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**Furniture — Children's high chairs —  
Part 2:  
Test methods**

*Ameublement — Chaises hautes pour enfants —  
Partie 2: Méthodes d'essai*

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ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 136, *Furniture*.

This second edition cancels and replaces the first edition (ISO 9221-2:1992), which has been technically revised.

ISO 9221 consists of the following parts, under the general title *Furniture — Children's high chairs*:

- *Part 1: Safety requirements*
- *Part 2: Test methods*

## Introduction

This part of ISO 9221 has been prepared in order to specify test methods to provide assurance that children's high chairs comply with the requirements in ISO 9221-1.

The tests are designed to evaluate properties without regard to materials, design/construction, or manufacturing processes.

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# Furniture — Children's high chairs —

## Part 2: Test methods

### 1 Scope

This part of ISO 9221 specifies test methods for the assessment of the requirements of children's high chairs.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7619-2, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 2: IRHD pocket meter method*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **children's high chair**

free standing chair that elevates the child to approximately dining table height, intended for holding the child from 6 months to 36 months of age who is capable of remaining in a sitting position due to his or her own coordination

#### 3.2

##### **crotch restraint**

strap or bar passing between the legs of the child which prevents the child from slipping forward out of the high chair

#### 3.3

##### **integral harness**

assembly intended to retain the child in the high chair comprising either a crotch restraint, waist strap and shoulder straps or comprising straps that pass over the child's shoulders and between the child's legs

#### 3.4

##### **waist belt**

strap, which when fastened, fully surrounds the child's waist

#### 3.5

##### **waist strap**

strap, which when fastened, goes from one side of the child to the other passing in front of the child's waist

#### 3.6

##### **opening**

space between structural members or components

**3.7**  
**shear and squeeze points**  
gaps which can cause harm to parts of the body and which occur when two parts close together or open during relative movements

**3.8**  
**locking device**  
device which is mounted on a frame and which will maintain parts of the frame in position of use

**3.9**  
**locking mechanism**  
mechanism composed by a locking device and one or more operating devices

Note 1 to entry: An action deactivates the locking devices, e.g. pushing a button, pressing a lever or turning a knob.

**3.10**  
**junction line**  
intersection of the seat and the backrest

Note 1 to entry: See [Figure 1](#).

Note 2 to entry: The method for determining the junction line can be found in [4.2](#).

## 4 General test conditions

### 4.1 Preliminary preparation

The tests are designed to be applied to a high chair that is fully assembled according to the manufacturer's instructions and ready for use.

If the product can be converted to other products not falling within the scope on this part of ISO 9221 (e.g. table and small chair, adult chair, swings, booster seats, etc.), these configurations shall not be tested according to this part of ISO 9221.

The tests shall be carried out in indoor ambient condition with a temperature between 15 °C and 25 °C. If the temperature lies outside this range, its maximum and minimum shall be recorded in the test report.

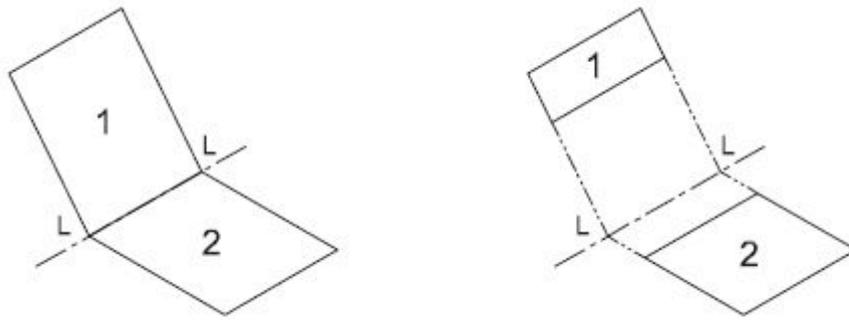
The high chair shall be tested as delivered. If the high chair is a knock-down type, it shall be assembled according to the instructions supplied with it. If the instructions allow for different adjustments or configurations of components (e.g. inclination of the backrest, height of the seat, position of the tray, position of castors/wheels, etc.), the most onerous combination shall be used for each test.

Knock-down fittings shall be tightened before testing. Further re-tightening shall not take place unless this is specifically required by the manufacturer's instructions.

### 4.2 Determination of the junction line

The junction line is shown in [Figure 1](#).

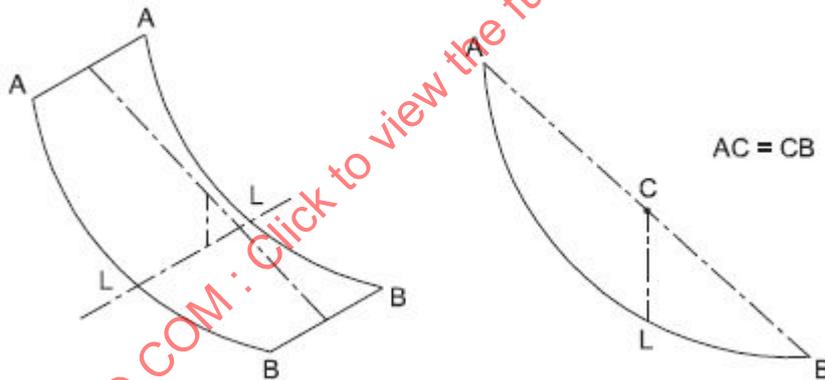
Where the backrest and the seat do not meet, the junction line is the projection of the backrest onto the seat (see [Figure 1](#)).

**Key**

- LL junction line
- 1 backrest
- 2 seat

**Figure 1 — Junction line**

When the seat unit is in the form of a hammock, then a theoretical junction line, "LL", is determined as shown in [Figure 2](#). The junction line may vary when the backrest is adjusted in different positions.

**Key**

- AA top edge of the backrest
- BB front edge of the seat
- LL junction line
- CL vertical projection of C on the hammock

**Figure 2 — Junction line for seat units in form of a hammock****4.3 Test sequence**

All tests shall be carried out on one sample and in the order laid down in this part of ISO 9221 except for the test in [6.9](#), which shall be performed at the end of the whole test procedure.

