adaptive main-beam shall be switched off when the illuminance produced by ambient lighting conditions exceeds 7 000 lx.

Compliance with this requirement shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority. If necessary the illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the Type Approval Authority.

- 6.22.9.4. The aggregate maximum intensity of the lighting units that can be energized simultaneously to provide the main-beam lighting or its modes, if any, shall not exceed 430 000 cd, which corresponds to a reference value of 100.

This maximum intensity shall be obtained by adding together the individual reference marks indicated on the several installation units that are simultaneously used to provide the main-beam.

- 6.22.9.5. The means according to the provisions of paragraph 5.8 of Regulation No 123, which allow the vehicle to be used temporarily in a territory with the opposite direction of driving than that for which approval is sought, shall be explained in detail in the owner's manual.

6.23. Emergency stop signal

6.23.1. Presence

Optional

The emergency stop signal shall be given by the simultaneous operation of all the stop or direction-indicator lamps fitted as described in paragraph 6.23.7.

6.23.2. Number

As specified in paragraph 6.5.2 or 6.7.2.

- 6.23.3. Arrangement
As specified in paragraph 6.5.3 or 6.7.3.
- 6.23.4. Position
As specified in paragraph 6.5.4 or 6.7.4.
- 6.23.5. Geometric visibility
As specified in paragraph 6.5.5 or 6.7.5.
- 6.23.6. Orientation
As specified in paragraph 6.5.6 or 6.7.6.
- 6.23.7. Electrical connections
- 6.23.7.1. All the lamps of the emergency stop signal shall flash in phase at a frequency of $4,0 \pm 1,0$ Hz.
- 6.23.7.1.1. However, if any of the lamps of the emergency stop signal to the rear of the vehicle use filament light sources the frequency shall be $4,0 + 0,0/- 1,0$ Hz.
- 6.23.7.2. The emergency stop signal shall operate independently of other lamps.
- 6.23.7.3. The emergency stop signal shall be activated and deactivated automatically.
- 6.23.7.3.1. The emergency stop signal shall be activated only when the vehicle speed is above 50 km/h and the braking system is providing the emergency braking logic signal defined in Regulations Nos 13 and 13-H.
- 6.23.7.3.2. The emergency stop signal shall be automatically deactivated if the emergency braking logic signal as defined in Regulations Nos 13 and 13-H is no longer provided or if the hazard warning signal is activated.
- 6.23.8. Tell-tale
Optional
- 6.23.9. Other requirements
- 6.23.9.1. Except as provided in paragraph 6.23.9.2 below, if a motor vehicle is equipped to tow a trailer, the control of the emergency stop signal on the motor vehicle shall also be capable of operating the emergency stop signal on the trailer.
- When the motor vehicle is electrically connected to a trailer, the operating frequency of the emergency stop signal for the combination shall be limited to the frequency specified in paragraph 6.23.7.1.1. However, if the motor vehicle can detect that filament light sources are not being used on the trailer for the emergency stop signal, the frequency may be that specified in paragraph 6.23.7.1.
- 6.23.9.2. If a motor vehicle is equipped to tow a trailer fitted with a service braking system of either continuous or semi-continuous type, as defined in Regulation No 13, it shall be ensured that a constant power supply is provided via the electrical connector for the stop lamps to such trailers while the service brake is applied.
- The emergency stop signal on any such trailer may operate independently of the towing vehicle and is not required to operate either at the same frequency as, or in phase with that on the towing vehicle.

- 6.24. Exterior courtesy lamp
- 6.24.1. Presence
- Optional on motor vehicles
- 6.24.2. Number
- Two, however further exterior courtesy lamps to illuminate steps and/or door handles are permitted. Each door handle or step shall be illuminated by not more than one lamp.
- 6.24.3. Arrangement
- No special requirement, however the requirements of paragraph 6.24.9.3 apply.
- 6.24.4. Position
- No special requirement.
- 6.24.5. Geometric visibility
- No special requirement.
- 6.24.6. Orientation
- No special requirement.
- 6.24.7. Electrical connections
- No special requirement.
- 6.24.8. Tell-tale
- No special requirement.
- 6.24.9. Other requirements
- 6.24.9.1. The exterior courtesy lamp shall not be activated unless the vehicle is stationary and one or more of the following conditions is satisfied:
- (a) The engine is stopped; or
 - (b) A driver or passenger door is opened; or
 - (c) A load compartment door is opened.
- The provisions of paragraph 5.10 shall be met in all fixed positions of use.
- 6.24.9.2. Approved lamps emitting white light with the exception of main beam head lamps, daytime running lamps and reversing lamps may be activated as courtesy lamp function. They may also be activated together with the exterior courtesy lamps and the condition of paragraphs 5.11 and 5.12 above may not apply.

- 6.24.9.3. The technical service shall, to the satisfaction of the Type Approval Authority, perform a visual test to verify that there is no direct visibility of the apparent surface of the exterior courtesy lamps, if viewed by an observer moving on the boundary of a zone on a transverse plane 10 m from the front of the vehicle, a transverse plane 10 m from the rear of the vehicle, and two longitudinal planes 10 m from each side of the vehicle; these four planes to extend from 1 m to 3 m above and perpendicular to the ground as shown in Annex 14.

At the request of the applicant and with the consent of the Technical Service this requirement may be verified by a drawing or simulation.

- 6.25. Rear-end collision alert signal

- 6.25.1. Presence

Optional

The rear-end collision alert signal shall be given by the simultaneous operation of all the direction indicator lamps fitted as described in paragraph 6.25.7.

- 6.25.2. Number

As specified in paragraph 6.5.2.

- 6.25.3. Arrangement

As specified in paragraph 6.5.3.

- 6.25.4. Position

As specified in paragraph 6.5.4.

- 6.25.5. Geometric visibility

As specified in paragraph 6.5.5.

- 6.25.6. Orientation

As specified in paragraph 6.5.6.

- 6.25.7. Electrical connections. Compliance with these requirements shall be demonstrated by the applicant, by simulation or other means of verification accepted by the Technical Service responsible for type approval.

- 6.25.7.1. All the lamps of the rear-end collision alert signal shall flash in phase at a frequency of $4,0 \pm 1,0$ Hz.

- 6.25.7.1.1. However, if any of the lamps of the rear end collision alert signal to the rear of the vehicle use filament light sources the frequency shall be $4,0 \pm 0,0$ Hz.

- 6.25.7.2. The rear-end collision alert signal shall operate independently of other lamps.

- 6.25.7.3. The rear-end collision alert signal shall be activated and deactivated automatically.

- 6.25.7.4. The rear-end collision alert signal shall not be activated if the direction indicator lamps, the hazard warning signal or the emergency stop signal is activated.

6.25.7.5. The rear-end collision alert signal may only be activated under the following conditions:

Vr	activation
$V_r > 30 \text{ km/h}$	$TTC \leq 1,4$
$V_r \leq 30 \text{ km/h}$	$TTC \leq 1,4/30 \times V_r$

‘Vr (Relative Speed)’: means the difference in speed between a vehicle with rear-end collision alert signal and a following vehicle in the same lane.

‘TTC (Time to collision)’: means the estimated time for a vehicle with rear-end collision alert signal and a following vehicle to collide assuming the relative speed at the time of estimation remains constant.

6.25.7.6. The activation period of the rear-end collision alert signal shall be not more than 3 seconds.

6.25.8. Tell-tale

Optional

6.26. Manoeuvring lamps (Regulation No 23)

6.26.1. Presence

Optional on motor vehicles.

6.26.2. Number

One or two (one per side)

6.26.3. Arrangement

No special requirement, however the requirements of paragraph 6.26.9 apply.

6.26.4. Position

No special requirement.

6.26.5. Geometric Visibility

No special requirement.

6.26.6. Orientation

Downwards, however the requirements of paragraph 6.26.9 apply.

6.26.7. Electrical Connections

Manoeuvring lamps shall be so connected that they cannot be activated unless the main-beam headlamps or the dipped-beam headlamps are switched ON at the same time.

The manoeuvring lamp(s) shall be activated automatically for slow manoeuvres up to 10 km/h provided that one of the following conditions is fulfilled:

- (a) Prior to the vehicle being set in motion for the first time after each manual activation of the propulsion system; or
- (b) Reverse gear is engaged; or
- (c) A camera based system which assists parking manoeuvres is activated

The manoeuvring lamps shall be automatically switched off if the forward speed of the vehicle exceeds 10 km/h and they shall remain switched off until the conditions for activation are met again.

6.26.8. Tell-tale

No special requirement.

6.26.9. Other requirements

6.26.9.1. The Technical Service shall, to the satisfaction of the Type Approval Authority, perform a visual test to verify that there is no direct visibility of the apparent surface of these lamps, if viewed by an observer moving on the boundary of a zone on a transverse plane 10 m from the front of the vehicle, a transverse plane 10 m from the rear of the vehicle, and two longitudinal planes 10 m from each side of the vehicle; these four planes to extend from 1 m to 3 m above and parallel to the ground as shown in Annex 14.

6.26.9.2. At the request of the applicant and with the consent of the Technical Service the requirement of 6.26.9.1 may be verified by a drawing or simulation or deemed be satisfied if the installation conditions comply with paragraph 6.2.3 of Regulation No 23, as noticed in the communication document in Annex 1, paragraph 9.

7. MODIFICATIONS AND EXTENSIONS OF APPROVAL OF THE VEHICLE TYPE OR OF THE INSTALLATION OF ITS LIGHTING AND LIGHT-SIGNALLING DEVICES

7.1. Every modification of the vehicle type, or of the installation of its lighting or light-signalling devices, or of the list referred to in paragraph 3.2.2 above, shall be notified to the Type Approval Authority which approved that vehicle type. The Authority may then either:

7.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still meets the requirements; or

7.1.2. Require a further test report from the Technical Services responsible for conducting the tests.

7.2. Confirmation of extension or refusal of approval, specifying the alteration, shall be communicated by the procedure specified in paragraph 4.3 above to the Parties to the Agreement applying this Regulation.

7.3. The Type Approval Authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

8. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2), with the following requirements:

8.1. Any vehicle approved pursuant to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraphs 5 and 6 above.

- 8.2. The holder of the approval shall in particular:
 - 8.2.1. Ensure existence of procedures for effective quality control of the vehicle as regards all aspects relevant to compliance with the requirements set out in paragraphs 5 and 6 above;
 - 8.2.2. Ensure that for each type of vehicle at least the tests prescribed in Annex 9 to this Regulation or physical checks from which equivalent data may be derived are carried out;
- 8.3. The Type Approval Authority may carry out any test prescribed in this Regulation. These tests will be on samples selected at random without causing distortion of the manufacturers delivery commitments.
- 8.4. The Type Approval Authority shall strive to obtain a frequency of inspection of once per year. However, this is at the discretion of the Type Approval Authority and their confidence in the arrangements for ensuring effective control of the conformity of production. In the case where negative results are recorded, the Type Approval Authority shall ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 9.1. The approval granted in respect of a type of vehicle pursuant to this Regulation may be withdrawn if the requirements are not complied with or if a vehicle bearing the approval mark does not conform to the type approved.
- 9.2. If a Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

10. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of vehicle approved in accordance with this Regulation, he shall inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Parties to the Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

11. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF TYPE APPROVAL AUTHORITIES

The Contracting 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 Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.

12. TRANSITIONAL PROVISIONS

12.1 General

- 12.1.1. As from the official date of entry into force of the most recent series of amendments, no Contracting Party applying this Regulation shall refuse to grant approval under this Regulation as amended by this most recent series of amendments.
- 12.1.2. As from the official date of entry into force of the most recent series of amendments, no Contracting Party applying this Regulation shall refuse national or regional type approval to a vehicle type approved under this Regulation as amended by this most recent series of amendments.

