Compulsory Specification for

Child restraints for use in motor vehicles

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DEPARTMENT OF TRADE AND INDUSTRY
DEPARTEMENT VAN HANDEL EN NYWERHEID

No. R. 862 **20 June 2003**

STANDARDS ACT, 1993

WITHDRAWAL AND REPLACEMENT OF THE COMPULSORY SPECIFICATION FOR CHILD RESTRAINTS FOR USE IN MOTOR VEHICLES

I, Alexander Erwin, Minister of Trade and Industry, hereby under section 22 (1) (a) (i), (iii) and (8) of the Standards Act, 1993 (Act No. 29 of 1993), and on recommendation of the Council of the South African Bureau of Standards, withdraw the compulsory specification for child restraints for use in motor vehicles as published by Government Notice No. R642 (Government Gazette 17955) of 2 May 1997, and declare the compulsory specification for child restraints for use in motor vehicles as set out in the Schedule to be a compulsory specification, with effect from the date two (2) months after the date of publication of this notice.

A Erwin
Minister of Trade and Industry

SCHEDULE

COMPULSORY SPECIFICATION FOR CHILD RESTRAINTS FOR USE IN MOTOR VEHICLES

1 Scope

This specification applies to child restraints that are suitable for installation in power-driven vehicles that have three or more wheels and meet the requirements of SABS 1429, *Motor vehicle safety – Strength of seats and their anchorages,* and SABS 1430, *Motor vehicle safety – Anchorages for restraining devices in motor vehicles*, and that are not intended for use with folding (tip-up) seats or with side-facing seats.

NOTE This safety specification is based largely on ECE Regulation No. 44, Revision 1 of 5 June 1998, *Uniform provisions concerning the approval of restraining devices for child occupants of power-driven vehicles ("child restraint system").*

2 Definitions

For the purposes of this specification, the following definitions apply:

2.1
additional anchorage
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 that is additional to the anchorage covered by SABS 1430, *Motor vehicle safety – Anchorages for restraining devices in motor vehicles*

2.2
adjusting device
adjuster
device that is intended to enable a restraint or its attachments to be adjusted to the physique of the wearer, or to the configuration of the vehicle (or to both). The adjusting device can be a part of the buckle, or can be a retractor or any other part of the safety belt

2.2.1
adjusting device mounted direct on child restraint
adjusting device for the integral harness that is mounted direct on the child restraint, as opposed to being supported direct by the webbing that it is designed to adjust

2.2.2
quick adjusting device
adjusting device that can be operated by one hand, in one smooth movement

2.3
adjustment system
complete system by which a vehicle seat or its parts can be adjusted to suit the physique of the seat's adult occupant. This system permits longitudinal displacement, or vertical displacement, or angular displacement

2.4
attachments
parts of the child restraint (including the securing components) that enable the child restraint to be secured firmly to the vehicle structure, either direct or through the vehicle seat

2.5
belt
child restraint that comprises a combination of straps with a securing buckle, adjusting devices and attachments

2.5.1
harness belt
belt that comprises the lap belt, the shoulder restraints and, if fitted, the crotch strap

2.5.2
Y-shaped belt
belt where the combination of straps is formed by a strap that is guided between the child's legs and a strap for each shoulder

2.6
booster cushion
firm cushion that can be used in combination with an adult safety belt and that is restrained either by the safety belt or by separate means

2.7
buckle
quick-release device that enables the child to be held by the restraint or the restraint to be held by the structure of the car, and that can be opened quickly. The buckle can incorporate the adjusting device

2.8
buckle release button

2.8.1
enclosed buckle release button
buckle release button that does not permit release of the buckle by using a sphere of diameter 40 mm

2.8.2
non-enclosed buckle release button
buckle release button that permits release of the buckle by using a sphere of diameter 40 mm

2.9
carry-cot
child restraint system that is intended to accommodate and restrain the child in the lying-down position, with the child's spine perpendicular to the median longitudinal plane of the vehicle, and that is so designed as to distribute the restraining forces over the child's head and body (excluding the limbs) in the event of a frontal collision or an abrupt deceleration

2.10
carry-cot restraint
device that is used to restrain a carry-cot by securing it to the structure of the vehicle

2.11
chair
structure that is a constituent part of the child restraint and that is intended to accommodate the child in the seated position

2.12
chair support
device that serves to raise the child safety chair

2.13
child restraint system
child restraint
arrangement of components that can comprise a combination of straps or flexible components with a securing buckle, adjusting devices, attachments and, in some cases, a supplementary device such

as a carry-cot, an infant carrier, a supplementary chair, or an impact shield (or both), capable of being anchored inside 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 an abrupt deceleration of the vehicle, by limiting the mobility of the wearer's body

2.13.1
integral class child restraint system
system that comprises a combination of straps or flexible components with a securing buckle, an adjusting device, attachments and, in some cases, a supplementary chair or an impact shield (or both), and that can be anchored by its own integral strap or straps

2.13.2
non-integral class child restraint system
system that comprises a partial restraint that, when used in conjunction with an adult safety belt that passes round the body of the child or restrains the device in which the child is placed, forms a complete restraint system

2.14
child-restraint type
refers to a group of child restraints that do not differ in such essential respects as the category (see 3.2) and the mass group (see 3.1), the position and the orientation (forward facing or rearward facing) in which the restraints are to be used, the geometry of the restraints, the dimensions, mass, material and colour of the seat, the padding and the impact shield, the material, weave, dimensions and colour of the straps, and the rigid components (e.g. buckle and attachments)

2.15
child safety chair
child restraint that incorporates a chair in which the child is seated

2.16
child support
that part of the child restraint that serves to raise the child in the child restraint

2.17
displacement system
device that enables a vehicle 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

2.18
energy absorber
device that is designed to dissipate energy independently of, or jointly with, a strap, and that forms part of a child restraint

2.19
forward facing
facing in the normal direction of travel of the vehicle

2.20
impact shield
device that is secured in front of the child and that is designed to distribute the restraining forces over the greater part of the height of the child's body in the event of a frontal impact

2.21
inclined position
special position of the chair, which allows the child to recline

2.22
infant carrier
restraint system that is intended to accommodate the child in the rearward-facing, semi-recumbent position and that is so designed as to distribute the restraining forces over the child's head and body (excluding the limbs) in the event of a collision or an abrupt deceleration

2.23
locking system
device that ensures that a vehicle seat and the constituent parts are maintained in the position of use

2.24
lock-off device
device that 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

2.24.1
class A lock-off device
device that prevents the child from pulling the webbing from the retractor through to the lap part of the adult safety belt when the belt is used to restrain the child direct

NOTE When supplied with group I restraints (see 3.1(c)), the device enables compliance with 5.2.9.

2.24.2
class B lock-off device
device that allows the retention of an applied tension in the lap part of an adult safety belt, when the belt is used to restrain the child restraint. The device is intended to prevent webbing from slipping from the retractor, which would result in the tension being released and the restraint being in a non-optimal position

2.25
lying-down position
prone position
supine position
position in which at least the head and body of the child are on a horizontal surface when the child is at rest in the child restraint

2.26
partial restraint
device such as a booster cushion that, when used in conjunction with an adult safety belt that passes round the body of the child or restrains the device in which the child is placed, forms a complete restraint system

2.27
rearward facing
facing in the direction opposite to the normal direction of travel of the vehicle

2.28
restraint anchorages
parts of the vehicle structure, or of the vehicle seat structure, to which the child-restraint attachments are secured

2.29
retractor
device that is designed to accommodate, in part or entirely, the strap of a child restraint

2.29.1
automatically locking retractor
retractor that allows extraction of the desired length of a strap and, when the buckle is fastened, automatically adjusts the strap to the wearer's physique, thereby preventing further extraction of the strap without voluntary intervention by the wearer

2.29.2
emergency-locking retractor
retractor that does not restrict the belt wearer's freedom of movement in normal driving conditions. The retractor has length-adjusting devices that automatically adjust the strap to the wearer's physique, and a locking mechanism that is actuated in an emergency, either by the deceleration of the vehicle, extraction of the strap from the retractor, or any other automatic means (single sensitivity), or by a combination of any of these means (multiple sensitivity)

2.30
seat type
descriptive of a category of vehicle seats that is similar in such essential respects as the shape, dimensions and materials of the seat structure, the types and dimensions of the seat adjustment and locking systems, and the type and dimensions of the adult safety belt anchorage on the seat, of the seat anchorage and of the affected parts of the vehicle structure

2.31
special-needs restraint
child restraint system designed for children who have special needs as a result of either a physical or a mental handicap

2.32
strap
flexible component that is designed to transmit restraining forces

2.32.1
child restraining strap
strap that is a constituent part of a belt and that is intended to restrain only the body of the child

2.32.2
child-restraint attachment strap
strap that attaches the child restraint to the structure of the vehicle and that can be a part of the vehicle-seat retaining device

2.32.3
crotch strap
strap (or divided straps, where two or more pieces of webbing make up the strap) that is attached to the child restraint and the lap strap, that is so positioned as to pass between the child's thighs, and that is designed to prevent the child from sliding under the lap belt in normal use and to prevent the lap belt from moving up off the child's pelvis in the event of an impact

2.32.4
guide strap
strap that keeps the shoulder strap of the adult safety belt in a position that is suitable to the child

NOTE The guide strap is not intended to carry a significant part of the dynamic load.

2.32.5
lap strap
strap that, 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 is intended to restrain, the child's pelvic region

2.32.6
shoulder strap
that part of the belt that is intended to restrain the child's upper torso

2.33
vehicle seat
structure, that can be integral with the vehicle structure, that is complete with trim, and that is intended to seat one adult person

2.34
group of vehicle seats
either a bench seat or a plurality of vehicle seats that 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 that passes between those anchorages), each seat accommodating one or more seated adult persons

2.35
vehicle bench seat
structure, complete with trim and intended to seat more than one adult person

2.36
vehicle front seats
group of vehicle seats that is situated foremost in the passenger compartment, i.e. that has no other seat in front of it

2.37
vehicle rear seats
fixed, forward-facing vehicle seats that are situated behind another group of vehicle seats

2.38
vehicle seat anchorage
system, including the affected parts of the vehicle structure, by which a vehicle seat as a whole is secured to the vehicle structure

3 Classification of child restraints

3.1 Mass group

Each child restraint can be classified as belonging to one of the following five mass groups in terms of the mass that it can support:

a) **group 0**: for children of mass less than 10 kg;

b) **group 0+**: for children of mass less than 13 kg;

c) **group I**: for children of mass from 9 kg to 18 kg;

d) **group II**: for children of mass from 15 kg to 25 kg; and

d) **group III**: for children of mass from 22 kg to 36 kg.

3.2 Category

Each child restraint can be classified as belonging to one of the following four categories in terms of the conditions in which it can be used:

a) **a universal category**: for use as specified in 5.1.1 and 5.1.3.1 on most vehicle seat positions;

b) **a restricted category**: for use as specified in 5.1.1 and 5.1.3.1 in designated seat positions for particular vehicle types as indicated by either the child restraint manufacturer or the vehicle manufacturer;

c) **a semi-universal category**: for use as specified in 5.1.1 and 5.1.3.2; and

d) **a specific vehicle category**: for use either in specific vehicle types in accordance with 5.1.2 and 5.1.3.3, or as a built-in child restraint.

3.3 Class

Each child restraint can be classified as belonging to one of the following two classes:

a) **integral class**, that comprises a combination of straps or flexible components with a securing buckle, an adjusting device, attachments and, in some cases, a supplementary chair, or an impact shield (or both), that is capable of being anchored by its own integral strap or straps; or

b) **non-integral class**, that can comprise a partial restraint (see 2.26) that, when used in conjunction with an adult seat belt that passes round the body of the child or restrains the device in which the child is placed, forms a complete restraint system.

4 Markings

4.1 The child restraint shall be clearly and indelibly marked with the manufacturer's name, trade name or trade mark, and part number, and with a means of identification for traceability purposes.

4.2 One of the plastics parts of the child restraint device (such as the shell, impact shield, or booster cushion, but other than the belt(s)) shall be clearly and indelibly marked with the year of manufacture.

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 correct routing of the webbing shall be clearly marked on the product by colour coding, as follows:

a) red when the restraint is installed forward-facing; and

b) blue when the device is rearward facing.

The same colours shall be used on the labels on the device that illustrate the methods of use.

The separate routes of the lap and shoulder straps of the safety belt shall each be distinguished on the product by colour coding, or by words (or both).

4.4 The marking defined in this clause shall be visible with the restraint in the vehicle. In the case of group 0 restraints, this marking shall also be visible with the child in the restraint.

4.5 Rearward-facing child restraints shall have a permanently attached label, visible in the installed position, that bears the warning:

"EXTREME HAZARD – DO NOT USE ON PASSENGER SEATS EQUIPPED WITH AIRBAGS".

4.6 In the case of child restraints that can be used forward facing and rearward facing, the following words shall be included:

"IMPORTANT – DO NOT USE FORWARD FACING BEFORE THE CHILD'S WEIGHT EXCEEDS ..... (Refer to instructions)".

5 General requirements

5.1 Positioning and securing on the vehicle

5.1.1 The use of child restraints in the universal, semi-universal and restricted categories (see 3.2) is permitted in the front and the rear seating position if the restraints are fitted in compliance with the manufacturer's instructions.

5.1.2 The use of child restraints in the specific vehicle category (see 3.2) is permitted in all seat positions and in the luggage area if the restraints are fitted in compliance with the manufacturer's instructions. In the case of a rearward-facing restraint, the design shall ensure that the child's head is supported when the restraint is in use.

5.1.3 Depending on the category to which it belongs, the child restraint shall be secured either to the vehicle structure, or to the seat structure.

5.1.3.1 In the case of the universal category and the restricted category, restraints shall be secured only by means of an adult safety belt (with or without a retractor) that meets the requirements of SABS 1080, *Restraining devices (safety belts) for occupants of adult build in motor vehicles (revised requirements)*, or of any equivalent standard, and that has been fitted to anchorages that meet the requirements of the said SABS 1430.

5.1.3.2 In the case of the semi-universal category, restraints shall be secured by means of the lower anchorages prescribed in the said SABS 1430 and additional anchorages that meet the requirements of annex A of this specification.

5.1.3.3 In the case of the specific vehicle category, the restraints shall be secured by means of the anchorages designed by the vehicle manufacturer or by the child restraint manufacturer.

5.1.4 In the case of child restraining straps or child-restraint attachment straps that utilize belt anchorages to which an adult safety belt or belts are already fitted, the test authority shall check that

a) the effective adult anchorage position complies with the said SABS 1430,

b) the effective operation of the one device is not hindered by the other, and

c) the buckles of the adult system and the additional system are not interchangeable.

5.1.5 In the case of child restraint systems that utilize bars (or extra devices attached to the anchorages that comply with the said SABS 1430) that move the effective anchorage position outside the scope of the said SABS 1430, the following shall apply:

a) the test authority shall apply the requirements of annex A of this specification, to the bar and to the fastenings;

b) the bar shall be included in the dynamic test, with the loading applied to the mid-position of the bar and to its greatest extension, if the bar is adjustable; and

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

5.1.6 The booster cushion shall be restrained by either an adult safety belt or by separate means.

5.1.7 The child restraint manufacturer shall declare in writing that the toxicity of the materials used in the manufacture of the child restraints and that are accessible to the restrained child complies with the relevant clauses of EN 71-3 *Safety of toys – Part 3: Migration of certain elements*. Tests to confirm the validity of the declaration may be carried out at the discretion of the test authority.

This subclause does not apply to child restraints of group II and group III.

NOTE The relevant EN specification can be obtained from CEN, 2 Rue Bréderode BP 5, B-1000 Bruxelles, Belgium, or from the SABS.

5.1.8 The child restraint manufacturer shall declare in writing that the flammability of the materials used in the manufacture of the child restraint complies with annex 4 of the *ECE consolidated resolution on the construction of vehicles* (RE 3) (1997). Tests to confirm the validity of the declaration can be carried out at the discretion of the test authority.

5.1.9 In the case of rearward-facing child restraints supported by the vehicle dashboard, the dashboard is assumed to be sufficiently rigid.

5.1.10 In the case of child restraints of the universal category, the main load-bearing contact point between the child restraint and the adult safety belt shall be not less than 150 mm from the C_r axis (see figure 1 to figure 4) when measured with the child restraint on the dynamic test bench. This shall apply to all adjustment configurations.

5.1.11 The maximum length of an adult safety belt that may be used to secure a universal category child restraint on the dynamic test bench, using the appropriate standard safety belt, is defined in annex B of this specification.

5.1.12 Child restraints of group 0 and group 0+ shall not be used forward facing.

5.2 Configuration

5.2.1 The configuration of the child restraint shall be such that

a) the restraint gives the required protection in any intended position of the restraint system; in the case of 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 that might be present,

b) 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 strap and lap strap shall be capable of movement relative to one another during the procedure prescribed in 6.2.1.4,

NOTE In these cases, the belt assembly of the child restraint system may be designed with two or more connecting parts. In the case of special-needs restraints it is recognized that the additional restraining devices will restrict the speed by which the child can be installed and removed. However, the additional devices shall be designed to release as quickly as possible.

c) setting the restraint in the inclined position, if possible, can be performed without readjustment of the straps; a deliberate hand-action shall be required in order to put the restraint in the inclined position,

d) a group 0, group 0+ and group I restraint system shall keep the child so positioned that the required protection is provided, even when the child is asleep, and

e) to prevent submarining, either by impact or through restlessness, a crotch strap shall be required on all forward-facing group I restraints that incorporate an integral harness belt assembly; 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 either the 9 kg or the 15 kg dummy.

5.2.2 In the case of groups I, II and III, all restraints that use a lap strap shall positively guide the lap strap to ensure that the loads transmitted by the lap strap are transmitted through the pelvis.

5.2.3 All straps of the restraint shall be so placed that they cannot cause discomfort to the child during 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 test manikin.

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

NOTE Y-shaped belts may only be used in rearward-facing child restraint systems.

5.2.5 The child restraint shall be so designed and installed as to

a) minimize the danger of injury to the child and to other occupants of the vehicle through, for example, sharp edges or protrusions (as defined in SABS 1047, *Motor vehicle safety: Interior fittings (passenger cars)*),

b) not exhibit sharp edges or protrusions that are liable to cause damage to vehicle seat covers or to occupants' clothing,

c) not subject weak parts of the child's body (abdomen, crotch, etc.) to the supplementary inertial forces that the restraint sets up, and

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

5.2.6 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, as far as possible. Special-needs restraints may have additional restraining devices; these shall be designed so as to avoid any risk of incorrect assembly and so that their means of release and mode of operation are immediately obvious to a rescuer in an emergency.

5.2.7 Where a child restraint intended for group I, group II and for groups I and II combined, includes a chair back, the internal height of the latter, determined in accordance with the diagram given in annex C of this specification, shall be not less than 500 mm.

5.2.8 Only automatically locking retractors or emergency locking retractors may be used.

5.2.9 In the case of group I restraints, it shall not be possible for the child to easily loosen that part of the system that restrains the pelvis after the child has been installed; any device that is designed to restrain the pelvis shall be permanently attached to the child restraint system.

5.2.10 A child restraint may be designed for use in more than one mass group, provided that it satisfies the requirements laid down for each of the groups concerned.

5.2.11 In the case of a child restraint that incorporates a retractor, the retractor shall meet the requirements of 6.2.3.

5.2.12 In the case of a booster cushion, the ease with which the straps and tongue of an adult safety belt pass through the fixture points shall be examined. This applies in particular to booster cushions that are designed for the front seats of cars, and that may have long, semi-rigid stalks. The fixed buckle should not be allowed to pass through the fixture points of booster cushions, or to permit a lie of belt completely different from that of the test trolley.

5.2.13 If the child restraint is designed to restrain more than one child, each restraint system shall be fully independent with regard to load transfer and adjustments.

5.2.14 If the child restraint incorporates inflatable elements, the restraint shall be so designed that the conditions of use (pressure, temperature, humidity) have no influence on its ability to comply with the requirements of this specification.

6 Particular requirements

6.1 Provisions applicable to the assembled restraint

6.1.1 Resistance to corrosion

6.1.1.1 The complete child restraint, or the parts thereof that are liable to corrode, shall be subjected to the corrosion test specified in 7.1.1.

6.1.1.2 After the corrosion test as prescribed in 7.1.1.1 and 7.1.1.2, no sign of deterioration that is likely to impair the proper functioning of the child restraint, and no significant corrosion, shall be visible to the unaided eye of the person conducting the test.

6.1.2 Energy absorption

In the case of a child restraint that has a backrest, the area of the backrest, described in annex D of this specification, shall that comprise such energy-absorbing material that, when tested in accordance with annex E, the peak acceleration is less than 588 m/s^2. This requirement also applies to areas of the impact shield that are in the head strike area.

6.1.3 Overturning

When the child restraint is tested as given in 7.1.2, the test manikin shall not fall out of the restraint and, when the test seat is in the upside-down position, the manikin's head shall not move more than 300 mm from its original position in a vertical direction relative to the test seat.

6.1.4 Dynamic test

6.1.4.1 General

6.1.4.1.1 Child restraints of the universal, the restricted and the semi-universal category shall be tested on the test trolley using the test seat described in F.3 of this specification, and in accordance with 7.1.3.1.

6.1.4.1.2 Child restraints of the specific vehicle category shall be tested with each vehicle model for which the child restraint is intended. The test authority responsible for conducting the tests may reduce the number of vehicle models tested if the models do not differ much in respect of the features mentioned in 6.1.4.1.3(c).

6.1.4.1.3 Child restraints of the specific vehicle category may be tested in one of the following ways:

a) using a vehicle body shell on the test trolley, as given in 7.1.3.2; or

b) using a complete vehicle, as given in 7.1.3.3; or

c) using a sufficient number of parts of the vehicle body shell to be representative of the vehicle structure and impact surfaces.

If the child restraint is intended for use on the rear seat, the test areas 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 on the front seat, the test areas 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.

If the child restraint is intended for use in combination with the adult safety belt(s), the appropriate adult belt(s) shall be included in the test.

The test authority responsible for conducting the tests may permit parts to be excluded from the test if they are found to be superfluous. The tests shall be conducted in accordance with 7.1.3.2.

6.1.4.1.4 If a child restraint system of the specific vehicle category is installed in the area behind the rearmost forward-facing adult seat position (for example, the luggage area), one test with the largest dummy on a complete vehicle, as given in 7.1.3.3, shall be performed. The tests given in 7.1.3.2 may be conducted if required by the manufacturer.

6.1.4.1.5 In the case of a special-needs restraint every dynamic test specified in this specification for each mass group shall be performed twice: first, using the primary means of the restraint and, second, with all restraining devices in use. In these tests, special attention shall be given to the requirements given in 5.2.3 and 5.2.4.

6.1.4.1.6 In the case of a restraint of the non-integral class the safety belt used shall be the standard belt and its anchorage brackets shall be as given in annex B of this specification. This requirement does not apply to child restraints of the specific vehicle category where the safety belt of the vehicle shall be used.

6.1.4.1.7 The dynamic tests shall be conducted on child restraints that have not previously been under load.

6.1.4.1.8 During the dynamic tests, no part of the child restraint that actually helps to keep the child in position shall break, no buckles or locking system or displacement system shall release, and the standard safety belt used to install the child restraint shall not become disengaged from any guide or locking device utilized in the tests.

6.1.4.2 Chest acceleration

6.1.4.2.1 The resultant chest acceleration during the dynamic tests shall not exceed 540 m/s^2, except during periods whose sum does not exceed 3 ms.

6.1.4.2.2 The vertical component of the acceleration from the abdomen towards the head shall not exceed 295 m/s^2, except during periods whose sum does not exceed 3 ms.

NOTE Chest acceleration limits do not apply when the newborn test manikin is used.

6.1.4.3 Abdominal penetration

During the verification described in G.4.5.3 of this specification, there shall be no visible sign that any part of the child restraint has penetrated the modelling clay in the abdomen.

NOTE Because the newborn test manikin is not fitted with any abdominal insert, only a subjective analysis can be used as a guide to abdominal penetration.

6.1.4.4 Manikin displacement

6.1.4.4.1 Child restraints of the universal, restricted and semi-universal categories

6.1.4.4.1.1 Forward-facing child restraints
When the restraint is tested in accordance with 7.1.3.1, the head of the test manikin shall not pass beyond the planes BA and DA, as defined in figure 1.