#### 4.4 Tolerances

Unless otherwise stated, the following tolerances apply:

- Forces:  $\pm 5\%$ ;
- Masses:  $\pm 0,5\%$ ;
- Dimensions:  $\pm 1,0$  mm;
- Angles:  $\pm 2^\circ$ ;
- Positioning of loading pads:  $\pm 5$  mm.

The forces may be replaced by masses. The relationship of  $10\text{ N} = 1\text{ kg}$  shall be used.

### 5 Test equipment

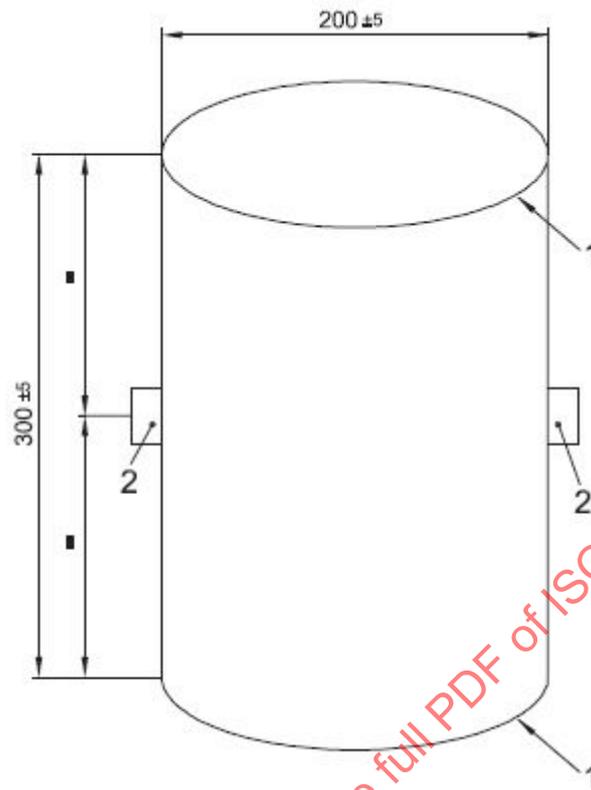
#### 5.1 General

Unless otherwise specified, test forces may be applied by any suitable device because results are dependent only upon correctly applied forces and not upon the apparatus.

The test forces in the static load tests shall be applied sufficiently slowly to ensure that negligible dynamic forces are applied.

#### 5.2 Test dummy

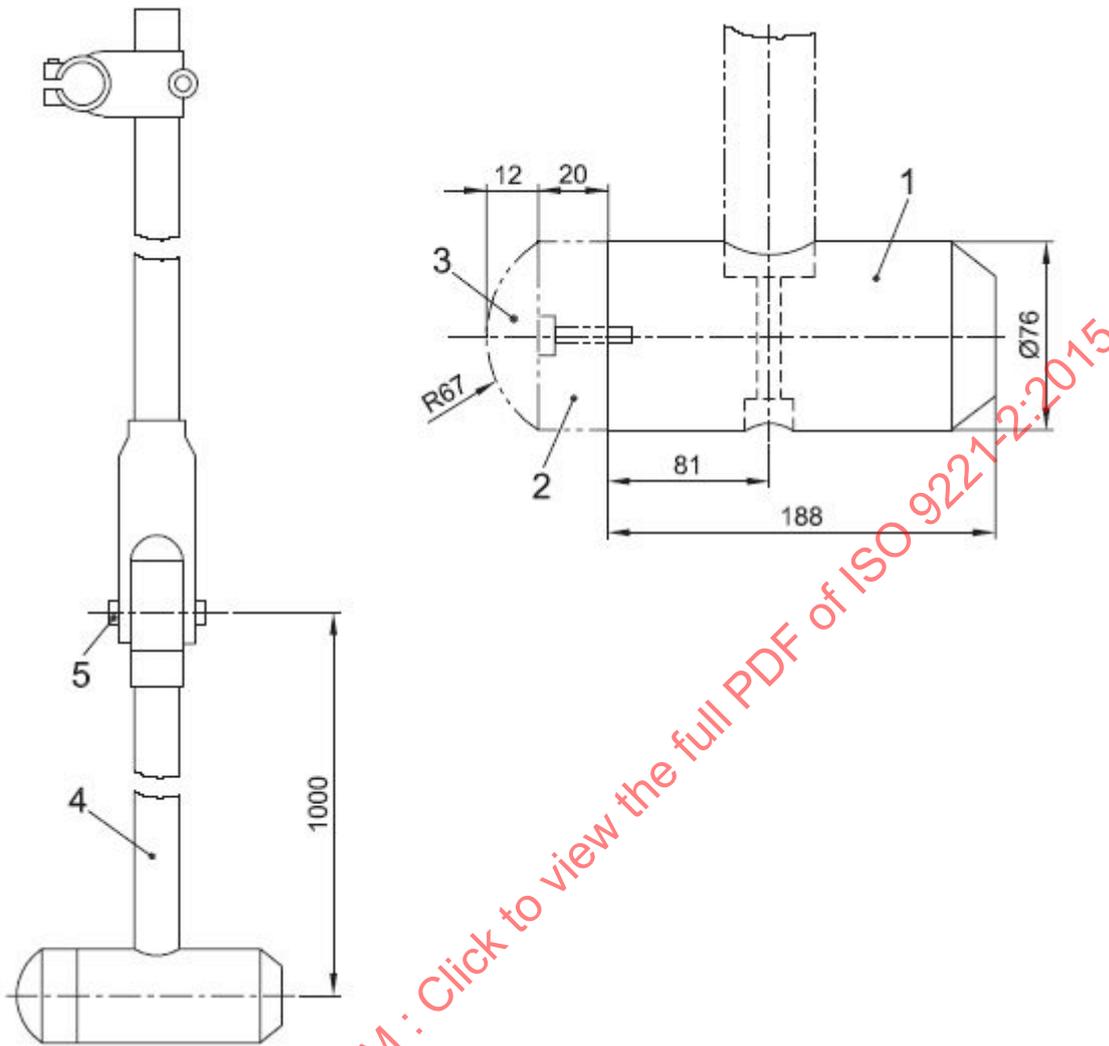
A rigid cylinder 200 mm in diameter and 300 mm in height, having a mass of 15 kg and with its centre of gravity 150 mm above its base. All the edges of the cylinder shall have a radius of 5 mm. Two safety harness anchorage points shall be provided. These shall be positioned 150 mm from the base and  $180^\circ$  to each other around the circumference (see [Figure 3](#)).