- 12.1.3. During the time period from the official date of entry into force of the most recent series of amendments and its mandatory application to new type approvals, Contracting Parties applying this Regulation shall continue to grant approvals to those types of vehicles which comply with the requirements of this Regulation as amended by all the applicable preceding series of amendments.
- 12.1.4. Existing approvals under this Regulation granted before the date of mandatory application of the most recent series of amendment shall remain valid indefinitely and Contracting Parties applying this Regulation shall continue to recognise them and shall not refuse to grant extensions of approvals to them (except for what indicated in paragraph 12.1.6 below).
- 12.1.5. When the vehicle type approved to any of the preceding series of amendments meets the requirements of this Regulation as amended by the most recent series of amendments, the Contracting Party which granted the approval shall notify the other Contracting Parties applying this Regulation thereof.
- 12.1.6. Notwithstanding paragraph 12.1.4 above, Contracting Parties whose application of this Regulation comes into force after the date of entry into force of the most recent series of amendments are not obliged to accept approvals which were granted in accordance with any of the preceding series of amendments to this Regulation.
- 12.1.7. Until the United Nations Secretary-General is notified otherwise, Japan declares that in relation to the installation of lighting and light-signalling devices, Japan will only be bound by the obligations of the Agreement to which this Regulation is annexed with respect to vehicles of categories M₁ and N₁.
- 12.2. Transitional provisions applicable to 03 series of amendments.
- Contracting Parties applying this Regulation:
- (a) From 10 October 2007 (12 months after the date of entry into force), shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the 03 series of amendments;
 - (b) Up to 9 October 2009 (36 months after the date of entry into force) shall not refuse national or regional type approval of a vehicle type approved to any of the preceding series of amendments to this Regulation.
 - (c) From 10 October 2009 (36 months after the entry into force) may refuse first national or regional entry into service of a vehicle of categories N₂ (with a maximum mass exceeding 7,5 tonnes), N₃, O₃ and O₄ exceeding 2 100 mm in width (for rear markings) and exceeding 6 000 mm in length (for side markings), except tractors for semi-trailers and incomplete vehicles, which do not meet the requirements of the 03 series of amendments to this Regulation.
 - (d) Notwithstanding paragraph 12.1.4, from 10 October 2011 (60 months after the date of entry into force) shall no more recognise approvals to this Regulation granted to type of vehicles of categories N₂ (with a maximum mass exceeding 7,5 tons), N₃, O₃ and O₄ exceeding 2 100 mm in width (for rear markings) and exceeding 6 000 mm in length (for side markings), except tractors for semi-trailers and incomplete vehicle, under any preceding series of amendment, that ceases to be valid.
 - (e) From 12 June 2010 (36 months from the entry into force of Supplement 3 to the 03 series of amendments) shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by Supplement 3 to the 03 series of amendments.
 - (f) Up to 11 January 2010 (18 months after the official date of entry into force of Supplement 4 to the 03 series of amendments) shall continue to grant approvals to new vehicle types which do not meet the requirements on vertical orientation of front fog lamps (paragraph 6.3.6.1.1) and/or on direction indicator operating tell-tale (paragraph 6.5.8) and/or on daytime running lamps switching off (paragraph 6.19.7.3).
 - (g) Up to 10 October 2011 (60 month after the official date of entry into force) shall continue to grant approvals to new vehicle types which do not meet the requirements on cumulative length of conspicuity markings (paragraph 6.21.4.1.3) ⁽¹⁾.

⁽¹⁾ Note by the secretariat: for paragraph 6.21.4.1.3., please refer to the text of the 03 series of amendments as contained in document E/ECE/324/Rev.1/Add.47/Rev.6 — E/ECE/TRANS/505/Rev.1/Add.47/Rev.6.

12.3. Transitional provisions applicable to 04 series of amendments.

Contracting Parties applying this Regulation:

- (a) From 7 February 2011 for vehicles of categories M₁ and N₁, and from 7 August 2012 for vehicles of other categories (respectively 30 and 48 months after the official date of entry into force) shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the 04 series of amendments.
- (b) After 22 July 2009 (date of entry into force of Supplement 2 to the 04 series of amendments) shall continue to grant approvals to vehicle types which do not meet the requirements of paragraph 5.2.1 as amended by the Supplement 2 to 04 series of amendments if they are fitted with headlamps approved to Regulation No 98 (prior to Supplement 9) or Regulation No 112 (prior to Supplement 8).
- (c) From 24 October 2012 (36 months from the entry into force of Supplement 3 to the 04 series of amendments) shall grant approvals only if the vehicle type to be approved meets the requirements on voltage limitation of paragraphs 3.2.7 and 5.27 to 5.27.4 of this Regulation as amended by Supplement 3 to the 04 series of amendments.
- (d) Up to 7 February 2011 for vehicles of categories M₁ and N₁ and to 7 August 2012 for vehicles of other categories (respectively 30 and 48 months after the official date of entry into force of Supplement 2 to the 04 series of amendments) shall continue to grant approvals to new vehicle types which do not meet the requirements on switching OFF of daytime running lamps reciprocally incorporated with front direction indicator lamps (paragraph 6.19.7.6).

12.3.1. Notwithstanding the transitional provisions above, Contracting Parties whose application of Regulation No 112 comes into force after 7 August 2008 (date of entry into force of the 04 series of amendments to the present Regulation) are not obliged to accept approvals if the vehicle type to be approved does not meet the requirements of paragraphs 6.1.2 and 6.2.2 of this Regulation as amended by the 04 series of amendments to this Regulation with regard to Regulation No 112.

12.4. Transitional provisions applicable to 05 series of amendments.

Contracting Parties applying this Regulation:

- (a) From 30 January 2015 (48 months from the official date of entry into force) shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the 05 series of amendments.
- (b) Until 30 July 2016 for new vehicles types of categories M₁ and N₁ and until 30 January 2018 for new vehicle types of other categories (respectively 66 and 84 months after the official date of entry into force) shall grant approvals if the new vehicle type to be approved meets the requirements of one or more of paragraphs 6.2.7.6.2 or 6.2.7.6.3 to 6.2.7.6.3.3 instead of those of paragraph 6.2.7.6.1 of this Regulation as amended by the 05 series of amendments.

12.5. Transitional provisions applicable to 06 series of amendments.

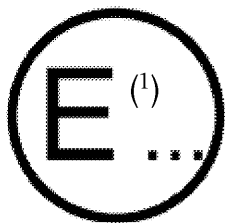
Contracting Parties applying this Regulation:

From 18 November 2017 (60 month after the date of entry into force) shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the 06 series of amendments.

ANNEX 1

COMMUNICATION

(maximum format: A4 (210 × 297 mm))



issued by: Name of administration

.....

.....

.....

concerning ⁽²⁾: Approval granted

Approval extended

Approval refused

Approval withdrawn

Production definitively discontinued

of a type of vehicle with regard to the installation of lighting and light- signalling devices, pursuant to Regulation No 48.

Approval No: Extension No:

1. Trade name or mark of the vehicle:
2. Manufacturer's name for the type of vehicle:
3. Manufacturer's name and address:
4. If applicable, name and address of the manufacturer's representative:
5. Submitted for approval on:
6. Technical Service responsible for conducting approval tests:
7. Date of test report:
8. Number of test report:
9. Concise description:

Lighting and light-signalling devices on the vehicle:

- 9.1. Main-beam headlamps: yes/no ⁽²⁾
- 9.2. Dipped-beam headlamps: yes/no ⁽²⁾
- 9.3. Front-fog lamps: yes/no ⁽²⁾

Comments: Reciprocally incorporated in headlamp: yes/no ⁽²⁾

- 9.4. Reversing lamps: yes/no ⁽²⁾
- 9.5. Front direction-indicators: yes/no ⁽²⁾
- 9.6. Rear direction-indicators: yes/no ⁽²⁾
- 9.7. Side direction-indicators: yes/no ⁽²⁾
- 9.8. Hazard warning signal: yes/no ⁽²⁾

- 9.9. Stop-lamps: yes/no ⁽²⁾
- 9.10. Rear registration plate
illuminating device: yes/no ⁽²⁾
- 9.11. Front position lamps: yes/no ⁽²⁾
- 9.12. Rear position lamps: yes/no ⁽²⁾
- 9.13. Rear fog-lamps: yes/no ⁽²⁾
- 9.14. Parking lamps: yes/no ⁽²⁾
- 9.15. End-outline marker lamps: yes/no ⁽²⁾
- 9.16. Rear retro-reflectors,
non-triangular: yes/no ⁽²⁾
- 9.17. Rear retro-reflectors, triangular: yes/no ⁽²⁾
- 9.18. Front retro-reflectors,
Non-triangular: yes/no ⁽²⁾
- 9.19. Side retro-reflectors,
Non-triangular: yes/no ⁽²⁾
- 9.20. Side marker lamps: yes/no ⁽²⁾
- 9.21. Daytime running lamps: yes/no ⁽²⁾
- 9.22. Adaptive front lighting system (AFS): yes/no ⁽²⁾
- 9.23. Cornering lamps: yes/no ⁽²⁾
- 9.24. Conspicuity markings: Rear Side
- 9.24.1. Full contour markings: yes/no ⁽²⁾ yes/no ⁽²⁾
- 9.24.2. Partial contour markings: yes/no ⁽²⁾ yes/no ⁽²⁾
- 9.24.3. Line markings: yes/no ⁽²⁾ yes/no ⁽²⁾
- 9.24.4. Exemption regarding conspicuity marking according to paragraph 6.21.1.2.5.
Rear
yes/no ⁽²⁾
Comments:
- Side
yes/no ⁽²⁾
Comments
- 9.25. Emergency stop signal: yes/no ⁽²⁾
- 9.26. Manoeuvring lamps: yes/no ⁽²⁾
- 9.27. Exterior courtesy lamps: yes/no ⁽²⁾
- 9.28. Equivalent lamps: yes/no ⁽²⁾
- 9.29. Maximum permissible load in the boot:

10. Comments:
- 10.1. Any comments on movable components:
- 10.2. Method used for the definition of the apparent surface:
- (a) Boundary of the illuminating surface ⁽²⁾ or
- (b) Light-emitting surface ⁽²⁾
- 10.3. Other comments (valid for right-hand or left-hand drive vehicles):
- 10.4. Comments concerning AFS (according to paragraphs 3.2.6 and 6.22.7.4 of this Regulation):
- 10.5. Comments regarding the extent of coverage of the conspicuity marking if it is less than the minimum value of 70 per cent required by paragraphs 6.21.4.1.2 and 6.21.4.2.2 of this Regulation.
- 10.6. For vehicles of M and N categories comments regarding the electrical supply conditions (according to paragraphs 3.2.7 and 5.27 of this Regulation)
- 10.7. Comments regarding conspicuity marking (according to paragraphs 6.21.1.2.5 and 6.21.4.3.1 of this Regulation)
- 10.8. Comments regarding conspicuity marking (Incomplete vehicle or Complete Vehicles according to paragraphs 6.21.1.2.1 and 6.21.1.2.2.1 of this Regulation):
- Incomplete vehicles: yes/no ⁽²⁾
- Complete vehicles: yes/no ⁽²⁾
- Completed vehicles: yes/no ⁽²⁾
11. Position of the approval mark:
12. Reason(s) for extension (if applicable):
13. Approval granted/extended/refused/withdrawn ⁽²⁾
14. Place:
15. Date:
16. Signature:
17. The following documents, bearing the approval number shown above, are available on request:

⁽¹⁾ Distinguishing number of the country which has granted/refused/withdrawn approval (see approval provisions in the Regulation).

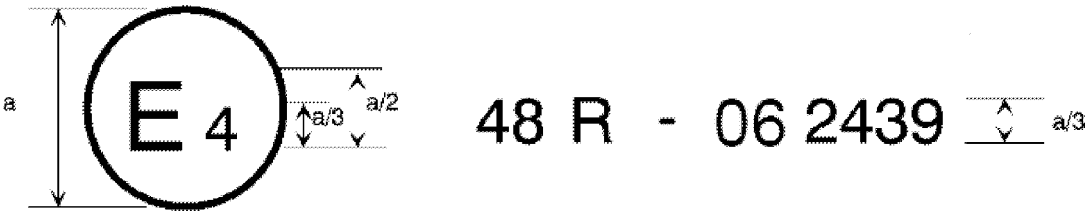
⁽²⁾ Strike out what does not apply.

ANNEX 2

ARRANGEMENTS OF APPROVAL MARKS

MODEL A

(See paragraph 4.4 of this Regulation)

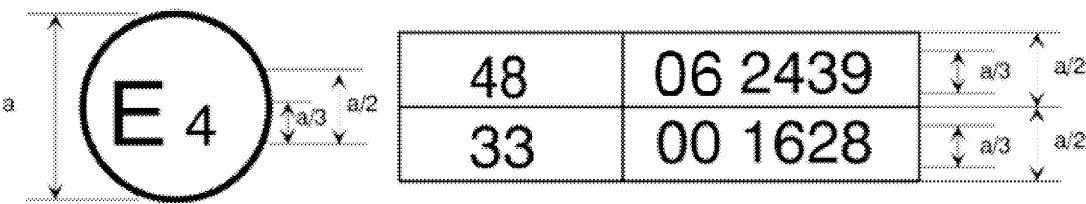


a = 8 mm min.

The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the installation of lighting and light-signalling devices, been approved in the Netherlands (E 4) pursuant to Regulation No 48 as amended by the 06 series of amendments. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No 48 as amended by the 06 series of amendments.

MODEL B

(See paragraph 4.5 of this Regulation)



a = 8 mm min.

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulation No 48 as amended by the 06 series of amendments and Regulation No 33 ⁽¹⁾. The approval number indicates that, at the dates when the respective approvals were given, Regulation No 48 was amended by the 06 series of amendments and Regulation No 33 was still in its original form.

⁽¹⁾ The second number is given merely as an example.