Dimensions in millimetres

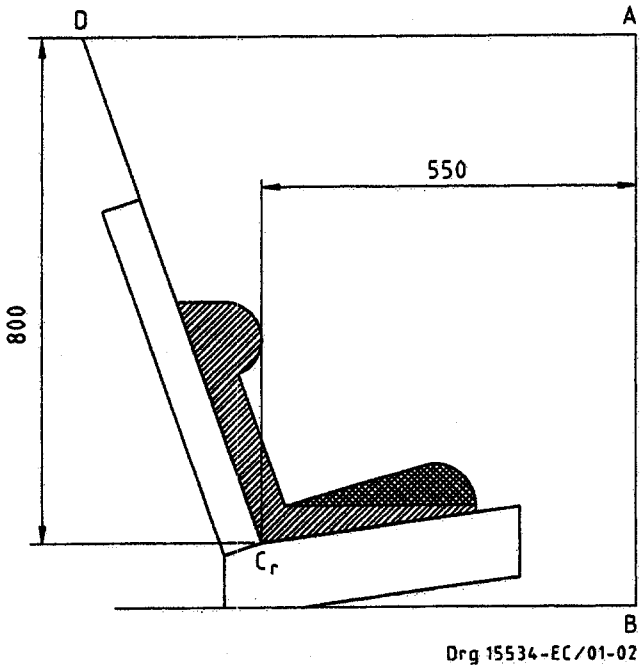


Figure 1 — Arrangement for testing a forward-facing child restraint

6.1.4.4.1.2 Rearward-facing child restraints

6.1.4.4.1.2.1 Child restraints supported by the dashboard

When the restraint is tested in accordance with 7.1.3.1, the head of the test manikin shall not pass beyond the planes AD and DC_r as defined in figure 2.

Dimensions in millimetres

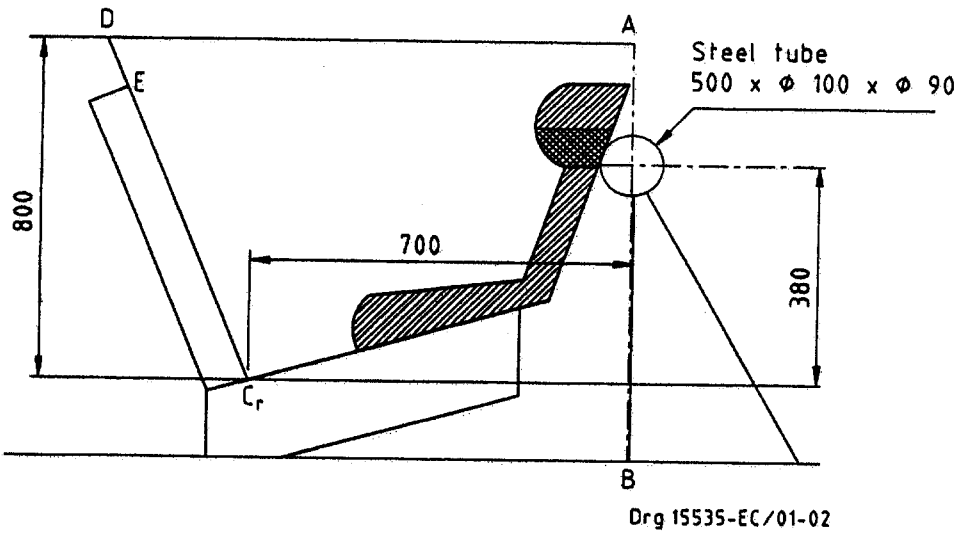


Figure 2 — Arrangement for testing a rearward-facing child restraint (supported by the dashboard)

6.1.4.4.1.2.2 Child restraints of group 0 not supported by the dashboard, and carry-cots

When the restraint is tested in accordance with 7.1.3.1, the head of the manikin shall not pass beyond the planes AB, AD and DE, as defined in figure 3.

Dimensions in millimetres

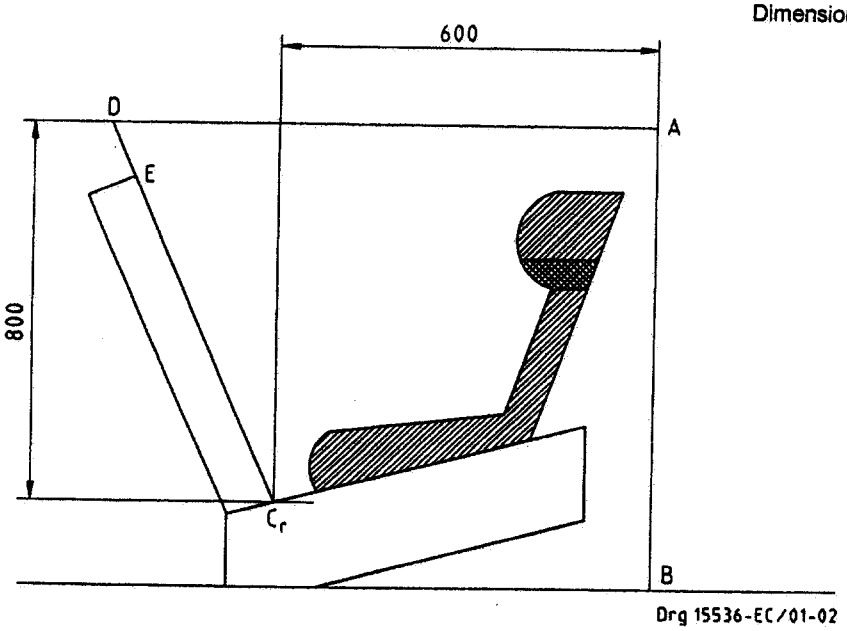


Figure 3 — Arrangement for testing rearward-facing child restraints of group 0 not supported by the dashboard, and carry-cots

6.1.4.4.1.2.3 Child restraints other than group 0 and not supported by the dashboard

When the restraint is tested in accordance with 7.1.3.1, the head of the manikin shall not pass beyond the planes FD, FG and DE, as defined in figure 4.

Dimensions in millimetres

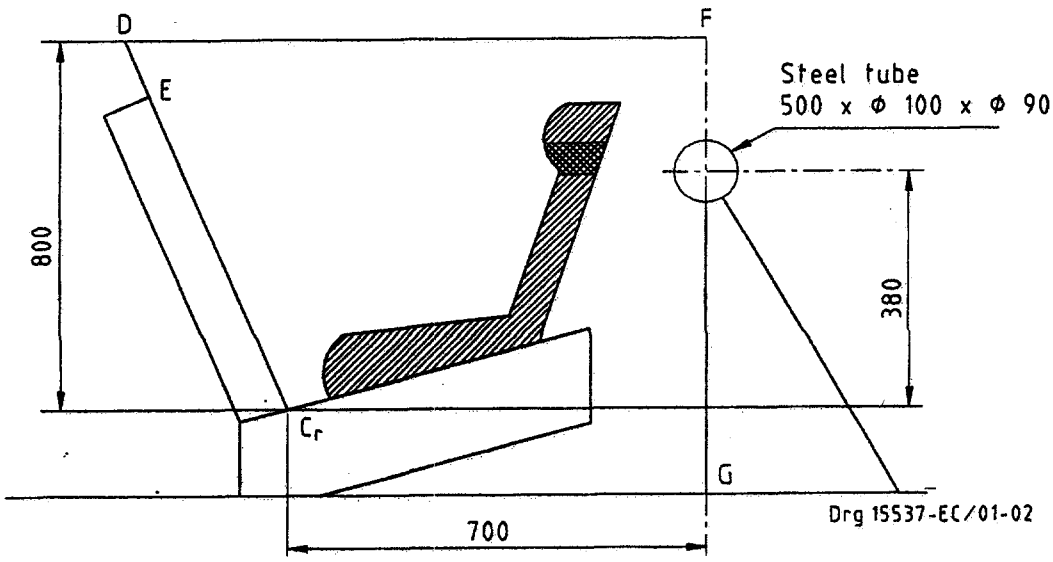


Figure 4 — Arrangement for testing rearward-facing child restraints, other than group 0 and not supported by the dashboard

Where such a child restraint comes into contact with the steel tube (see figure 4) and all the performance criteria are met, one further dynamic test (frontal impact) shall be conducted with the heaviest dummy intended for that child restraint and without the steel tube, and all the requirements other than for forward displacement shall be met.

6.1.4.4.2 Child restraints of the specific vehicle category

When a child restraint of this category is tested using a complete vehicle (see 7.1.3.3) or in a vehicle body shell (see 7.1.3.2), the head of the test manikin shall not come into contact with any part of the vehicle, except as follows: If there is such contact by the head of the test manikin, the speed of impact of the head shall be less than 24 km/h and the part contacted shall meet the requirements for energy-dissipating material laid down in the said SABS 1047 (see 5.2.5). In tests with complete vehicles it shall be possible, after the test, to remove the manikin from the child restraint without the use of tools.

6.2 Requirements applicable to individual components of the restraint

6.2.1 Buckle

6.2.1.1 The buckle shall be so designed as to preclude any possibility of incorrect manipulation. This means, *inter alia*, that it shall not be possible to leave the buckle in a partially closed position, it shall not be possible to exchange the buckle parts inadvertently when the buckle is being locked, and 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 6.2.4.1.1. This subclause is not applicable to belt assemblies already approved in accordance with SABS 1080, *Restraining devices (safety belts) for occupants of adult build in motor vehicles (revised requirements)*, or any equivalent standard in force. In the case of a special-needs restraint only the buckle on the primary means of restraint shall comply with the requirements of 6.2.1.1 to 6.2.1.8, inclusive.

6.2.1.2 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 the buckle by pressure on a button or on a similar device. The surface to which this pressure is applied shall have, in the position of actual unlocking, in the case of enclosed devices, an area of not less than 4,5 cm^2 with a width of not less than 15 mm, and in the case of non-enclosed devices, an area of 2,5 cm^2 with a width of not less than 10 mm.

6.2.1.3 The buckle release area shall be red; no other part of the buckle shall be of this colour.

6.2.1.4 It shall be possible to release the child from the restraint by means of a single operation on a single buckle. In the case of a group 0 and a group 0+ restraint, the child may be removed together with devices such as an infant carrier, a carry-cot or a carry-cot restraint, provided that the child restraint system can be released by operation of a not more than two buckles. A clip connection between the shoulder straps of a harness belt is deemed not to comply with the single operation requirement.

6.2.1.5 In the case of group II and group III restraints, the buckle shall be so placed that the child occupant can reach it. In addition, the buckle shall, for all groups of restraint, be so placed that its purpose and mode of operation are immediately obvious to a rescuer in an emergency.

6.2.1.6 Opening of the buckle shall enable the child to be removed independently of the chair, chair support or impact shield, if fitted. The crotch strap shall be released by operation of the same buckle.

6.2.1.7 The buckle shall be capable of withstanding repeated operation and shall, before the dynamic tests prescribed in 7.1.3, undergo a test that comprises 5 000 opening and closing cycles under normal conditions of use.

6.2.1.8 The buckle shall be subjected to the tests of opening given in 6.2.1.8.1 and 6.2.1.8.2.

6.2.1.8.1 Test under load

6.2.1.8.1.1 A child restraint that has already undergone the dynamic tests prescribed in 7.1.3 shall be used for this test.

6.2.1.8.1.2 The force required to open the buckle in the test given in 7.2.1.1 shall not exceed 80 N.

6.2.1.8.2 No-load test

A buckle that has not previously been subjected to a load shall be used for this test. The force required to open the buckle when it is not under load shall be in the range of 40 N to 60 N for the test given in 7.2.1.2.

6.2.1.9 During the strength test given in 7.2.1.3.2, no part of the buckle or the adjacent straps or adjusters shall break or be detached.

6.2.1.9.1 A harness buckle of mass group 0 and mass group 0+ shall withstand 4 000 N.

6.2.1.9.2 A harness buckle of mass group I and higher shall withstand 10 000 N.

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

6.2.2 Adjusting device

6.2.2.1 The range of adjustment shall be sufficient to permit correct adjustment of the child restraint throughout the mass group for which the restraint is intended and to permit satisfactory installation in all specified vehicle models.

6.2.2.2 All adjusting devices shall be of the quick adjusting type, except that adjusting devices used only for the initial installation of the restraint in the vehicle may be of other than the quick adjusting type.

6.2.2.3 Devices of the quick adjusting type shall be easy to reach when the child restraint is correctly installed and the child or test manikin is in position.

6.2.2.4 A device of the quick adjusting type shall be easily adjustable to the child's physique. In particular, in a test performed in accordance with 7.2.2.1, the force required to operate a manual adjusting device shall not exceed 50 N.

6.2.2.5 Two samples of the child restraint adjusting devices shall be tested as given in 7.2.3. The amount of strap slip shall not exceed 25 mm for one adjusting device or 40 mm for all the adjusting devices when tested according to 7.2.3.

6.2.2.6 The device shall not break or become detached when tested as given in 7.2.2.1.

6.2.2.7 An adjuster mounted direct on the child restraint shall be capable of withstanding repeated operation and shall, before the dynamic tests given in 7.1.3, undergo a test comprising 5 000 ± 5 cycles, as specified in 7.2.7.

6.2.3 Retractors

6.2.3.1 Automatically locking retractors

6.2.3.1.1 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.

6.2.3.1.2 If the retractor is part of a lap strap, the retracting force of the strap shall be not less than 7 N, as measured in the free length between the test manikin and the retractor, in accordance with 7.2.3.1. If the retractor is part of a chest restraint, the retracting force of the strap shall be not less than 2 N and not 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 test manikin and the guide or pulley. If the assembly incorporates a manually or an automatically operated device that prevents the strap from being completely retracted, that device shall not be in operation when these measurements are made.

6.2.3.1.3 The strap shall be repeatedly withdrawn from the retractor and allowed to retract, under the conditions given in 7.2.3.2, until 5 000 cycles have been completed. The retractor shall then be subjected to the corrosion test described in 7.1.1 and to the dust-resistance test described in 7.2.3.5. 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 6.2.3.1.1 and 6.2.3.1.2.

6.2.3.2 Emergency-locking retractors

6.2.3.2.1 An emergency-locking retractor shall, when tested as given in 7.2.3.3, satisfy the requirements given in 6.2.3.2.1.1 to 6.2.3.2.1.4.

6.2.3.2.1.1 It shall be locked when the deceleration of the vehicle reaches 4,4 m/s^2.

6.2.3.2.1.2 It shall not lock for strap accelerations of less than 7,8 m/s^2, as measured in the axis of strap extraction.

6.2.3.2.1.3 It shall not lock when its sensing device is tilted by not more than 12° in any direction from the installation position specified by the manufacturer of the retractor.

6.2.3.2.1.4 It shall lock when its sensing device is tilted by more than 27° in any direction from the installation position specified by the manufacturer of the retractor.

6.2.3.2.2 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.

6.2.3.2.3 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 14,7 m/s^2, as measured in the axis of strap extraction.

6.2.3.2.4 In the tests referred to in 6.2.3.2.1.1 and 6.2.3.2.3, the amount of strap extraction that occurs before the retractor locks shall not exceed 50 mm, starting at the length of unwinding specified in 7.2.4.3.1. In the test referred to in 6.2.3.2.1.2, locking shall not occur during the 50 mm of strap extraction starting at the length of unwinding specified in 7.2.3.3.1.

6.2.3.2.5 If the retractor is part of a lap strap, the retracting force of the strap shall be not less than 7 N when measured in the free length between the test manikin and the retractor, in accordance with 7.2.3.1. If the retractor is part of a shoulder restraint, the retracting force of the strap shall be not less than 2 N and not more than 7 N when measured similarly. 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 manually or an automatically operated device that prevents the strap from being completely retracted, that device shall not be in operation when these measurements are made.

6.2.3.2.6 The strap shall be repeatedly withdrawn from the retractor and allowed to retract, under the conditions given in 7.2.3.2, until 40 000 cycles have been completed. The retractor shall then be subjected to the corrosion test described in 7.1.1 and to the dust-resistance test described in 7.2.3.5. It shall then satisfactorily complete a further 5 000 cycles of withdrawal and retraction (making 45 000 cycles in all). After the above tests, the retractor shall continue to operate correctly and to meet the requirements of 6.2.3.2.1 to 6.2.3.2.5.

6.2.4 Straps

6.2.4.1 Width

6.2.4.1.1 The minimum width of the child restraint straps shall be 25 mm for restraints of group 0, group 0+ and group I, and 38 mm for restraints of group II and group III.

These dimensions shall be measured during the strap strength test given in 7.2.4.1, without stopping the machine and under a load equal to 75 % of the breaking load of the strap.

6.2.4.2 Strength after room conditioning

6.2.4.2.1 On two sample straps conditioned as given in 7.2.4.2.1, the breaking load of the strap shall be determined as given in 7.2.4.1.2.

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

6.2.4.3 Strength after special conditioning

6.2.4.3.1 On two straps conditioned as given in one of the provisions of 7.2.4.2 (except 7.2.4.2.1), the breaking load of the strap shall be not less than 75 % of the average of the loads determined in the test referred to in 7.2.4.1.

6.2.4.3.2 In addition, the breaking load shall be not less than 3,6 kN for restraints of group 0, group 0+ and group I, 5 kN for those of group II, and 7,2 kN for those of group III.

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

6.2.4.3.4 The type 1 abrasion conditioning procedure given in 7.2.4.2.6 shall be performed only when the microslip test given in 7.2.3 gives a result above 50 % of the limit given in 6.2.2.5.

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

6.2.5 Lock-off device

6.2.6.1 The lock-off device shall be permanently attached to the child restraint.

6.2.5.2 The lock-off device shall not impair the durability of the adult safety belt.

6.2.5.3 The lock-off device shall not prevent the rapid release of the child.

6.2.5.4 In the case of class A devices (see 2.24.1) the amount of slip of the webbing shall not exceed 25 mm after the test given in 7.2.6.1.

6.2.5.5 In the case of class B devices (see 2.2.4.2) the amount of slip of the webbing shall not exceed 25 mm after the test given in 7.2.6.2.

7 Description of tests

7.1 Tests of the assembled restraint

7.1.1 Corrosion

7.1.1.1 Position the metal items of the child restraint in a test chamber, in accordance with annex H of this specification. In the case of a child restraint that incorporates a retractor, unwind the strap to its full length minus 100 mm ± 3 mm. Except for short interruptions that might be necessary, for example to check and replenish the salt solution, the exposure test shall proceed continuously for a period of 50 h.

7.1.1.2 On completion of the exposure test, gently wash, or dip, the metal items of the child restraint in clean running water at a temperature not higher than 38 °C, to remove any salt deposit that might have formed. Allow to dry at a room temperature of 18 °C to 25 °C for 24 h and inspect in accordance with 6.1.1.2.

7.1.2 Overturning

7.1.2.1 Place the test manikin in the restraint installed in accordance with this specification and taking into account the manufacturer's instructions and with the standard slack as specified in 7.1.3.6.

7.1.2.2 Fasten the restraint to the test seat or vehicle seat. Rotate the entire seat around a horizontal axis contained in the median longitudinal plane of the seat through an angle of 360° at a speed of 2°/s to 5°/s. For the purposes of this test, a restraint intended for use in specific vehicles may be attached to the test seat described in annex F of this specification.

7.1.2.3 Repeat the test while rotating the seat in the reverse direction after, if necessary, the test manikin has been replaced in its initial position. With the rotational axis in the horizontal plane and at 90° to that of the two earlier tests, repeat the procedure in the two directions of rotation.

7.1.2.4 Do these tests while using both the smallest and the largest appropriate manikin of the group(s) for which the restraining device is intended.

7.1.3 Dynamic tests

7.1.3.1 Tests using the trolley and the test seat

7.1.3.1.1 Forward facing

7.1.3.1.1.1 The trolley and test seat used in this dynamic test shall meet the requirements given in annex F of this specification, and the dynamic crash test installation procedure shall be in accordance with annex I.

7.1.3.1.1.2 The trolley shall remain horizontal throughout deceleration.

7.1.3.1.1.3 Achieve the deceleration of the trolley by using the apparatus given in annex F of this specification, or any other device that gives equivalent results. This apparatus shall be capable of the performance specified in 7.1.3.4 and in annex J of this specification.

7.1.3.1.1.4 Make the following measurements and inspections:

a) the trolley speed, immediately before impact;

b) the stopping distance;

c) the displacement of the test manikin's head in the vertical and horizontal planes for group I, group II and group III restraints and, for group 0 and group 0+ restraints, the displacement of the manikin (other than that of its limbs);

d) the chest acceleration in three mutually perpendicular directions, except in the case of the newborn test manikin; and

e) any visible signs of penetration of the modelling clay in the abdomen (see 6.1.4.3), except in the case of the newborn test manikin.

7.1.3.1.1.5 Film the tests at frequency at least 500 frames per second.

7.1.3.1.1.6 After impact, visually inspect the child restraint, without opening the buckle, to determine whether there has been any failure or breakage.

7.1.3.1.2 Rearward facing

7.1.3.1.2.1 Rotate the test seat through an angle of 180°, in accordance with the requirements of the rear impact test.

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

7.1.3.1.2.3 The deceleration conditions shall satisfy the requirements of 7.1.3.4.

7.1.3.1.2.4 Make the measurements as given in 7.1.3.1.1.4.

7.1.3.1.2.5 Film the tests at at least 500 frames per second.

7.1.3.1.2.6 After impact, visually inspect the child restraint, without opening the buckle, to determine whether there has been any failure or breakage.

7.1.3.2 Test using the trolley and the vehicle body shell

7.1.3.2.1 Forward facing

7.1.3.2.1.1 The method used to secure the vehicle during the test shall not be such that the anchorages of the vehicle seats, adult safety belts and any additional anchorages required to secure the child restraint will be strengthened, or such that the normal deformation of the structure will be lessened. No part of the vehicle shall be present which, by limiting the movement of the test manikin, would reduce the load imposed on the child restraint during the test. The eliminated parts of the structure may be replaced by parts of equivalent strength, provided that they do not hinder the movement of the test manikin.

7.1.3.2.1.2 A securing device shall be regarded as satisfactory if it produces no effect on an area that extends over the entire 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 the requirements of 7.1.3.2.1.1 are satisfied.

7.1.3.2.1.3 The vehicle seat and child restraint shall be fitted and shall be placed in a position that has been selected by the test authority to give the most adverse conditions in respect of strength, compatible with installing the test manikin in the vehicle. The position of the vehicle seat back and the child restraint shall be stated in the report. The vehicle seat back, if adjustable for inclination, shall be locked as specified by the manufacturer or, in the absence of any specification, at an actual seat back angle as near as possible to 25°.

7.1.3.2.1.4 Unless the instructions for fitting and use require otherwise, the front seat shall be placed in the most forward position normally used in the case of child restraints that are intended for use in the front seating position, and in the rearmost position normally used in the case of child restraints that are intended for use in the rear seating position.

7.1.3.2.1.5 The deceleration conditions shall satisfy the requirements of 7.1.3.4. The test seat shall be the seat of the actual vehicle.

7.1.3.2.1.6 Make the following measurements and inspections:

a) the trolley speed, immediately before impact;

b) the stopping distance;

c) any contact of the test manikin's head (in the case of group 0, not taking the manikin's limbs into account) with the interior of the vehicle body shell;

d) the chest deceleration in three mutually perpendicular directions, except in the case of the newborn test manikin; and

e) any visible signs of penetration of the modelling clay in the abdomen (see 6.1.4.3), except in the case of the newborn test manikin.

7.1.3.2.1.7 Film the tests at least 500 frames per second.

7.1.3.2.1.8 After impact, visually inspect the child restraint, without opening the buckle, to determine whether there has been any failure or breakage.