**Key**

- 1 top edge of the backrest
- 2 front edge of the seat

**Figure 3 — Test dummy****5.3 Impact hammer**

A striker in the form of a cylindrical object having a total mass of 6,5 kg, supported from a pivot by a steel tube of 38 mm in diameter and with a wall thickness of 2 mm (see [Figure 4](#)). The distance between the pivot and the centre of gravity of the striker shall be 1 000 mm. The pendulum arm shall be pivoted by a low friction bearing.



**Key**

- 1 pendulum head, steel mass 6,4 kg
- 2 hardwood
- 3 rubber 50 IRHD (see ISO 7619-2)
- 4 pendulum arm, length 950 mm; high tensile steel tube  $\varnothing$  38 mm  $\times$  2 mm; mass 2 kg  $\pm$  0,2 kg
- 5 pivot point

Mass of assembly (Pos. No 1,2 and 3): 6,5 kg  $\pm$  0,07 kg

**Figure 4 — Impact hammer**

**5.4 Loading pad**

A rigid cylindrical object 100 mm in diameter having a smooth hard surface and rounded edges with radius of 12 mm.

**5.5 Small loading pad**

A rigid cylindrical object 30 mm in diameter and at least 10 mm in thickness having a smooth hard surface and rounded edges with radius of  $(0,8 \pm 0,3)$  mm.

## 5.6 Stops

Stops to prevent the article from sliding but not tilting, no higher than 12 mm except in cases where the design of the item necessitates the use of higher stops, in which case the lowest stops that will prevent the item from moving shall be used.

## 5.7 Floor surface

Horizontal, flat and rigid plane with a smooth surface. For the tests according to 6.2 and 6.18.3, a rubber mat 2 mm thick, with hardness  $(75 \pm 10)$  IRHD according to EN ISO 868, ISO 7619-1 or ISO 7619-2, shall be used on a concrete floor.

## 5.8 Beams

Stops to prevent the article from sliding but not tilting, no higher than 12 mm except in cases where the design of the item necessitates the use of higher stops, in which case the lowest stops that will prevent the item from moving shall be used.

### 5.8.1 Beam for stability test and for measurement of the lateral protection length

A beam, not less than 900 mm long, with a square section of  $(25 \pm 1)$  mm  $\times$   $(25 \pm 1)$  mm and with a mass of  $0,5$  kg  $\pm$  10 g.

NOTE An aluminium beam with a square section of 25 mm  $\times$  25 mm, with a length of approximately 1 020 mm and a wall thickness of 2 mm complies with these requirements.

### 5.8.2 Beam for height of lateral protection test

A beam, 86 mm wide with a mass of  $0,5$  kg  $\pm$  10 g.

## 5.9 Slide gauges

Cones with an angle of  $30^\circ \pm 0,5^\circ$ , made of plastics or other hard, smooth material mounted on a force measuring device (see Figure 5). There shall be four cones having diameters 5 mm  $\begin{matrix} -0,1 \\ 0 \end{matrix}$  mm,

7 mm  $\begin{matrix} -0,1 \\ 0 \end{matrix}$  mm, 12 mm  $\begin{matrix} 0 \\ +0,1 \end{matrix}$  mm, and 18 mm  $\begin{matrix} 0 \\ +0,1 \end{matrix}$  mm.

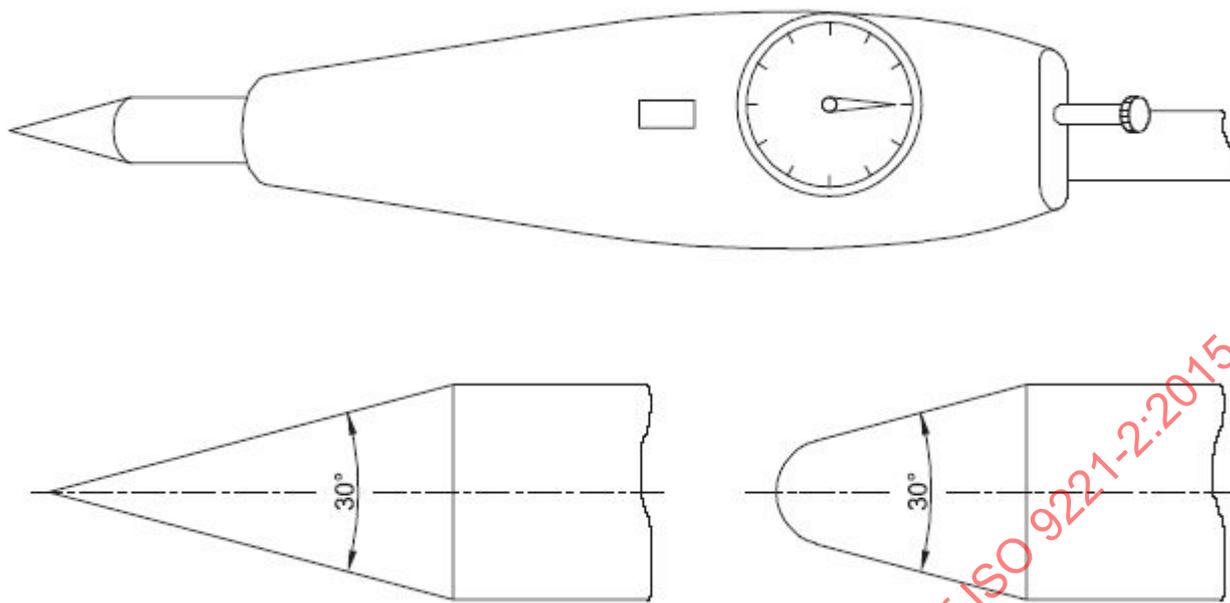


Figure 5 — Example of slide gauges

#### 5.10 Force-measuring device

E.g. a dynamometer.