ANNEX 3

EXAMPLES OF LAMP SURFACES, AXES, CENTRES OF REFERENCE, AND ANGLES OF GEOMETRIC VISIBILITY

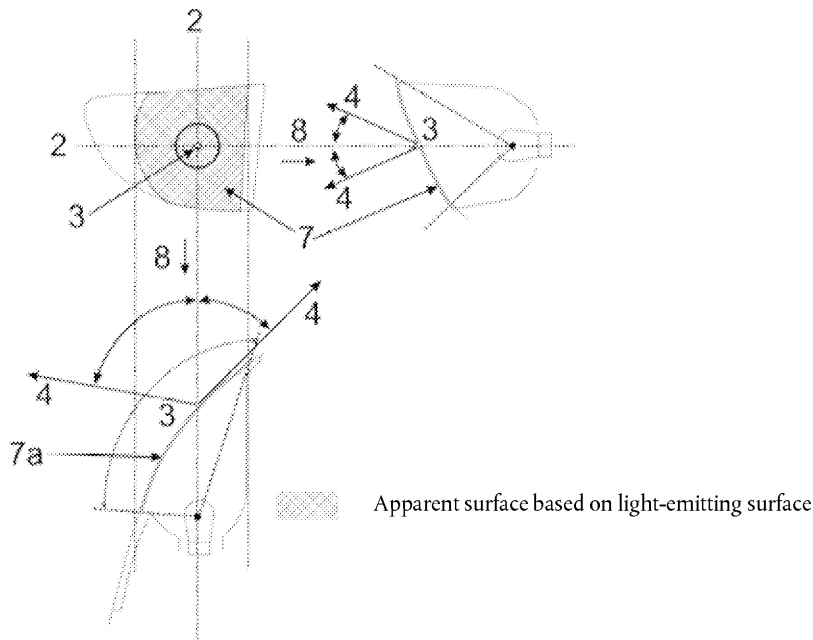
These examples show some arrangements to aid the understanding of the provisions and are not intended to be design restrictive.

KEY for all examples in this annex:

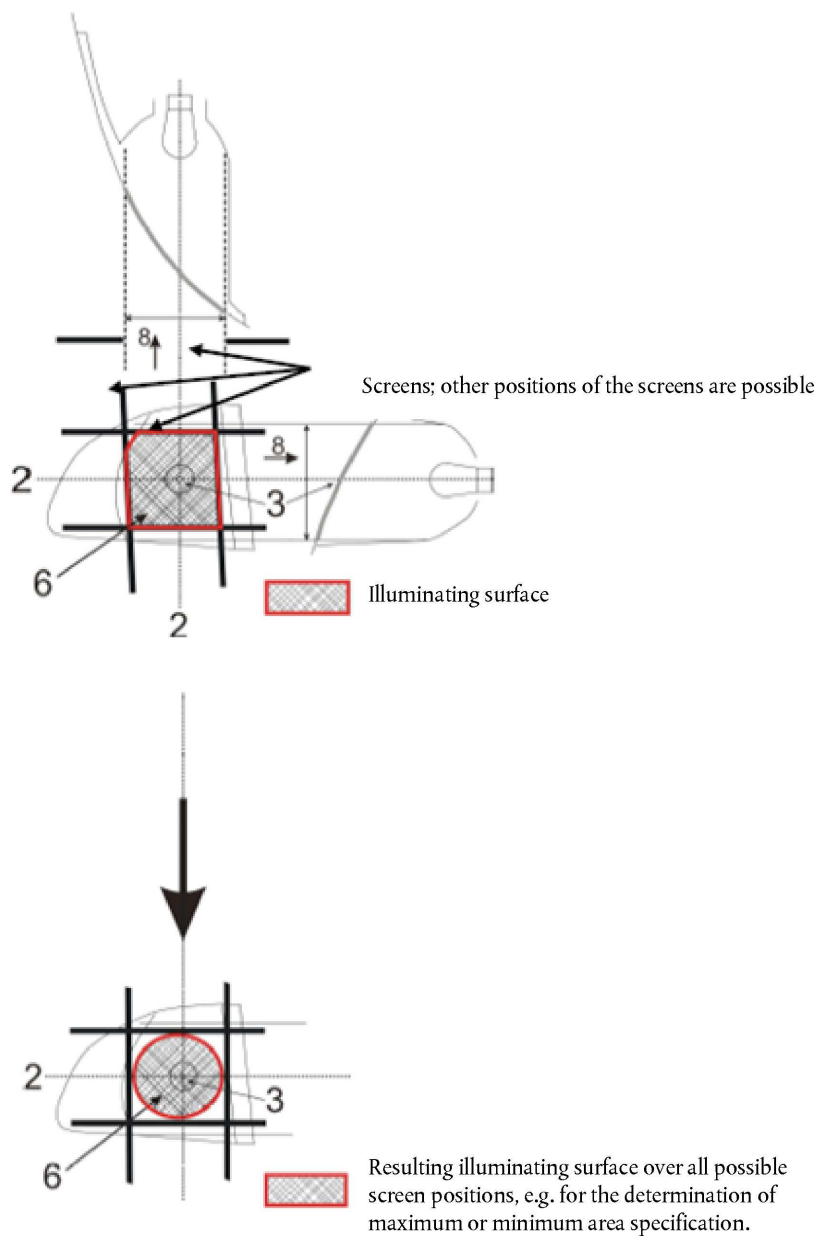
1. Illuminating surface	IO Inner optical part
2. Axis of reference	LG Light guide
3. Centre of reference	L Outer lens
4. Angle of geometric visibility	R Reflector
5. Light-emitting surface	S Light source
6. Apparent surface based on the illuminating surface	X Not part of this function
7a. Apparent surface based on the light-emitting surface according to paragraph 2.8(a) (with outer lens)	F1 Function one
7b. Apparent surface based on the light-emitting surface according to paragraph 2.8(b) (without outer lens)	F2 Function two
8. Direction of visibility	

PART 1

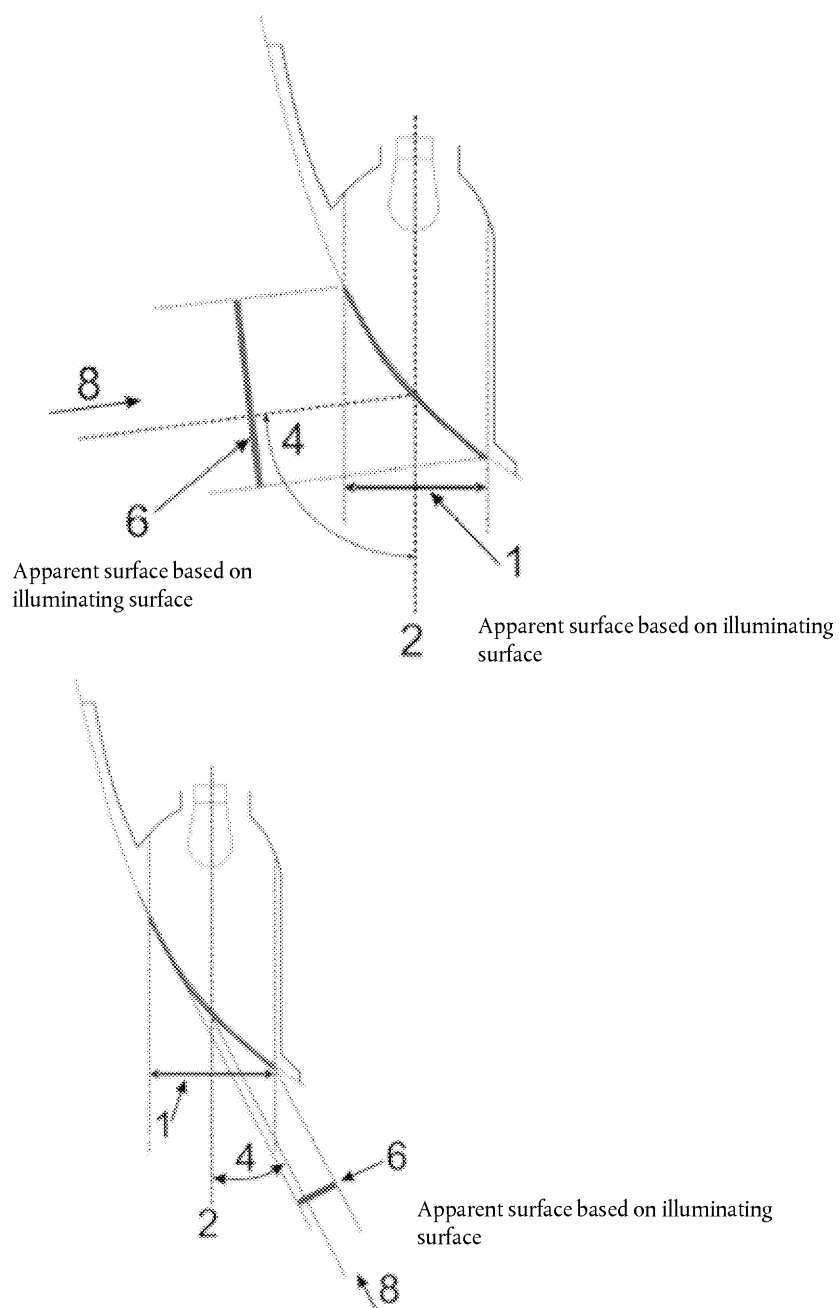
Light emitting surface of a light-signalling device other than a retro-reflector



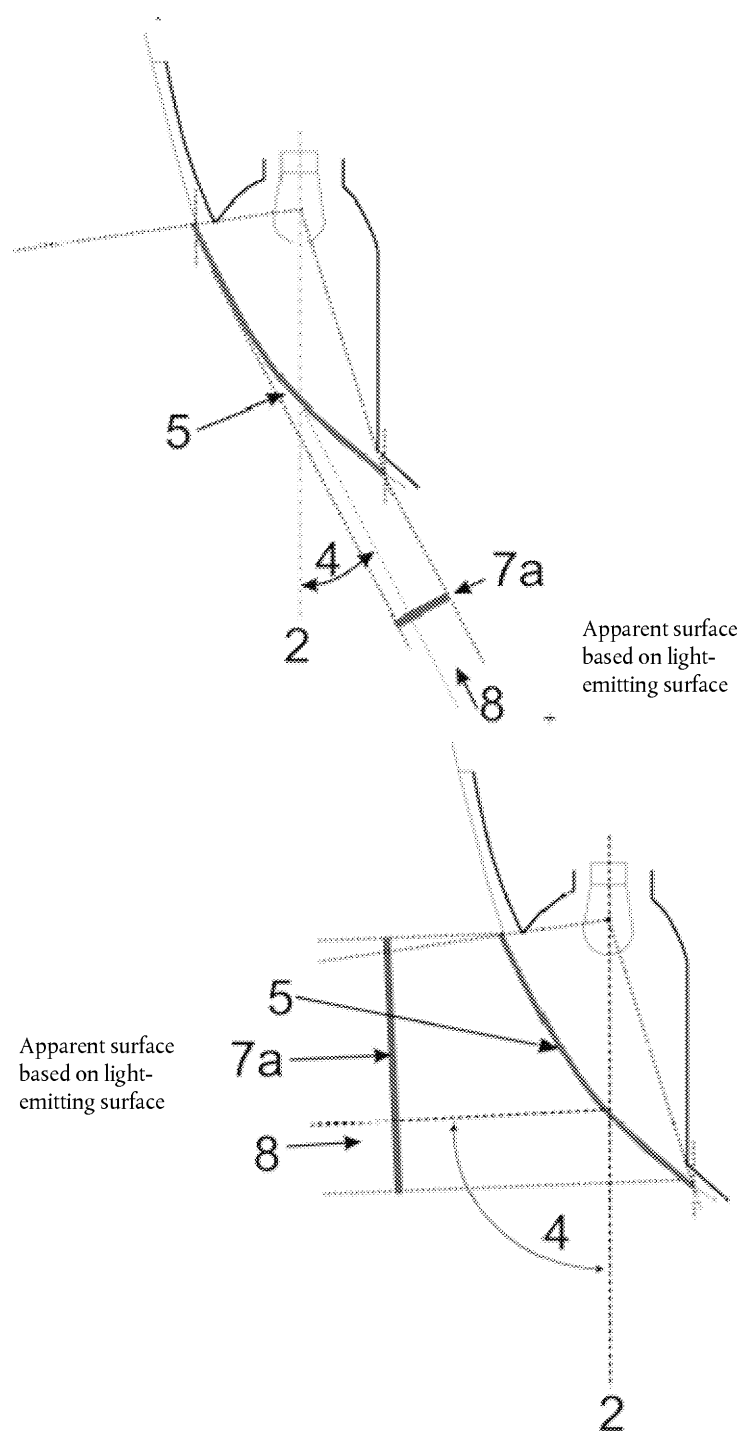
PART 2

Illuminating surface of a light-signalling device other than a retro-reflector

PART 3

Examples of apparent surface based on illuminating surface in different directions of geometric visibility

PART 4

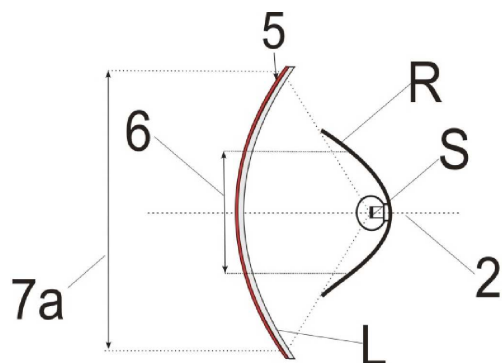
Examples of apparent surface based on light emitting surface in different directions of geometric visibility