7.1.3.2.2 Rearward facing

7.1.3.2.2.1 For rear impact tests, rotate the vehicle body shell through an angle of 180° on the test trolley.

7.1.3.2.2.2 In all other respects, the requirements for frontal impact apply.

7.1.3.3 Test using the complete vehicle

7.1.3.3.1 The deceleration conditions shall satisfy the requirements of 7.1.3.4.

7.1.3.3.2 For frontal impact tests, use the procedure set out in annex K of this specification.

7.1.3.3.3 For rear impact tests, use the procedure set out in annex L of this specification.

7.1.3.3.4 Make the following measurements and inspections:

a) the speed of the vehicle or the impactor, immediately before impact;

b) any contact of the manikin's head (in the case of group 0, not taking the manikin's limbs into account) with the interior of the vehicle;

c) the chest acceleration in three mutually perpendicular directions, except in the case of the newborn test manikin; and

d) any visible signs of penetration of the modelling clay in the abdomen (see 6.1.4.3), except in the case of the newborn test manikin.

7.1.3.3.5 Film the tests at at least 500 frames per second.

7.1.3.3.6 If the front seats are adjustable for inclination, lock the seats as specified by the manufacturer or, in the absence of any specification, at an actual seat back angle as near as possible to 25°.

7.1.3.3.7 After impact, visually inspect the child restraint, without opening the buckle, to determine whether there has been any failure or breakage.

7.1.3.4 Conditions for dynamic tests

The conditions for dynamic tests are summarized in table 1.

Table 1 — Conditions for dynamic tests

1	2	3	4	5	6	7	8
		Frontal impact			Rear impact		
Test	Restraint	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[a]	50 + 0 − 2	1	650 ± 50	–	–	–
	Rearward facing front and rear seats – universal, semi-universal or restricted[b]	50 + 0 − 2	1	650 ± 50	30 + 2 − 0	2	275 ± 25
Vehicle body on trolley	Forward facing[a]	50 + 0 − 2	1 or 3	650 ± 50	–	–	–
	Rearward facing[a]	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

NOTE 1 Test pulse No. 1: as given in annex J of this specification – frontal impact.
NOTE 2 Test pulse No. 2: as given in annex J of this specification – rear impact.
NOTE 3 Test pulse No. 3: deceleration pulse of vehicle subjected to frontal impact.
NOTE 4 Test pulse No. 4: deceleration pulse of vehicle subjected to rear impact.
NOTE 5 All restraint systems of group 0 and group 0+ shall be tested in accordance with rearward-facing conditions in both frontal and rear impact.

[a] During calibration, the stopping distance shall be 650 mm ± 30 mm.
[b] During calibration, the stopping distance shall be 275 mm ± 20 mm.

7.1.3.5 Child restraints that require the use of additional anchorages

7.1.3.5.1 In the case of semi-universal child restraints that require the use of additional anchorages, the frontal impact test, in accordance with 7.1.3.4, shall be carried out as given in 7.1.3.5.2 to 7.1.3.5.5.

7.1.3.5.2 In the case of restraints with short upper attachment straps, for example restraints intended to be attached to the rear parcel shelf, the upper anchorage configuration on the test trolley shall be as given in F.5 of this specification.

7.1.3.5.3 In the case of restraints with long uppe (.Er attachment straps, for example restraints 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 given in F.5 of this specification.

7.1.3.5.4 In the case of restraints intended for use in both configurations, the test that uses the anchorage configurations given in 7.1.3.5.2 and 7.1.3.5.3 shall be carried out, except that, in the case of the test that uses the anchorage configurations given in 7.1.3.5.3, only the heavier manikin shall be used.

7.1.3.5.5 In the case of rearward-facing restraints, the lower anchorage configuration on the test trolley shall be as given in F.5 of this specification.

7.1.3.6 Test manikins

7.1.3.6.1 General

The test manikins used to test the child restraint shall comply with annex G of this specification.

7.1.3.6.2 Installation of the test manikin

7.1.3.6.2.1 Frontal impact with forward-facing restraints and rear impact with rearward-facing restraints

Place the test manikin so that there is a gap between the front of the manikin and the restraint.

7.1.3.6.2.2 Forward impact with rearward-facing restraints

Place the test manikin so that there is a gap between the rear of the manikin and the restraint.

7.1.3.6.2.3 Carry-cots

Place the test manikin in a straight horizontal position as close as possible to the centre-line of the carry-cot.

7.1.3.6.2.4 Child restraint with a separately anchored chair

7.1.3.6.2.4.1 Place the test manikin in the vehicle seat or test seat. Place a board 25 mm thick and 60 mm wide between the back of the test manikin and the backrest of the vehicle seat or test seat. The board should follow as closely as possible the curvature of the chair and its lower end should be at the height of the manikin's hip joint.

Adjust the belt in accordance with the manufacturer's instructions, but to a tension of 250 N ± 25 N greater than the adjusting force, with the deflection angle of the strap at the adjuster measuring 45° ± 5°, or alternatively, at the angle prescribed by the manufacturer. Remove the board.

7.1.3.6.2.4.2 The longitudinal plane that passes through the centre-line of the manikin shall be set midway between the two lower belt anchorages; however, note shall also be taken of 7.1.3.2.1.3. In the case of booster cushions to be tested with the test manikin that represents a 10-year-old child, the longitudinal plane that passes through the centre-line of the manikin shall be positioned 75 mm ± 5 mm to the left or right of the point midway between the two lower belt anchorages.

7.1.3.6.2.4.3 In the case of restraints that require the use of a standard belt, the shoulder strap may be positioned on the test manikin before the dynamic test by means of a lightweight masking tape of sufficient width and length. In the case of rearward-facing devices, the head of the manikin may be held against the backrest of the restraint system by means of a lightweight masking tape of sufficient width and length.

7.1.3.7 Category of test manikin

7.1.3.7.1 The following categories of test manikin shall be used when testing restraints of the various mass groups:

a) **group 0 restraint**: test using a newborn manikin and a manikin of mass 9 kg;

b) **group 0+ restraint**: test using a newborn manikin and a manikin of mass 11 kg;

c) **group I restraint**: test using manikins of mass 9 kg and 15 kg respectively;

d) **group II restraint**: test using manikins of mass 15 kg and 22 kg respectively; and

e) **group III restraint**: test using manikins of mass 22 kg and 32 kg respectively.

7.1.3.7.2 If the child restraint system is suitable for two or more mass groups, the tests shall be carried out while using the lightest and heaviest manikins specified above for all the groups concerned. However, if the configuration of the restraint alters considerably from one group to the next, for instance when the configuration of the harness or the length of the harness is changed, the test authority may, if it deems it advisable, add a test with a manikin of intermediate mass.

7.1.3.7.3 If the child restraint system is designed for two or more children, one test shall be carried out with the heaviest manikins occupying all the seat positions. A second test shall be carried out with the lightest and the heaviest manikins specified above. The test authority may, if it deems it advisable, add a third test with any combination of manikins or empty seat positions.

7.2 Tests of individual components

7.2.1 Buckle

7.2.1.1 Opening test under load

7.2.1.1.1 Use a child restraint that has already been subjected to the dynamic test specified in 7.1.3 for this test.

7.2.1.1.2 Remove the child restraint from the test trolley or from the vehicle, without opening the buckle. Apply a tension of 200 N ± 2 N to the buckle. If the buckle is attached to a rigid part, apply a force that reproduces the angle formed between the buckle and that rigid part during the dynamic test.

7.2.1.1.3 Apply a load at a speed of 400 mm/min ± 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. Secure the buckle against a rigid support during the application of the opening force.

7.2.1.1.4 Apply the buckle opening force, using a dynamometer or similar device in the manner and direction of normal use. The contact end shall be a polished metal hemisphere of radius 2,5 mm ± 0,1 mm.

7.2.1.1.5 Measure the buckle opening force and note any failure.

7.2.1.2 Opening test under zero load

7.2.1.2.1 Mount and position under a zero load condition a buckle assembly that has not previously been subjected to a load.

7.2.1.2.2 Use the method of measuring the buckle opening force as given in 7.2.1.1.3 and 7.2.1.1.4.

7.2.1.2.3 Measure the buckle opening force.

7.2.1.3 Strength test

7.2.1.3.1 Use two samples for the strength test. All adjusters, except adjusters mounted direct on a child restraint, are included in the test.

7.2.1.3.2 Annex M shows a typical device for a buckle strength test. The buckle is placed on the upper round plate A within the relief. All the 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 the straps shall be vertical between A and B. The round clamping plate C is then clamped lightly 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 the straps are loaded respective to their arrangement. The buckle stays 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 mm/min ± 20 mm/min until the required values are reached.

7.2.2 Adjusting device

7.2.2.1 Ease of adjustment

7.2.2.1.1 When testing a manual adjusting device, steadily draw the strap through the adjusting device, having regard for the normal conditions of use, at a rate of approximately 100 mm/s. After the first 25 mm of strap movement, measure, to the nearest newton, the maximum force.

7.2.2.1.2 Carry out the test in both directions of strap travel through the device, while the strap is subjected ten times to the full travel cycle, before making the measurement.

7.2.2.2 Microslip test (see annex N, figure N.3)

7.2.2.2.1 Keep the components and adjusting devices to be subjected to the microslip test in an atmosphere at a temperature of 20 °C ± 5 °C and a relative humidity of (65 ± 5) % for a minimum of 24 h before testing. Carry out the test at a temperature of between 15 °C and 30 °C.

7.2.2.2.2 Arrange the free end of the strap in the configuration in which it is when the adjusting device is in use in the vehicle. The free end of the strap shall not be attached to any other part.

7.2.2.2.3 Place the adjusting device on a vertical piece of strap, one end of which bears a 50 N load (guided so that the load is prevented from swinging and the strap from twisting). Mount the free end of the strap vertically upwards or downwards from the adjusting device, as it is in the vehicle. Pass the other end over a deflector roller, with its horizontal axis parallel to the plane of the section of strap that supports the load, and the section that passes over the roller being horizontal.

7.2.2.2.4 Arrange the adjusting device under test so that its centre, in the highest position to which it can be raised, is 300 mm ± 20 mm from a support table and the load of 50 N is 100 mm ± 20 mm from the said support table.

7.2.2.2.5 Complete 20 pretest cycles and then complete 1 000 cycles at a frequency of 0,5 cycles per second, the total amplitude being 300 mm ± 20 mm, or as specified in 7.2.4.2.6.2. Apply the 50 N load only during the time that corresponds to a shift of 100 mm ± 20 mm for each half period. Measure the microslip from the position at the end of the 20 pretest cycles.

7.2.3 Retractor

7.2.3.1 Retracting force

Measure the retracting forces with the child restraint fitted with a test manikin as for the dynamic test given in 7.1.3. Measure the strap tension at the point of contact with (but just clear of) the manikin, while the strap is retracted at an approximate rate of 0,6 m/min.

7.2.3.2 Durability of the retractor mechanism

Withdraw the strap and allow it 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, introduce, at each fifth cycle, a jolt to lock the retractor. The jolts occur in equal numbers at each of five different extractions, namely at 90 %, 80 %, 75 %, 70 % and 65 % of the total length of the strap on the retractor. However, where the length of the strap exceeds 900 mm, the above percentages are related to the final 900 mm of strap that can be withdrawn from the retractor.

7.2.3.3 Locking of the emergency-locking retractors

7.2.3.3.1 Test the retractor once for locking, when the strap has been unwound to its full length minus 300 mm ± 3 mm.

7.2.3.3.2 In the case of a retractor that is actuated by strap movement, the extraction shall be in the direction in which it normally occurs when the retractor is installed in a vehicle.

7.2.3.3.3 When retractors are being tested for sensitivity to vehicle acceleration, they shall be tested at the above extraction length in both directions along two mutually perpendicular axes that 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 test authority shall consult the child restraint manufacturer. One of these test directions shall be selected by the test authority to give the most adverse conditions with respect to actuation of the locking mechanism.

7.2.3.3.4 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 245 m/s^2.

7.2.3.3.5 For testing for compliance with the requirements of 6.2.3.2.1.3 and 6.2.3.2.1.4, the retractor shall be mounted on a horizontal table and the table tilted at a speed not exceeding 2°/s until locking has occurred. The test shall be repeated with tilting in other directions, to ensure that the requirements are satisfied.

7.2.3.4 Corrosion test

Carry out the corrosion test as described in 7.1.1.

7.2.3.5 Dust-resistance test

7.2.3.5.1 Position the retractor in a test chamber, as shown in annex Q of this specification. Mount the retractor in an orientation similar to that in which it is mounted in the vehicle. The test chamber shall contain dust as specified in 7.2.3.5.2. Extract from the retractor, and keep extracted, a length of 550 mm of the strap, except that it shall be subjected to ten complete cycles of retraction and withdrawal within 1 min or 2 min after each agitation of the dust. For a period of 5 h, agitate the dust every 20 min for 5 s by compressed air that is free of oil and moisture, is at a gauge pressure of 550 kPa ± 50 kPa and enters through an orifice of diameter 1,5 mm ± 0,1 mm.

7.2.3.5.2 The dust used in the test described in 7.2.3.5.1 shall consist of about 1 kg of dry quartz with the particle size distribution shall be as follows:

a) passing through 150 µm aperture, 104 µm wire diameter: 99 % to 100 %;

b) passing through 105 µm aperture, 64 µm wire diameter: 76 % to 86 %; and

c) passing through 75 µm aperture, 52 µm wire diameter: 60 % to 70 %.

7.2.4 Straps

7.2.4.1 Strap strength test

7.2.4.1.1 Carry out each test on two new samples of strap, conditioned as specified in 6.2.4.

7.2.4.1.2 Grip each strap 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 about 100 mm/min. The free length of the specimen between the clamps of the machine at the start of the test shall be 200 mm ± 40 mm.

7.2.4.1.3 Increase the tension until the strap breaks and note the breaking load.

7.2.4.1.4 If the strap slips or breaks at or within 10 mm of either of the clamps, deem the test to be invalid and carry out a new test out on another specimen.

7.2.4.2 Conditioning

7.2.4.2.1 Room conditioning

Keep the strap for 24 h ± 1 h in an atmosphere that has a temperature of 23°C ± 5°C and a relative humidity of (50 ± 10) %. If the test is not carried out immediately after conditioning, place the specimen in a hermetically closed receptacle until the test begins. Determine the breaking load within 5 min after removal of the strap from the conditioning atmosphere or from the receptacle.

7.2.4.2.2 Light conditioning

7.2.4.2.2.1 Use the apparatus described in SABS ISO 105-B02, *Textiles – Tests for colour fastness – Part B02: Colour fastness to artificial light – Xenon arc fading lamp test*, and a test strap of length at least 1,3 m.

Expose a central portion of the strap, of length at least 200 mm, to light for the time necessary to produce fading of standard blue dye No. 7 to a contrast equal to grade No. 4 on the grey scale according to SABS ISO 105-A02, *Textiles – Tests for colour fastness – Part A02: Grey scale for assessing change in colour.*

7.2.4.2.2.2 After exposure, keep the strap for a minimum of 24 h in an atmosphere that has a temperature of 23 °C ± 5 °C and a relative humidity of (50 ± 10) %. Determine the breaking load within 5 min after removal of the strap from the conditioning apparatus.

7.2.4.2.3 Cold conditioning

7.2.4.2.3.1 Keep the strap for a minimum of 24 h in an atmosphere at a temperature of 23 °C ± 5 °C and a relative humidity of (50 ± 10) %.

7.2.4.2.3.2 Then keep the strap for 90 min ± 5 min on a plane surface in a low-temperature chamber in which the air temperature is –30 °C ± 5 °C. Fold the strap and load the fold with a masspiece of mass 2 kg ± 0,2 kg that has previously been cooled to –30 °C ± 5 °C. When the strap has been kept under load for 30 min ± 5 min in the same low-temperature chamber, remove the masspiece and measure the breaking load within 5 min after removal of the strap from the low-temperature chamber.

7.2.4.2.4 Heat conditioning

7.2.4.2.4.1 Keep the strap for 180 min ± 10 min in a heating-cabinet atmosphere that has a temperature of 60 °C ± 5 °C and a relative humidity of (65 ± 5) %.

7.2.4.2.4.2 Determine the breaking load within 5 min after removal of the strap from the heating cabinet.

7.2.4.2.5 Exposure to water

7.2.4.2.5.1 Keep the strap fully immersed for 180 min ± 10 min in distilled water, at a temperature of 20 °C ± 5 °C, to which a trace of wetting agent has been added. Any wetting agent suitable for the fibre under test may be used.

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

7.2.4.2.6 Abrasion conditioning

7.2.4.2.6.1 Keep the components or devices to be subjected to the abrasion test in an atmosphere at a temperature of 23 °C ± 5 °C and a relative humidity of (50 ± 10) % for a minimum of 24 h before testing. Keep the room temperature during testing between 15 °C and 30 °C.

7.2.4.2.6.2 Table 2 sets out the general conditions for each type of abrasion conditioning.

Table 2 — General conditioning for each type of abrasion conditioning

1	2	3	4
	Load N	**Frequency** Hz	**Cycles** No.
Type 1	10 ± 0,1	30 ± 10	1 000 ± 5
Type 2	5 ± 0,05	30 ± 10	5 000 ± 5

7.2.4.2.6.3 Where there is insufficient strap to test over 300 mm of shift, the test may be applied over a shorter length, subject to a minimum of 100 mm.

7.2.4.2.7 Particular test conditions

7.2.4.2.7.1 Type 1 (in cases where the strap slides through the quick adjusting device)

Apply the 10 N load vertically and permanently on one of the straps. Attach the other strap, horizontally, to a device that is capable of giving the strap a back-and-forth motion. So place the adjusting device that the horizontal strap remains under tension (see figure N.1 of annex N).

7.2.5.2.7.2 Type 2 (in cases where the strap changes direction in passing through a rigid part)

During this test, the angles of both straps shall be as shown in figure N.2 of annex N. The 5 N load shall be permanently applied. In cases where the strap changes direction more than once in passing through a rigid part, the load of 5 N may be so increased as to achieve the prescribed 300 mm of strap movement through that rigid part.

7.2.5 Lock-off devices

7.2.5.1 Class A devices

Set up the child restraint with the largest manikin for which the child restraint is intended, as shown in figure 5. Use the webbing as specified in annex B of this specification. Fully apply the lock-off device and make a mark on the belt where the belt enters the lock-off device. Attach the force gauges to the belt via a D ring, and apply a force equal to twice (± 5 %) the mass of the heaviest dummy of group I for at least 1 s. Apply the force for a further nine times. Make a further mark on the belt where it enters the lock-off device and measure the distance between the two marks. During this test, the retractor shall be unlocked.

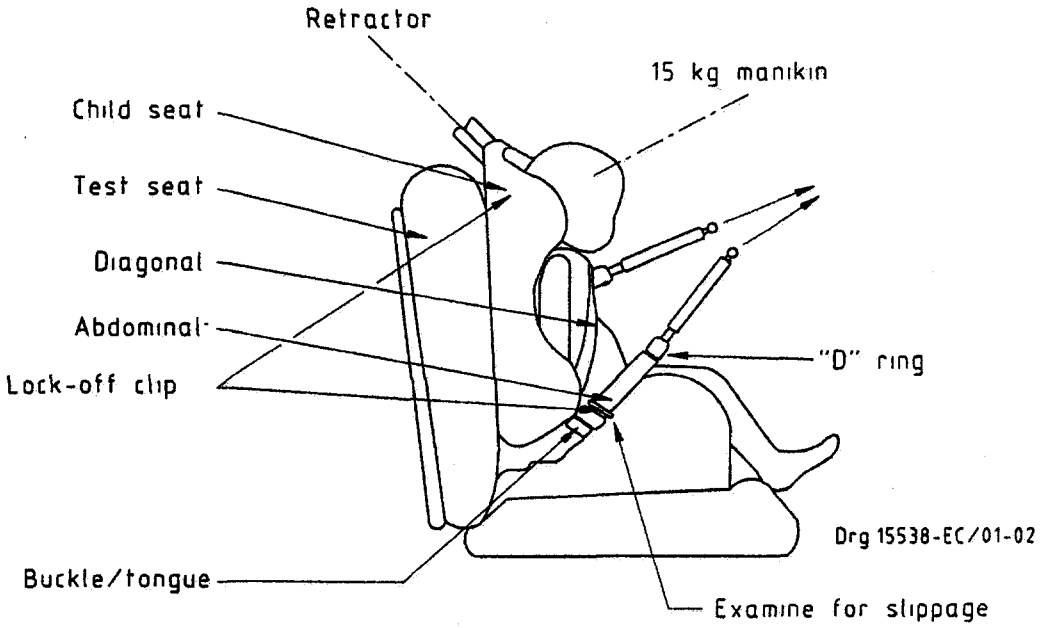
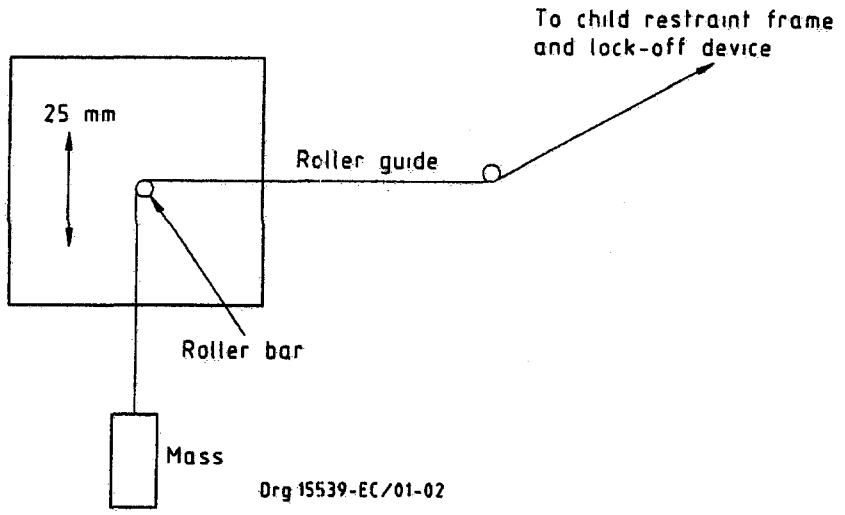


Figure 5 — Schematic layout of class A lock-off test

7.2.5.2 Class B devices

Firmly secure the child restraint and pass webbing, as specified in annex B of this specification, through the lock-off device and frame following the routing described in the manufacturer's instructions. Pass the belt through the testing equipment, as shown in figure 6, and attach it to a mass of 5,25 kg ± 0,05 kg. Ensure that there is 650 mm ± 40 mm of free webbing between the mass and the

point where the webbing leaves the frame. Fully apply the lock-off device and make a mark on the belt where it enters the lock-off device. Raise and then release the mass so that it falls freely over a distance of 25 mm ± 1 mm. Repeat this 100 times ± 2 times at a frequency of 60 cycles ± 2 cycles per minute, to simulate the jerking action of a child restraint in a car. Make a further mark on the belt where it enters the lock-off device and measure the distance between the two marks. The lock-off device shall cover the full width of the webbing in the installed condition with a 15 kg dummy installed. Conduct the test using the same webbing angles as those formed in normal use and with the free end of the lap belt portion fixed. For the duration of the test the child restraint system is firmly attached to the test bench used in the overturning or dynamic test. The loading strap can be attached to the simulated buckle.



Drop height of mass = 25 mm
Distance from roller bar to roller guide = 300 mm
Using strap of the webbing specified for the standard safety belt as defined in annex B.

Figure 6 — Schematic layout of class B lock-off test

7.2.7 Conditioning procedure for adjusters mounted direct 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 7.1.3.6. Mark a reference line on the webbing where the free end of the webbing enters the adjusting device.

Remove the dummy and place the restraint in the conditioning rig shown in figure P.1 of annex P.

Cycle the webbing for a total distance of not less than 150 mm through the adjusting device. 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 adjusting device.

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 adjusting device 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.

7.3 High-speed films and videos

7.3.1 Determine the behaviour of the test manikin and its displacement by means of a high-speed camera.

7.3.2 Firmly mount a calibration screen on the trolley or in the vehicle structure in such a way that the displacement of the manikin can be determined.