#### 5.11 Test load

Cylinder of 5 kg mass and 100 mm diameter.

#### 5.12 Small parts cylinder

Small parts cylinder for assessment of small components, having dimensions in accordance with [Figure 6](#).

Dimensions in millimetres

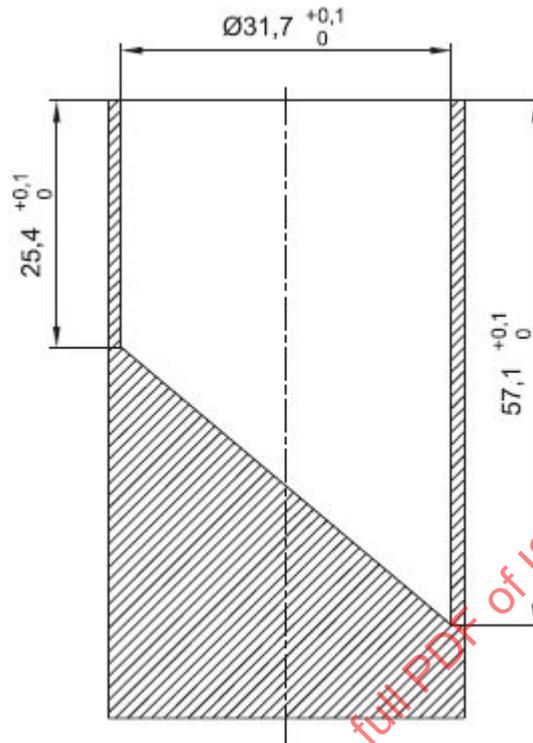
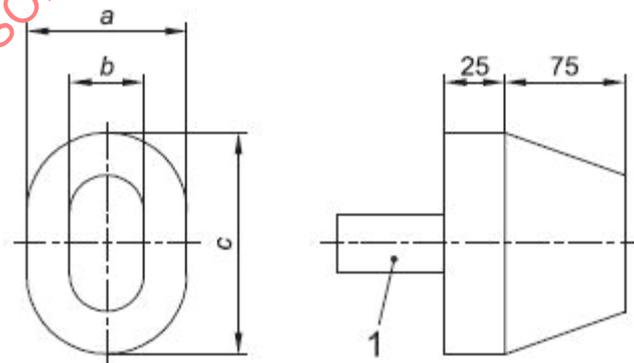


Figure 6 — Test cylinder

### 5.13 Small torso probe

The small torso probe shall be made from plastics or other hard, smooth material with dimensions as shown in [Figure 7](#).