PART 5

Example of illuminating surface in comparison with light-emitting surface in the case of a 'single function lamp' (see paragraphs 2.8 to 2.9 of this Regulation)

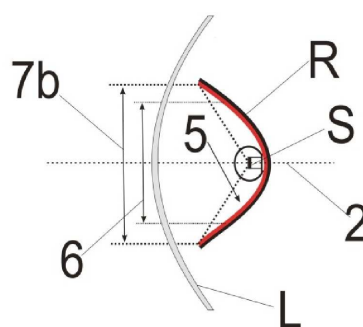
Examples of a light source with a reflector optic behind an outer lens:

Example 1



(Including the outer lens)

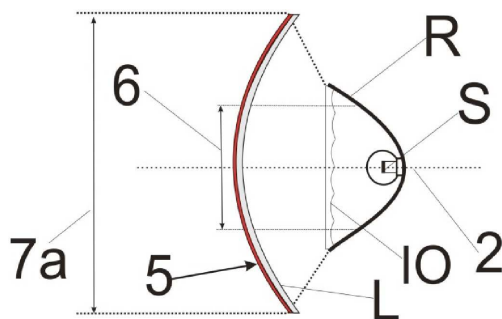
Example 2



(Excluding the non-textured outer lens)

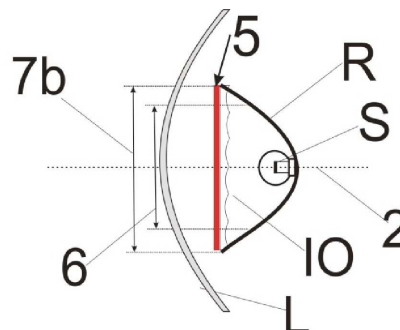
Examples of a light source with a reflector optic with an inner lens behind an outer lens:

Example 3



(Including the outer lens)

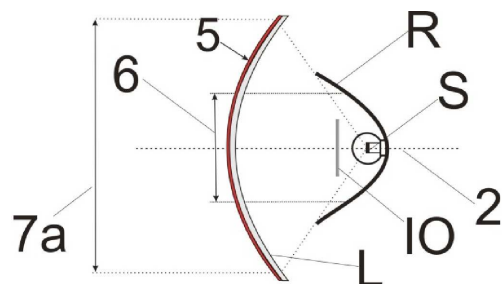
Example 4



(Excluding the non-textured outer lens)

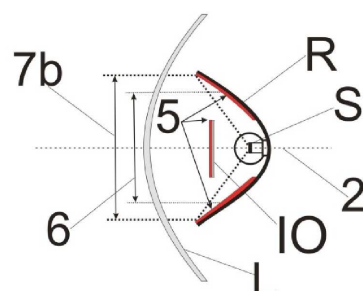
Examples of a light source with a reflector optic with a partial inner lens behind an outer lens:

Example 5



(Including the outer lens)

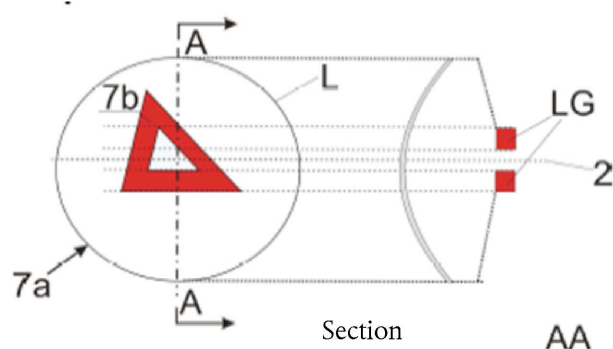
Example 6



(Excluding the non-textured outer lens)

Example of a light guide optic behind an outer lens:

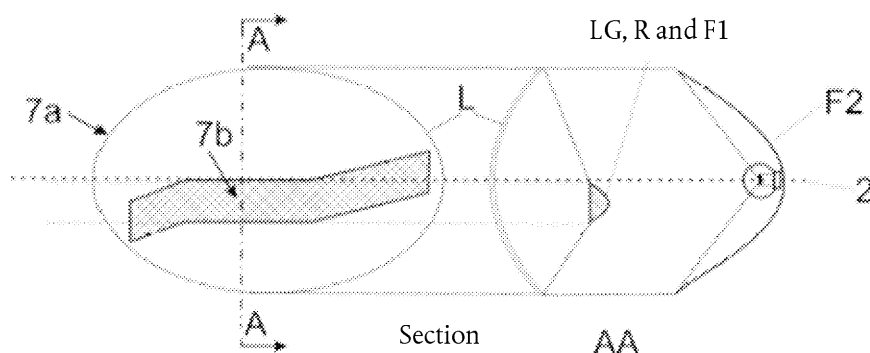
Example 7



 In the case where the non-textured outer lens is excluded, "7b" is the apparent surface according to paragraph 2.8(b).

Example of a light guide optic or a reflector optic behind an outer lens:

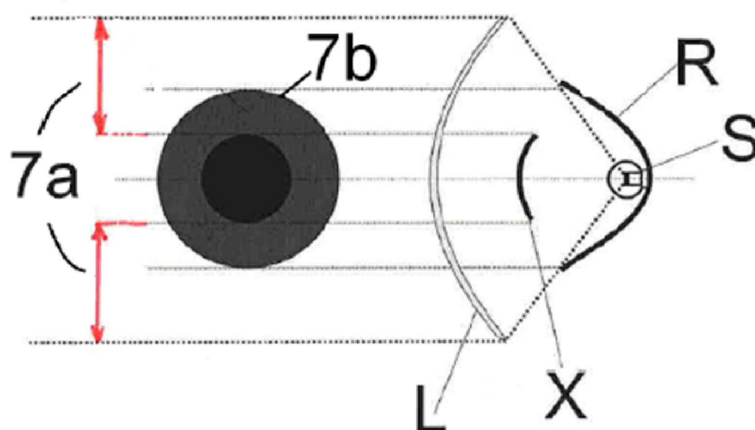
Example 8



 In the case where the non textured outer lens is excluded, "7b" is the apparent surface according to paragraph 2.8(b), and F1 shall not transparent to F2.

Example of a light source with a reflector optic in combination with an area which is not part of this function, behind an outer lens:

Example 9



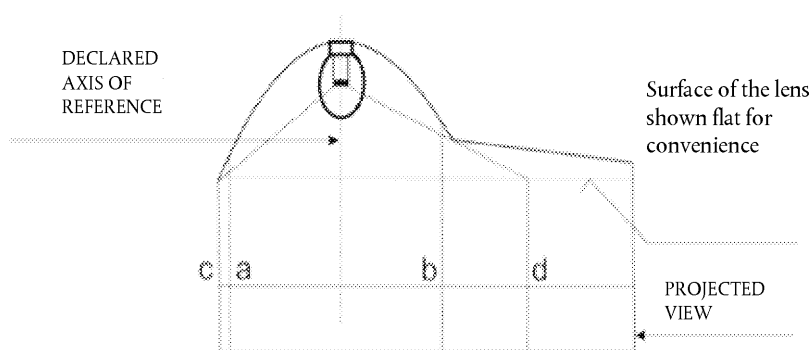
 In the case where the non textured outer lens is excluded, "7b" is the apparent surface according to paragraph 2.8(b).

PART 6

Examples showing the determination of the light-emitting surface in comparison with illuminating surface (See paragraphs 2.8 and 2.9 of this Regulation)

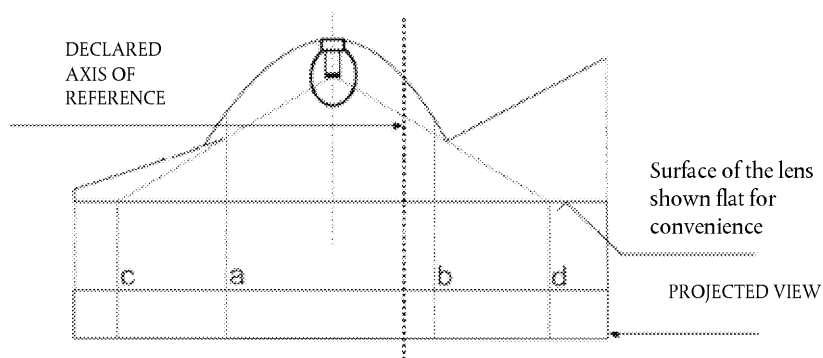
Note: Reflected light could/may contribute to the determination of the light emitting surface

Example A



	Illuminating surface	Declared light-emitting surface according to 2.8(a)
Edges are	a and b	c and d

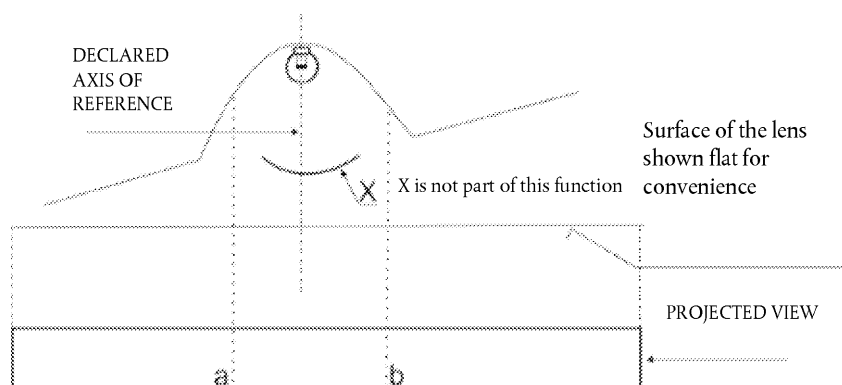
Example B



	Illuminating surface	Declared Light-emitting surface according to 2.8(a)
Edges are	a and b	c and d

Example C

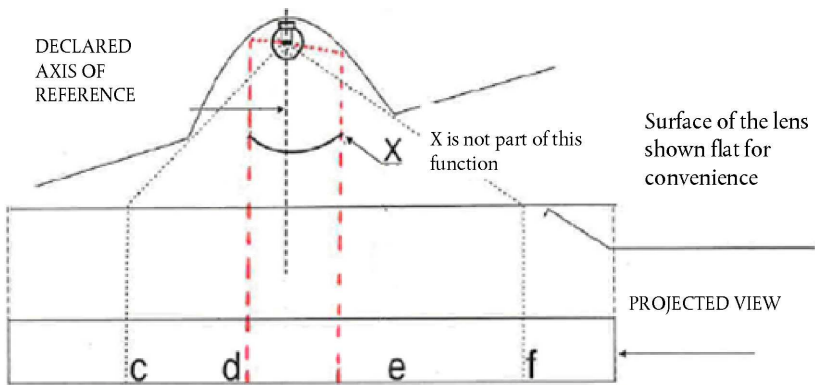
Example to determine the illuminating surface in combination with an area which is not part of the function:



	Illuminating surface
Edges are	a and b

Example D

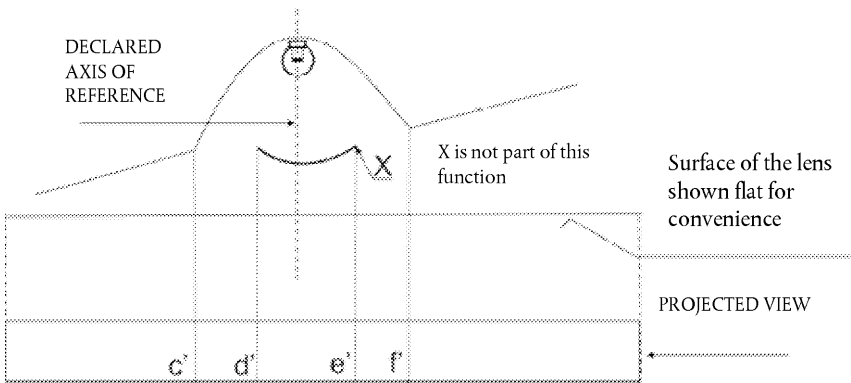
Example to determine a light emitting surface according to 2.8(a) in combination with an area which is not part of the function:



	Declared Light-emitting surface according to 2.8(a)
Edges are	c-d and e-f

Example E

Example to determine the apparent surface in combination with an area which is not part of the function and a non-textured outer lens (according to 2.8(b)):

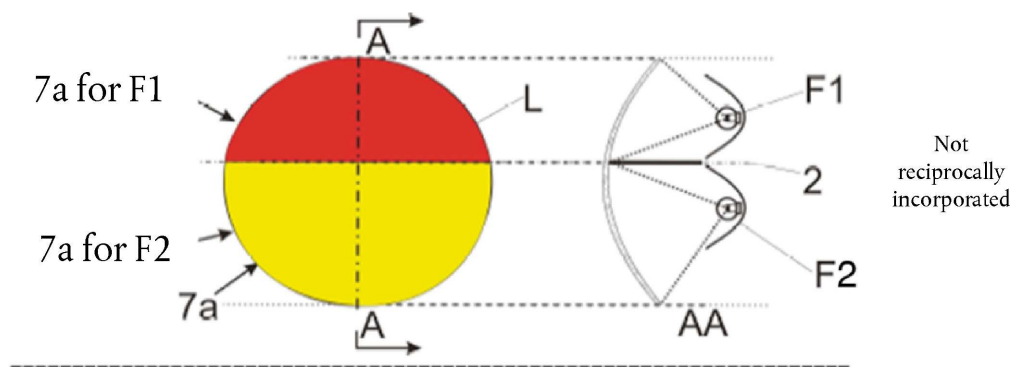


	Declared Light emitting surface according to 2.8(b) for example
Edges are	c'-d' and e'-f'