8 Instructions

8.1 Each child restraint shall be accompanied by instructions for installation and use, at least in English.

8.2 The instructions for installation shall include the following:

a) For child restraints of the universal category the following label shall be clearly visible at the point of sale without removing the packing:

> **Notice**
>
> 1. This is a universal child restraint. It is for general use in vehicles and it will fit most, but not all, car seats.
>
> 2. A correct fit is likely if the vehicle manufacturer declares in the vehicle handbook that the vehicle is capable of accepting a universal child restraint for this age group.
>
> 3. This child restraint has been classified as universal under more stringent conditions than those that applied to earlier designs that do not carry this notice.
>
> 4. If in doubt, consult either the child restraint manufacturer or the retailer.

b) For child restraints of the restricted and semi-universal categories 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 onto the indicated 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.

c) For child restraints of the specific vehicle category, information on the applicable vehicle shall be clearly visible at the point of sale without removing the packing.

d) 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 for use in the listed vehicles fitted with lap/3-point/static/retractor safety belts, that comply with SABS 1080 or other equivalent specifications. (Delete lap/3-point, etc. as appropriate.) (In the case of carry-cot restraints, a list of items for which the device is suited shall be given.)

e) 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.

f) The method of installation shall be illustrated by means of photographs, or very clear drawings (or both).

g) 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 likely, during everyday use of the vehicle, to become trapped by a movable seat or in a door of the vehicle.

h) The user shall be advised to use carry-cots perpendicular to the longitudinal axis of the vehicle.

i) In the case of rearward-facing child restraint systems, the customer shall be advised not to use the systems in seating positions where an airbag is installed. This information shall be clearly visible at the point of sale without removing the packing.

j) In the case of 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.

8.3 The instructions for use shall include the following:

a) the mass group(s) for which the device is intended;

b) when the child restraint is used in combination with an adult safety belt, the type of safety belt to be used, using the following wording: "Only suitable for use in the listed vehicles fitted with lap/3-point/static/retractor safety belts that comply with SABS 1080 or other equivalent specifications" (delete lap/3-point, etc. as appropriate);

c) the method of use, illustrated by means of photographs or clear drawings (or both); in the case of seats that can be used both in forward-facing and rearward-facing positions, clear warning must be given to keep the restraint rearward-facing until the child's mass exceeds a stated limit, or until some other dimensional criterion is exceeded;

d) the operation of the buckle and adjusting devices, explained clearly;

e) a recommendation that any straps holding the restraint to the vehicle be tight, that any straps restraining the child be adjusted to the child's body, and that straps should not be twisted;

f) the importance of ensuring that any lap strap be worn low down, so that the pelvis is firmly engaged;

g) a recommendation that the restraint be replaced when it has been subjected to violent stresses during a collision;

h) instructions for cleaning;

i) a general warning to the user concerning the danger of making any alterations or additions to the restraint without the approval of the competent authority, and the danger of not following closely the installation instructions provided by the manufacturer of the child restraint;

j) when a chair is not provided with a textile cover, a recommendation that the chair be kept away from sunlight, to prevent it from becoming too hot for the child's skin;

k) a recommendation that the child not be left in the child restraint unattended;

l) a recommendation that any luggage or other objects liable to cause injuries in the event of a collision be properly secured; and

m) a recommendation that

1) the child restraint not be used without the cover, and

2) the seat cover not be replaced with any other cover than the one recommended by the manufacturer, because the cover constitutes an integral part of the restraint performance.

9 Equivalent

ECE type-approved child restraints in accordance with ECE Regulation 44, revision 1 of 5 June 1998 or later version may be deemed to comply with this compulsory specification.

Annex A

Additional anchorages required for attaching child restraints of the semi-universal category to motor vehicles

A.1 This annex applies only to the additional anchorages for attaching child restraints in the semi-universal category, or to bars and other special items used to secure child restraints to the bodywork, whether or not they make use of the anchorages covered by the said SABS 1430.

A.2 The anchorages shall be determined by the manufacturer of the child restraint, in agreement with the vehicle manufacturer, and details shall be submitted for approval to the test authority that conducts the tests. The test authority might take into account information obtained from the vehicle manufacturer.

A.3 The manufacturer of the child restraint shall provide the necessary parts for fitting the anchorages and a special plan for each vehicle, showing the exact location of each anchorage.

A.4 The user shall be responsible for fitting the anchorages to the vehicle in accordance with the instructions provided by the manufacturer of the child restraint.

Annex B

Standard seat belt

B.1 Test configurations

The seat belt for the dynamic test and for the maximum-length requirement shall be made to one of the two configurations shown in figure B.1. These are a three-point retracting belt (figure B.1(a)) and a two-point static belt (figure B.1(b)).

B.2 The three-point retracting belt

B.2.1 The three-point retractor retracting belt (see figure B.1(a)) has the following rigid parts:

a) retractor R;

b) pillar loop P (also see figure B.2);

c) two anchorage points A1 and A2 (see figure B.3); and

d) central part C (see figure B.4).

B.2.2 The retractor shall comply with the requirements of the said SABS 1080, or its equivalent, in respect of retraction force. The retractor spool diameter is 33 ± 0,5 mm.

B.2.3 The retracting belt shall be fitted to the anchorages on the test seat described in annex F (see figure F.11), as follows:

a) belt anchorage A1 shall be fitted to trolley anchorage BO (outboard);

b) belt anchorage A2 shall be fitted to trolley anchorage A (inboard);

c) belt pillar loop P shall be fitted to trolley anchorage C;

d) belt retractor R shall be fitted to trolley anchorage Re; and

e) the value of *X* in figure K.1 is 215 mm ± 5 mm. The length of the strap from P to A1 in figure K.1 for universal and semi-universal child restraints is 2 190 mm ± 5 mm, measured parallel to the centre line of the strap with 150 mm ± 5 mm of strap on the spool of the retractor. The length of the strap from P to A1 for restricted child restraints is at least 2 190 mm, measured parallel to the centre line of the strap with 150 mm ± 5 mm of strap on the spool of the retractor.

B.2.4 The strap requirements for the belt are as follows:

Material: polyester spinnblack – width: 48 mm ± 2 mm at 10 000 N

– thickness: 1,0 mm ± 0,2 mm

– elongation: (8 ± 2)% at 10 000 N

B.3 Two-point static belt

B.3.1 The two-point static belt shown in figure B.1(b) consists of two standard anchorage plates as shown in figure B.2 and a strap that meets the requirements of B.2.4.

B.3.2 The two-point belt anchorage plates shall be fitted to trolley anchorages A and B. The value of *Y* in figure B.1(b) is 1 300 mm ± 5 mm. This is the maximum length requirement for the approval of universal child restraints with two-point belts.

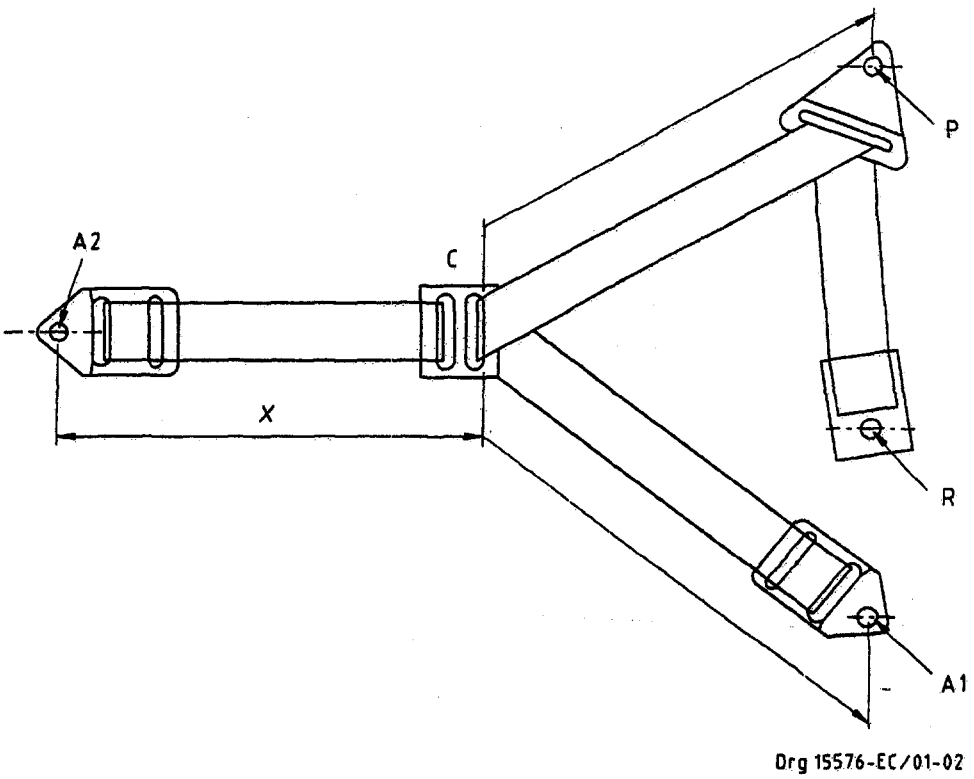


Figure B.1(a) — Three-point retracting belt

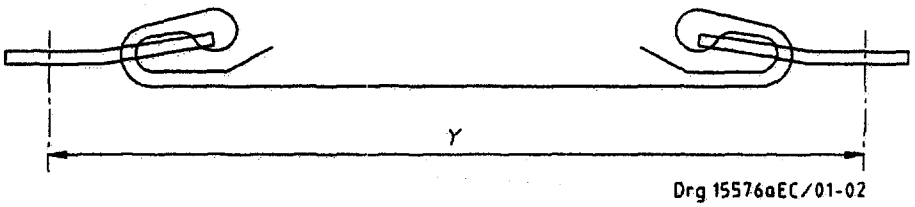


Figure B.1(b) — Two point static belt

Figure B.1 — Standard belt configuration

Dimensions in millimetres

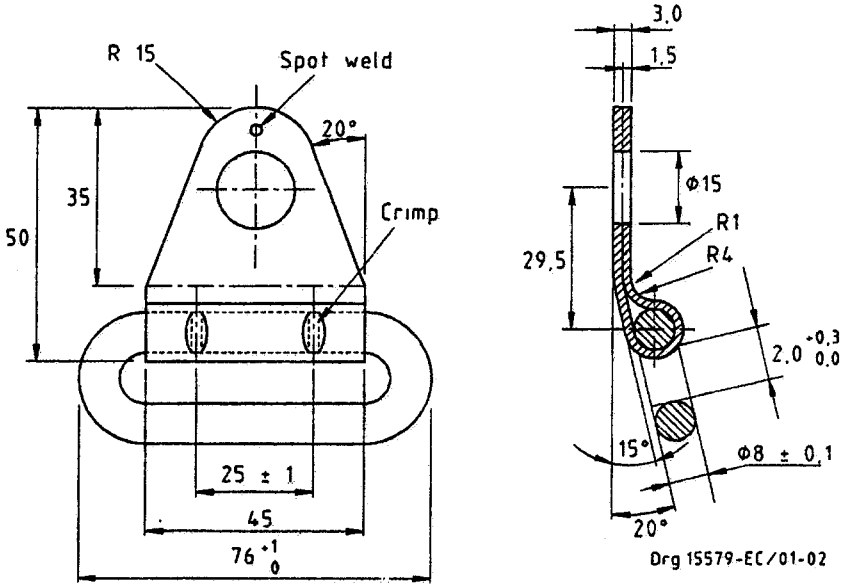


Figure B.2 — Pillar loop

Dimensions in millimetres

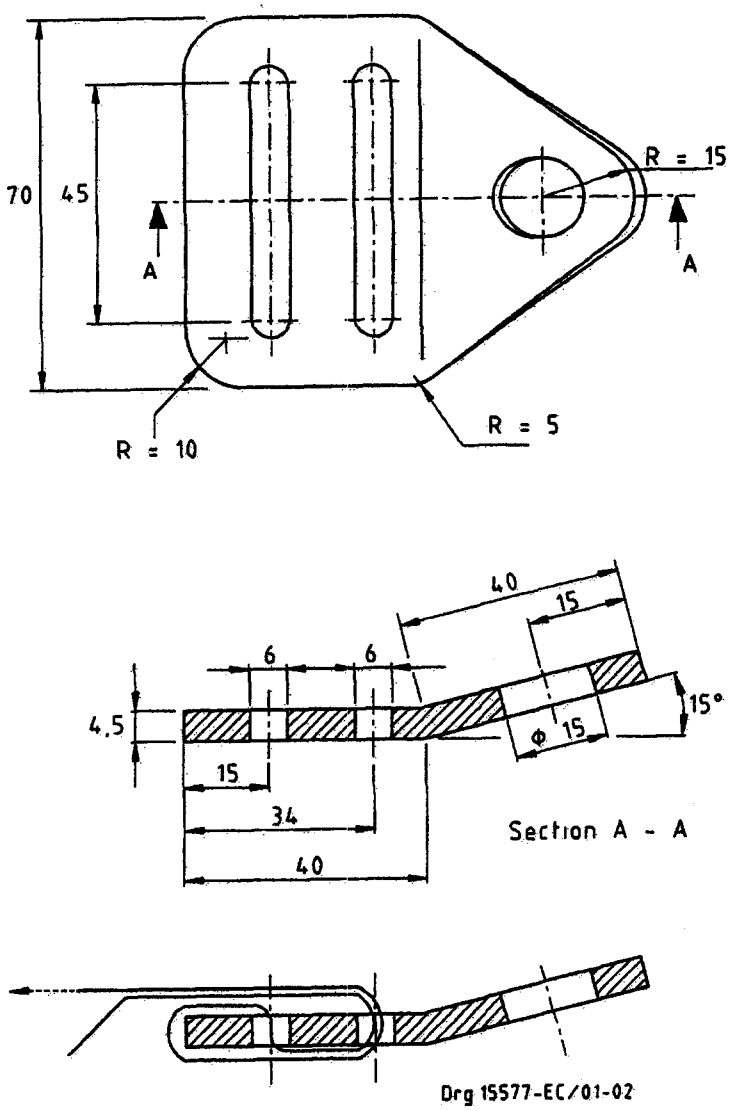


Figure B.3 — Typical standard anchorage plate

Dimensions in millimetres

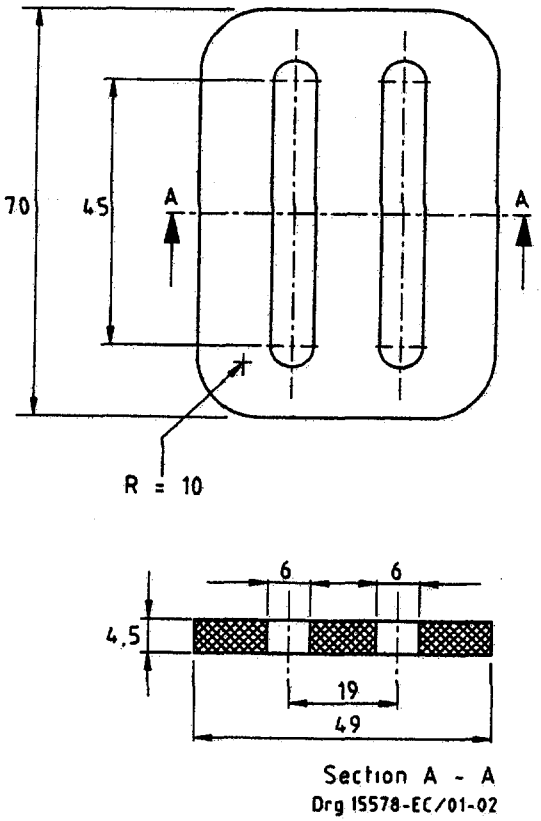


Figure B.4 — Central part of the standard belt configuration

Annex C

Chair

Dimensions in milimetres

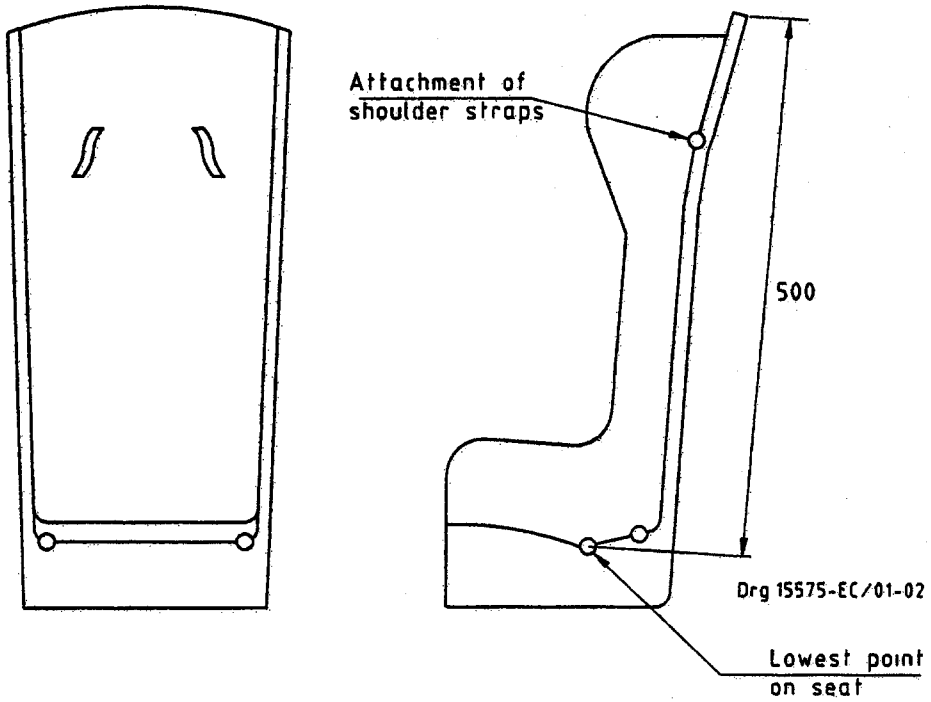


Figure C.1 — Chair diagram

Annex D

Method of defining head impact area of child restraints having backrests and defining the minimum size of side wings for rearward-facing child restraints

D.1 Place the device on the test seat described in annex F. Reclinable devices shall be set in the most upright position. Place the smallest manikin in the device in accordance with the manufacturer's instructions. Mark a point A on the backrest on the same horizontal level as the shoulder of the smallest manikin at a point 2 cm inside the outer edge of the arm. All internal surfaces above the horizontal plane passing through point A shall comprise special energy-absorbing material tested in accordance with annex E. This material shall cover the internal surfaces of the backrest and side wings, including the inner edges (zone of radius) of the side wings. The energy-absorbing material may form an integral part of the child seat.

D.2 For rearward-facing devices there shall be side wings of minimum depth 90 mm, measured from the median of the surface of the backrest. The side wings shall start at the horizontal plane, pass 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 reduced gradually.

D.3 The requirement given in D.2 in respect of the minimum size of side wings does not apply to child restraints of mass group II and group III in the specific vehicle category to be used in the luggage area in accordance with 5.1.2. of this specification.

Annex E

Testing of energy-absorbing material

E.1 Headform

E.1.1 The headform shall consist of a solid wooden hemisphere with an added smaller spherical segment, as shown in figure E.1. 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 acceleration along the direction of fall.

E.1.2 The headform shall have a total mass, including that of the accelerometer, of 2,75 ± 0,05 kg.

Dimensions in millimetres

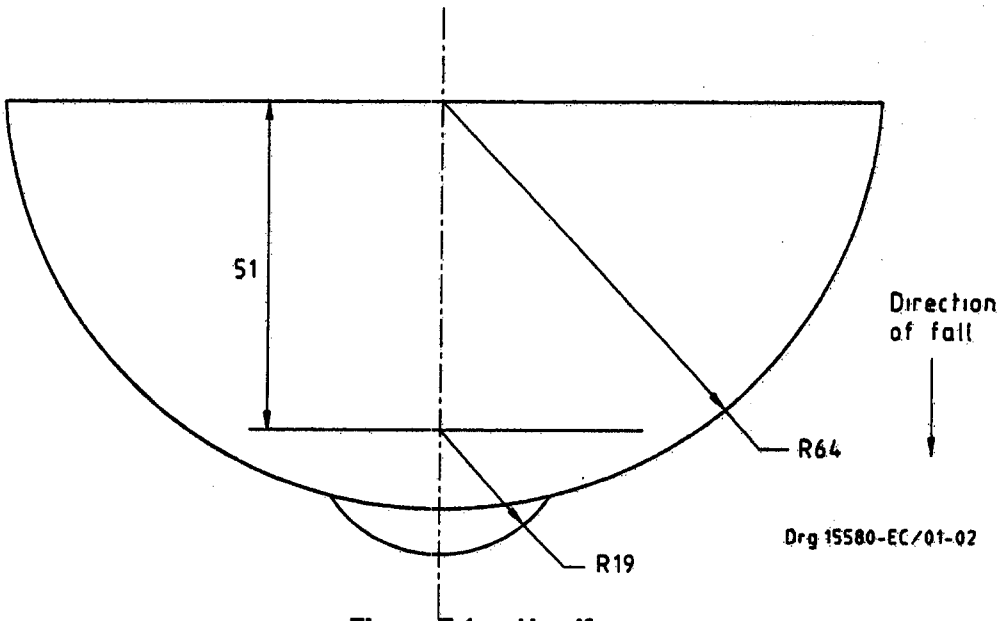


Figure E.1 — Headform

E.2 Instrumentation

The acceleration shall be recorded during the test, using equipment in accordance with channel frequency class 1 000, as specified in the latest version of the said SABS ECE R44.

E.3 Procedure

E.3.1 Take three samples of each material from one or more child restraints.

E.3.2 The sample shall be fully restrained on its outer surfaces in the region of impact and shall be supported directly beneath the point of impact on a smooth rigid base, for example, a solid concrete plinth, such that only the energy-absorbing characteristics of the material construction are measured.

E.3.3 Raise the headform to a height of 100 $^{0}_{-1}$ mm from the upper surface of the sample to the lowest point on the headform, and allow it to fall. Record the acceleration experienced by the headform during impact. Repeat this procedure with the remaining samples.

Annex F

Description of trolley

F.1 Trolley

For tests on child restraints, the trolley, carrying the test seat only, shall have a mass of 400 kg ± 20 kg. For tests on restraint systems, the trolley with the attached vehicle structure shall have a nominal mass of 800 kg. The total mass of the trolley and vehicle structure may, if necessary, be increased by increments of 200 kg. In no case shall the total mass differ from the nominal mass by more than 40 kg.

F.2 Calibration screen

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.

F.3 Test seat

F.3.1 The test seat shall be constructed as given in F.3.1.1 to F.3.1.8 (inclusive).The 3-dimensional view of the test seat is shown in figure F.1.

F.3.1.1 The seat has a rigid back, is fixed to the trolley, is covered with polyurethane foam of thickness 70 mm and is tilted 20° rearwards; the lower part of the back is made of a tube of diameter 20 mm.

F.3.1.2 The horizontal part of the seat, the dimensions of which are given in figure F.2, is rigid. The rear part of the seating is made of rigid sheet metal, the upper edge of which is a tube of diameter 20 mm. For the tests, the horizontal part of the seat is covered with a light cloth not liable to affect the rigidity of the foam block.

F.3.1.3 An opening is left between the back and the cushion of the test seat see figure F.2.

F.3.1.4 The width of the test seat is 800 mm.

F.3.1.5 The back and the horizontal part of the seat is covered with polyurethane foam that complies with SABS ECE R44. The dimensions of the cushion conform to figure F.2.

F.3.1.6 The polyurethane foam is covered with a sun shade cloth, made of poly-acrylate fibre that complies with the said SABS ECE R44.

F.3.1.7 The seat and the seat back shall be as given in F3.1.7.1 to F.3.1.7.12 (inclusive).

F.3.1.7.1 The foam cushion of the seat is produced from a foam block (800 mm × 575 mm × 135 mm; see figure F.2) so that its shape resembles the shape of the aluminium bottom plate specified in figure F.3.

F.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 along the longest side of the plate, three on each side, the position being dependent on the construction of the trolley. It is recommended that the bolts be glued to the plate with an appropriate adhesive before being fastened with nuts.

F.3.1.7.3 The cover material (1 250 mm × 1 200 mm; see figure F.4) is cut across the width so 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.

F.3.1.7.4 The cover material is marked with two lines that run across the width and that are drawn 375 mm from the centre line of the cover material (see figure F.4).

F.3.1.7.5 The foam cushion of the seat is placed upside down on the cover material with the aluminium bottom plate on top.

F.3.1.7.6 The cover material is stretched on both sides until the lines drawn on the material 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.

F.3.1.7.7 At the position of the grooves in the bottom plate and in the foam, the cover material is incised.

F.3.1.7.8 The cover is glued to the aluminium plate with a flexible glue. The nuts are removed before gluing.