Dimensions in millimetres



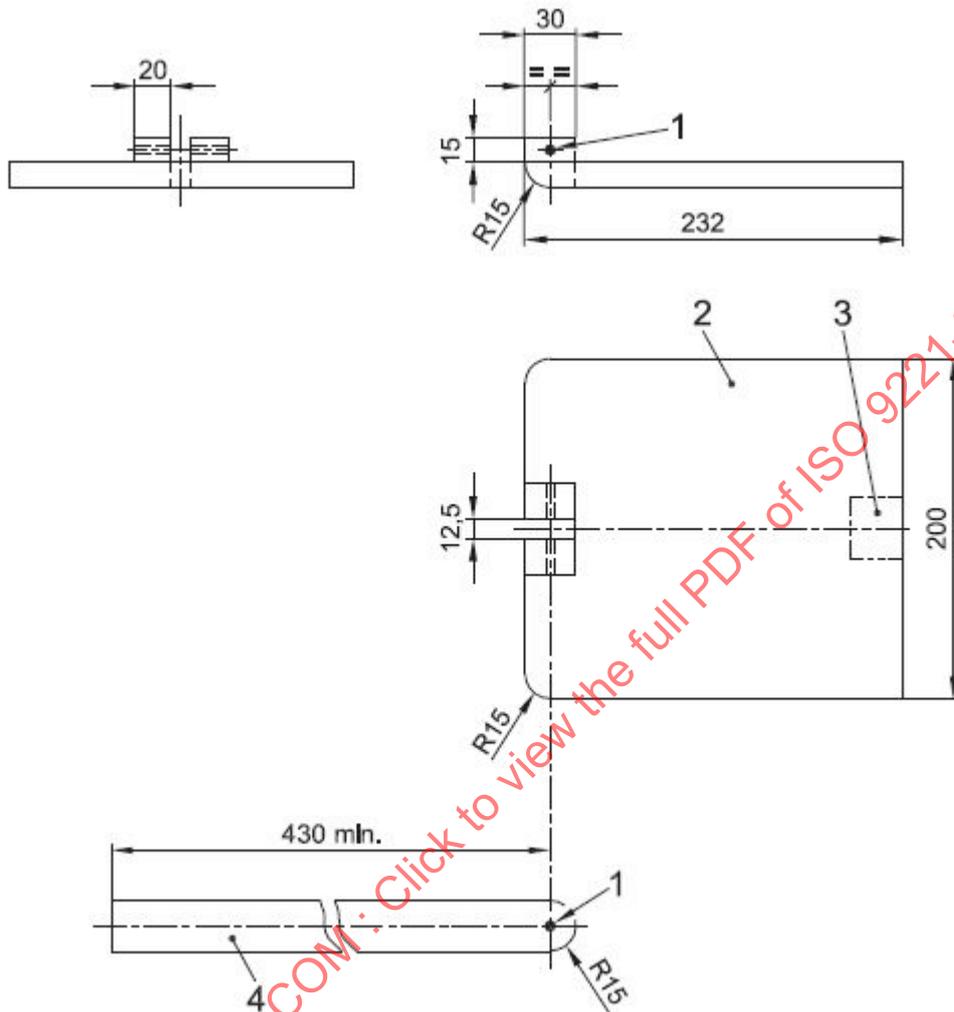
**Key**

- 1 handle
- a 86
- b 40
- c 120

Figure 7 — Small torso probe

5.14 Device for measuring the angle, the length and the height of the backrest and the height of the lateral protection

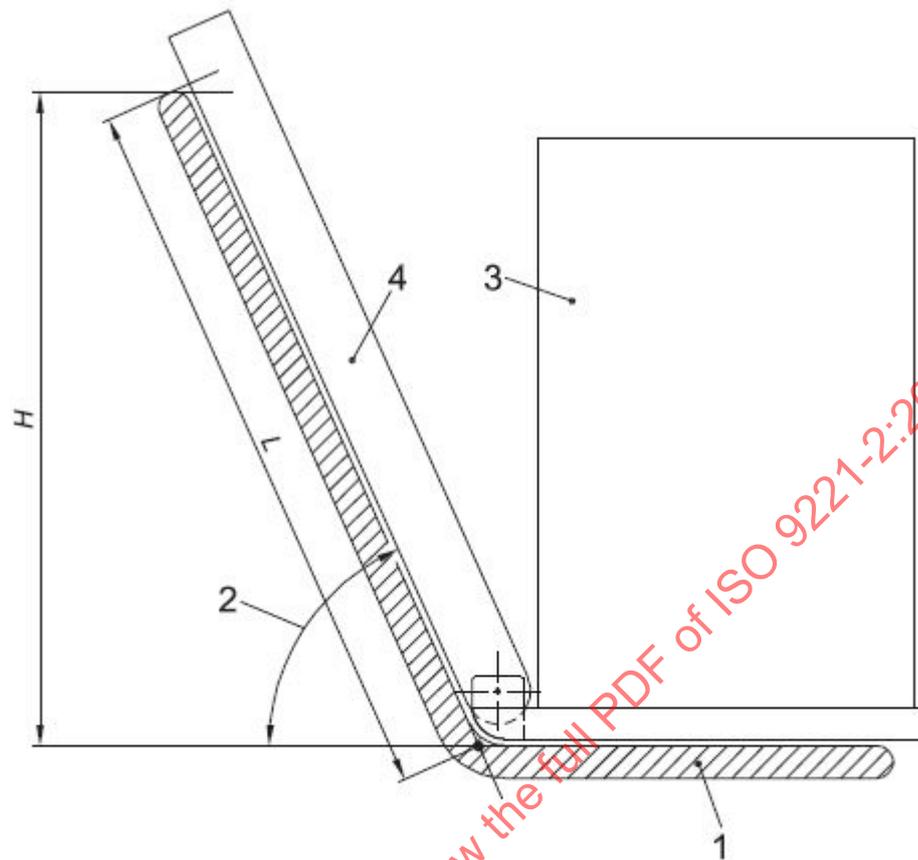
Dimension in millimetres



Key

- 1 pivot hole
  - 2 base board: 9 mm plywood or hardwood
  - 3 allowed cut-off for crotch restraint
  - 4 measuring device - reclining board: 30 mm × 12 mm hardwood
- Pivot pin: 5 mm × 60 mm steel or other hard material

Figure 8 — Device for measuring the backrest angle, length and height

**Key**

- 1 seat frame
- 2 angle to be measured
- 3 test dummy (see 5.2)
- 4 measuring device
- $L$  length of the backrest
- $H$  height of the backrest

**Figure 9 — Measurement of the back rest angle, length and height**

**5.15 Leg probe**

A cylindrical probe with a diameter of 38 mm and a length of at least 76 mm.

**5.16 Wedge block**

A block with smooth surfaces and with dimensions according to [Figure 10](#), made of hard, smooth material.

Dimensions in millimetres

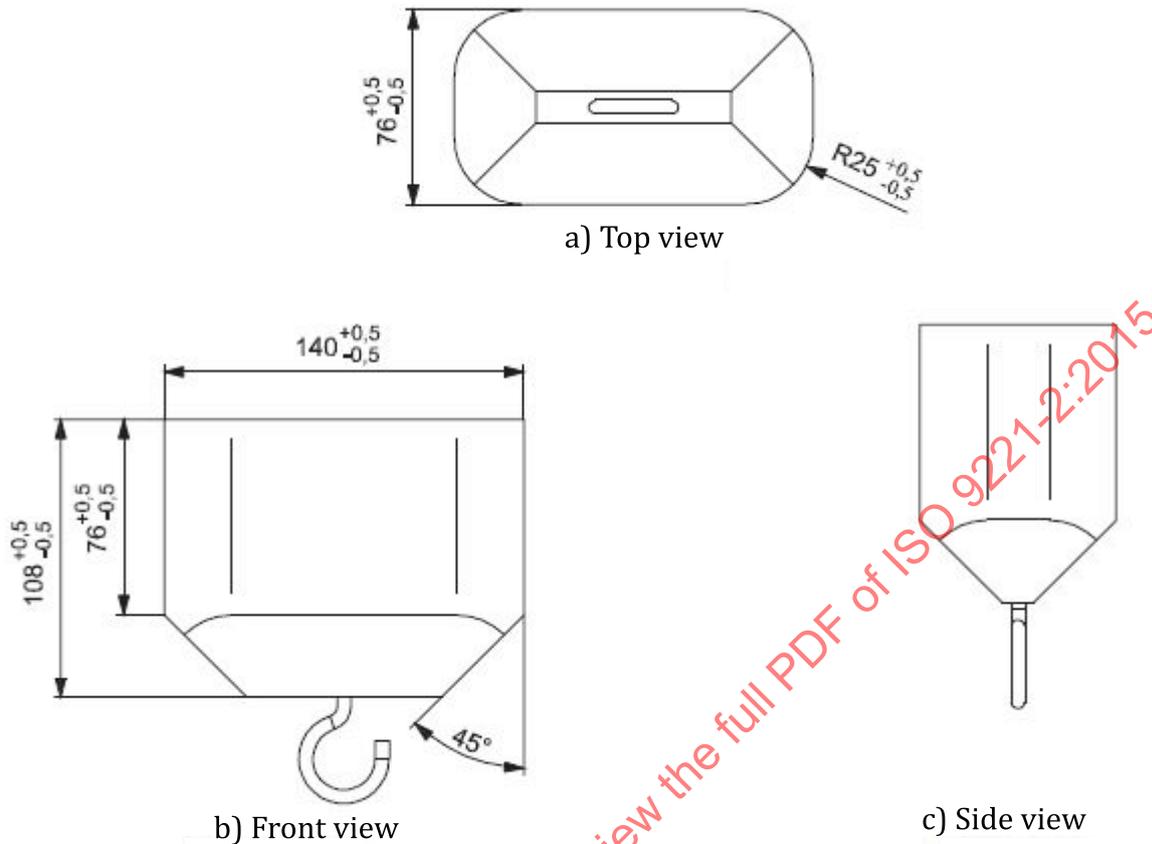


Figure 10 — Wedge block

## 6 Test procedures

### 6.1 General

Before beginning the tests, visually inspect the high chair thoroughly. Record defects so that they are not assumed to have been caused by the tests.