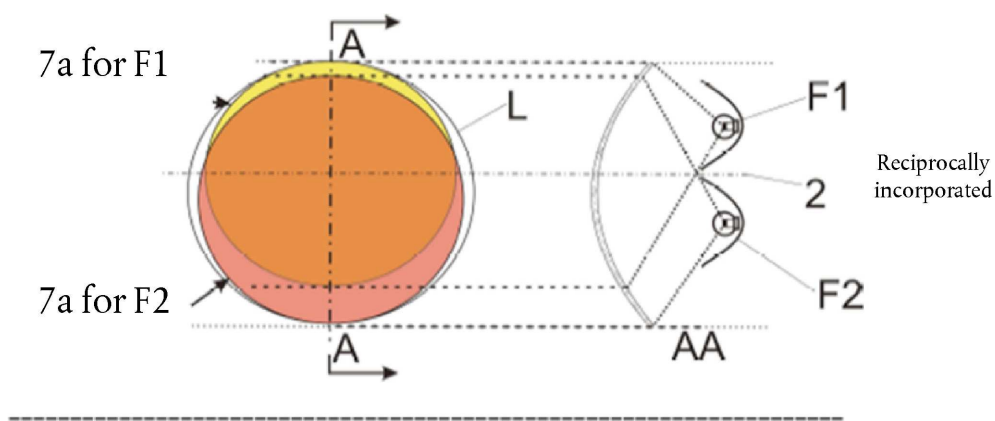
PART 7

Examples to enable a decision regarding the reciprocal incorporation of two functions

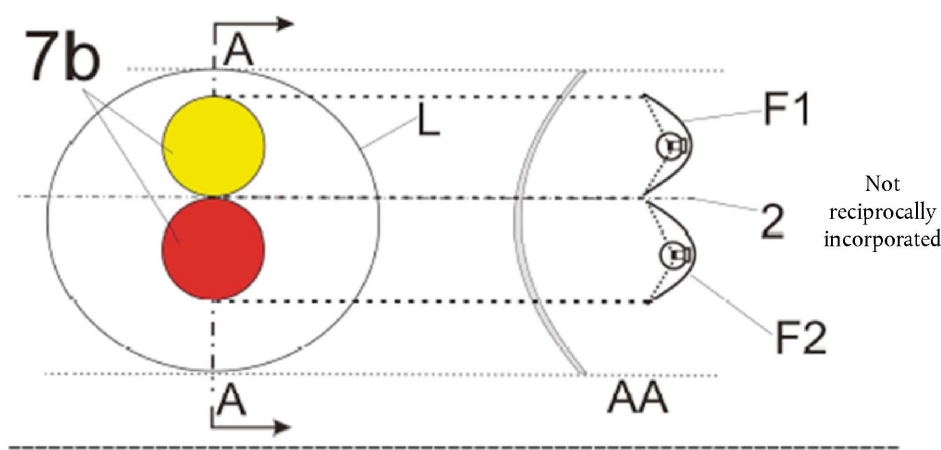
In the case with a textured outer lens and a wall in between:



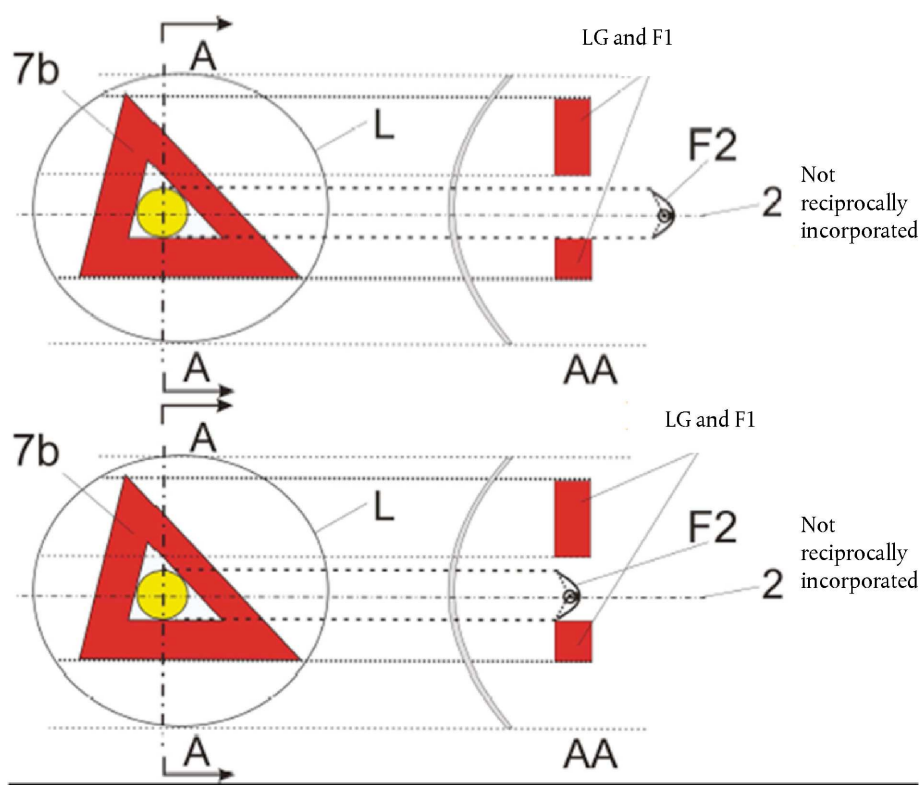
In the case with a textured outer lens:



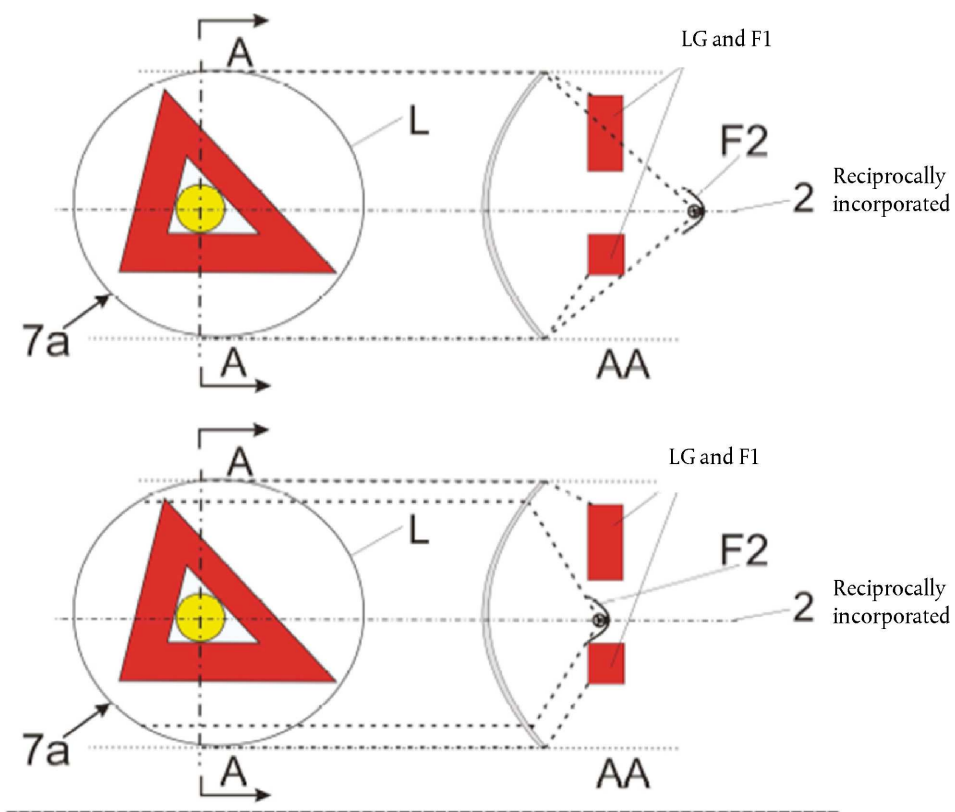
In the case where the non-textured outer lens is excluded:



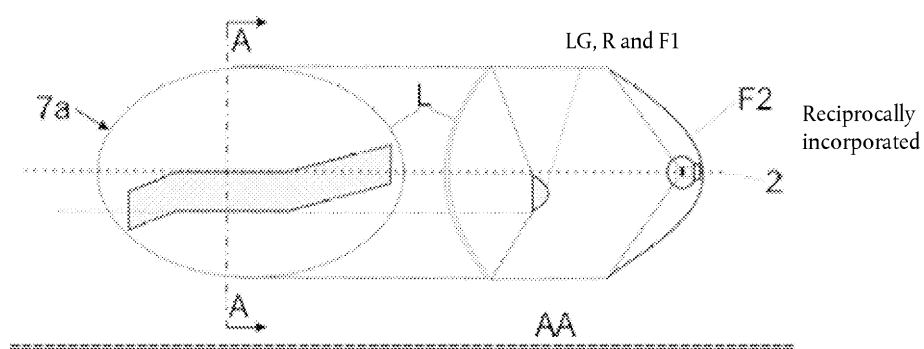
In the case where the non-textured outer lens is excluded:



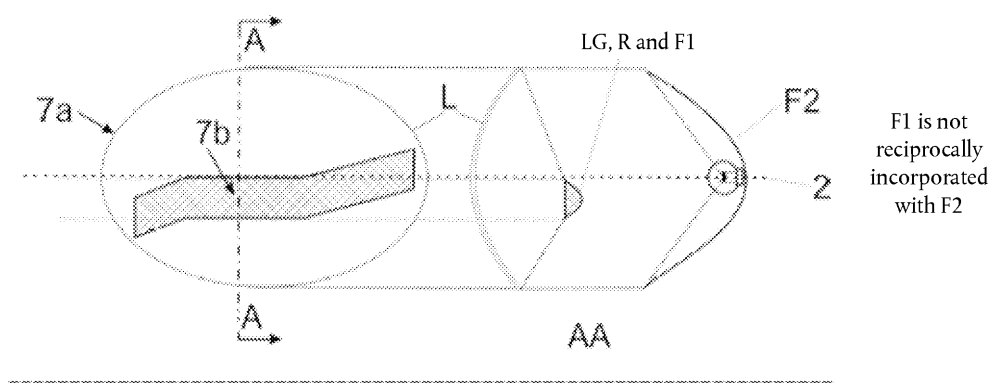
In the case where the outer lens (textured or not) is included:



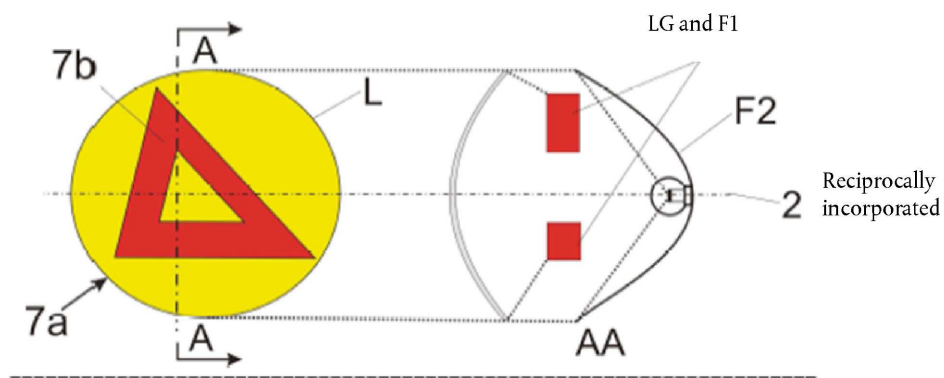
In the case where the outer lens (textured or not) is included:



In the case where the non-textured outer lens is excluded, '7b' is the apparent surface according to paragraph 2.8 and F1 shall not be transparent to F2:



In the case where the non-textured outer lens is excluded or not:



ANNEX 4

VISIBILITY OF A RED LAMP TO THE FRONT AND VISIBILITY OF A WHITE LAMP TO THE REAR

(See paragraphs 5.10.1 and 5.10.2 of this Regulation)