F.3.1.7.9 The flaps on the side are folded onto the plate and are glued down.

F.3.1.7.10 The flaps in the grooves are folded inside and taped down with a strong tape.

F.3.1.7.11 The flexible glue is left to dry for at least 12 h.

F.3.1.7.12 The seat back cushion is covered in exactly the same way as the seat, except that the lines on the cover material (1 250 mm × 850 mm) are drawn 320 mm from the centre line of the material.

F.3.1.8 Line C_r coincides with the intersecting line between the top plane of the seat and the front plane of the seat back.

Dimensions in millimetres

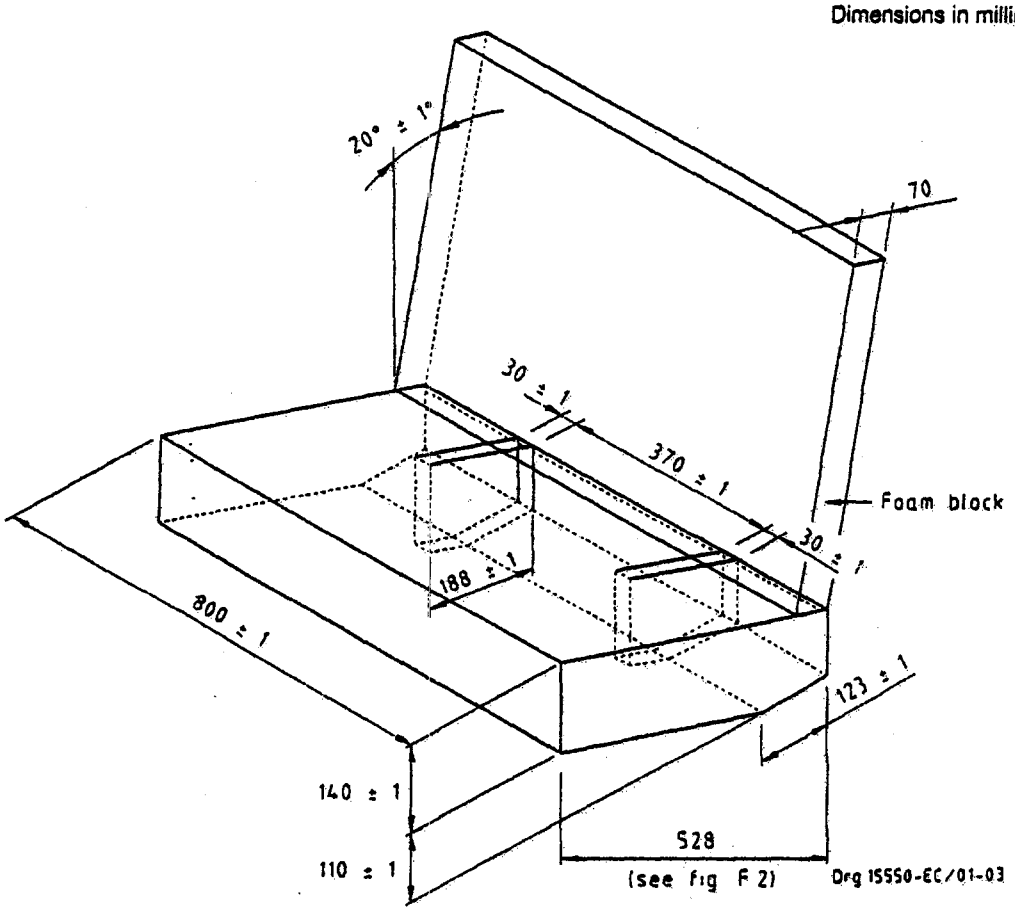
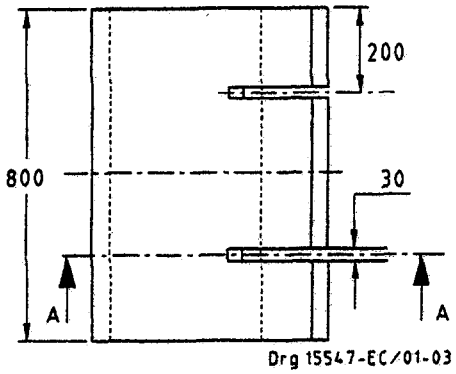
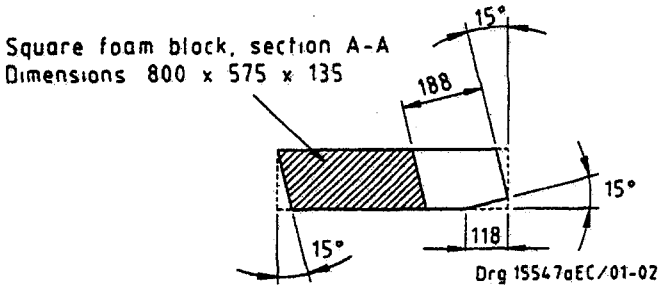


Figure F.1 — 3-Dimensional view of seat

Dimensions in millimetres





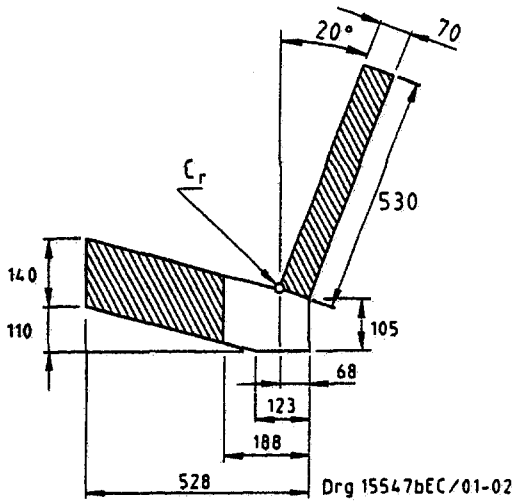


Figure F.2 — Dimensions of the seat and the seat cushions

Dimensions in millimetres

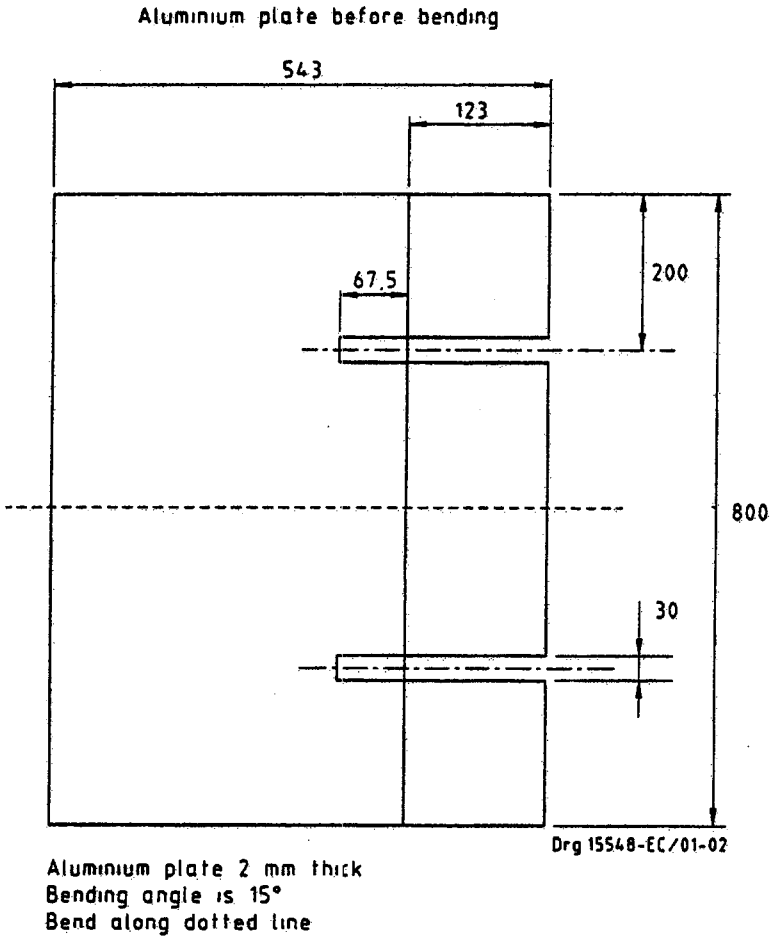


Figure F.3 — Dimensions of the aluminium bottom plate

Dimensions in millimetres

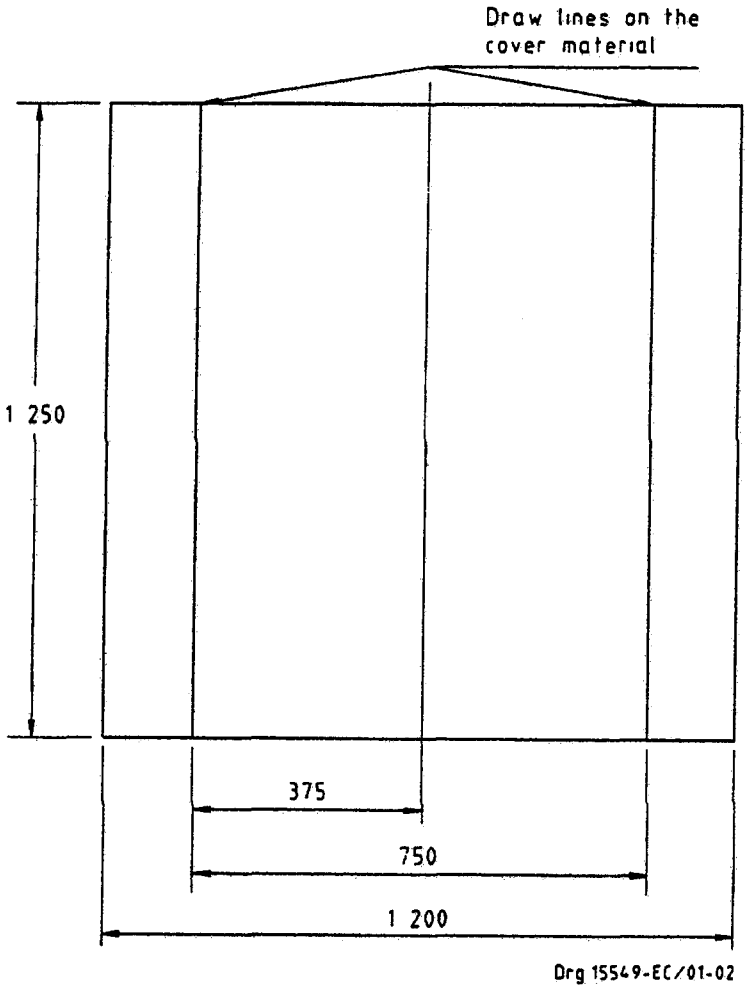


Figure F.4 — Dimensions of the cover material

F.3.2 Testing of rearward-facing restraints

F.3.2.1 Fit a special frame on the trolley, in order to support the child restraint as shown in figure F.5.

F.3.2.2 Firmly attach a steel tube of dimensions 500 mm × 100 mm (o.d) × 90 mm (i.d) to the trolley in such a way that a load of 5 000 N applied horizontally to the centre of the tube does not cause movement exceeding 2 mm.

Dimensions in millimetres

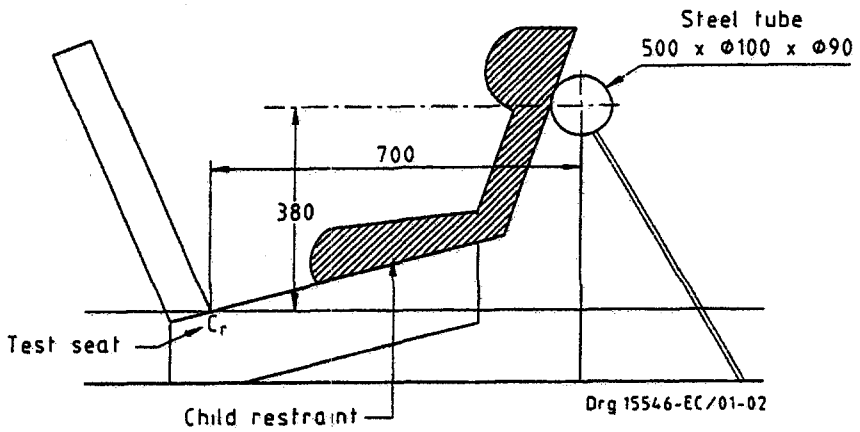


Figure F.5 — Arrangement for testing a rearward-facing restraint

F.4 Stopping device

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

F.4.2 If necessary, an additional absorber is used for each 200 kg increase in nominal mass.

F.4.3 Each absorber comprises the following:

a) outer casing formed from a steel tube;

b) polyurethane tube that serves as the energy absorber;

c) polished steel olive-shaped knob that penetrates into the absorber;

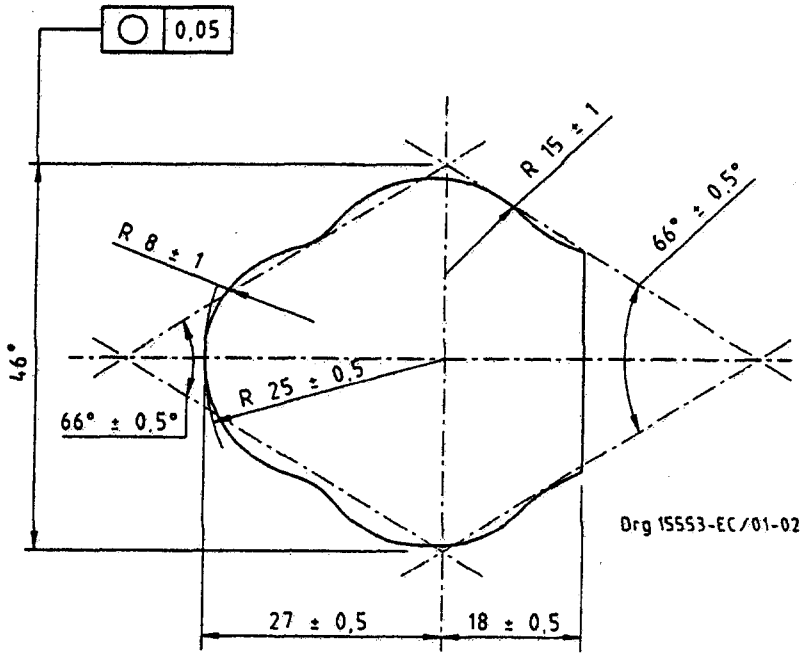
d) shaft; and

e) impact plate.

F.4.4 The dimensions of the various parts of the absorber are as shown in figure F.6 to figure F.10.

F.4.5 The characteristics of the polyurethane are given in the said SABS ECE R44.

F.4.6 The stopping device assembly is maintained for at least 12 h at a temperature of between 15 °C and 25 °C before being used for the calibration tests described in annex J. The stopping device assembly shall, for each type of test, meet the performance requirements given in figure J.1 and figure J.2. For dynamic testing of a child restraint, the stopping device assembly is maintained for at least 12 h at the same temperature, to within 2 °C, as that at which it is maintained before the calibration test. Any other device that gives equivalent results shall be deemed to be acceptable.



* This dimension can vary between 43 mm and 49 mm

Figure F.6 — Stopping device olive-shaped knob

Dimensions in millimetres

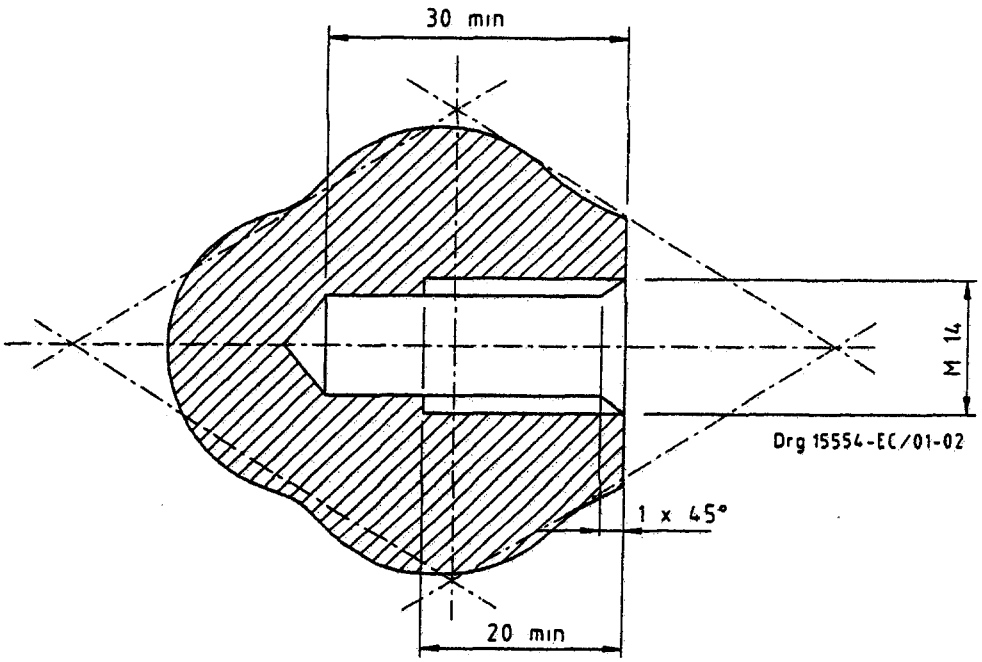
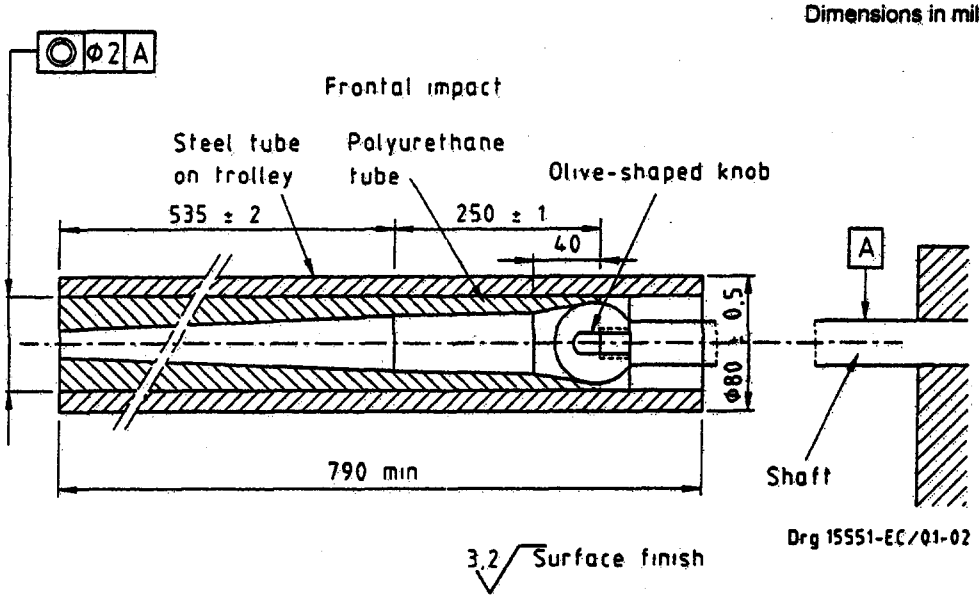
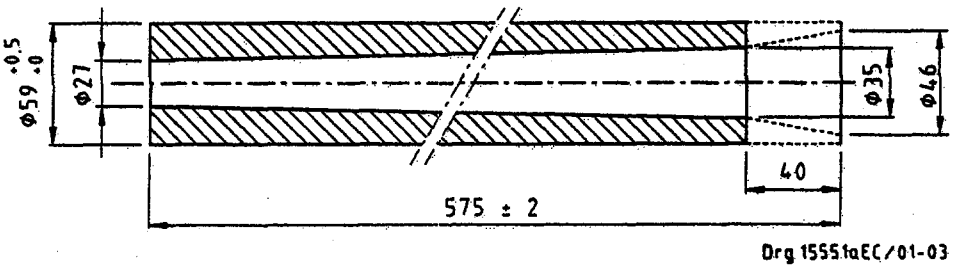


Figure F.7 — Stopping device olive-shaped knob — Cross-section

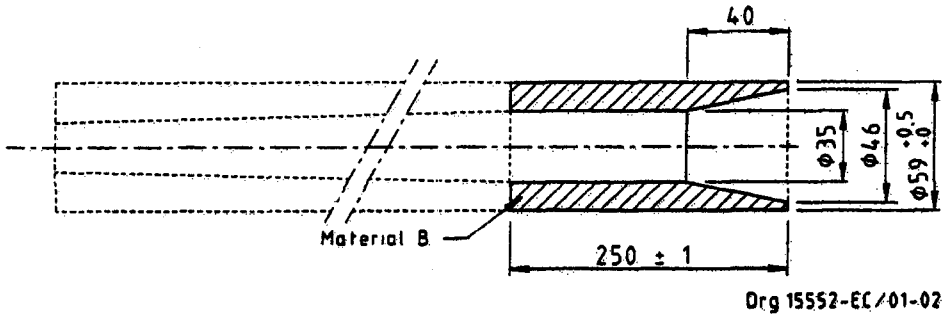
Dimensions in millemetres



(a)



(b) — Material B



(c) — Material B

Figure F.8 — Stopping device — Frontal impact

Dimensions in millimetres

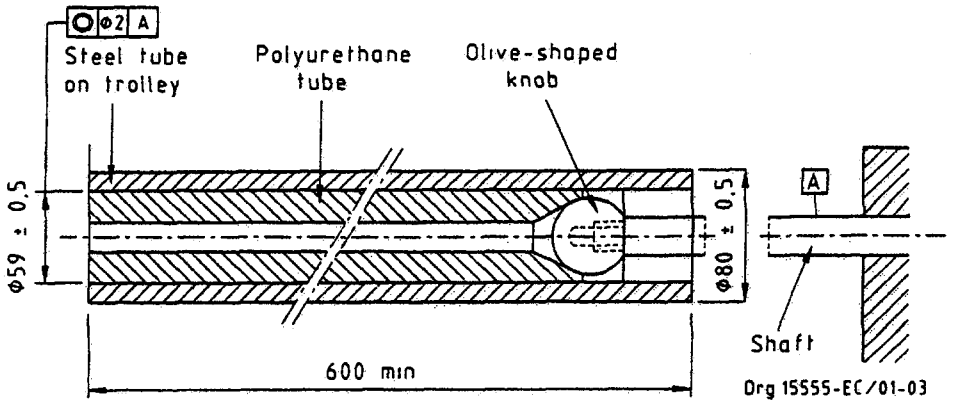


Figure F.9 — Stopping device (assembled) — Rear impact dimensions

Dimensions in millimetres

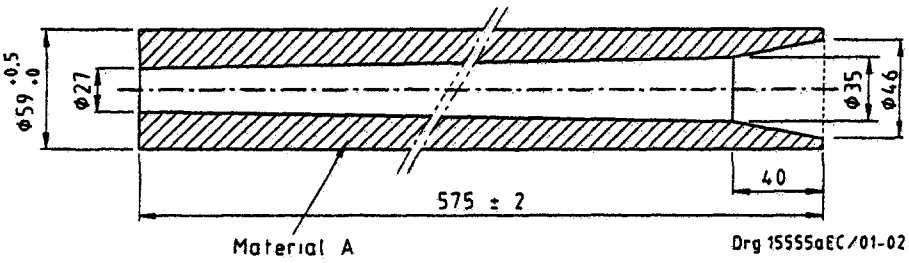


Figure F.10 — Stopping device (polyurethane tube) — Rear impact dimensions

F.5 Arrangement and use of anchorage points on the test trolley

F.5.1 The anchorage points are positioned as shown in figure F.11.

F.5.2 Child restraints in the universal and restricted categories shall use the following anchorage points:

a) for child restraints approved for use with lap belts: points A and B; and

b) for child restraints approved for use with lap and diagonal belts: points A, B and C.

F.5.3 Anchorage points A, B and C (C is optional) that meet the requirements of SABS 1429:1987, *Motor vehicle safety: Strength of seats and their anchorages*, shall be used for child restraints in the universal category.

F.5.4 Anchorage points A, B and D, which have only one additional upper anchorage point, shall be used for child restraints in the semi-universal category.

F.5.5 Anchorage points A, B, E and F, which have two additional upper anchorage points, shall be used for child restraints in the semi-universal category.