### 6.2 Impact test

The high chair shall be placed in the normal position of use on the floor surface (see 5.7) with the legs against stops (see 5.6) opposite to the direction of the force.

Adjust the impact hammer (see 5.3) to fall from a height of 116 mm. The hammer shall strike the structure at the impact point, when the arm of the impact hammer is vertical (see Figure 11).

The impact hammer shall strike, from the outside, the centre of the uppermost point of the back, the front, and both lateral protections.

If the high chair overturns during the test, it shall be allowed to fall freely on the floor surface (see 5.7).

Repeat the test on the backrest only from the inside of the high chair in the same manner as above.

The test shall be carried out for a total of 10 times at each point.

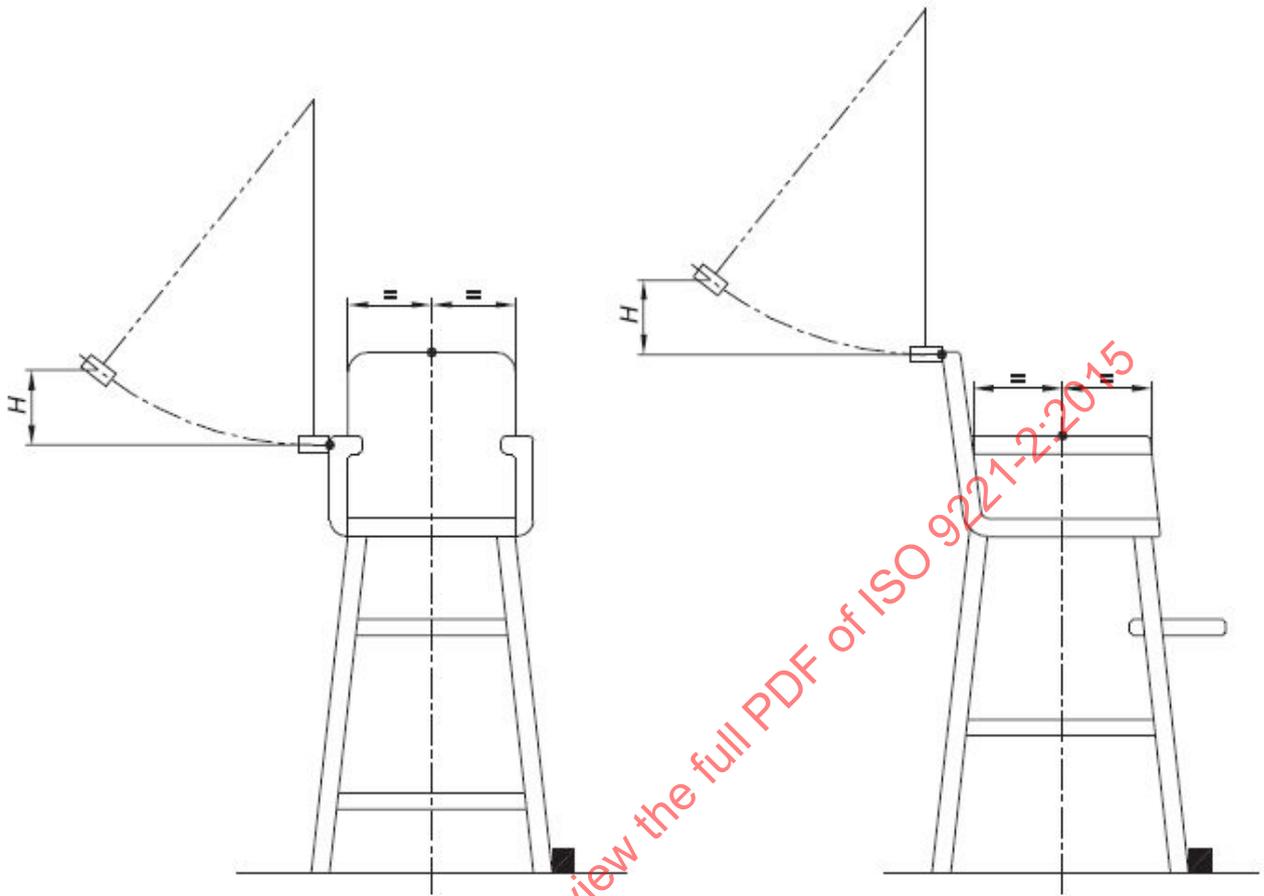


Figure 11 — Impact test

### 6.3 Durability of the locking mechanism

Operate any locking or attachment mechanism 300 times.

Before and after carrying out the test, measure the force required to operate the mechanism.

### 6.4 Strength of the locking mechanism

Place the high chair on the floor with the test dummy (see 5.2) in the centre of the seat.

Apply a force of 200 N at the point and in the direction considered most likely to fold the high chair.

If the high chair tends to tilt, secure it in a manner which does not prevent the folding.

Record whether the high chair collapses.

### 6.5 Small parts

Apply a tensile force to the component to be tested through a clamp or other suitable means. The force shall be

- 50 N, where the largest accessible dimension of the component is less than or equal to 6 mm, and
- 90 N, where the largest accessible dimension of the component is greater than 6 mm.

Apply the force gradually over 5 s and maintain for 10 s. If the component has become detached, check whether the component fits wholly within the cylinder (see 5.12).

## 6.6 Openings

### 6.6.1 Openings between moving parts

Check if the 5 mm slide gauge penetrates the gap with a force of no more than 30 N.

If the 5 mm slide gauge penetrates, check whether the 18 mm slide gauge (see 5.9) with an applied force of up to 5 N penetrates the gap.