Figure 1

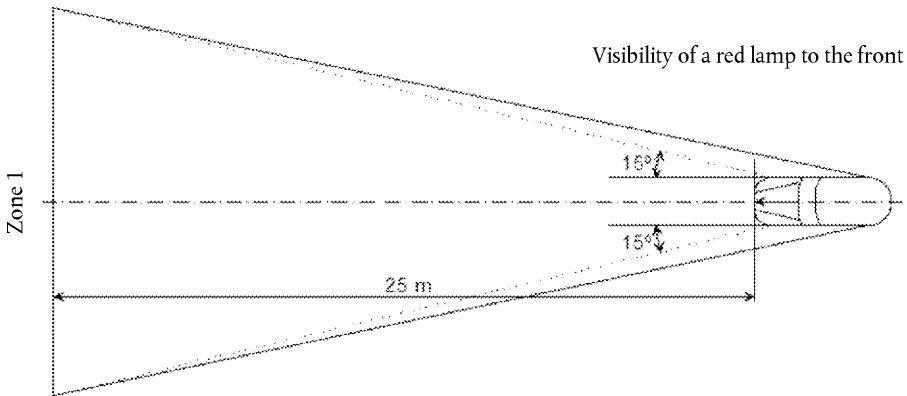
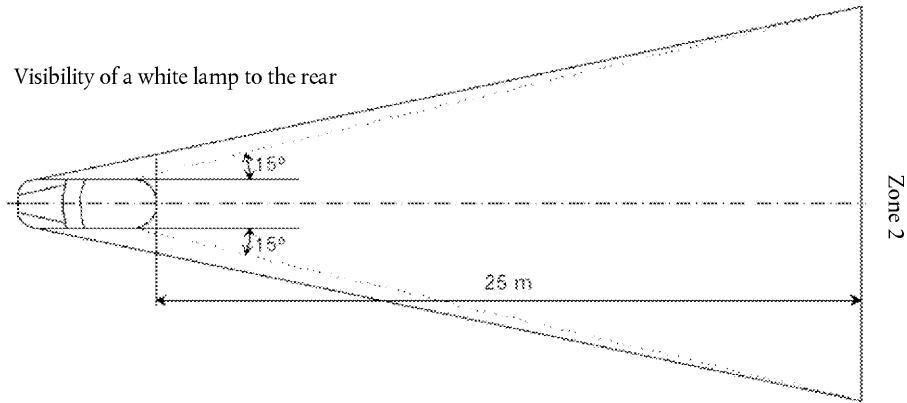


Figure 2



ANNEX 5

STATES OF LOADING TO BE TAKEN INTO CONSIDERATION IN DETERMINING VARIATIONS IN THE VERTICAL ORIENTATION OF THE DIPPED-BEAM HEADLAMPS

Loading conditions on axles referred to in paragraphs 6.2.6.1 and 6.2.6.3.1.

1. For the following tests, the mass of the passengers shall be calculated on the basis of 75 kg per person.
2. Loading conditions for different types of vehicles:
 - 2.1. Vehicles in category M₁ ⁽¹⁾:
 - 2.1.1. The angle of the light beam of the dipped-beam headlamps shall be determined under the following load conditions:
 - 2.1.1.1. One person in the driver's seat;
 - 2.1.1.2. The driver, plus one passenger in the front seat farthest from the driver;
 - 2.1.1.3. The driver, one passenger in the front seat farthest from the driver, all the seats farthest to the rear occupied;
 - 2.1.1.4. All the seats occupied;
 - 2.1.1.5. All the seats occupied, plus an evenly distributed load in the luggage boot, in order to obtain the permissible load on the rear axle or on the front axle if the boot is at the front. If the vehicle has a front and a rear boot, the additional load shall be appropriately distributed in order to obtain the permissible axle loads. However, if the maximum permissible laden mass is obtained before the permissible load on one of the axles, the loading of the boot(s) shall be limited to the figure which enables that mass to be reached;
 - 2.1.1.6. Driver, plus an evenly distributed load in the boot, in order to obtain the permissible load on the corresponding axle.

However, if the maximum permissible laden mass is obtained before the permissible load on the axle, the loading of the boot(s) shall be limited to the figure which enables that mass to be reached.
 - 2.1.2. In determining the above loading conditions, account shall be taken of any loading restrictions laid down by the manufacturer.
 - 2.2. Vehicles in categories M₂ and M₃ ⁽¹⁾:

The angle of the light beam from the dipped-beam headlamps shall be determined under the following loading conditions:

 - 2.2.1. Vehicle unladen and one person in the driver's seat;
 - 2.2.2. Vehicles laden such that each axle carries its maximum technically permissible load or until the maximum permissible mass of the vehicle is attained by loading the front and rear axles proportionally to their maximum technically permissible loads, whichever occurs first.
 - 2.3. Vehicles in category N with load surfaces:
 - 2.3.1. The angle of the light beam from the dipped-beam headlamps shall be determined under the following loading conditions:
 - 2.3.1.1. Vehicle unladen and one person in the driver's seat;

⁽¹⁾ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.3, para. 2 — www.uncece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

- 2.3.1.2. Driver, plus a load so distributed as to give the maximum technically permissible load on the rear axle or axles, or the maximum permissible mass of the vehicle, whichever occurs first, without exceeding a front axle load calculated as the sum of the front axle load of the unladen vehicle plus 25 per cent of the maximum permissible payload on the front axle. Conversely, the front axle is so considered when the load platform is at the front.
 - 2.4. Vehicles in category N without a load surface:
 - 2.4.1. Drawing vehicles for semi-trailers:
 - 2.4.1.1. Unladen vehicle without a load on the coupling attachment and one person in the driver's seat;
 - 2.4.1.2. One person in the driver's seat: technically permissible load on the coupling attachment in the position of the attachment corresponding to the highest load on the rear axle.
 - 2.4.2. Drawing vehicles for trailers:
 - 2.4.2.1. Vehicle unladen and one person in the driver's seat;
 - 2.4.2.2. One person in the driver's seat, all the other places in the driving cabin being occupied.
-

ANNEX 6

MEASUREMENT OF THE VARIATION OF DIPPED-BEAM INCLINATION AS A FUNCTION OF LOAD

1. SCOPE

This annex specifies a method for measuring variations in motor vehicle dipped-beam inclination, in relation to its initial inclination, caused by changes in vehicle attitude due to loading.

2. DEFINITIONS

2.1. Initial inclination

2.1.1. Stated initial inclination

The value of the dipped-beam initial inclination specified by the motor vehicle manufacturer serving as a reference value for the calculation of permissible variations.

2.1.2. Measured initial inclination

The mean value of dipped-beam inclination or vehicle inclination measured with the vehicle in condition No 1, as defined in Annex 5, for the category of vehicle under test. It serves as a reference value for the assessment of variations in beam inclination as the load varies.

2.2. Dipped-beam inclination

It may be defined as follows:

Either as the angle, expressed in milliradians, between the direction of the beam towards a characteristic point on the horizontal part of the cut-off in the luminous distribution of the headlamp and the horizontal plane,

Or by the tangent of that angle, expressed in percentage inclination, since the angles are small (for these small angles, 1 per cent is equal to 10 mrad).

If the inclination is expressed in percentage inclination, it can be calculated by means of the following formula:

$$\frac{(h_1 - h_2)}{L} \times 100$$

where:

h_1 is the height above the ground, in millimetres, of the above-mentioned characteristic point, measured on a vertical screen perpendicular to the vehicle longitudinal median plane, placed at a horizontal distance L ;

h_2 is the height above the ground, in millimetres, of the centre of reference (which is taken to be the nominal origin of the characteristic point chosen in h_1);

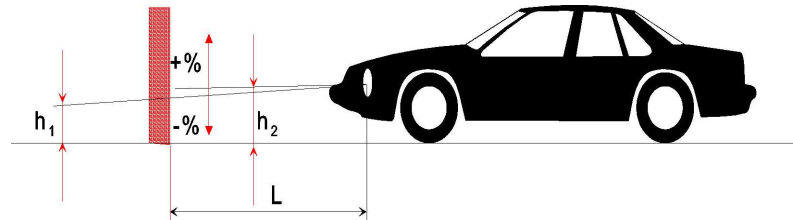
L is the distance, in millimetres, from the screen to the centre of reference.

Negative values denote downward inclination (see Figure 1).

Positive values denote upward inclination.

Figure 1

Dipped-beam downward inclination of a category M1 vehicle



Notes:

1. This drawing represents a category M_1 vehicle, but the principle shown applies equally to vehicles of other categories.
2. Where the vehicle does not incorporate a headlamp-levelling system, the variation in dipped-beam inclination is identical with the variation in the inclination of the vehicle itself.

3. MEASUREMENT CONDITIONS

- 3.1. If a visual inspection of the dipped-beam pattern on the screen or a photometric method is used, measurement shall be carried out in a dark environment (for example, a dark room) of sufficient area to allow the vehicle and the screen to be placed as shown in Figure 1. Headlamp centres of reference shall be at a distance from the screen of at least 10 m.
- 3.2. The ground on which measurements are made shall be as flat and horizontal as possible, so that the reproducibility of measurements of dipped-beam inclination can be assured with an accuracy of $\pm 0,5$ mrad ($\pm 0,05$ per cent inclination).
- 3.3. If a screen is used, its marking, position and orientation in relation to the ground and to the median longitudinal plane of the vehicle, shall be such that the reproducibility of the measurement of the dipped-beam inclination can be assured with an accuracy of $\pm 0,5$ mrad ($\pm 0,05$ per cent inclination).
- 3.4. During measurements, the ambient temperature shall be between 10 and 30 °C.

4. VEHICLE PREPARATION

- 4.1. Measurements shall be carried out on a vehicle which has travelled a distance of between 1 000 km and 10 000 km, preferably 5 000 km.
- 4.2. Tyres shall be inflated to the full-load pressure specified by the vehicle manufacturer. The vehicle shall be fully replenished (fuel, water, oil) and equipped with all the accessories and tools specified by the manufacturer. Full fuel replenishment means that the fuel tank shall be filled to not less than 90 per cent of its capacity.
- 4.3. The vehicle shall have the parking brake released and the gearbox in neutral.
- 4.4. The vehicle shall be conditioned for at least 8 h at the temperature specified in paragraph 3.4 above.
- 4.5. If a photometric or visual method is used, headlamps with a well-defined dipped-beam cut-off should preferably be installed on the vehicle under test in order to facilitate the measurements. Other means are allowed to obtain a more precise reading (for example, removal of the headlamp lens).

5. TEST PROCEDURE

5.1. General

The variations in either dipped-beam or vehicle inclination, depending on the method chosen, shall be measured separately for each side of the vehicle. The results obtained from both left and right headlamps under all the load conditions specified in Annex 5, shall be within the limits set out in paragraph 5.5 below. The load shall be applied gradually without subjecting the vehicle to excessive shocks.

5.1.1. Where an AFS is fitted, the measurements shall be carried out with the AFS in its neutral state.

5.2. Determination of the measured initial inclination

The vehicle shall be prepared as specified in paragraph 4 above and laden as specified in Annex 5 (first loading condition of the respective vehicle category). Before each measurement, the vehicle shall be rocked as specified in paragraph 5.4 below. Measurements shall be made three times.

5.2.1. If none of the three measured results differ by more than 2 mrad (0,2 per cent inclination) from the arithmetic mean of the results, that mean shall constitute the final result.

5.2.2. If any measurement differs from the arithmetic mean of the results by more than 2 mrad (0,2 per cent inclination), a further series of 10 measurements shall be made, the arithmetic mean of which shall constitute the final result.

5.3. Measurement methods

Any method may be used to measure variations of inclination provided that the readings are accurate to within $\pm 0,2$ mrad ($\pm 0,02$ per cent inclination).

5.4. Treatment of vehicle in each loading condition

The vehicle suspension and any other part likely to affect dipped-beam inclination shall be activated according to the methods described below.

However, the technical authorities and manufacturers may jointly propose other methods (either experimental or based upon calculations), especially when the test poses particular problems, provided such calculations are clearly valid.

5.4.1. M_1 category vehicles with conventional suspension

With the vehicle standing on the measuring site and, if necessary, with the wheels resting on floating platforms (which shall be used if their absence would lead to restriction of the suspension movement likely to affect the results of measurements), rock the vehicle continuously for at least three complete cycles, for each cycle, first the rear and then the front end of the vehicle is pushed down.

The rocking sequence shall end with the completion of a cycle. Before making the measurements, the vehicle shall be allowed to come to rest spontaneously. Instead of using floating platforms, the same effect can be achieved by moving the vehicle backwards and forwards for at least a complete wheel revolution.

5.4.2. M_2 , M_3 and N category vehicles with conventional suspension

5.4.2.1. If the treatment method for category M_1 vehicles described in paragraph 5.4.1 is not possible, the method described in paragraph 5.4.2.2 or 5.4.2.3 may be used.

5.4.2.2. With the vehicle standing on the measuring site and the wheels on the ground, rock the vehicle by temporarily varying the load.

5.4.2.3. With the vehicle standing on the measuring site and the wheels on the ground, activate the vehicle suspension and all other parts which may affect the dipped-beam inclination by using a vibration rig. This can be a vibrating platform on which the wheels rest.

5.4.3. Vehicles with non-conventional suspension, where the engine has to be running.

Before making any measurement wait until the vehicle has assumed its final attitude with the engine running.

5.5. Measurements

The variation of the inclination of the dipped-beam shall be assessed for each of the different loading conditions in relation to the measured initial inclination determined in accordance with paragraph 5.2 above.