F.5.6 Anchorage points R_1, R_2, R_3, R_4 and R_5, which have one or more additional anchorage points, shall be the additional anchorage points for rearward-facing child restraint systems in the semi-universal category.

F.5.7 Except in the case of point C, the points that correspond to the arrangement of the anchorages show where the ends of the belt are connected to the trolley or to the load transducer, as the case may be. The structure that carries 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 occurs in the parts that bear the anchorages during the test.

F.5.8 In the case of carry-cots of group 0, the points A_1 and B_1 can be used alternatively, as specified by the manufacturer of the restraint systems. A_1 and B_1 are located on a line through A and B and at a distance of 350 mm from R_1.

F.5.9 For testing of child restraints in the universal and restricted categories, a standard retractor belt, as specified in annex B, shall be fitted to the test seat.

Dimensions in millimetres

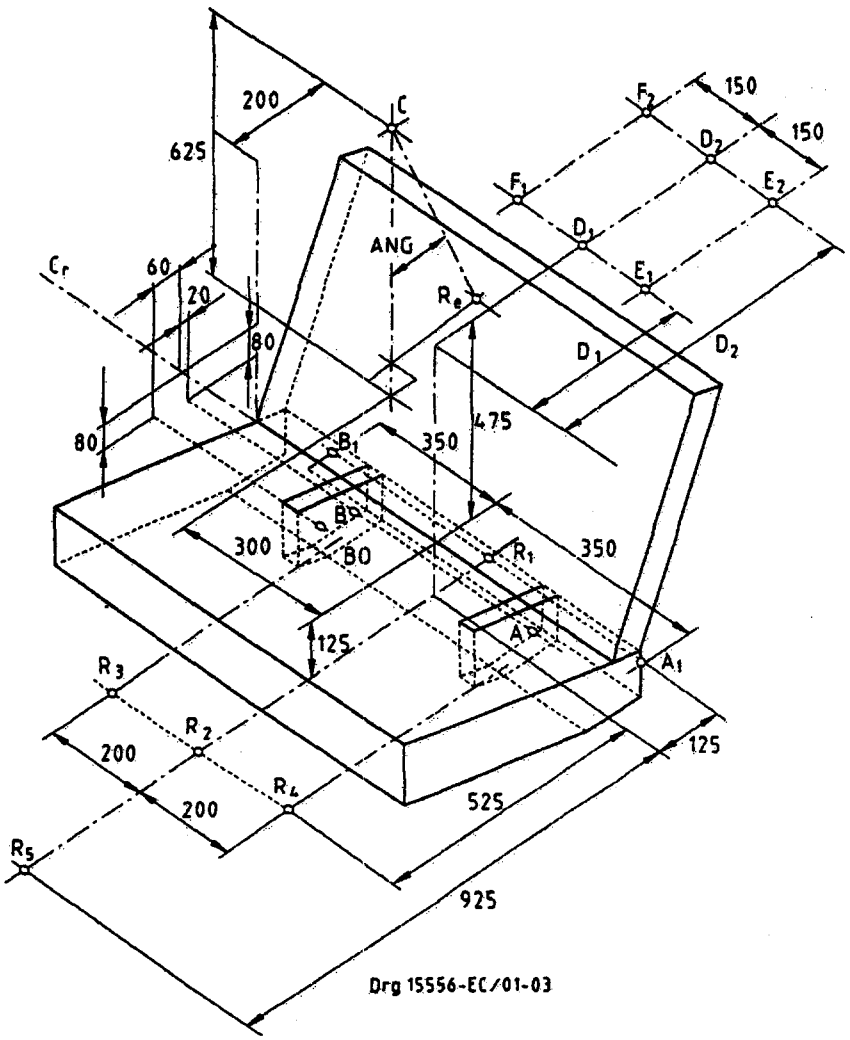
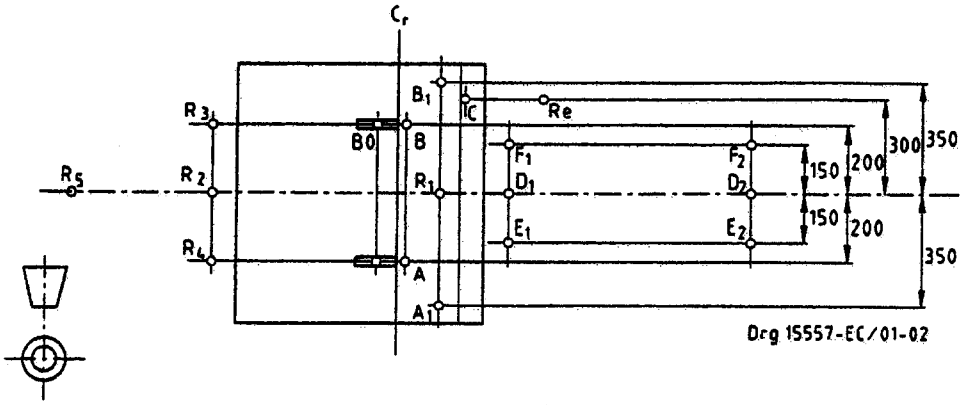
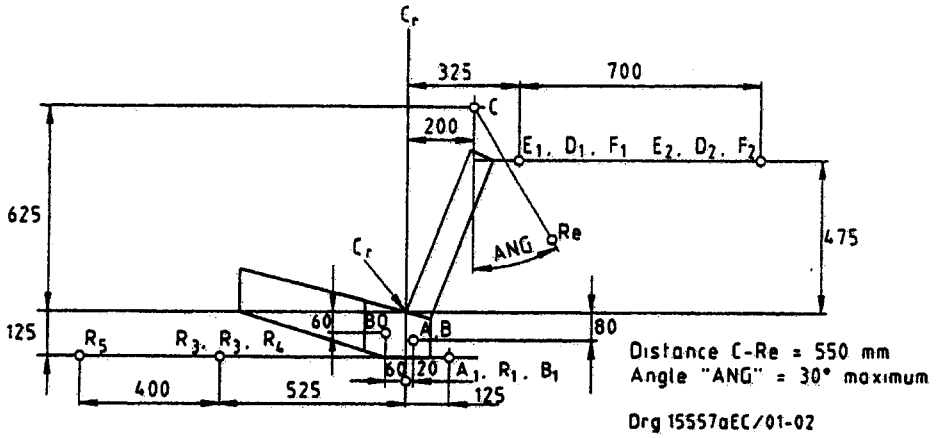


Figure F.11 — View of the arrangement of anchorage points on the test trolley — Three dimensional view

Dimensions in millimetres



(a) — Top view



(b) — Side view

Figure F.12 — Arrangement of anchorage points on the test trolley

Annex G

Description of manikins

G.1 General

G.1.1 The manikins given in this specification are described in G.2 to G.4, and in the technical drawings of this annex.

G.1.2 Alternative manikins may be used, provided that:

a) their equivalence can be demonstrated to the satisfaction of the test authority, and

b) their use is recorded in the test report.

G.2 Description of the 9-month-old, 3-year-old, 6-year-old and 10-year-old manikins

G.2.1 General

G.2.1.1 The dimensions and masses of the test manikins are based on those of children of the 50th percentile aged nine months, three years, six years and ten years.

G.2.1.2 The manikins consist of a metal and polyester skeleton with cast polyurethane body components.

G.2.2 Construction

G.2.2.1 Head

The head is made of polyurethane and is reinforced by metal strips. Measuring equipment can be housed inside the head on a polyamide block at the centre of gravity.

G.2.2.2 Vertebrae

G.2.2.2.1 Neck vertebrae

The neck is made of five rings of polyurethane that contains a core of polyamide elements. The atlas-axis block is made of polyamide.

G.2.2.2.2 Lumbar vertebrae

The five lumbar vertebrae are made of polyamide.

G.2.2.3 Chest

G.2.2.3.1 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.

G.2.2.3.2 The skeleton is coated with polyurethane. Measuring equipment can be housed in the chest cavity.

G.2.2.4 Limbs

G.2.2.4.1 The arms and legs are made of polyurethane, reinforced with metal elements in the form of square tubes, strips and plates.

G.2.2.4.2 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.

G.2.2.5 Pelvis

G.2.2.5.1 The pelvis is made of glass-reinforced polyester, coated with polyurethane.

G.2.2.5.2 The shape of the upper part of the pelvis, which is important for determining sensitivity to abdominal loading, simulates, as far as possible, the shape of a child's pelvis.

G.2.2.5.3 The hip joints are situated just below the pelvis.

G.2.2.6 Assembly of the test manikin

G.2.2.6.1 Neck, chest and pelvis

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

G.2.2.6.2 Head and neck

The head is mounted and adjusted by means of a bolt and nut through the atlas-axis block.

G.2.2.6.3 Torso and limbs

G.2.2.6.3.1 The arms and legs are mounted on, and adjusted in relation to, the torso by means of ball-and-socket joints.

G.2.2.6.3.2 In the case of the arm joints, the balls are connected to the torso; in the case of the leg joints, the balls are connected to the legs.

G.2.3 Main characteristics

G.2.3.1 Mass

Table G.1 — Mass of each component of manikins

1	2	3	4	5
Component	Mass, by age group kg			
	9-month-old	3-year-old	6-year-old	10-year-old
Head and 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

G.2.3.2 Principal dimensions

G.2.3.2.1 The principal dimensions, based on figure G.1, are given in table G.2.

Dimensions in millimetres

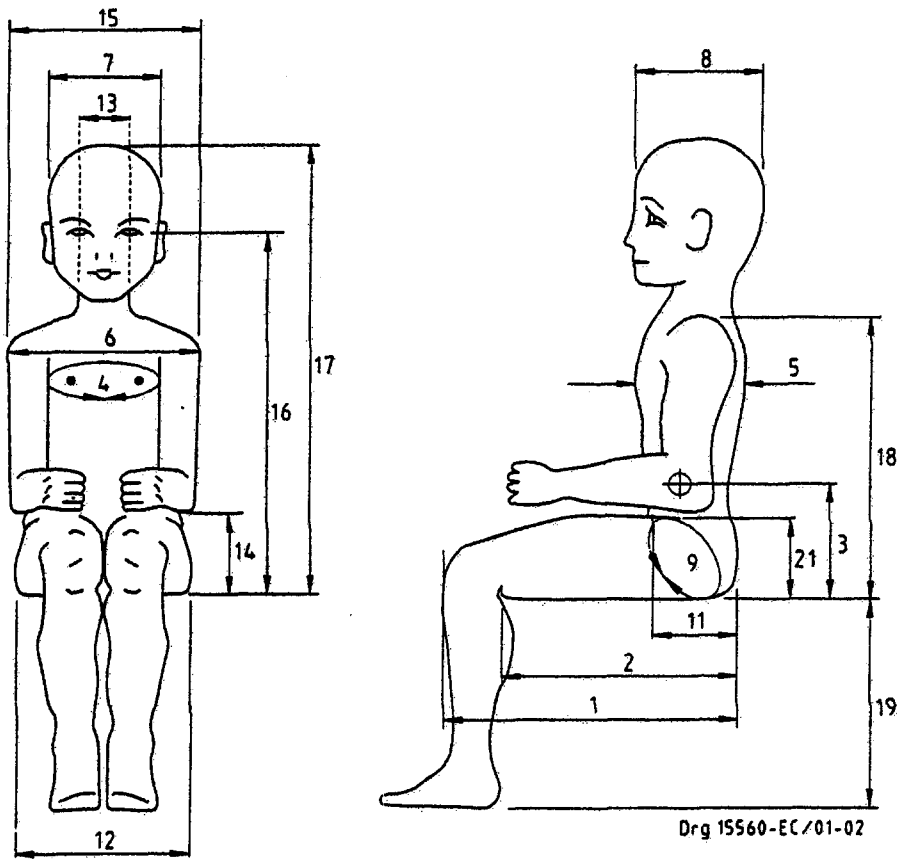


Figure G.1 — Principal dimensions of manikins

Table G.2 — Principal dimensions of manikins

1	2	3	4	5	6
No.	Dimensions	Dimensions, by age group mm			
		9-month-old	3-year-old	6-year-old	10-year-old
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
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

G.2.4 Adjustment of joints

G.2.4.1 General

In order to achieve reproducible results when using the test manikins, adjust the friction in the various joints, the tension in the neck and lumbar cables and the stiffness of the abdominal insert to the specified values.

G.2.4.2 Adjustment of the neck cable

G.2.4.2.1 Place the torso on its back in the horizontal plane.

G.2.4.2.2 Mount the complete neck assembly without the head.

G.2.4.2.3 Tighten the tension nut on the atlas-axis block.

G.2.4.2.4 Put a suitable bar or bolt through the atlas-axis block.

G.2.4.2.5 Loosen the tension nut until the atlas-axis block is lowered by 10 mm ± 1 mm when a load of 50 N directed downwards is applied to the bar or bolt through the atlas-axis block (see figure G.2).

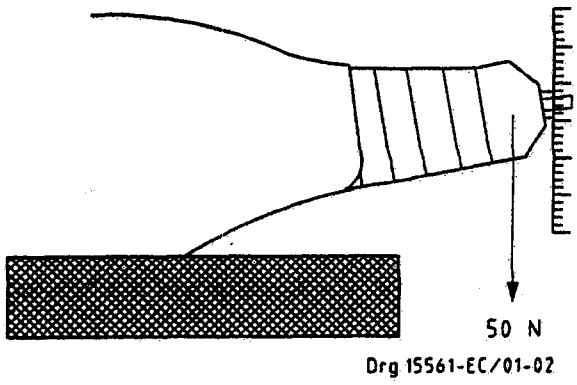


Figure G.2 — Adjustment of the neck cable

G.2.4.3 Atlas-axis joint

G.2.4.3.1 Place the torso on its back in the horizontal plane.

G.2.4.3.2 Mount the complete neck and head assembly.

G.2.4.3.3 Tighten the bolt and adjustment nut through the head and the atlas-axis block, with the head in the horizontal position.

G.2.4.3.4 Loosen the adjustment nut until the head can be moved (see figure G.3).

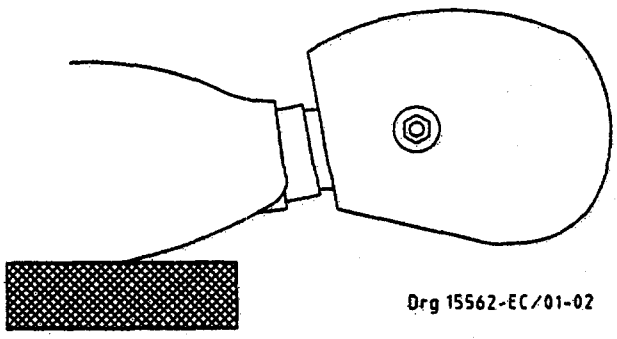


Figure G.3 — Adjustment of the atlas-axis joint

G.2.4.4 Hip joint

G.2.4.4.1 Place the pelvis on its front in the horizontal plane.

G.2.4.4.2 Mount the upper leg without the lower leg.

G.2.4.4.3 Tighten the adjustment nut, with the upper leg in the horizontal position.

G.2.4.4.4 Loosen the adjustment nut until the upper leg can be moved (see figure G.4).

G.2.4.4.5 Check the hip joints frequently in the initial stages. (This is necessary because of running-in problems.)

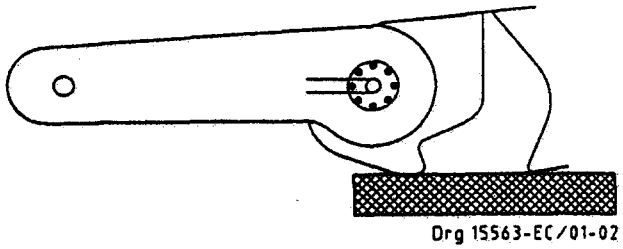


Figure G.4 — Adjustment of the hip joint

G.2.4.5 Knee joint

G.2.4.5.1 Place the upper leg in the horizontal plane.

G.2.4.5.2 Mount the lower leg.

G.2.4.5.3 Tighten the adjustment nut of the knee joint, with the lower leg in the horizontal plane.

G.2.4.5.4 Loosen the adjustment nut until the lower leg can be moved (see figure G.5).

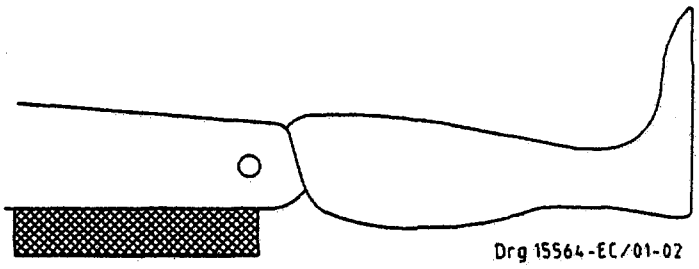


Figure G.5 — Adjustment of the knee joint

G.2.4.6 Shoulder joint

G.2.4.6.1 Place the torso upright.

G.2.4.6.2 Mount the upper arm without the lower arm.

G.2.4.6.3 Tighten the adjustment nuts of the shoulder, with the upper arm in the horizontal plane.

G.2.4.6.4 Loosen the adjustment nuts until the upper arm can be moved (see figure G.6).

G.2.4.6.5 Check the shoulder joints frequently in the initial stages. (This is necessary because of running-in problems.)

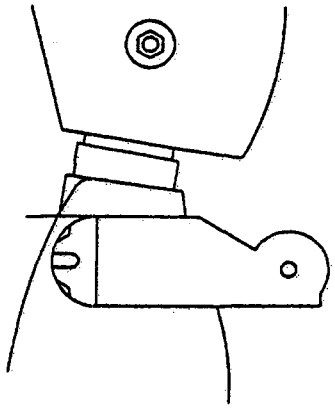


Figure G.6 — Adjustment of the shoulder joint

G.2.4.7 Elbow joint

G.2.4.7.1 Place the upper arm in the vertical plane.

G.2.4.7.2 Mount the lower arm.

G.2.4.7.3 Tighten the adjustment nut of the elbow, with the lower arm in the horizontal plane.

G.2.4.7.4 Loosen the adjustment nut until the lower arm can be moved (see figure G.7).

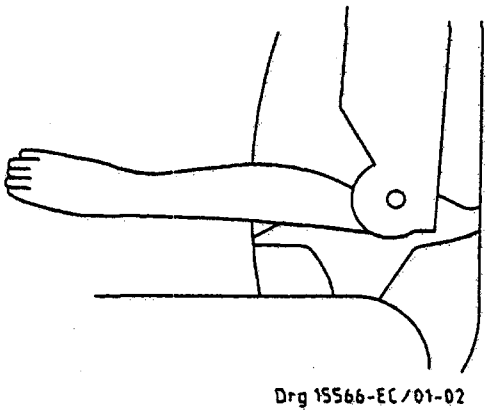


Figure G.7 — Adjustment of the elbow joint

G.2.4.8 Lumbar cable

G.2.4.8.1 Assemble the upper torso, lumbar vertebrae, lower torso, abdominal insert, lumbar cable and spring.

G.2.4.8.2 Tighten the cable adjustment nut in the lower torso until the spring is compressed to two-thirds of its unloaded length (see figure G.8).

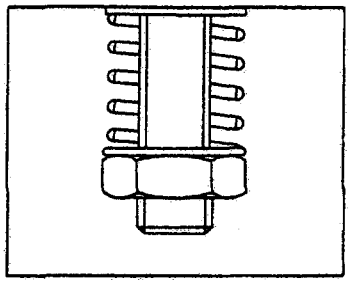


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Figure G.8 — Adjustment of the lumbar cable

G.2.4.9 Calibration of the abdominal insert

G.2.4.9.1 Carry out the calibration by means of a suitable tension-producing machine.

G.2.4.9.2 Mount the abdominal insert on a rigid block of the same length and width as the lumbar spine. Ensure that the thickness of this block is at least twice the thickness of the lumbar spine (see figure G.9).

G.2.4.9.3 Apply an initial load of 20 N.

G.2.4.9.4 Apply a constant load of 50 N.

G.2.4.9.5 Ensure that the deflection of the abdominal insert after two minutes under the constant load is

a) 11,5 mm ± 2,0 mm in the case of the 9-month-old manikin,

b) 11,5 mm ± 2,0 mm in the case of the 3-year-old manikin,

c) 13,0 mm ± 2,0 mm in the case of the 6-year-old manikin, and

d) 13,0 mm ± 2,0 mm in the case of the 10-year-old manikin.

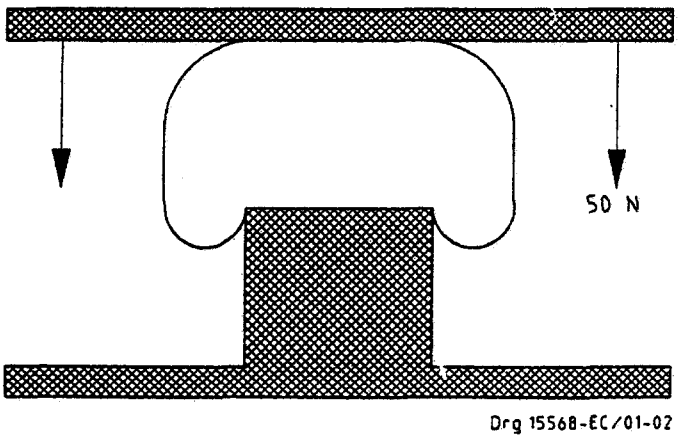

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Figure G.9 — Calibration of the abdominal insert

G.2.5 Instrumentation

G.2.5.1 General

The calibration and measuring procedures shall be based on a suitable procedure (see note to J.2).

G.2.5.2 Installation of the accelerometer in the chest

Mount the accelerometer in the protected cavity in the chest.

G.2.5.3 Indication of abdominal penetration

G.2.5.3.1 Connect a sample of modelling clay vertically to the front of the lumbar vertebrae by means of thin adhesive tape.

G.2.5.3.2 Note that a deflection of the modelling clay does not necessarily mean that penetration has taken place.

G.2.5.3.3 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 mm ± 2 mm.

G.2.5.3.4 Use only the modelling clay that is supplied with the test manikins.

G.2.5.3.5 Ensure that the temperature of the modelling clay during the test is 30 °C ± 5 °C.

G.3 Description of the newborn test manikin

G.3.1 General

The manikin comprises a head, torso, arms and legs as a single unit. The torso, arms and legs are a single moulding of sorbothane type material covered with a PVC skin and containing a steel 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 manikin are based on those of a 50th percentile newborn baby and are given in table G.3 and table G.4 and in figure G.10.

Table G.3 — Principal dimensions of the newborn test manikin

1	2	3
	Dimensions	mm
A	Rump - Crown	345
B	Rump - Sole (with straight leg)	250
C	Head width	105
D	Head depth	125
E	Shoulder width	150
F	Chest width	105
G	Chest depth	100
H	Hip width	105
I	Centre of gravity from top of head	235

Table G.4 — Mass distribution of the newborn manikin

1	2
Component	**Mass** kg
Head and neck	0,7
Torso	1,1
Arms	0,5
Legs	1,1
Total mass	3,4
NOTE The thickness of the PVC skin should be 1 mm $^{+0,5}_{-0}$ mm, and the specific gravity should be 0,865 ± 0,1.	