### 6.6.2 Other openings

Check whether the 7 mm slide gauge with an applied force of up to 30 N enters 10 mm or more into any accessible opening in any possible direction. If the 7 mm slide gauge enters 10 mm or more, check if the 12 mm slide gauge enters 10 mm or more with an applied force of up to 5 N.

Check whether the opening/closing distance is always less than 5 mm. If greater than 5 mm, check whether the opening/closing distance is less than 12 mm under a force of 50 N.

Check whether the small torso probe (see 5.13) with an applied force of up to 30 N enters into any accessible opening located above the seat. The probe shall be inserted in a straight direction along the longitudinal axis of the probe.

## 6.7 Strength of harness/belt attachment points

With the seat of the high chair fixed rigidly in its upright position, gradually apply a force of 150 N within 5 s and maintain it for 1 min in the direction of normal use to each of the harness/belt attachment points, in turn.

## 6.8 Strength of components of the restraint system

Gradually apply a force of 150 N within 5 s to each component of the restraint system, in turn, and maintain it for 1 min in the direction most likely to cause failure.

## 6.9 Slippage of straps of the restraint system

Remove approximately 125 mm of the restraint system on both sides of the adjustment system from the product.

Fix one of the ends that was fixed to the high chair to a clamping device in such a way that the strap and the adjustment system hang freely.

The distance between the clamping device and the point at which the force is applied shall be approximately 200 mm. The adjustment system shall be approximately in the middle point between the clamping device and the point to which the force is applied.

Apply a force to the other end that was fixed to the high chair as described below.

The strap shall be under tension in the same way it is intended when the restraint system is in use.

Gradually apply a force of 10 N within 5 s to the strap and keep it for  $(10 \pm 1)$  s.

Remove the force.

Draw a line across the width of strap flush with the adjustment system. Other means of establishing the measurement are also accepted.

Gradually apply a force of 150 N within 5 s to the strap and keep it for  $(60 \pm 2)$  s.

Remove the force.

Draw a line across the width of the strap in the same manner as mentioned above (on the same side of the adjustment system).

Remove the strap from the adjustment system. Measure the distance between the centre of the two lines drawn flush with the adjustment system.

Record this distance as the slippage.

## 6.10 Backrest tests

### 6.10.1 Determination of backrest angle

Position the device for measuring the angle (see 5.14) on the centreline of the seat of the high chair as close to the backrest as possible and position the test dummy (see 5.2) centrally on the base board as shown in Figure 9. Ensure that the reclining board is resting firmly against the backrest.

Record the backrest angle as the angle between the reclining board and the horizontal.

### 6.10.2 Determination of backrest height

Position the device shown in Figure 8 on the centreline of the seat of the high chair as far toward the rear as possible and locate the test dummy centrally on the base board as shown in Figure 9. Measure the vertical distance between the top of the backrest and the surface of the seat, as shown in Figure 9.

Record the height of the backrest.

### 6.10.3 Determination of length of reclinable backrest

Position the device shown in Figure 8 on the centreline of the seat of the high chair as far toward the rear as possible and locate the test dummy centrally on the base board as shown in Figure 9. Ensure that the reclining board is resting firmly against the backrest. Measure the length of the back rest, as shown in Figure 9.

Record the length of the backrest.

### 6.10.4 Strength of reclinable backrest mechanism

Adjust the backrest to the middle of its adjustment range or, for backrests with only two possible positions, adjust the backrest in the most upright position. With the base of the high chair secured to the floor, apply through the loading pad (see 5.4) a rearward force of 100 N perpendicular to the centre of the backrest at a point 50 mm below its top edge for 1 h.

## 6.11 Seat vertical static load test

Position a mass of 40 kg, distributed over an area of 150 mm × 150 mm on the centre of the seat. Maintain the load for 1 min. Lift the high chair clear of the floor at the point of balance on the lateral protection. Maintain the high chair off the floor for 1 min. Remove the load.

## 6.12 Footrest vertical static load test

Position a mass of 20 kg, distributed over an area of 75 mm × 150 mm on the centre of the footrest. Maintain the load for 1 min. Remove the load.

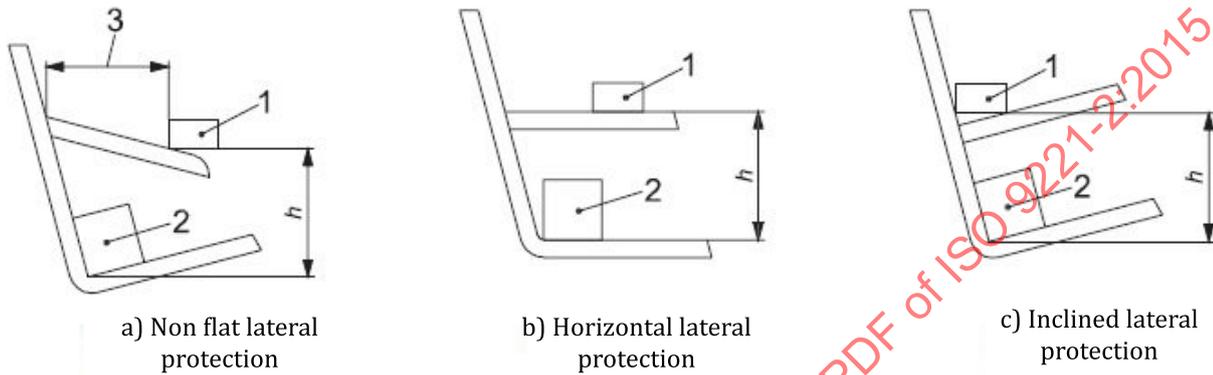
### 6.13 Lateral protection measurements

#### 6.13.1 Determination of lateral protection height

Position the test load (see 5.11) on the centreline of the seat with an edge in contact with the junction line.

Position the beam (see 5.8.2) across the lateral protections with the 86 mm side in a horizontal position.

Measure the minimum height of the lateral protections as the vertical distance between the under surface of the beam and the under surface of the test cylinder (see Figure 12).