If the vehicle is fitted with a manual headlamp-levelling system, the latter shall be adjusted to the positions specified by the manufacturer for given loading conditions (according to Annex 5).

5.5.1. To begin with, a single measurement shall be made in each loading condition. Requirements have been met if, for all the loading conditions, the variation in inclination is within the calculated limits (for example, within the difference between the stated initial inclination and the lower and upper limits specified for approval) with a safety margin of 4 mrad (0,4 per cent inclination).

5.5.2. If the result(s) of any measurement(s) does (do) not lie within the safety margin indicated in paragraph 5.5.1 or exceed(s) the limit values, a further three measurements shall be made in the loading conditions corresponding to this (these) result(s) as specified in paragraph 5.5.3.

5.5.3. For each of the above loading conditions:

5.5.3.1. If none of the three measured results differs by more than 2 mrad (0,2 per cent inclination) from the arithmetic mean of the results, that mean shall constitute the final result.

5.5.3.2. If any measurement differs from the arithmetic mean of the results by more than 2 mrad (0,2 per cent inclination), a further series of 10 measurements shall be made, the arithmetic mean of which shall constitute the final result.

5.5.3.3. If a vehicle is fitted with an automatic headlamp-levelling system which has an inherent hysteresis loop, average results at the top and bottom of the hysteresis loop shall be taken as significant values.

All these measurements shall be made in accordance with paragraphs 5.5.3.1 and 5.5.3.2.

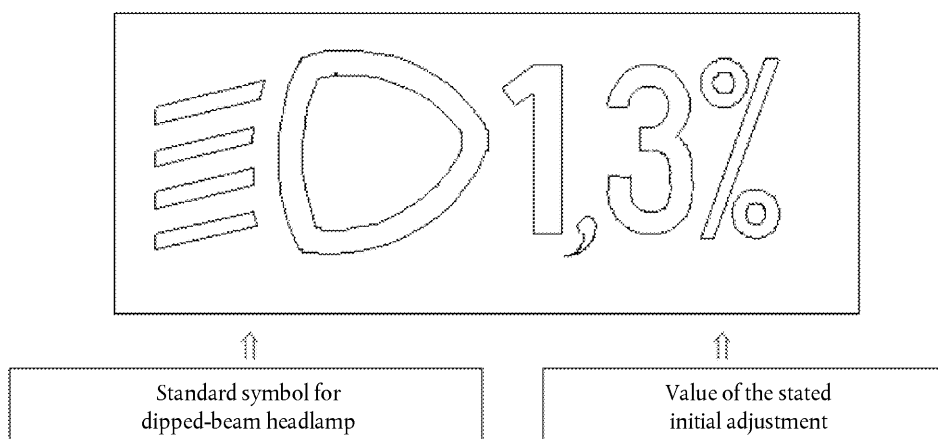
5.5.4. Requirements have been met, if, under all loading conditions, the variation between the measured initial inclination determined in accordance with paragraph 5.2 and the inclination measured under each loading condition is less than the values calculated in paragraph 5.5.1 (without safety margin).

5.5.5. If only one of the calculated upper or lower limits of variation is exceeded, the manufacturer shall be permitted to choose a different value for the stated initial inclination, within the limits specified for approval.

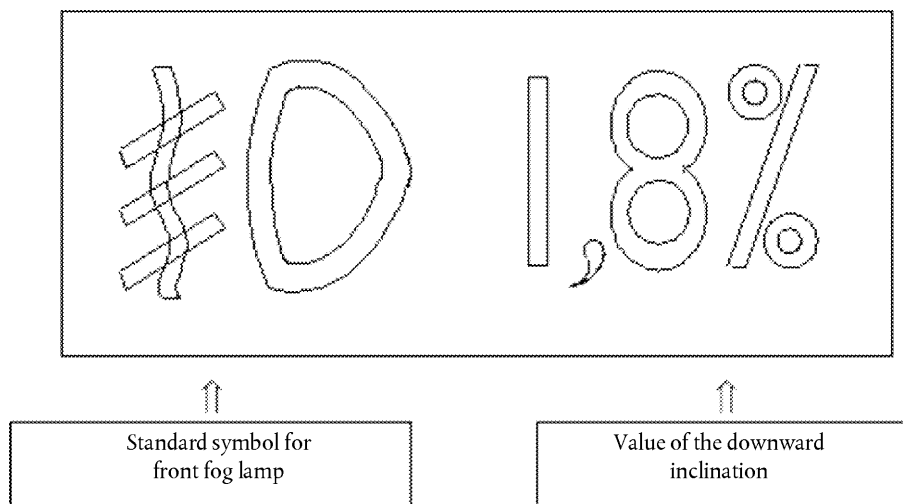
ANNEX 7

**INDICATION OF THE DOWNWARD INCLINATION OF THE DIPPED-BEAM HEADLAMPS CUT-OFF
REFERRED TO IN PARAGRAPH 6.2.6.1.1 AND DOWNWARD INCLINATION OF THE FRONT FOG LAMP
CUT-OFF REFERRED TO IN PARAGRAPH 6.3.6.1.2 OF THIS REGULATION***Example 1*

The size of the symbol and characters is left to the discretion of the manufacturer.

*Example 2*

The size of the symbol and characters is left to the discretion of the manufacturer.



ANNEX 8

THE CONTROLS FOR THE HEADLAMP-LEVELLING DEVICES REFERRED TO IN PARAGRAPH 6.2.6.2.2 OF THIS REGULATION

1. SPECIFICATIONS

1.1. Downward inclination of the dipped-beam shall in all cases be produced in one of the following ways:

- (a) By moving a control downwards or to the left;
- (b) By rotating a control in a counter clockwise direction;
- (c) By depressing a button (push-pull control).

If several buttons are used to adjust the beam, the button which gives the greatest downward inclination shall be installed to the left or below the button(s) for other dipped-beam positions.

A rotary control which is installed edge-on, or with only the edge visible, should follow the operating principles of control of types (a) or (c).

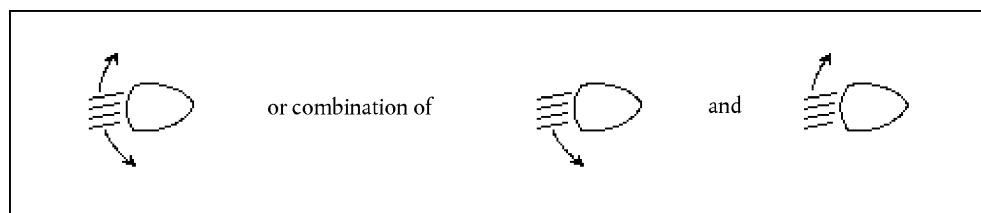
1.1.1. This control shall carry symbols indicating clearly the movements corresponding to the downward and upward inclination of the dipped-beam.

1.2. The '0' position corresponds to the initial inclination according to paragraph 6.2.6.1.1 of this Regulation.

1.3. The '0' position which, according to paragraph 6.2.6.2.2 of this Regulation has to be a 'stop position', need not necessarily be at the end of the scale.

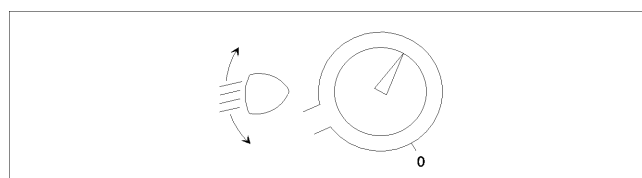
1.4. The marks used on control shall be explained in the owner's handbook.

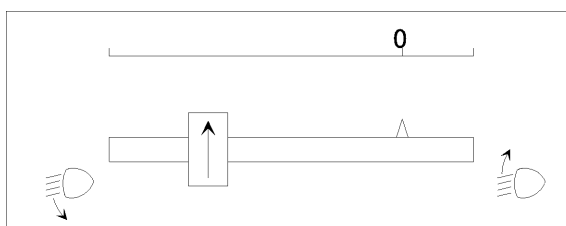
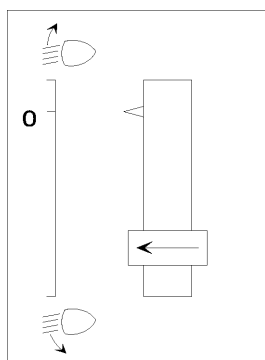
1.5. Only the following symbols may be used to identify the controls:



Symbols employing five lines instead of four may also be used

Example 1



Example 2*Example 3*

ANNEX 9

CONTROL OF CONFORMITY OF PRODUCTION

1. TESTS

1.1. Position of lamps

The position of lamps, as defined in paragraph 2.7 of this Regulation, in width, in height and in length shall be checked in accordance with the general requirements set out in paragraphs 2.8 to 2.10, 2.14 and 5.4 of this Regulation.

The values measured for the distances shall be such that the individual specifications applicable to each lamp are fulfilled.

1.2. Visibility of lamps

1.2.1. The angles of geometric visibility shall be checked in accordance with paragraph 2.13 of this Regulation.

The values measured for the angles shall be such that the individual specifications applicable to each lamp are fulfilled except that the limits of the angles may have an allowance corresponding to the $\pm 3^\circ$ variation permitted in paragraph 5.3 for the mounting of the light-signalling devices.

1.2.2. The visibility of red light towards the front and of white light towards the rear shall be checked in accordance with paragraph 5.10 of this Regulation.

1.3. Alignment of dipped-beam headlamps and class 'F3' front fog lamps towards the front

1.3.1. Initial downward inclination

The initial downward inclination of the cut-off of the dipped-beam and the class 'F3' front fog lamps shall be set to the plated figure as required and shown in Annex 7.

Alternatively the manufacturer shall set the initial aim to a figure that is different from the plated figure where it can be shown to be representative of the type approved when tested in accordance with the procedures contained in Annex 6 and in particular paragraph 4.1.

1.3.2. Variation of inclination with load

The variation of the dipped-beam downward inclination as a function of the loading conditions specified within this section shall remain within the range:

0,2 per cent to 2,8 per cent for headlamp mounting height $h < 0,8$;

0,2 per cent to 2,8 per cent for headlamp mounting height $0,8 \leq h \leq 1,0$; or

0,7 per cent to 3,3 per cent (according to the aiming range chosen by the manufacturer at the approval);

0,7 per cent to 3,3 per cent for headlamp mounting height $1,0 < h \leq 1,2$ m;

1,2 per cent to 3,8 per cent for headlamp mounting height $h > 1,2$ m.

In the case of a class 'F3' front fog lamp with (a) light source(s) having a total objective luminous flux which exceeds 2 000 lumens, the variation of the downward inclination as a function of the loading conditions specified within this section shall remain within the range:

0,7 per cent to 3,3 per cent for front fog lamp mounting height $h \leq 0,8$;

1,2 per cent to 3,8 per cent for front fog lamp mounting height $h > 0,8$ m.

The states of loading to be used shall be as follows, as indicated in Annex 5 to this Regulation, for every system adjusted accordingly.

1.3.2.1. Vehicles in category M_1 :

Paragraph 2.1.1.1.

Paragraph 2.1.1.6 taking into account

Paragraph 2.1.2.

1.3.2.2. Vehicles in category M_2 and M_3 :

Paragraph 2.2.1.

Paragraph 2.2.2.

1.3.2.3. Vehicles in category N with load surfaces:

Paragraph 2.3.1.1.

Paragraph 2.3.1.2.

1.3.2.4. Vehicles in category N without load surfaces:

1.3.2.4.1. Drawing vehicles for semi-trailers:

Paragraph 2.4.1.1.

Paragraph 2.4.1.2.

1.3.2.4.2. Drawing vehicles for trailers:

Paragraph 2.4.2.1.

Paragraph 2.4.2.2.

1.4. Electrical connections and tell-tales

The electrical connections shall be checked by switching on every lamp supplied by the electrical system of the vehicle.

The lamps and tell-tales shall function in accordance with the provisions set out in paragraphs 5.11 to 5.14 of this Regulation and with the individual specifications applicable to each lamp.

1.5. Light intensities

1.5.1. Main-beam headlamps

The aggregate maximum intensity of the main beam headlamps shall be checked by the procedure described in paragraph 6.1.9.2 of this Regulation. The value obtained shall be such that the requirement in paragraph 6.1.9.1 of this Regulation is fulfilled.

- 1.6. The presence, number, colour, arrangement and, where applicable, the category of lamps shall be checked by visual inspection of the lamps and their markings.

These shall be such that the requirements set out in paragraphs 5.15 and 5.16 as well as in the individual specifications applicable to each lamp are fulfilled.