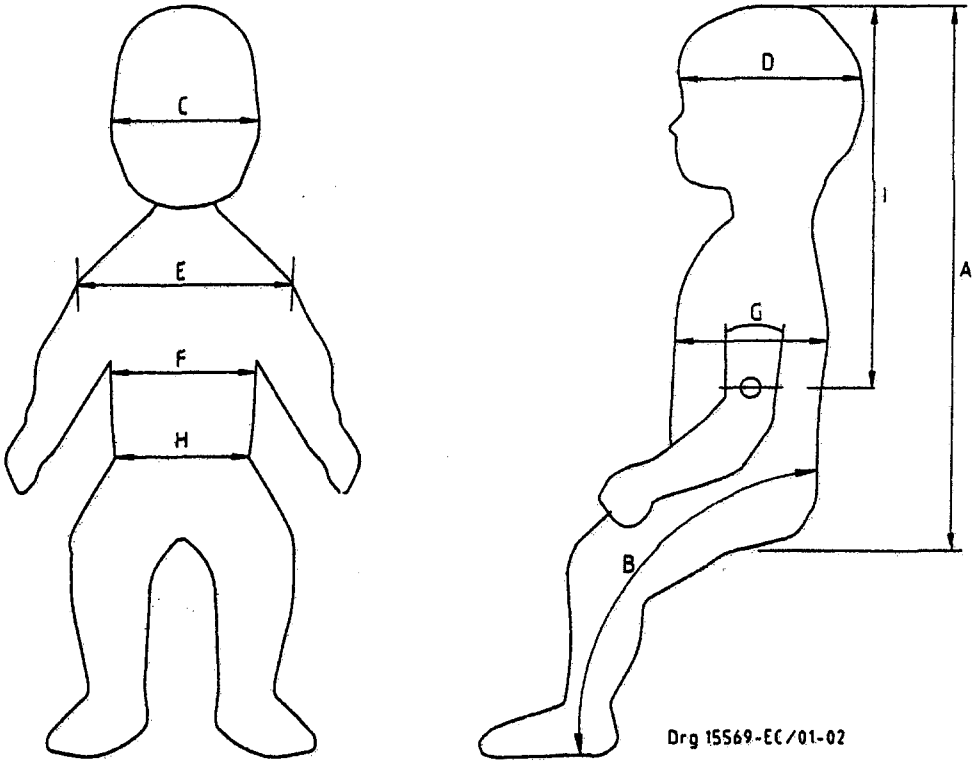


Figure G.10 — Principal dimensions of the newborn manikin

G.3.2 Calibration of the newborn manikin

G.3.2.1 Shoulder stiffness

G.3.2.1.1 Place the manikin on its back on a horizontal surface and support the torso on one side, to prevent movement (see figure G.11).

G.3.2.1.2 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 on the centre of the manikin's shoulder and adjacent to point A on the shoulder (see figure G.11). The lateral deflection of the plunger from the point of first contact with the arm should be between 30 mm and 50 mm.

G.3.2.1.3 Repeat on the opposite shoulder, reversing the support.

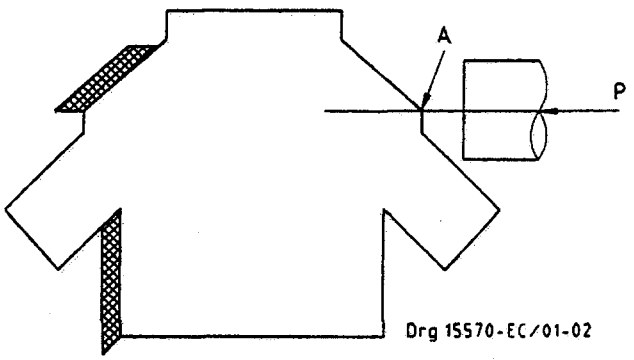


Figure G.11 — Arrangement of the newborn manikin for calibration of shoulder stiffness

G.3.2.2 Leg joint stiffness

G.3.2.2.1 Place the manikin on its back on a horizontal plane (see figure G.12) and strap the two lower legs together, bringing the inside of the knees into contact.

G.3.2.2.2 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.

G.3.2.2.3 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 that the lower limbs do not contact any surface during the test.

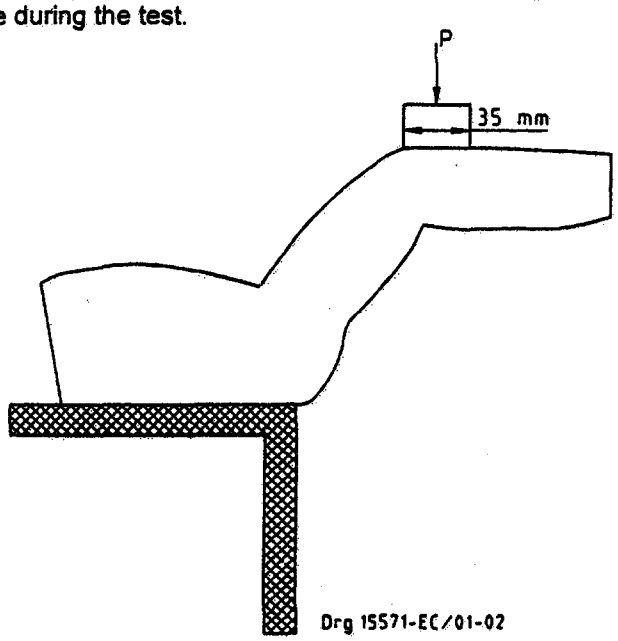


Figure G.12 — Arrangement of the newborn manikin for calibration of leg joint stiffness

G.3.3 Temperature

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

G.4 Description of the 18-month-old manikin

G.4.1 General

The dimensions and masses of the components of the manikin are based on the anthropometry of a 50th percentile child, aged 18 months.

G.4.2 Construction

G.4.2.1 Head

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

G.4.2.2 Neck

The neck consists of three parts:

a) a solid rubber column;

b) an adjustable joint at the top of the rubber column, that allows rotation under adjustable friction around the lateral axis (this joint is known as the OC joint); and

c) a non-adjustable spherical joint at the base of the neck.

G.4.2.3 Torso

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

G.4.2.4 Abdomen

The abdomen of the dummy is a one-part deformable element that is inserted in the opening between the thorax and the pelvis.

G.4.2.5 Lumbar spine

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

G.4.2.6 Pelvis

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 that simulates the flesh-skin of the pelvis and buttocks.

G.4.2.7 Hip joint

The hip joints are mounted on the lower part of the pelvis. The joint allows for rotation around a lateral axis and also rotation around an axis at right angles to the lateral axis, using a gimbal joint. Adjustable friction is applied to both axes.

G.4.2.8 Knee joint

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

G.4.2.9 Shoulder joint

The shoulder joint is mounted on the thoracic skeleton. Click-stops allow the positioning of the arm in two initial positions.

G.4.2.10 Elbow joint

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

G.4.2.11 Assembly of the manikin

G.4.2.11.1 The spine cable is mounted in the lumbar spine.

G.4.2.11.2 The lumbar spine is mounted in the skeleton between the pelvis and the thoracic spine.

G.4.2.11.3 The abdominal insert is fitted between the thorax and the pelvis.

G.4.2.11.4 The neck is mounted on top of the thorax.

G.4.2.11.5 The head is mounted on top of the neck using the interface plate.

G.4.2.11.6 The arms and legs are mounted.

G.4.3 Main characteristics

G.4.3.1 Mass

Table G.5 — Mass distribution of the 18-month-old manikin

1	2
Component	**Mass** kg
Head and neck	2,73
Torso	5,06
Upper arm (2 ×)	0,54
Lower arm (2 ×)	0,50
Upper leg (2 ×)	1,22
Lower leg (2 ×)	0,96
Total mass	11,01

G.4.3.2 Principal dimensions

The principal dimensions, based on figure G.1, are given in table G.6.

Table G.6 — Principal dimensions of the 18-month-old manikin

1	2	3
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
13	Seat to elbow	125
14	Shoulder width	224
15	Height, sitting	495[a]
16	Shoulder height, sitting	305
17	Sole to popliteus, sitting	173
18	Stature (not shown)	820[a]
19	Thigh height, sitting	66

[a] Manikin's buttocks, back and head resting against a vertical surface.

G.4.4 Adjustment of joints

G.4.4.1 General

In order to achieve reproducible results when 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 before any adjustments are made.

G.4.4.2 Lumbar spine

G.4.4.2.1 The lumbar spine is calibrated before it is mounted in the dummy.

G.4.4.2.2 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 (see figure G.14).

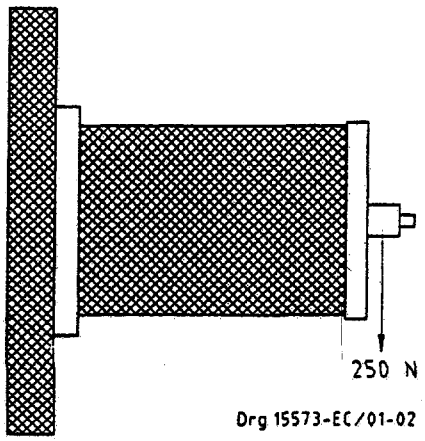


Figure G.13 — Adjustment of the lumbar spine

G.4.4.2.3 Apply a downward force of 250 N to the upper mounting plate. The resulting downward displacement recorded between 1 s and 2 s after the onset of force application, shall be between 9 mm and 12 mm.

G.4.4.3 Calibration of the abdominal insert

G.4.4.3.1 Mount the abdominal insert on a rigid block of the same length and width as the lumbar spine. The thickness of this block shall be at least twice the thickness of the lumbar spine (see figure G.9).

G.4.4.3.2 Apply an initial load of 20 N.

G.4.4.3.3 Apply a constant load of 50 N.

G.4.4.3.4 The deflection of the abdominal insert after 2 min shall be 12 mm ± 2 mm.

G.4.4.4 Adjustment of the neck

G.4.4.4.1 Mount the complete neck, consisting of the rubber column, the spherical base joint and the OC joint, against a vertical surface so that the frontal side is facing downward (see figure G.14).

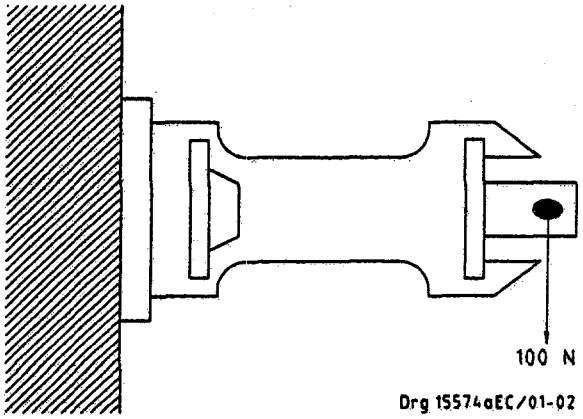


Figure G.14 — Adjustment of the neck

G.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 of 22 mm ± 2 mm.

G.4.4.5 OC joint

G.4.4.5.1 Mount the complete neck and head assembly.

G.4.4.5.2 Place the torso on its back in the horizontal plane.

G.4.4.5.3 Tighten the bolt and adjustment nut through the head and the OC joint by means of a torque wrench until the head is unable to move owing to gravity.

G.4.4.6 Hip

G.4.4.6.1 Mount the upper leg, without the lower leg, on the pelvis.

G.4.4.6.2 Place the upper leg in the horizontal plane.

G.4.4.6.3 Increase the friction exerted on the lateral axis until the leg is unable to move owing to gravity.

G.4.4.6.4 Place the upper leg in the horizontal plane, in the direction of the lateral axis.

G.4.4.6.5 Increase the friction at the gimbal joint until the upper leg unable to move owing to gravity.

G.4.4.7 Knee

G.4.4.7.1 Mount the lower leg to the upper leg.

G.4.4.7.2 Place the upper leg and the lower leg in the horizontal plane, with the upper leg supported.

G.4.4.7.3 Tighten the adjustment nut at the knee until the lower leg unable to move owing to gravity.

G.4.4.8 Shoulders

G.4.4.8.1 Extend the lower arm and place the upper arm in the highest position it will click into.

G.4.4.8.2 The click-stops in the shoulder should be serviced or replaced if the arm does not remain in this position.

G.4.4.9 Elbow

G.4.4.9.1 Place the upper arm in the lowest position it will click into and the lower arm in the upper click-stop position.

G.4.4.9.2 The click-stops in the elbow should be serviced or replaced if the lower arm does not remain in this position.

G.4.5 Instrumentation

G.4.5.1 General

G.4.5.1.1 Although provision has been made to equip the 18-month-old manikin with a number of transducers, replacements of equal size and weight are standard equipment.

G.4.5.1.2 The calibration and measuring procedures shall be based on the said SABS ECE R44.

G.4.5.2 Installation of the accelerometer in the chest

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

G.4.5.3 Indication of abdominal penetration

The occurrence or absence of abdominal penetration must be assessed using high speed photography.

Annex H

Corrosion test

H.1 Test apparatus

H.1.1 The apparatus consists 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 are optional, provided that the test conditions are met.

H.1.2 The design of the apparatus is such that drops of solution that have accumulated on the ceiling or cover of the chamber do not fall on test samples.

H.1.3 Drops of solution that fall from test samples are not returned to the reservoir for respraying.

H.1.4 The apparatus is not constructed of materials that will affect the corrosiveness of the mist.

H.2 Location of test samples in the mist chamber

H.2.1 Samples, except retractors, are 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 on the dominant surface being tested.

H.2.2 A retractor is so supported or suspended that the axis of the reel for storing the strap is perpendicular to the principal direction of horizontal flow of mist through the chamber. The strap that opens in the retractor is also facing in this principal direction.

H.2.3 Each sample is so placed as to permit free settling of mist on all samples.

H.2.4 Each sample is so placed as to prevent the salt solution from one sample from dripping onto any other sample.

H.3 Salt solution

H.3.1 The salt solution is to be prepared by dissolving 5 ± 1 parts (by mass) of sodium chloride in 95 parts of distilled water. The salt is sodium chloride that is substantially free of nickel and copper and that contains not more than 0,1 % of sodium iodide and not more than 0,3 % of total impurities in the dry state.

H.3.2 The solution is such that, when atomized at 35°C, the collected solution has a pH value in the range 6,5 to 7,2.

H.4 Compressed air

H.4.1 The compressed air supply to the nozzle or nozzles for atomizing the salt solution is free of oil and dirt, and is maintained at a pressure of between 70 kPa and 170 kPa.

H.5 Conditions in the mist chamber

H.5.1 The exposure zone of the mist chamber is maintained at 35 °C ± 5 °C. At least two clean mist collectors are so placed in the exposure zone that no drops of solution from the test samples or any

other source are collected. The collectors are placed near the test samples, one as near as possible to any nozzle and one as far as possible from all the nozzles. The mist is such that, for each 80 cm^2 of horizontal collecting area, from 1,0 mℓ to 2,0 mℓ of solution per hour, when measured over an average of at least 16 h, is collected in each collector.

H.5.2 The nozzle or nozzles is/are so directed or baffled that the spray does not impinge direct on the test samples.

Annex I

Installation for dynamic crash test

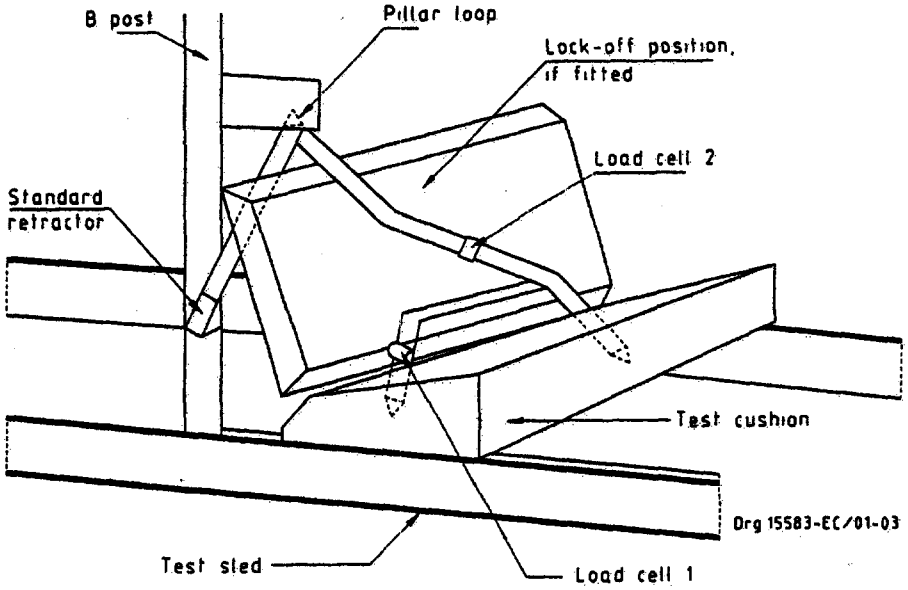


Figure I.1 — Dynamic crash test

I.1 Method

I.1.1 Lap belt only

Fit load cell 1 to the outboard position, as shown in figure I.1. Install the child restraint and tension the reference belt at the outboard position to achieve a load of 75 N ± 5 N at the outboard position.

I.1.2 Lap and diagonal belt

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

I.1.2.2 Adjust the lap portion of the reference belt to achieve a tension load of 50 N ± 5 N at load cell 1. Make a chalk mark on the webbing where it passes through the simulated buckle. While maintaining the belt at this position adjust the diagonal to achieve a tension of 50 N ± 5 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.

I.1.2.3 Extract all the webbing from the retractor spool and allow the tension in the belt between the retractor and the pillar loop to drop to the retractor tension. The spool shall be locked before the dynamic test. Conduct the dynamic crash test.

NOTE 1 Installation is conducted after fitting the manikin in the restraint.

NOTE 2 Because the foam test cushion will compress after installation of the child restraint, the dynamic test is conducted no more than 10 min after installation. To allow the cushion to recover, the minimum period between two tests using the same cushion is 20 min.

NOTE 3 Load cells fitted directly onto the belt webbing may be disconnected electrically, but are left in place during the dynamic test. The mass of each cell does not to exceed 250 g. Alternatively, the lap belt-webbing load cell may be replaced by a load cell fixed at the anchorage point.

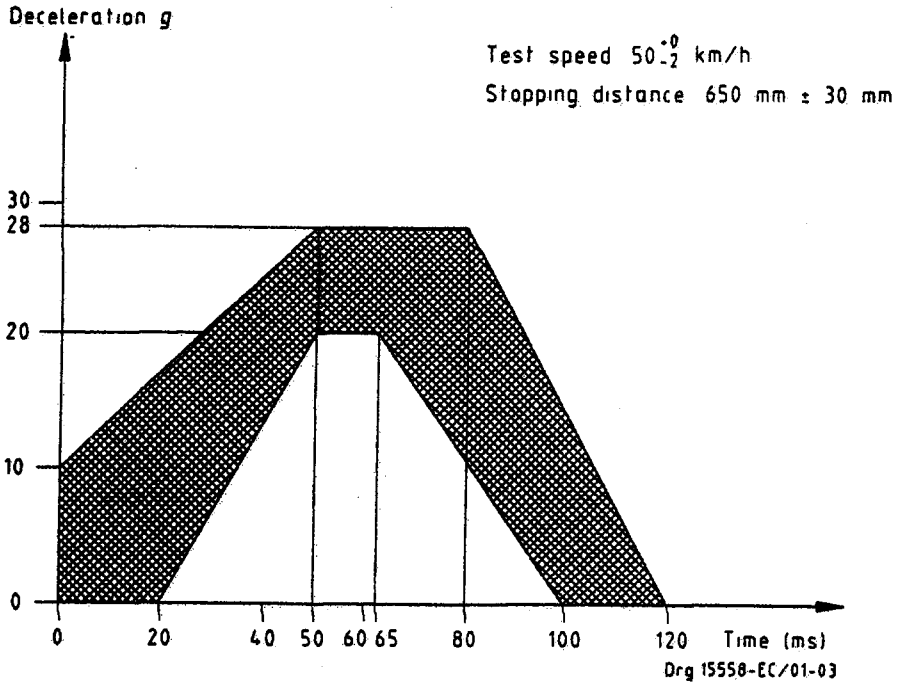
Annex J

Calibration testing — Curve of the trolley's deceleration as a function of time

J.1 The deceleration curve of the trolley weighted with inert masspieces to produce a total mass of 455 kg ± 20 kg in the case of tests performed in accordance with 7.1.3.1 of this specification and of 910 kg ± 40 kg in the case of tests performed in accordance with 7.1.3.2 of this specification, where the nominal mass of the trolley and the attached vehicle structure is 800 kg, shall be, in the case of frontal impact, within the hatched area shown in figure J.1, and, in the case of rear impact, within the hatched area shown in figure J.2.

J.2 If necessary, the nominal mass of the trolley and the attached vehicle structure may be increased by an additional inert mass of 28 kg for each increment of 200 kg. In no case shall the total mass of the trolley, the vehicle structure and the inert masspieces differ from the nominal value for calibration tests by more than 40 kg. During calibration of the stopping device, the stopping distance shall be 650 mm ± 30 mm in the case of frontal impact, and 275 mm ± 20 mm in the case of rear impact.

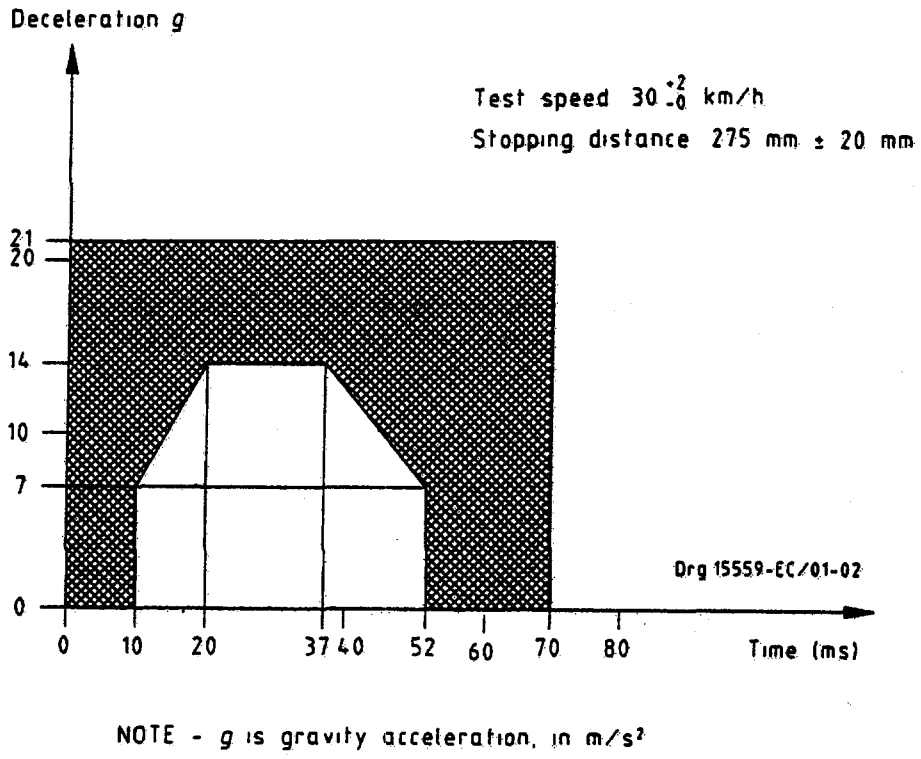
NOTE The calibration and measuring procedures should correspond to those defined in a suitable procedure[1)] and the measuring equipment should correspond to the specification of a data channel, with a channel frequency class (CFC) 60.



NOTE - g is gravity acceleration, in m/s^2

Figure J.1 — Curves of the trolley's deceleration as a function of time (curve for calibrating stopping device): frontal impact

[1] A suitable procedure is given in SABS ECE R44, *Uniform provisions concerning the approval of restraining devices for child occupants of power-driven vehicles ("child restraint system").*



NOTE - g is gravity acceleration, in m/s^2

Figure J.2 — Curves of the trolley's deceleration as a function of time (curve for calibrating stopping device): rear impact

Annex K

Frontal impact test against a barrier

K.1 Installations, procedure and measuring instruments

K.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.

K.1.2 Barrier

The barrier shall consist 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 its mass is at least 70 000 kg. The front face shall be vertical, perpendicular to the axis of the run-up track, and covered with plywood boards of thickness 20 mm ± 1 mm and 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 that gives results at least equally conclusive, may likewise be used.

K.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 barrier on a course perpendicular to the front face of the barrier. The maximum lateral misalignment permitted between the vertical median line of the front of the vehicle and the vertical median line of the barrier shall be ± 300 mm.

K.1.4 State of the vehicle

K.1.4.1 The vehicle under test shall either be fitted with all the normal components and equipment the mass of which is included in its unladen service mass, 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 mass of the vehicle as a whole are concerned.

K.1.4.2 If the vehicle is driven by external means, the fuel installation shall be filled to at least 90 % of its capacity, either with fuel or with a non-flammable liquid, that has a density and a viscosity close to those of the fuel normally used. All other systems (brake-fluid containers, radiators, etc.) shall be empty.

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

K.1.4.4 If the manufacturer so requests, the test authority responsible for conducting the tests may allow the same vehicle as is used for tests prescribed by other specifications (including tests capable of affecting its structure) to be used for the tests prescribed by this specification.