**Key**

- 1 test beam (see 5.8.2)
- 2 test load
- 3 length of the lateral protection
- h* lateral protection height

**Figure 12 — Lateral protection height measurements**

#### 6.13.2 Determination of lateral protection length

This test method applies only to high chairs fitted with active restraint system.

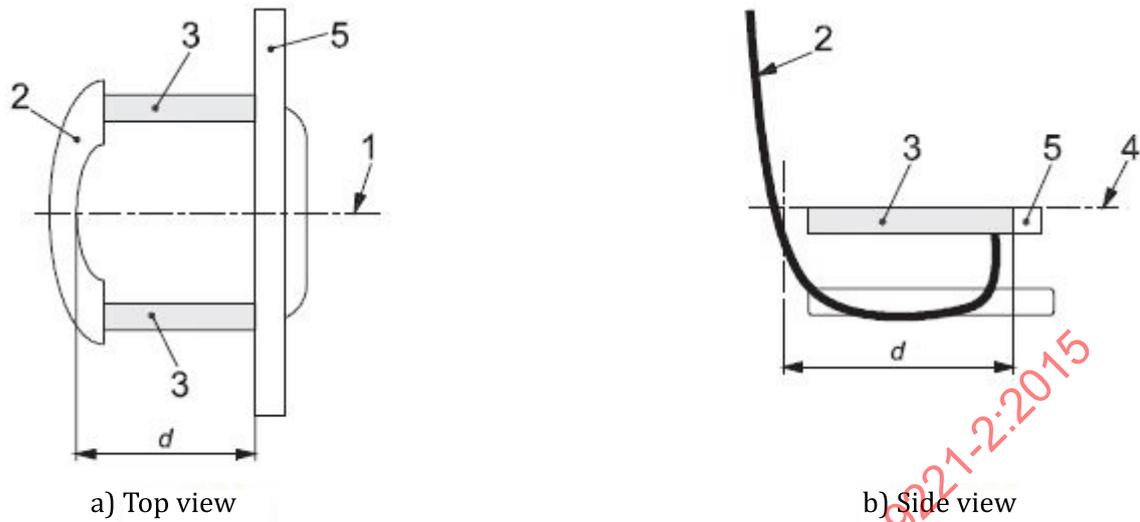
Position the beam (see 5.8.1) horizontally with one edge in contact with the front of the lateral protection.

In cases where the lateral protections do not have a constant height (see Figure 14), the test beam shall be placed at the point in which their height (measured according to 6.13.1) is at least 140 mm.

Check if the vertical projection of the edge of the beam in contact with the lateral protection falls outside the area between the crotch strap and the backrest.

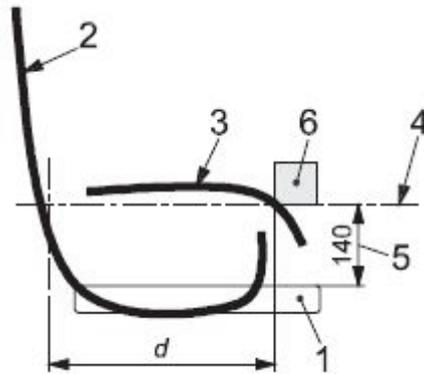
Measure the maximum horizontal distance from the centre of uncompressed backrest to the beam, parallel to the centreline of the seat (see Figure 13).

Record this distance as the length of the lateral protections.

**Key**

- 1 seat center line
- 2 backrest
- 3 lateral protection
- 4 horizontal line
- 5 test beam (see 5.8.1)
- $d$  length of lateral protection

**Figure 13 — Measurement of the length of lateral protection**



**Key**

- 1 seat
- 2 backrest
- 3 lateral protection
- 4 horizontal line
- 5 140 mm (see 6.13.1)
- 6 test beam (see 5.8.1)
- d* length of lateral protection

**Figure 14 — Measurement of the length of lateral protection in the case of non-horizontal lateral protection**

**6.14 Leg openings test**

**6.14.1 Wedge block test**

Restrain the high chair in such a way it cannot slide on the floor or tip over.

Position the wedge block (see 5.16) on the seat. Rotate it along its main axis to attain the most onerous position and place its tapered part against the leg opening, keeping its main axis perpendicular to the opening.

Gradually pull the wedge block by its hook with a force of 30 N from the outside of the high chair in a straight direction along the wedge block main axis.

**6.14.2 Gaps between leg openings**

Insert the leg probe (see 5.15) into one leg opening with its main axis perpendicular to the opening.

Move the probe along the leg opening perimeter, keeping it with its main axis perpendicular to the leg opening, to simulate the movement of the leg of a child seated in the high chair.

Check if the leg probe can pass freely from this leg opening to the other.

**6.15 Measurement of the distance between the backrest and the crotch restraint**

Adjust the backrest to the most upright position and the crotch restraint to the position furthest from the backrest.

Measure the horizontal distance between the front surface of the uncompressed backrest and the crotch restraint 50 mm above the lowest point on the uncompressed seating surface along the centreline of the seat.

### 6.16 Measurement of the distance between the backrest and the horizontal member

Position the test load (see 5.11) on the centre line of the seat and with an edge in contact with the junction line. Position an additional mass of  $(2,5 \pm 0,1)$  kg on the test load.

During the test, a force of 40 N shall be applied by the small loading pad(s) (see 5.5) to horizontal members and backrests made of flexible or upholstered material.

Measure the maximum horizontal distance along the centre line from the inner edge of the horizontal member to the backrest (see Figure 15).

Record this distance as the distance between the backrest and the horizontal member.



#### Key

- 1 seat centreline
- 2 backrest
- 3 horizontal member
- 4 horizontal line
- $d$  distance between the horizontal member and the backrest

Figure 15 — Measurement of the distance between the backrest and the horizontal member

### 6.17 Stability tests

#### 6.17.1 General

For the stability tests in 6.17.3 and 6.17.4, the beam (see 5.8.1) shall be attached to the high chair in a manner so that the weight of the beam is balanced, i.e. the beam and its fixings shall have no influence on the stability of the high chair. The beam shall be attached in such a way that, when the load is applied to it, it is horizontal.

#### 6.17.2 Positioning

Place the high chair on the floor surface (see 5.7).