ANNEX 10

RESERVED

ANNEX 11

VISIBILITY OF CONSPICUITY MARKINGS TO THE REAR, FRONT AND SIDE OF A VEHICLE

(See paragraph 6.21.5 of this Regulation)

Figure 1a

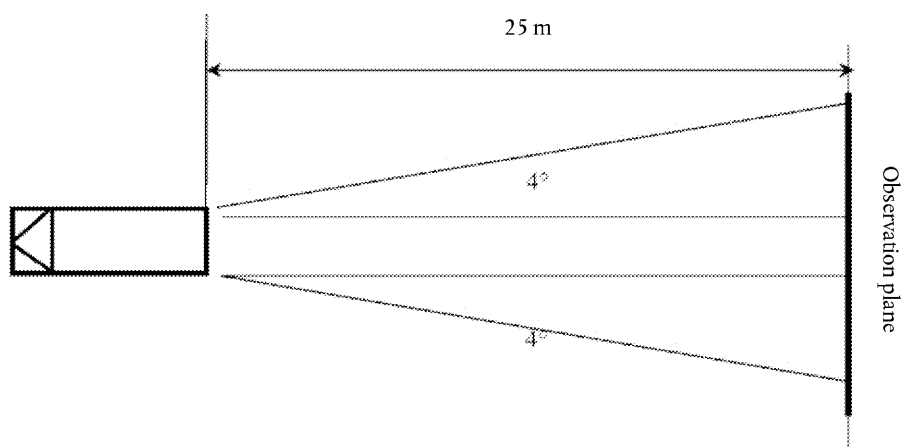
Rear

Figure 1b

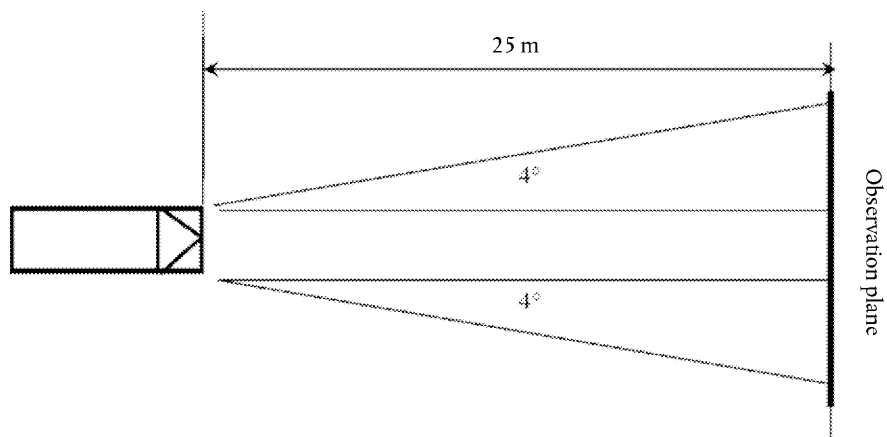
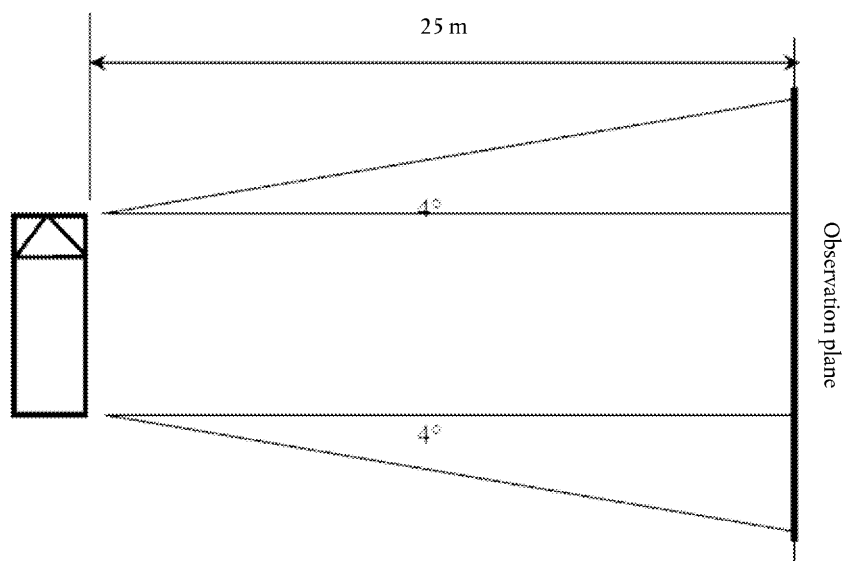
Front (trailers only)

Figure 2

Side

ANNEX 12

TEST DRIVE

1. Test drive specifications for the automatic control of the main-beam headlamps
 - 1.1. The test drive shall be carried out in clear atmosphere ⁽¹⁾ and with clean head-lamps
 - 1.2. The test course shall comprise test sections with traffic conditions, at speed corresponding to the relevant type of road, as described in Table 1 below:

Table 1

Test Section	Traffic conditions	Road type		
		Urban areas	Multi-lane road, e.g. motorway	Country road
	Speed	50 ± 10 km/h	100 ± 20 km/h	80 ± 20 km/h
	Average percentage of the full test course length	10 per cent	20 per cent	70 per cent
A	Single oncoming vehicle or single preceding vehicle in a frequency so that the main beam will switch ON and OFF.		X	X
B	Combined oncoming and preceding traffic situations, in a frequency so that the main beam will switch ON and OFF.		X	X
C	Active and passive overtaking manoeuvres, in a frequency so that the main beam will switch ON and OFF.		X	X
D	Oncoming bicycle, as described in paragraph 6.1.9.3.1.2.			X
E	Combined oncoming and preceding traffic situations	X		

- 1.3. Urban areas shall comprise roads with and without illumination.
- 1.4. Country roads shall comprise sections having two lanes and sections having four or more lanes and shall include junctions, hills and/or slopes, dips and winding roads.
- 1.5. Multi-lane roads (e.g. motorways) and country roads shall comprise sections having straight level parts with a length of more than 600 m. Additionally they shall comprise sections having curves to the left and to the right.
- 1.6. Dense traffic situations shall be taken into account.
2. Test drive specifications for adaptive main-beam headlamps
 - 2.1. The test drive shall be carried out in clear atmosphere ⁽¹⁾ and with clean head-lamps.
 - 2.2. The test course shall comprise test sections with traffic conditions, at speed corresponding to the relevant type of road, as described in Table 2 below:

⁽¹⁾ Good visibility (meteorological optical range MOR > 2 000 m defined according to WMO, Guide to Meteorological Instruments and Methods of Observation, Sixth Edition, ISBN: 92-63-16008-2, pp 1. 9. 1/1. 9. 11, Geneva 1996).

Table 2

Test Section	Traffic conditions	Road type		
		Urban areas	Multi-lane road, e.g. motorway	Country road
	Speed	50 ± 10 km/h	100 ± 20 km/h	80 ± 20 km/h
	Average percentage of the full test course length	10 per cent	20 per cent	70 per cent
A	Single oncoming vehicle or single preceding vehicle in a frequency so that the adaptive main beam will react to demonstrate the adaptation process.		X	X
B	Combined oncoming and preceding traffic situations. in a frequency so that the adaptive main beam will react to demonstrate the adaptation process.		X	X
C	Active and passive overtaking manoeuvres, in a frequency so that the adaptive main beam will react to demonstrate the adaptation process.		X	X
D	Oncoming bicycle, as described in paragraph 6.22.9.3.1.2.			X
E	Combined oncoming and preceding traffic situations	X		

2.3. Urban areas shall comprise roads with and without illumination.

2.4. Country roads shall comprise sections having two lanes and sections having four or more lanes and shall include junctions, hills and/or slopes, dips and winding roads.

2.5. Multi lane roads (e.g. motorways) and country roads shall comprise sections having straight level parts with a length of more than 600 m. Additionally they shall comprise of sections having curves to the left and to the right.

2.6. Dense traffic situations shall be taken into account

2.7. For the test sections A and B in the table above the engineers conducting the tests shall evaluate and record the acceptability of the performance of the adaptation process in relation to oncoming and preceding road users. This means that the test engineers shall be seated in the vehicle being tested and additionally be seated in the oncoming and preceding vehicles.

ANNEX 13

AUTOMATIC SWITCHING CONDITIONS DIPPED-BEAM HEADLAMPS

Automatic switching conditions dipped-beam headlamps ⁽¹⁾

Ambient light outside the vehicle ⁽²⁾	Dipped-beam headlamps	Response time
less than 1 000 lux	ON	no more than 2 seconds
between 1 000 lux and 7 000 lux	at manufacturer's discretion	at manufacturer's discretion
more than 7 000 lux	OFF	more than 5 seconds, but no more than 300 seconds

⁽¹⁾ Compliance with these conditions shall be demonstrated by the applicant, by simulation or other means of verification accepted by the Type Approval Authority.

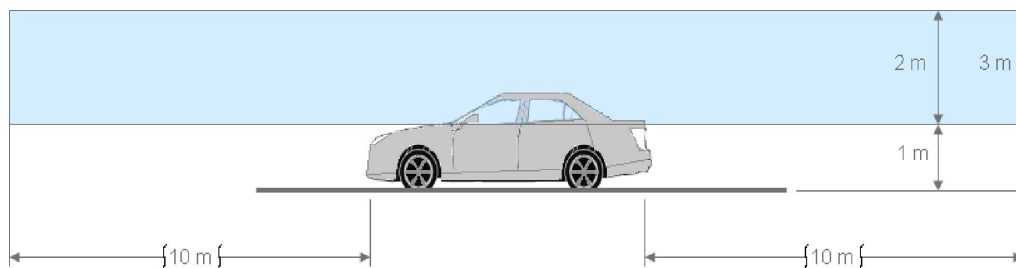
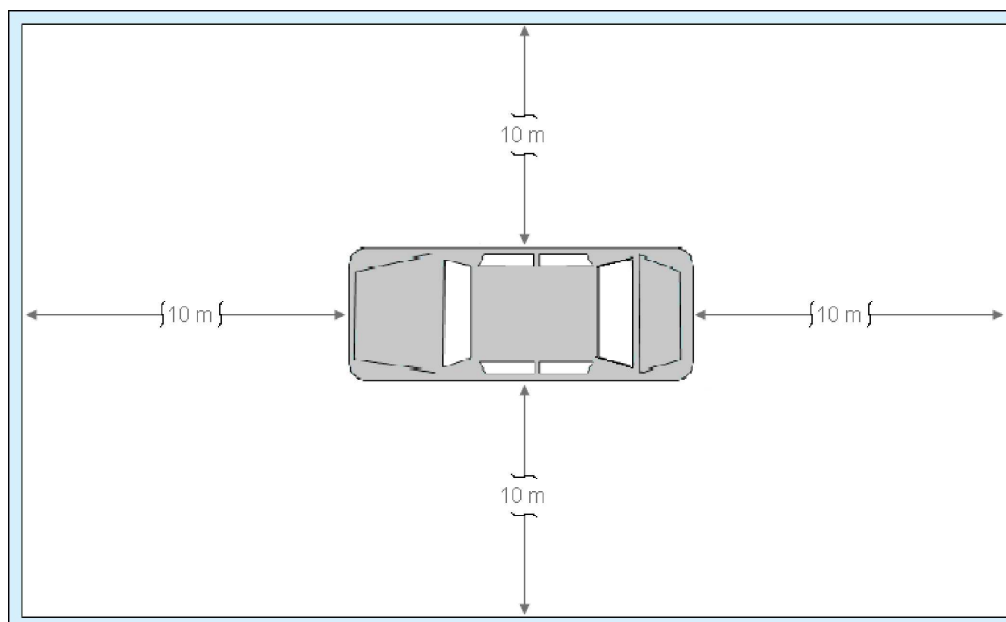
⁽²⁾ The illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the Type Approval Authority.

ANNEX 14

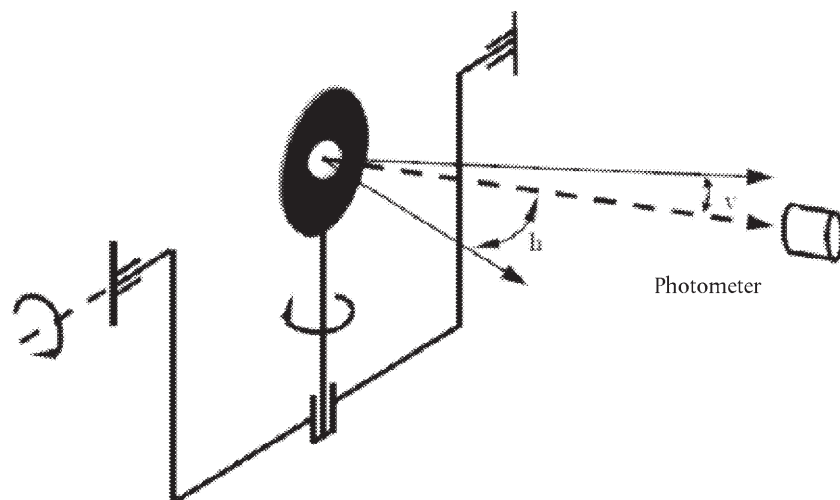
OBSERVING AREA TOWARDS THE APPARENT SURFACE OF MANOEUVRING AND COURTESY LAMPS

Zones of observation

This drawing shows the zone from one side, the other zones are from the front, the rear and from the other side of the vehicle

**Boundaries of the zones**

ANNEX 15

**GONIO(PHOTO)METER SYSTEM USED FOR THE PHOTOMETRIC MEASUREMENTS AS DEFINED IN
PARAGRAPH 2.34 OF THIS REGULATION**

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