K.1.5 Impact velocity

The impact velocity shall be 50 km/h $^{0}_{-2}$ km/h. However, if the test has been carried out at a higher impact velocity and the vehicle has satisfied the conditions prescribed, the test shall be considered satisfactory.

K.1.6 Measuring instruments

The instrument used to record the velocity referred to in K.1.5 above shall be accurate to within 1 %.

Annex L

Rear impact test procedure

L.1 Installations, procedures and measuring instruments

L.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 impacted vehicle 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 %, measured over a length of 1 m.

L.1.2 Impactor

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

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

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

a) The impacting surface shall be vertical and perpendicular to the median longitudinal plane of the impacted vehicle.

b) The direction of movement of the impactor shall be substantially horizontal and parallel to the median longitudinal plane of the impacted vehicle.

c) 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.

d) The ground clearance of the lower edge of the impacting surface shall be 175 mm ± 25 mm.

L.1.3 Propulsion of the impactor

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

L.1.4 Special provisions applicable where a moving barrier is used

L.1.4.1 If the impactor is secured to a carriage (moving barrier) by a restraining element, the latter shall be rigid and incapable of being deformed by the impact. The carriage shall, at the moment of impact, be capable of moving freely, shall no longer be subject to the action of the propelling device, and shall have a velocity of between 30 km/h and 32 km/h.

L.1.4.2 The combined mass of carriage and impactor shall be 1 100 kg ± 20 kg.

L.1.5 Special provisions applicable where a pendulum is used

L.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.

L.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.

L.1.5.3 A stopping device shall be incorporated in the pendulum to prevent any secondary impact by the impactor on the test vehicle.

L.1.5.4 At the moment of impact, the velocity of the centre of percussion of the pendulum shall be between 30 km/h and 32 km/h.

L.1.5.5 The reduced mass m_r at the centre of the pendulum is defined by the equation:

$$m_r = m \times l/a$$

where

a[1)] is the distance between the centre of the percussion and the axis of rotation;

l is the distance between the centre of gravity and the axis of rotation.

L.1.5.6 The reduced mass m_r shall be 1 100 kg ± 20 kg.

L.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 that given in L.1.4.1 or L.1.5.4 (as applicable), or with a mass greater than that given in L.1.4.2 or L.1.5.6 (as applicable), or with both a higher velocity and a greater mass than those prescribed, and the vehicle has met the requirements prescribed, the test shall be considered satisfactory.

L.1.7 State of the vehicle during the test

The vehicle under test shall either be fitted with all the normal components and equipment the mass of which is included in its unladen service mass or be in such condition as to fulfil this requirement in so far as the distribution of the service mass of the vehicle as a whole is concerned.

L.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.

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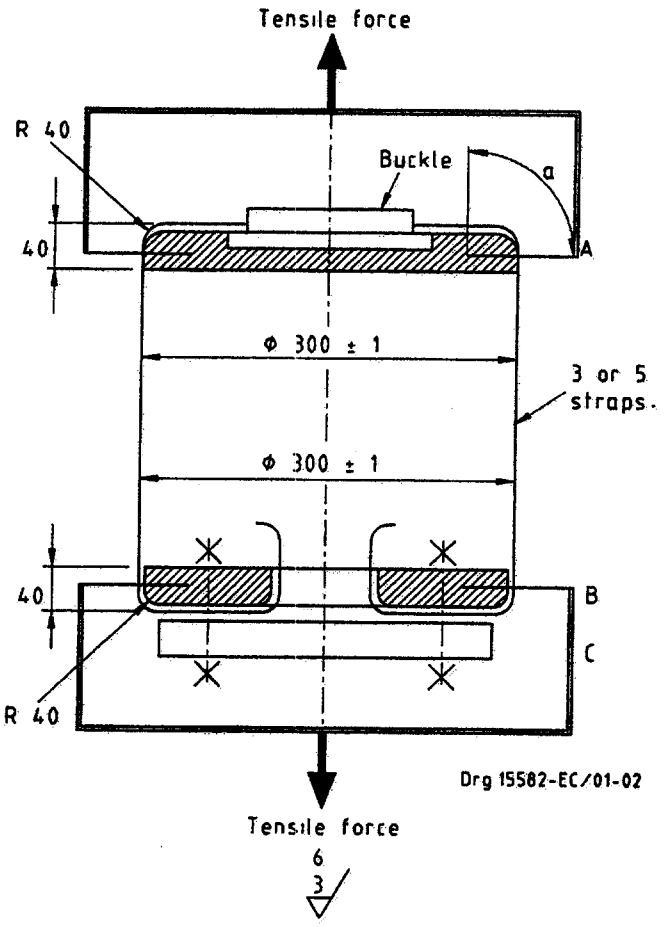
[1] The distance *a* is equal to the length of the sybchronous pendulum under consideration.

Annex M

Typical buckle strength test device

Dimensions in millimetres

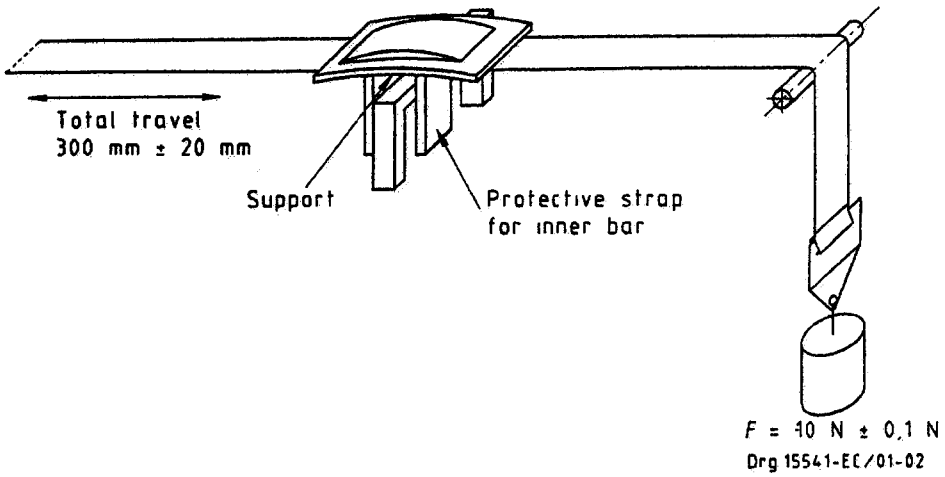


a = surface at A

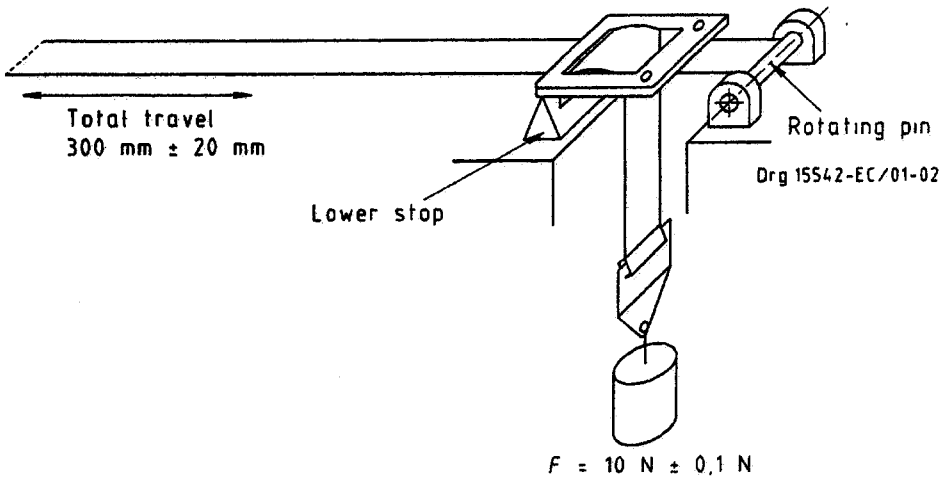
Figure M.1 — Typical buckle strength test device

Annex N

Abrasion and microslip test

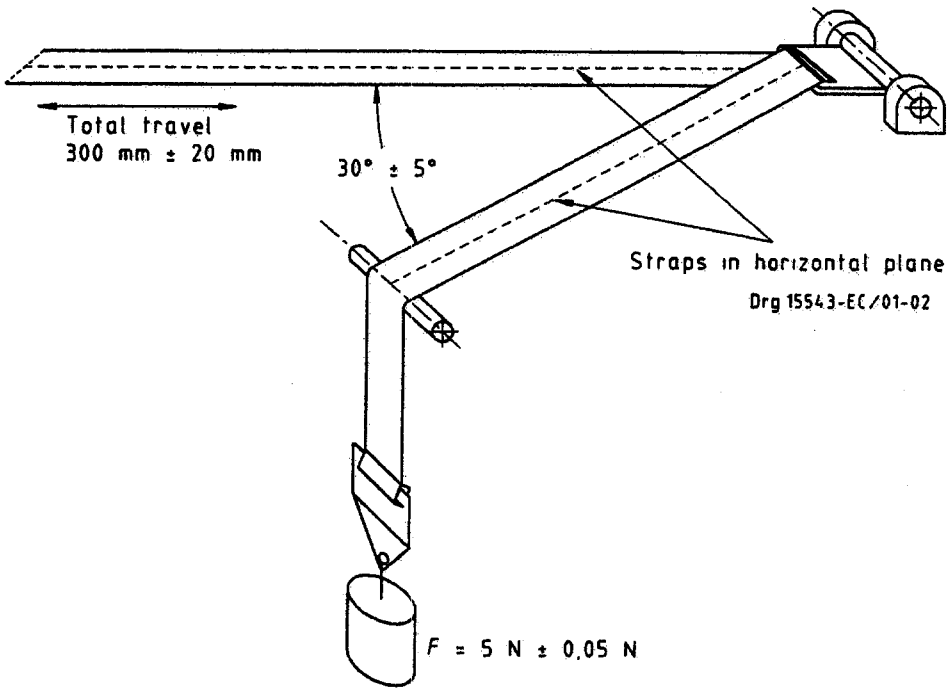


Example a

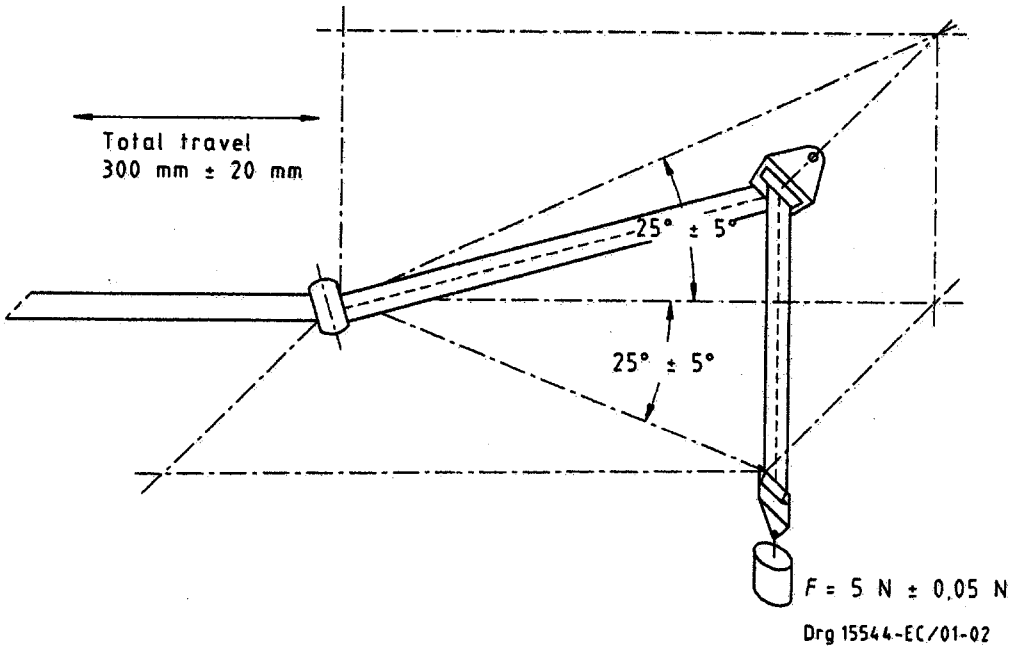


Example b

Figure N.1 — Procedure type 1
Examples of test arrangements corresponding to the type of adjusting device

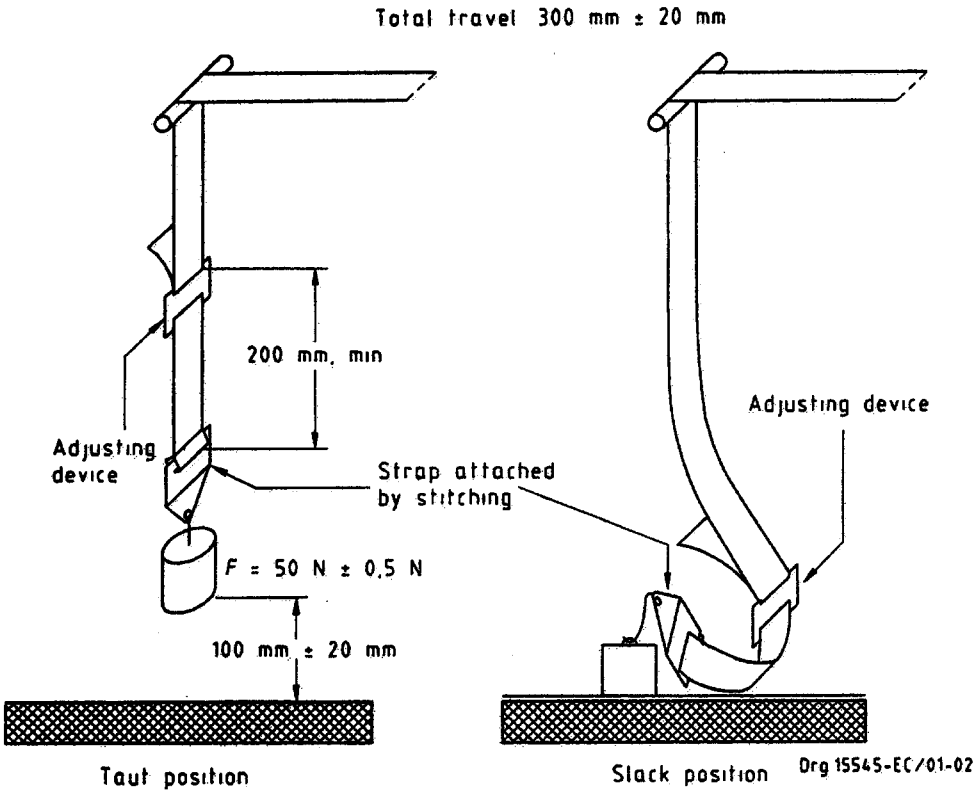


(a) Test in the buckle



(b) Test in a guide or pulley

Figure N.2 — Procedure type 2



The load of 50 N on the testing device shall be guided vertically so that load-swing and twisting of the strap are prevented.

The attaching device shall be fixed to the load of 50 N in the same way as in the vehicle.

Figure N.3 — Microslip test

Annex O

Arrangement of apparatus for dust-resistance test

Dimensions in millimetres

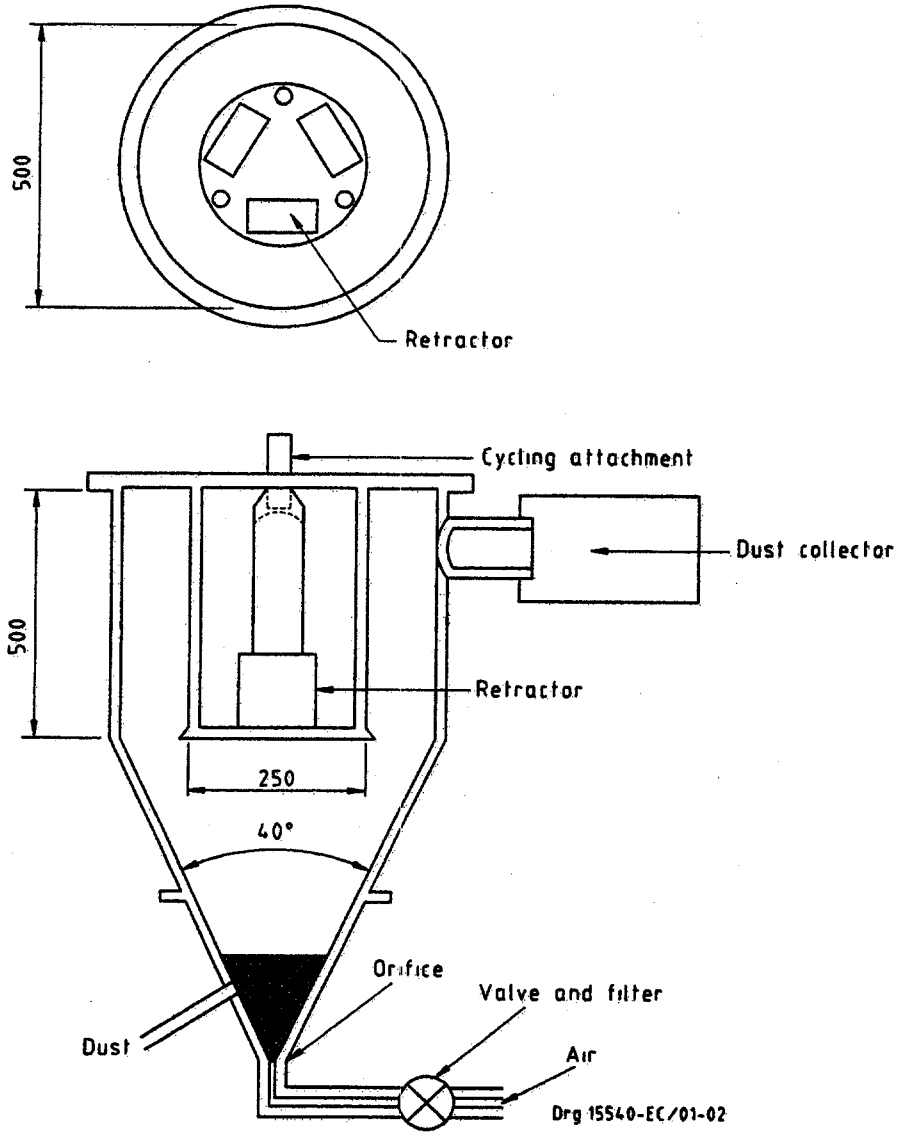


Figure O.1 — Arrangement of apparatus for dust-resistance test

Annex P

Description of conditioning of adjusters mounted directly on child restraints

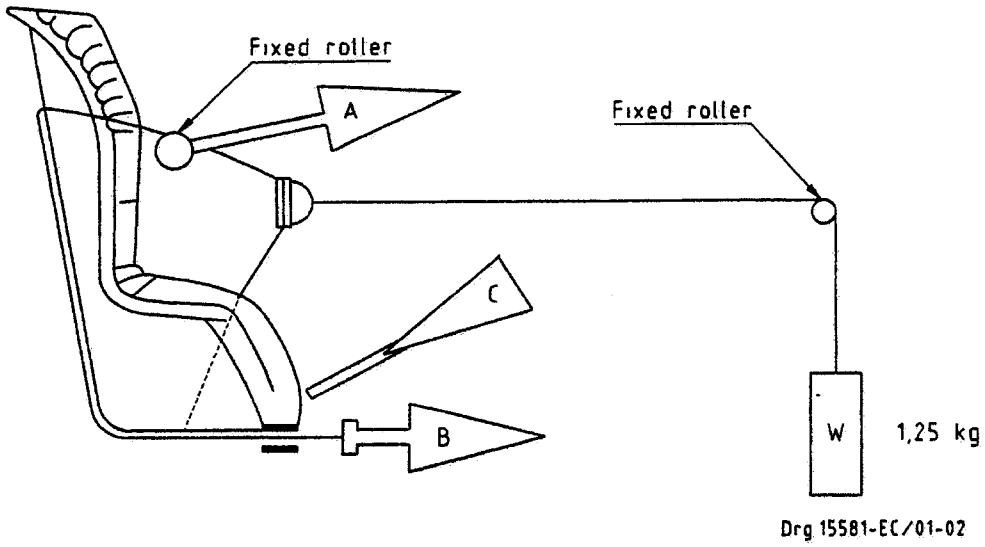


Figure P.1 — Arrangement of adjusters mounted directly on child restaints for conditioning

P.1 Method

P.1.1 With the webbing set at the reference position described in 7.2.7, withdraw at least 50 mm of webbing from the integral harness by pulling on the free end of the webbing.

P.1.2 Attach the adjusted part of the integral harness to the pulling device A.

P.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.

P.1.4 Connect free end of webbing to pulling device B.

P.2 The cycle

P.2.1 Pull B at least 150 mm while A exerts no tension on the integral harness.

P.2.2 Activate the adjusters and pull A while B exerts no tension on the free end of the webbing.

P.2.3 At the end of stroke, deactivate the adjuster.

P.2.4 Repeat cycle as specified in 6.2.2.7.

Annex Q

Explanatory notes

Q.1 The explanatory notes given in this annex concern difficulties with interpretation. They are meant as a guide for the test authority.

Q.1.1 Subclause 2.2.1: A quick adjuster can also be a device with a rotation shaft and spring similar to the retractor with a manual release. The adjuster should be tested in accordance with 6.2.2.5 and 6.2.3.1.3.

Q.1.2 Subclause 2.9.2: A semi-universal restraint specified for fitting to the rear seat in both a saloon and an estate type vehicle in which the entire belt assembly is identical, is one type.

Q.1.3 Subclause 2.9.3: The significance of changes in the dimensions or mass (or both) 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.

Q.1.4 Subclauses 2.9.4 and 2.9.5: These shall not apply to any safety belts that have been separately approved in accordance with the said SABS 1080 and that are necessary to anchor the child restraint to the vehicle or to restrain the child.

Q.1.5 Subclause 4.1.2: For rearward-facing child restraints the correct position of the top of the restraint relative to the dummy head is ensured by installing the largest dummy for which the device was specified, in the most reclined configuration, and making sure that the horizontal line at the height of the eye passes below the top of the seat.

Q.1.6 Subclause 4.2.4: This shall be assessed by examination of the high-speed film results where visible penetration of the abdomen by any part of the restraint, or riding up of any lap strap onto the chest, shall constitute a failure. (Twisting of the manikin out of the shoulder strap before the point of maximum displacement shall itself also be considered as a failure, but at the manufacturer's request, two further tests may be performed with the appropriate manikin. All test requirements shall be met in full during these tests.)

Q.1.7 Subclause 6.1.2.1 and annexes E and D: Either energy absorbing material or the integral material of the child restraint structure can be tested for compliance with annexes E and D, where the structure is not homogeneous, or, if there is likely to be varying performance over the child restraint system structure, the test authority will determine the worst case for testing compliance. The energy absorbing material may form the whole or part of the child restraint system cover.

Q.1.8 Subclause 6.1.3: The overturning test shall be conducted using the same installation procedure and parameters as those defined for the dynamic test. Stopping of the rig during the overturning is not allowed.

Q.1.9 Subclause 6.1.4.2.2: This refers to the acceleration of tensile loads in the spine of the dummy.

Q.1.10 Subclause 6.1.4.3: "Visible sign 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.

Q.1.11 Subclause 6.2.1.5: The requirement specified in the first sentence is complied with if the hand of the manikin can reach the buckle.

Q.1.12 Subclause 6.2.2.1: This shall be used to ensure that separately approved guide-straps are easily attached and detached.

Q.1.13 Subclause 6.2.4.1.1: Two straps are required. Measure the breaking load of the first strap. Measure the width of the second strap at 75 % of this load.

Q.1.14 Subclause 7.1.2.2: "Fastened to the test seat" means the test seat as given in annex D. "Specific vehicles 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.

Q.1.15 Subclause 7.2.2.1.1: "Having regard for the normal conditions of use" means that this test should be performed with the restraint mounted on the test seat or vehicle seat, but without the manikin.

The manikin shall be used only to position the adjusting device. In the first instance, the straps should be adjusted in accordance with 7.1.3.6.2.3 or 7.1.3.6.2.4. The test should then be conducted after removal of the manikin.

Q.1.16 Subclause 7.2.4.2.6: This shall not apply to guide straps that are approved separately under this specification.